CORPORATE RISK MANAGEMENT PRACTICES: EVIDENCE FROM CROATIAN AND SLOVENIAN COMPANIES

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DECLARATION

"I certify that this work has not been accepted in substance for any degree, and is not concurrently being submitted for any degree other than that of Doctor of Philosophy (Ph.D.) being studied at the University of Greenwich. I also declare that this work is the result of my own investigations except where otherwise identified by references and that I have not plagiarised another's work".

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ABSTRACT

In this thesis the rationales of corporate risk management, as well as the implementation of different risk management strategies and the use of risk management instruments in Croatian and Slovenian companies have been investigated. Based on arguments arising from the review of the literature, we have proposed several hypotheses. We have tested whether the decision to hedge or not, and the decision to hedge with derivatives made by Croatian and Slovenian non-financial companies, is a function of six factors – financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility maximisation and hedge substitutes. We have also tested the assumption that corporate risk management is more developed or has different rationales among Slovenian than among Croatian companies.

On the basis of our research results, it could be concluded that the explored hedging rationales have little predictive power in explaining corporate risk management decisions both in Croatian and Slovenian companies. The evidence based on univariate and multivariate empirical relations between the decision to hedge or use derivatives in Croatian companies and the predicted theories of hedging fails to provide support for any of the tested hypotheses but one - capital market imperfections and costly external financing.

The univariate analysis and multivariate regression conducted for Slovenian companies have revealed that there is no statistically significant explanatory variable for the decision to hedge; therefore we can conclude it is not dependent on any of the predicted theories of hedging. The decision to use derivatives, however, has been shown as dependent on the size of the company. The multivariate test has proven a positive relation between the use of derivatives and the size of Slovenian companies, which supports the informational and

transactional scale economies argument that larger firms will be more likely to use derivatives.

The analysis conducted to explore differences between risk management practices in Slovenian and Croatian companies has shown statistically significant evidence that Slovenian companies use all types of derivatives, especially structured derivatives, more intensively than Croatian companies. Additionally, Croatian companies use simple risk management instruments like natural hedging to a greater extent in comparison with Slovenian companies. These findings are consistent with our research prediction that Slovenian companies have more advanced risk management practices than Croatian companies.

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1. INTRODUCTION

1.1 Subject of research

According to Fisher and Hall (1969), risk is defined as the inability to predict the outcome of a future event with complete certainty. Entrepreneurs are viewed as making decisions under uncertainty on the basis of probabilistic expectations about future outcomes. If certainty is a situation where the entrepreneur's anticipation will be fulfilled, then uncertainty can be measured by the likelihood that the actual outcome will differ from the anticipated outcome.

There is a common agreement that risk management, like all other fields of business, is both an art and a science. As an art, risk management needs personnel with considerable background in many fields such as economics, law, mathematics and insurance, who are able to apply their knowledge to different risk situations. As a science, risk management should be based on the principles derived from a consistent body of knowledge, which would give more insight into the phenomenon of pure risks and guide risk managers' behaviour and decisions (Gahin, 1967).

Schmit and Roth (1990) have argued that risk management can be described as the performance of activities designed to minimise the negative impact of risk regarding possible losses. Because risk reduction is costly, minimising the negative impact will not necessarily eliminate risk. Rather, management must decide between alternative methods to balance risk and cost, and the alternative chosen will depend upon the organisation's risk characteristics. It might be helpful to arrive at agreement on just what the function of risk management is in a corporation. The most important function of risk management is transferring to someone else a risk that the company is unwilling or unable to assume itself. Sometimes, it also involves buying a service that another can perform for the company, better or cheaper than the company can itself (Smith, 1964).

The research subject of this thesis is corporate or financial risk management[1] practices in Croatian and Slovenian companies. The determinants of corporate hedging, together with the implementation of different risk management strategies and the use of risk management instruments, in Croatian and Slovenian companies are investigated. This evidence is important for evaluating the overall risk characteristics of firms that use different hedging instruments, which is of interest to bankers, investors, the monetary authorities, and to scholars as well. Our research aims to explore whether financial risk management, as one of the most important objectives of modern corporate strategy, is less developed or has different rationales in Slovenian and Croatian companies than among their western counterparts.

Financial or corporate risks - the risks to a corporation stemming from price fluctuations - are pervasive, and directly or indirectly influence the value of a company. A combination of greater deregulation, international competition, interest rates and foreign exchange rate volatility, together with commodity price discontinuities starting in the late 1960s, heightened corporate concerns, which have resulted in the increased importance of financial risk management in the decades that followed. Whether it is a multinational company and exchange rates, transportation companies and the price of fuel, or real estate companies and interest rates, how and to what extent such risks are managed now often plays a major role in the success or failure of a business. In this thesis we explore whether Croatian and Slovenian companies are aware of the price uncertainties and if they are, what kind of risk management strategies they undertake in order to protect their earnings and cash-flows from adverse fluctuations.

It should be noted that, before derivatives markets were truly developed, the means for dealing with corporate risks were few, and thus financial risks were largely outside managerial

[1] In this thesis, financial risk is equated with the corporate risk, and the analysis will include interest-rate risk, exchange-rate risk and commodity price risk.

control. Shareholders and stakeholders have accepted explanations that unfavourable and unforeseeable movements of prices which were not under the control of management resulted in poor financial results. Few exchange-traded derivatives existed, but they allowed corporate users to hedge only certain financial risks, in limited ways and over fairly short time horizons. The derivatives markets were very incomplete. Firms were often forced to resort to operational alternatives like establishing plants abroad to minimise exchange-rate risks, or to natural hedging by trying to match the currency structure of their assets and liabilities.

During the 1980s and 1990s, markets for derivative instruments such as forwards and futures, swaps and options, and innovative combinations of these basic financial instruments, have developed and grown at a breathtaking pace, and many corporations have become active participants in derivatives markets. It could be said that the derivatives revolution began. Since then, the range and quality of both exchange-traded and OTC derivatives, together with the depth of the market for such instruments, have expanded intensively (Allen and Santomero, 1998).

With the development of the derivatives market, active risk management has become an important part of modern corporate strategy, as can be seen from the fact that financial executives in companies all around the world have ranked risk management as one of their most important objectives. Moreover, Bartram (2000) has argued that efficient corporate risk management has become a leading competitive advantage in almost all industrial sectors. By engaging in risk management, corporate managers believe they affect the exposure that firms have to interest rates, exchange rates, and commodity prices, and investors seem to pay attention to these exposures.

Essentially, research studies on corporate risk management can be broadly categorised into three groups. The first group of papers comprises theoretical papers addressing the issue of the relevance or irrelevance of corporate risk management. Arguments in favour of the irrelevance of corporate risk management are based on the capital asset pricing model (Sharpe, 1964;

Lintner, 1965; Mossin, 1966) and the Modigliani-Miller theorem (Modigliani and Miller, 1958). On the other hand, imperfections in the capital market are used to argue for the relevance of corporate risk management practices. The second group of papers investigates the hedging effectiveness of various risk management instruments such as derivatives, diversification strategies, operational hedging etc. The last group of papers consists of empirical studies trying to determine what risk management practices are in use, and what factors influence a corporate decision to hedge. They have played a leading role in the advancement of economic knowledge and understanding of corporate risk management. This thesis belongs to the last group of papers, incorporating an extensive review of theoretical and empirical studies regarding the determinants, rationales and practices of corporate risk management published in the last few decades.

1.2 Research Goals, Aims and Objectives

In spite of the extensive body of literature on corporate risk management and the efforts that have been devoted to developing theoretical rationales for hedging, it seems fair to say that there is not yet a single accepted framework which can be used to guide hedging strategies, or widely accepted explanations for risk management as a corporate policy. There is no consensus as to which theory is the most important in explaining corporate risk management decisions. Rather than presenting additional evidence on the existence of financial market imperfections, this dissertation produces new empirical evidence on hedging rationales by exploring the risk management activity in Croatian and Slovenian companies, which should support the implications of the theory that it develops.

Corporate risk management is a propulsive field that has made significant progress, but it still has much room for further contributions. In this thesis we explore rationales as well as existing practices of corporate risk management. Hypotheses explaining corporate hedging decision are tested, and empirical evidence on the relative importance of these corporate motives is offered. Additionally, the implementation of different risk management strategies and the use of risk management instruments in Croatian and Slovenian companies are investigated.

Research hypotheses are tested on the biggest companies in the selected countries and a comparative analysis of research results is made. Two countries - Croatia and Slovenia - have been chosen for a comparative analysis. From 1918 these countries were part of Yugoslavia, firstly the Kingdom of Serbs, Croats and Slovenes, then the Socialist Federal Republic of Yugoslavia.[2] Therefore, for a long time they have followed similar economic and political patterns. After they declared their independence from the Republic of Yugoslavia in 1991, they started to develop their own economies.

Croatia is a larger country than Slovenia.[3] It has 4.5 million inhabitants and a total area of 56, 538 square kilometres, while Slovenia has 1.95 million inhabitants and a total area of 20, 526 square kilometres. Before the dissolution of Yugoslavia, Croatia was, after Slovenia, the most prosperous and industrialised republic with a per capita output about one-third above the Yugoslav average. Since the break-up of Yugoslavia and the Balkan Civil War that affected the country from 1991 to 1995, Croatia's economic performance has fallen short of its potential. The disruptions caused by the War and the lack of competitiveness of many export sectors led to a decline in traditional industries like base metals, textiles, wood and food

[2] Until the end of World War I, Slovenia and Croatia were part of the Austro-Hungarian Empire. When Austria-Hungary collapsed after the War, fear of an expansionist Italy inspired Croatian, Slovenian and Serbian leaders to form the new federation known as the Kingdom of Serbs, Croats and Slovenes. Regardless of ethnic hatred, language barriers and cultural and religious differences, the creation of Yugoslavia, which was re-established as the communist-ruled Federal Republic of Yugoslavia after World War II, fulfilled the dream of many South Slavs, who disregarded fundamental differences between the twelve million people of the new country. After a few decades of expressing increasing dissatisfaction with the federal system in general, especially during the 1970s and 1980s, Slovenia and Croatia declared their independence from the Republic of Yugoslavia on June 25, 1991.

industry. Only in the recent past has the economy begun to show the kind of performance its people and infrastructure should be able to deliver, with tourism[4], banking and public investment leading the way. The average growth rate in the period 2000-2005 was 4 per cent[5], but it is achieved through high fiscal and current account deficits. Overall, it could be concluded that Croatia's economy remains vulnerable to external shocks, in view of its reliance on the tourism sector, and also the weakness of its merchandise export sectors.[6] Progress in enterprise restructuring through the ending of the privatisation process, SME development and export promotion will therefore continue to be important in ensuring macroeconomic stability and balanced growth in the future.

One of Croatia's major problems remains the high unemployment, at about 14 per cent, with structural factors slowing its decline. The private sector has not grown fast enough to generate jobs for workers whose jobs continue to be eliminated through privatisation and restructuring. Another serious problem Croatia still faces is corruption – as reported by Transparency International, from the least to the most corrupt countries (1-145) in the year 2005, Croatia ranks as 67th country. Croatia's relationships with the EU and the United States have improved considerably in recent years – it has made good progress in accession to the World Trade Organisation and NATO, and initiating the processes required to join the European Union – which could be seen as good indicators for the future growth and prosperity of Croatia. The EU accession process should accelerate country's fiscal and structural reforms.

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[3] The following review is based on The Economist Intelligence Unit Limited publications – namely "Country Profile" for Croatia and Slovenia in the period 2000-2006 as well as "Croatia Review 2006" and "Slovenia Review 2006".

[4] Croatia's location on the Adriatic links the interior of eastern and southern Europe with the Mediterranean. The county possesses great tourist assets – the Adriatic coastline rich in historically significant sites.

[5] GDP growth rate varied from 2.9 per cent in the year 2000, to 5.2 per cent in the year 2002 and 3.7 per cent in 2005.

[6] The macroeconomic stabilisation programme conducted in the beginning of 1990s has resulted in low inflation rates and stable domestic currency, but the other side of this coin is currency's overvaluation on foreign exchange rates, which has reduced Croatia's export competitiveness.

In contrast to Croatia, which faced huge losses during the Balkan Civil Wars, Slovenia had only "the Ten Day War" and it managed to escape the intense violence that affected much of the rest of the former Yugoslavia. The largely homogeneous Slovenia was spared any significant involvement in ethnically based conflicts. It could be said that Slovenia has enjoyed a high degree of internal political stability during its short history of self-rule. Its economy has been remarkably steady, particularly for a very open system in transition, with considerable potential vulnerability to external shocks. A balanced level of trade, with exports and imports each exceeding 50 per cent of annual GDP on a regular basis, characterises Slovenia's small economy. With Slovenia's strong economy and low unemployment rates, as well as the establishment of stable democracy since independence, the country was regarded as one of the better prepared EU candidate countries.

By 2002, Slovenia distinguished itself as being one of Europe's least corrupt countries. It was ranked as the most corruption-free of the former communist states of Eastern Europe (27th place on the scale from 1 to 145 as reported by Transparency International). Also, Slovenia enjoys a strong Standard & Poor A rating for its long-term foreign currency debt obligations. This development was regarded as a favourable one in regard to EU accession. In March 2004 Slovenia was admitted into NATO, while in May 2004 it entered in the EU. Today, it is one of the best economic performers in central and eastern Europe, with a GDP per capita estimated at 13,534 US dollars in 2005. Slovenia has enjoyed healthy growth figures since 1997, averaging 4 per cent annual GDP growth. In contrast to Croatia, one of Slovenia's major assets is its well educated and productive work force. Privatisation of the economy proceeded at an accelerated pace in 2002-03, and the budget deficit dropped from 3 per cent of GDP in 2002 to 1.6 per cent in 2003.

Regarding the political disputes between the two neighbouring countries under analysis, since the break-up of the former Yugoslavia relations between Slovenia and Croatia have been strained by disagreements concerning their delineation of the maritime border in Piran Bay, which has been seen as a prominent issue in both countries' foreign policy and in public opinion. Regarding economic relations, Slovenia is among Croatia's major export and import partners, participating in 7.4 per cent of Croatia's import as well as 8.3 per cent of Croatia's export in the year 2005, whereas Croatia is only a major export partner to Slovenia but not a major import partner. Slovenia is more oriented towards trade with the EU members – roughly two-thirds of Slovenia's trade is with the EU – which makes Germany, Italy, France and Austria its major import partners.

It can be seen from the analysis presented above that, in spite of the same starting position after the dissolution of Yugoslavia, Slovenia has achieved much better results than Croatia during the last fifteen years. Therefore, besides other objectives, this research explores whether financial risk management, as one of the most important objectives of modern corporate strategy, is more developed or has different rationales among the Slovenian than among the Croatian companies. Empirical research is conducted on the biggest and the most successful companies due to the fact that these companies have access to derivatives markets and should have developed a risk management function. The majority of existing studies have been conducted on American or Western-European companies. The purpose and contribution of this research is in bringing new evidence and adding value to the prevailing knowledge and understanding of the rationales and practices of corporate risk management gained in the case of the south-eastern European countries.

1.3 Research Hypothesis

There are a considerable number of studies on corporate risk management practices. The financial literature on why firms manage risk at all is usually traced back to 1984. In that year, Stulz (1984) suggested a viable reason for objective function concavity, and his contribution is widely cited as a starting point of this burgeoning literature. A number of potential rationales for hedging have been developed by, amongst others, Smith and Stulz (1985), Stulz (1990; 1996), Breeden and Viswanathan (1990), Mayers and Smith (1990), DeMarzo and Duffie (1992), Nance, Smith and Smithson (1993), Froot, Scharfstein and Stein (1993; 1994), Dolde (1995), Tufano (1996; 1998), Mian (1996), Geczy, Minton and Schrand (1997), Minton and Schrand (1999), Haushalter (2000), Hoyt and Khang (2000), Allayannis and Weston (2001), Allayannis and Ofek (2001) and Haushalter, Randall and Lie (2002).

Studies that test the relevance of risk management for the firm generally support the expected relationships between risk and the firm's characteristics. Mayers and Smith (1990) have found that among firms owned by less diversified investors and among smaller firms there is a tendency to reduce their risk by hedging. Stulz (1984), Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993) have constructed models of corporate hedging. These models have predicted that firms attempt to reduce the risks they face if they have poorly diversified and risk-averse owners, face progressive taxes, suffer large costs from potential bankruptcy, or have funding needs for future investment projects in the face of strongly asymmetric information. In many instances, such risk reduction can be achieved by hedging.

Nance, Smith and Smithson (1993), as well as Dolde (1995), Getzy, Minton and Schrand (1997) and Haushalter (2000) have also found evidence that firms whose capital structures are highly leveraged hedge more. The probability of the firm encountering financial distress is directly related to the size of the firm's fixed claims relative to the value of its assets. Hence, hedging becomes more valuable the more a firm is indebted because financial distress can lead to bankruptcy and reorganisation or liquidation - situations in which the firm faces direct costs of financial distress.

Warner (1977) has found that these direct costs of financial distress are less than proportional to the firm's size, implying that small firms are more likely to hedge. Additionally, smaller firms are more likely to have taxable income in the progressive region of the tax schedule; again implying that small firms are more likely to hedge. In contrast to Warner's findings, Mian (1996), Getzy, Minton and Schrand (1997) and Hushalter (2000) have argued that larger firms were more likely to hedge. One of the key factors in the corporate risk management rationale pertains to the costs of engaging in risk-management activities. The cost of hedging includes the direct transaction costs and the agency costs of ensuring that managers transact appropriately.[7]

The assumption underlying this rationale is that there are substantial economies of scale or economically significant costs related to hedging (e.g. costs related to executing the transactions, hiring personnel with the required skills, acquiring relevant information and monitoring the hedge positions, etc.). Indeed, for many firms (particularly smaller firms), the marginal benefits of a hedging program may be exceeded by these marginal costs. These facts suggest there may be sizable set-up costs related to operating a corporate risk-management program. Thus, numerous firms may not hedge at all, even though they are exposed to financial risks, simply because it is not an economically worthwhile activity.

Therefore, only firms with sufficiently large risk exposures are likely to benefit from a formal hedging program. Organising the Treasury for risk management involves significant fixed costs. A survey conducted by Dolde (1995) found that more than 45 per cent of the

[7] Transaction costs of hedging include the costs of trading, as well as the substantial costs of information systems needed to provide the data necessary to decide on the appropriate hedging positions to take. For forwards, futures, options, and swaps, this cost consists of out-of-pocket costs such as brokerage fees in futures markets and the implicit cost of the bid-ask spread. These costs have fallen with the growth of the derivatives markets. Then, there are agency costs that such activities bring, which include the costs of the internal control systems to run the hedging program. These include the problems associated with the opportunities for speculation that participation in derivative and other markets allows. Scandals that have occurred in Metalgesellschaft, Barings Bank and other firms where large amounts of money were lost, are extreme examples of these agency costs. Due to these scandals, there is more oversight at the level of the corporate board, and companies have been devoting more resources to ensure that hedging programs are better controlled.

Fortune 500 firms surveyed used at least one full-time-equivalent professional for risk management, with almost 15 per cent using three or more full-time-equivalents. His survey data have also indicated that management's lack of familiarity with sophisticated financial instruments is a major impediment to the hedging decision. In addition to economies of scale in obtaining information on hedging techniques and instruments, there are also economies of scale in transaction costs associated with trading financial derivatives.

Nance, Smith and Smithson (1993) have examined the use of forwards, futures, swaps, and options on Fortune 500 firms using survey data. They have found that firms that hedged had larger investment tax credits, larger tax loss carry forwards and more of the range of pre-tax income in the convex region of the tax schedule. In addition, larger firms, firms with higher debt/equity ratios and less coverage of fixed claims, as well as firms with a wider range of investment projects available (measured by more growth options in their investment opportunity set) were more likely to hedge.

To conclude, the results of the empirical studies suggest that the use of derivatives and risk management practices are broadly consistent with the predictions from the theoretical literature, which is based upon value maximising behaviour. By hedging financial risks such as currency, interest rate and commodity risk, firms can decrease cash flow volatility. By reducing the volatility of cash flows, firms can decrease expected taxes, agency costs and costs of financial distress, thereby enhancing the present value of expected future cash flows. In addition, reducing cash flow volatility can improve the probability of having sufficient internal funds for planned investments, (e.g. see: Stulz, 1984; Smith and Stulz, 1985; Froot, Scharfstein and Stein, 1993) eliminating the need either to cut profitable projects or bear the transaction costs of obtaining external funding. However, this gain must be balanced against the management's potential to over-invest when using internal funds, which leads to avoidance of the external market scrutiny discipline.

It is important to note that firms must weigh benefits of cash flow volatility reduction against the costs, which can vary across firms and industries. For example, Minton and Schrand (1999) have argued that risk management costs are likely to be low for firms in oil and gas, mining, and agriculture industries where liquid and well-developed derivatives markets exist for a risk that represents a significant source of a firm's cash flow volatility. In contrast, hedging costs are likely to be higher for firms in which significant cash flow volatility results from factors that are relatively uncorrelated with interest rates, foreign exchange prices or commodity prices. In total, if the costs of using corporate risk management instruments, e.g. financial derivatives that include employee salaries, computers, training and facilities as well as transaction costs, are less than the benefits provided via the avenues mentioned above, or any other benefit perceived by the market, then risk management will be a shareholder-value enhancing activity (empirical evidence found by Allayannis and Weston, 2001).

Another line of reasoning that differs from the shareholders value maximisation hypothesis is generally attributed to the work of Stulz (1984) and it refers to the managerial utility maximisation hypothesis. He has argued that managers have limited ability to diversify their own personal wealth position, associated with the company stock holdings and the capitalisation of their career earnings. Therefore, they will have an incentive to hedge their own wealth associated with the employment position at the expense of the shareholders.

To avoid this problem, Stulz (1984) has suggested that a managerial compensation contract must be designed so that when managers increase the value of the firm they also increase their expected utility. Specifically, Smith and Stulz (1985) have discussed that the incorporation of option-like provisions in managers' compensation increases the incentives for managers to take risks. The expected utility of managerial wealth can be a convex function of the firm's expected profits when managers own unexercised options.

Consequently, the more option-like features there are in the compensation plans, the less managers will hedge. This theory is confirmed by Tufano (1996), who has found that firms whose managers have more wealth invested in the firm's stock manage more corporate risk, while managers who own more stock options have less incentives to hedge.

A very different managerial theory of hedging, based on asymmetric information, is put forward by Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992), who focus on managers' reputations. They have argued that managers may prefer to engage in risk management so as to better communicate their skills to the labour market. Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992) have argued that younger executives are more willing to embrace new concepts like risk management than are their older colleagues. Managerial tenure might play a similar role, because it is possible that short-tenure financial managers would have less developed reputations than longer-tenure managers. Therefore, they would have an incentive to signal their quality through hedging. To the extent that these assumptions are correct, firms with younger managers, and those whose managers have shorter tenures on the job would be more willing to manage risk.

Another theory connected to corporate risk management refers to alternative financial policies. It has been argued that, instead of managing risk through hedging, firms could pursue alternative activities that substitute for financial risk management strategies. Although they are not considered as a special kind of risk management strategy, it should be noted that the literature has argued that alternative financial policies, usually referred to as "hedge substitutes", can also reduce a firm's risk without requiring the firm to directly engage in risk management activities. Firms could adopt conservative financial policies such as maintaining low leverage, a low dividend pay-out ratio or carrying large cash balances to protect them against potential hardship (see: Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Structured debt, also referred to as hybrid debt, can be seen as another example of “hedge substitutes” (see e.g.: Nance, Smith and Smithson, 1993; Smith and Stulz, 1985). A firm that issues structured debt can achieve the identical market exposure by issuing debt and entering into a derivatives contract. In addition to the structured debt, the firm could control agency problems by using preferred stock rather than straight debt (see: Nance, Smith and Smithson, 1993; Smith and Stulz, 1985). So it could be concluded that the greater use of these substitute risk management activities should be associated with less financial risk management activities

1.3.1 Summary of Empirical Predictions

Based on the arguments that arise from the analysed papers presented in this thesis we propose several hypotheses. First we argue that hedging can increase the value of the firm by reducing the costs associated with financial distress, the agency costs of debt, expected taxes and capital market imperfections. These premises are known as the shareholder maximisation hypothesis and are tested in the first four assumptions.

1) The argument of reducing the transaction costs of financial distress implies that the benefits of hedging should be greater the larger the fraction of fixed claims in the firm’s capital structure and the smaller the firm. However, the informational and transactional scale economies argument implies that larger firms will be more likely to hedge; so the predicted impact of size is indeterminate. We believe that the argument is stronger in the case of the significant economies of scale in information and transaction costs of hedging. Therefore, we predict a positive relation between a company’s size and the decision to hedge, as well as a company’s leverage and the decision to hedge.

2) The argument of the agency cost of debt implies that the benefits of hedging should be greater the higher the firm’s leverage and asymmetric information problem.

3) The argument of capital market imperfections implies that the benefits of hedging should be greater the more growth options there are in the firm's investment opportunity set.

4) The tax hypothesis suggests that the benefits of hedging should be greater the higher the probability that the firm's pre-tax income is in the progressive region of the tax schedule and also the greater the value of the firm's tax loss carry-forwards, investment tax credits and other provisions of the tax code.

The next group of assumptions regards the managerial utility maximisation hypothesis. We argue as follows.

5) Managers with greater stock ownership would prefer more risk management, while those with greater option holdings would prefer less risk management. Additionally, firms with younger managers and those whose managers have shorter tenures on the job would be more inclined to manage risk.

We have also tested the hypothesis regarding the alternative financial policies that are considered substitutes for corporate hedging because they reduce expected taxes, transaction costs, or agency costs. We propose the following assumption.

6) The likelihood of the firm employing risk management instruments is lower the more convertible debt the firm issues, the more preferred stock the firm issues, the more liquid the firm's assets are, and the lower the firm's dividend payout is.

The last group of assumptions regards risk management practices in Croatia vs Slovenia. To test the hypothesis that financial risk management, as one of the most important objectives of modern corporate strategy, is more developed or has different rationales among Slovenian than among Croatian companies, we propose following research propositions.

7) The Slovenian companies have more advanced risk management practices in comparison with the Croatian companies, measured by the total number of companies that use derivative instruments to manage their risk exposures.

8) The Slovenian companies have more advanced risk management practices than the Croatian companies, measured by the implementation of the more sophisticated risk management strategies. To distinguish the less and more sophisticated risk management strategies, we took the use of different derivatives instruments with an emphasis on structured derivatives as an example of the more advanced risk management strategies, while instruments like natural hedge or international and business diversification we have classified as a less sophisticated risk management strategies.

1.4 Methodology

A considerable part of a material presented in the thesis is a result of an analysis or survey of existing literature. An extensive list of the prevailing theoretical and empirical literature regarding the determinants, rationales and practices of corporate risk management is presented in Chapter 2. Besides the survey of the literature, we have conducted empirical research and collect our own unique data set to test the research hypothesis.

At the beginning of our analysis, we have presented summary statistics for the proxy variables, which have given an insight into corporate characteristics of firms in the sample. Then, by using t-test, we have tested the differences between means for the two independent separate samples: hedgers and nonhedgers as well as users and nonusers of derivative instruments. T-test enables a calculation of statistically significant differences between small and mutually unrelated parametric samples. In other words, it points to those differences that are not random. Additionally, correlation analysis was conducted by calculating Pearson's correlation coefficient as a measure of linear correlation because variables in the model are of interval/ratio nature (Bryman and Cramer, 1997).

In our multivariate analysis, binominal logistic regression was estimated to distinguish between the possible explanations for the decision to hedge and use derivatives. We have chosen binomial (or binary) logistic regression because it is a form of regression that is used when the dependent variable is a dichotomy (limited, discrete and not continuous) and the independents are of any type (Hosmer and Lemeshow, 1989; Rice, 1994; Allison, 1999; Menard, 2002). Besides the fact that the dependent variable in our research is discrete and not continuous, we have chosen logistic regression because it enables the researcher to overcome many of the restrictive assumptions of OLS regression. Because multiple proxies are available to measure some characteristics of a firm, we have estimated separate logistic regressions, using all possible combinations of variables representing each predicted construct.

Among the other research methods that we have employed in this thesis, a comparative analysis was used in Chapter 6 as a dominant method in order to compare the results of empirical research conducted on the Croatian and Slovenian companies. Chapter 6 is a "classic" compare-and-contrast work (Walk, 1998) in which we have weighted results for both countries equally trying to find crucial differences as well as commonalities in financial risk management practices. The body of the chapter is organised in the point-by-point way, in which the points about Slovenia are presented with the comparable points about Croatia.

1.5 Outline of the Chapters

This thesis is divided into seven chapters. Chapter 1 is the introduction, where the research area and research subject are defined. Then, the goals of the doctoral thesis are determined, out of which the thesis objectives are derived. The goals and objectives outline are followed by the main thesis discussion and the methodology section. Finally, the outline of chapters is provided at the end of Chapter 1.

Chapter 2 presents a literature review that provides the historical and theoretical basis for this study covering the relevance of corporate risk management function and its influence on the company's value, together with the rationales for hedging. One of the most important implications of modern capital market theory is that diversified shareholders should care only about the systematic component of total risk. On the surface it would appear that this implies that managers of firms who are acting in the best interests of shareholders should be indifferent about hedging of risks that are unsystematic. However, it is apparent that managers are constantly engaged in hedging activities that are directed at the reduction of unsystematic risk. Two classes of explanations or determinants for management concern with hedging of non-systematic risk have appeared in the literature. The first class of explanations focuses on risk management as a means to maximise shareholder value, and the second focuses on risk management as a means to maximise managers' private utility. Chapter 2 presents and discusses the theories related to these arguments and their empirical implications.

Chapter 3 describes data sources and research methods used to undertake the survey. The relevance of the analysis conducted to the test research hypothesis is explained. In this chapter we provide a review of the methodology used in the most recent empirical studies conducted on the corporate risk management, as well as the methodology of our research. The methodology review is presented in a way that follows our research hypothesis. The variables used as proxies to test different hypotheses in the analysed papers are presented in section 3.2., which has helped us to create our own set of variables that we present in section 3.3. This is followed by section 3.4., where a review of the econometric and statistical analysis used in previous studies is presented in sub-section 3.4.1., which again was a base for econometric analysis conducted in our thesis presented in sub-section 3.4.2. Finally, data description and the process of collecting research data are explained in section 3.5.

The empirical results are presented and discussed in Chapters 4, 5 and 6. Chapter 4 presents research results on risk management rationales and practices in Croatian companies, while Chapter 5 presents results for Slovenian companies. In sections 4.2. and 5.2. summary statistics of companies' different characteristics in the Croatian and Slovenian samples are presented. Here we provide a detailed description of corporate risk management practices, such as usage of different risk management instruments, motives for usage and non-usage, exposures and types of financial risk hedged by the analysed Croatian and Slovenian non-financial companies. In sections 4.3. and 5.3. results of univariate analysis have been presented. The analysis has been conducted for two different groups. In the first group, we have explored differences between sub-samples of hedgers and nonhedgers, while in the second group we have investigated differences between companies that are derivative users and those companies that do not use derivatives. In both cases, we have employed the Pearson test of correlation and t-test to determine if the means of two unrelated samples differ.

In sections 4.4. and 5.4. we present the results of multivariate analysis for the Croatian and Slovenian companies. We have employed logistic regression where we tested the hypothesis that the decision to hedge, as well as the decision to hedge with derivatives, is a function of the six factors - financial distress costs, agency costs, capital market imperfections, taxes, managerial utility, and hedge substitutes. Chapter 6 presents a comparative analysis of results for both countries where we explore whether financial risk management, as one of the most important objectives of modern corporate strategy, is more developed or has different rationales among Slovenian than among Croatian companies.

A final chapter concludes the dissertation, summarising the findings and contributions of the dissertation, evaluation some of the limitations of the study and introducing avenues for further research.

2. LITERATURE REVIEW

2.1 Corporate Risk Management Practices

2.1.1 The Relevance of Corporate Risk Management Function and its Influence on the Company's Value

In this sub-section, we present the relevance of our research subject and its influence on the company's value, as corporate risk management function was for a long time considered to be irrelevant from the shareholders' value maximisation view. It has been only two decades since both scholars and practitioners have realised that managing corporate risk lies at the heart of a competitive corporate strategy, and that the management of corporate risk is central to organisational evolution.

In a classical decision theory, risk is devised as reflecting the variation in the distribution of possible outcomes, their likelihoods, and their subjective values. Risk is measured either by nonlinearities in the revealed utility for money or by the variance of the probability distribution of possible gains and losses associated with a particular alternative (Pratt, 1964; Arrow, 1965). In the latter formulation, a risky alternative is one for which the variance is large and risk is one of the attributes that, along with the expected value of the alternative, are used in evaluating alternative gambles. It should be emphasised that the idea of risk is embedded in the larger idea of choice as affected by the expected return of an alternative (Lindley, 1971).

Virtually all theories of choice assume that decision makers prefer larger expected returns to smaller ones, provided all other factors (e.g. risk) are constant. In general, they also assume that decision makers prefer smaller risks to larger ones, provided other factors (e.g. expected value) are constant (Arrow, 1965). Thus, expected value is assumed to be positively associated, and risk is assumed to be negatively associated, with the attractiveness of an alternative. If the risk of an investment is high, it is expected that the return on that investment will also be high, or else a lower risk investment would have been sought (Oviatt and Bauerschmidt, 1991).

Finding a satisfactory empirical definition within this theoretical framework has proven difficult. Simple measures of mean and variance have led to empirical observations that can be interpreted as being off the mean-variance frontier. This has led to efforts to develop modified conceptions of risk, particularly in studies of financial markets. Early criticism of variance definitions of risk (Markowitz, 1952), as confounding downside risk with upside opportunities, has contributed to a number of efforts to develop models based on the semivariance (Fishburn, 1977). Both variance and semivariance ideas of risk, however, have been shown to be inconsistent except under rather narrow conditions (Levy and Markowitz, 1979) and these results have stimulated scholars to estimate risk and risk preference from observed prices.

This procedure is essentially the approach of the majority of the contemporary literature on risk financial markets. One example is the capital asset pricing model (CAPM) that has become one standard approach to financial analysis (Sharpe, 1964; Lintner, 1965; Mossin, 1966). It defines the degree to which a given portfolio co-varies with the market portfolio as the systematic risk. The residual (in a regression sense) is defined as nonsystematic or specific risk (March and Shapira, 1987). The model, which is commonly used to assess the risk-adjusted return on a particular stock, separates risk into two components: (1) systematic risk, which captures the variation in a stock's return ascribable to market-wide forces and (2) business, or unsystematic, risk, which reflects the variation in a stock's return ascribable to firm-specific forces.

Empirical tests by financial economists relying on the Capital Asset Pricing Model and using stock market data have confirmed that the relationship between return and systematic risk – the undiversifiable risk that an individual security has in common with the overall economy – is positive (Copeland and Weston, 1988). According to the CAPM, since investors can diversify away business risk, they only worry about the market risk of a stock, which is called its beta. Thus, under the assumptions of the CAPM, corporate managers should not be concerned with reducing their firm-specific business risk since it should have no effect on their firms' stock returns. There is no reason for the corporation to hedge on behalf of the investor. Or, put somewhat differently, hedging transactions at the corporate level sometimes lose money and sometimes make money, but on average they break even.

The conclusion is that companies cannot systematically make money by hedging. Unlike individual risk management, corporate risk management does not hurt, but it also does not help (Froot, Scharfstein and Stein, 1994). From this perspective, the expected net present value of business risk management on the efficient capital market should be zero. Hence, a decision of a financial manager to insure or hedge the company's future cash flows would be just "neutral mutations" which do not influence the company's value, while in the worst case, a decision to manage risk would be irrational behaviour because it incurs certain costs which lower the shareholders' wealth (Shapiro and Titman, 1998). It could be concluded that business risk management is unnecessary from the perspective of the CAPM.

Miller and Modigliani's "M&M" proposition supports these findings (Modigliani and Miller, 1958). According to the classic Modigliani and Miller paradigm, risk management is irrelevant to the firm and, under certain conditions, the corporate capital structure decision is irrelevant. The key insight of Franco Modigliani and Merton Miller is that value is created on the left-hand side of the balance sheet when companies make good investments that ultimately increase operating cash flows. How companies finance those investments on the right-hand side of a balance sheet - whether through debt, equity or retained earnings - is completely irrelevant. These decisions about financial policy can affect only how the value created by a company’s real investments is divided among its investors. In an efficient capital market, they cannot affect the overall value of those investments (Froot, Scharfstein and Stein, 1994).

In the "frictionless" M&M framework, management cannot increase a firm's value by changing either capital structure or hedging policy. These are purely financial transactions that do not affect the value of a company’s operating assets. Investors can adjust their own holdings of debt and equity to create whatever capital structure they desire, just as they can do their own hedging against financial risks. The stockholders of an airline, for example, can diversify their holdings into oil companies, hedging themselves against the risk of oil price increases. If the airline's management faces hedging costs in excess of stockholders' diversification costs, the firm should not hedge against oil price increases (Culp, 1994). Because investors effectively lever (or unlever) the companies in their portfolios through their own borrowing and lending decisions, an individual company's debt-to-equity ratio, and the kinds of securities it chooses to issue, should not affect its value. The conditions underlying the M&M propositions also imply that decisions to hedge corporate exposures to interest rates, exchange rates and commodity prices are equally irrelevant – because stockholders already protect themselves against such risks by holding well-diversified portfolios. Indeed, once the transaction costs associated with hedging instruments are factored in, a Modigliani-Miller disciple would argue against risk management at all.

The M&M propositions were intended to hold only under a restrictive set of conditions, the most important of which are that there are no costs associated with bankruptcy or financial distress, no taxes or transactions costs, that corporate investment decisions are not influenced by financing choices, including decisions to hedge various price risks, that reliable information about the firm's future earnings prospects is costlessly available to all investors and managers alike, and that individuals and firms have equal access to all security markets, including the ability to issue identical securities on the same terms (Culp, 1994). It should be noted that, thirty years after the M&M propositions were created, even Merton Miller (Miller, 1988) has written that the view that capital structure is literally irrelevant to corporate finance is far from what Modigliani and Miller ever actually said about the real-world applications of their theoretical propositions.

Despite the fact that, in the basic M&M world, hedging does not alter a firm's value, markets where derivatives are traded are dominated by corporations and institutions, not by individuals trading for their personal accounts. In the real world, financial managers and treasurers give a great deal of thought to matters of capital structure and securities design. Bettis (1981) has suggested that managing corporate risk lies at the heart of a competitive strategy, which could be seen from the widespread and growing use of derivatives in hedging interest rate, currency and commodity price risks.

The positive import of the M&M framework, and its main message to corporate practitioners, is presented by several theories suggesting that hedging is a value-increasing strategy for the firm. Research in the 1980s and 1990s has extended the knowledge on risk management by examining the unique characteristics of large, widely held corporations. Based on work by Mayers and Smith (1982) in the area of the corporate demand for insurance, scholars such as Stulz (1984), Smith and Stulz (1985) and Shapiro and Titman (1998) have examined why large, well-diversified firms actively engage in hedging activities. These authors argued that the earlier theories are applicable to individuals and small, closely held firms but could not be used as a theoretical rationale for hedging by large corporations.

The authors demonstrated several theories of hedging which overcome the irrelevancy arguments of modern portfolio and corporate finance theory.

Most of these theories rely on the introduction of frictions into the M&M model and argue that market imperfections enable firms to add value through hedges that cannot be exactly duplicated by individual investors. That is, if corporate financing and hedging decisions are capable of increasing firm values, they can do so only for reasons such as the following: they reduce the probability or costs of financial distress, they reduce taxes or transactions costs, they reduce the costs associated with information “asymmetries” by signalling management's view of the company's prospects to investors, or they reduce “agency” problems (conflicts of interest among management, shareholders, and creditors), including distortions of management's incentives to undertake all value-adding investments (Bartram, 2000).

Hedging refers to activities undertaken by the company in order to mitigate the impact of uncertainties stemming from price fluctuations on the value of the firm. Modern financial theory defines the market value of a firm as the sum of the expected discounted future cash flows. Thus, a reduction in corporate risk may affect the market value of a firm through either future cash flows or through the weighted average cost of capital that presents the discount rate in the model.

$$V_c = \sum_{t=0}^{T} CF_t \frac{1}{(1+wacc)^t} \tag{1}$$

V_c - present value of the company

CF_t - future cash flows in period t

$wacc$ - weighted average cost of company’s capital (discount rate)

t - 0,1,2,3,….,T (analysed period)

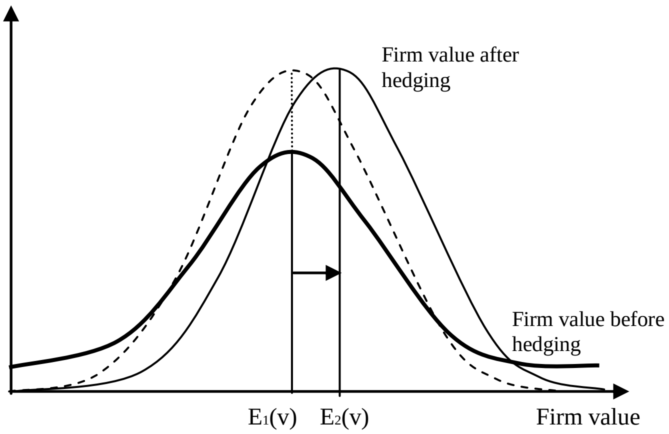
By hedging financial risks such as currency, interest rate and commodity risk, firms can decrease cash flow volatility, which leads to a lower variance of a firm value. This means that not only is a firm's value moving less, but the probability of occurring low values is smaller than without hedging (Bartram, 2000). Positive theories of risk management, as a lever for shareholder value creation, argue that a firm's value is a concave objective function because of capital market imperfections. By reducing the volatility of cash flows, firms can decrease expected taxes, agency costs and costs of financial distress, thereby enhancing the present value of expected future cash flows. In addition, reducing cash flow volatility can improve the probability of having sufficient internal funds for planned investments eliminating the need either to cut profitable projects or bear the transaction costs of obtaining external funding.

A very important motive for corporate risk reduction derives from the effect of uncertainty about the firm's operations on its cash flows. In stable environments, corporations' operations should be efficient and the volatility of their earnings should be low. Conversely, in unstable environments, firms' operations might be less efficient and their earnings more volatile. Production planning provides a simple example. In a stable environment with little uncertainty about the demand for firms' products, they can efficiently manage production scheduling, finished-goods inventory management and the timing and amounts of supplies of raw materials and labour. Firms can thus realise numerous cost savings. In such a setting, it is in the interest of shareholders to reduce corporate risk (Amihud, Dodd and Weinstein, 1986; Aron, 1988; Marshall, Yawitz and Greenberg, 1984).

This class of arguments suggests in effect that low corporate risk allows firms to acquire inputs cheaply or to operate efficiently. In industries that are less than perfectly competitive, reduced corporate risk will enhance a firm's market value. Thus, according to this motive for corporate risk reduction**,** a negative relation should exist between cash flows and corporate risk. This risk reduction motive is called the cash-flow motive. The results of Amit and

Wernerfelt's study (1990) support the thesis that lowering corporate risk is valuable because, ceteris paribus, it allows firms to increase cash flows. Results suggest that low corporate risk allows firms to acquire factors of production at lower costs, to operate more efficiently, or both. Consequently, a reduced cash flow volatility results in lower costs associated with the capital market imperfections, larger cash flows to the owners of the firm, and thus higher expected firm value (see graph 2.1.). In general, a concave corporate objective function is a necessary condition for risk management at the firm level to create value (Bartram, 2000).

Graph 2.1. The Effect of Hedging on Firm Value



Source: Bartram, 2000

However, the results of implementing risk management instruments, especially derivatives use, on the shareholder value are still an open question. With the popular press spotlighting the misuse and abuse of derivatives, many firms still worry that the use of derivative products may result in negative price effects and reduction of the company's value. The following analysis aims to present results of studies that address this issue and offer a reduction of companies' concern.

Allayannis and Weston (2001) examined the use of foreign currency derivatives in a sample of 720 large US non-financial firms between 1990 and 1995, and its potential impact on the firm's value. They assumed that firms which hedge their exposures to exchange rate risk by using foreign currency derivatives are likely to be rewarded by investors with higher valuation in the marketplace, as hedging may substantially mitigate underinvestment. They found a positive relation between firm value and the use of FCDs. On average, firms that face currency risk and use currency derivatives have 4.87 per cent higher value than firms that do not use currency derivatives. Additionally, they performed further tests to examine whether hedging causes an increase in firm value. They found evidence that firms that begin a hedging policy experience an increase in value above those firms that choose to remain unhedged. Also, firms that cease hedging experience a decrease in value relative to those firms that choose to remain hedged. These results are consistent with theories that suggest the decision to hedge is value-increasing. While their results suggest that the use of FCDs increases firm value, Allayannis and Weston (2001) have argued that other types of derivatives use, such as interest rate or commodity, may also be beneficial for a firm.

Another study that has addressed the question of whether there is a direct relation between hedging and a firm's value is Tufano (1998). In his paper he has studied North American gold mining firms, and their exposures to fluctuations in gold prices. Almost certainly, the value of gold mines changes with the price of gold. Tufano measured the size of these exposures, analytically established their determinants and empirically tested how observed exposures correspond to analytically predicted exposures. He has shown how exposures are determined jointly by market characteristics such as the price of gold, firm characteristics such as the firm's cost structure, and the financial policies of the firm such as its leverage choices and risk management policy. As predicted, gold exposures are negatively related to the level of the gold price, the volatility of gold prices, the degree to which the firm has activities outside mining, and the amount of hedging done by the firm. Also, as predicted by theory, the amount of exposure is positively related to the amount of financial leverage held by the firm. Finally, exposures seem larger for larger firms, where firm size is measured by current production, reserves, or market value, although part of this result might be attributable to the slower speed at which the prices of smaller firms seem to adjust to new information. The study has shown that capital markets take firm-specific and market-specific factors into account when determining exposures of firms and incorporate information on hedging activities into their valuation of the firms. From Tufano's (1998) results it is obvious that risk management plays an important role in changing the risk exposures of gold mining firms, and that the stock market recognises it.

Cho (1988) has explored the relationship between a firm's value and risk management activities using Gordon's Constant Dividend Growth Model. In the framework of the infinite growth model, the value of a firm depends upon after-tax expected earnings, cost of capital, the earnings growth rate, and the dividend payout ratio. Cost of capital is evaluated after considering fluctuations of cash flows. Firm value is determined by discounting appropriate cash flows at cost of capital in excess of the earnings growth rate. Optimum levels of loss control with and without risk management activities have been examined, and relevant elements affecting loss control have been identified. With the assumption that risk management activities affect the firm's cost of capital, Cho (1988) has shown that under certain conditions, risk management activities lower the cost of capital, thus raising the present value of the firm to investors. This result suggests that the investors place positive value on the risk management process.

2.1.2 Complete versus Selective Hedging

The risk management process involves the determination of what risks a corporation faces. It is useful to break down the risks inherent in financial assets into three subgroups;

risks that can be eliminated or avoided by business practices, risks that can be transferred to other participants, and risks that must be actively managed at the firm level. This will allow companies both to consider which risks belong to each group and how to deal with each type of risk.

When a company has classified the different types of risk to which it is exposed, the job of a risk manager is to decide how he will protect a company from those risks. A risk manager will attain maximum risk management effectiveness by applying common sense, knowledge of his own company and its financial ramifications, and knowledge of managing risks in more or less equal parts. Once a financial manager has assessed all of the risks to which a company may be exposed, he must separate them into two piles - those he is unwilling or unable to retain, and those he feels the company can deal with. Each risk must be assessed in light of its price and the impact on either the company's profit and loss or its balance sheet (Smith, 1964).

Few scholars have explored how managers conceptualise risk. Mao's (1970) interviews with executives have indicated that managers characterise risk as failure to meet some target rate of return, rather than variance. MacCrimmon and Wehrung (1986) identified the magnitude of the loss, the chance of loss and the exposure to loss as the essence of risk. March and Shapira (1987) have reported that when managers were asked whether they viewed risk in terms of a distribution of all possible outcomes, or just the negative ones, or just the positive ones, 80 per cent indicated they considered only the negative outcomes. On the basis of this result, March and Shapira (1987) have concluded that there is a persistent tension between "risk" as a measure (e.g. variance) on the distribution of possible outcomes, and "risk" as a danger or hazard.

Firms invest in financial and real options to reduce downside risk while maintaining upside potential (see: Bowman and Hurry, 1993; Kogut, 1991). The use of risk variance measures in empirical strategy research conflicts with the understanding of risk as performance below expectations found in much of the strategy literature. The behavioural decision theory, finance, and management studies provide a strong basis for shifting strategy researchers' attention from variance measures of risk to downside measures (Miller and Reuer, 1996).

Selective hedging emerges from the acceptance of the downside risk reduction while maintaining upside potential, instead of complete risk reduction and acceptance of the variance minimisation model. The fundamental objective of corporate risk management function can be seen from a perspective of a well-out-of-the-money put option that limits the corporate loss, while the opportunity for realising potential gains is left open (Stulz, 1996). In other words, the purpose of selective hedging is not risk avoidance, in the strict sense, but avoidance of loss. When hedging is done selectively, the advantage of hedging to the individual firm may often be measured approximately by the amount of loss avoided directly by the hedging. Selective hedging almost inevitably yields large advantages to a corporation that is able to anticipate price changes reasonably well (Working, 1962).

The choice of a risk management strategy depends to a great extent on the information available to the financial manager regarding the future expectations of commodity price, interest rates and exchange rate movements. Efficient risk management does not imply minimisation of all risks that a corporation is exposed to by forming a perfect hedge. It implies the choice of a strategy that will allow a company to protect its cash flow from severe outcomes, while leaving a possibility to realise extra earnings though financial price changes that has a positive impact on the company's cash flows. Companies that have a competitive advantage in collecting information and which leave a certain risky position open could increase their value due to a strategy of selective risk management.

2.1.3 Measures of Exposure to Corporate Risks

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Exposure refers to the extent to which external environmental contingencies affect a company's performance (Miller, 1998). There are several ways companies can measure their risk exposure. Many financial institutions quantify the probability of lower-tail outcomes by using a very popular and well known-measure called Value at Risk (VaR) (e.g. see: Dowd, 1999; 2000). The biggest advantage of VaR is its ability to compress the expected distribution of bad outcomes into a single number. Regardless of its advantages, VaR is not an adequate measure in the case of non-financial companies and cannot be used as an effective tool for corporate risk management. VaR is a measure calculated for a short period and it tells the maximum extent of a company's losses in 95 cases out of 100 (VaR evaluated at the 5 per cent level of significance) in a given day, or in a given month. VaR does not give useful information when management's concern is whether firm value will fall below some critical value over an extended period of time.

An alternative to VaR is future cash flow simulation in order to estimate the default probabilities of a company. The most practical approach to assessing a company's probability of financial distress is to conduct a sensitivity analysis on the expected distribution of cash flows. Using Monte Carlo simulations, a company's cash flows can be projected over a ten-year horizon in a way that reflects the combined effect of, as well as interaction between, all the firm's major risk exposures on its default probability. To do this properly, the financial manager must specify a range of likely future economic scenarios and how the firm's cash flows will be affected by these developments. The probability of distress over the period would be measured by the fraction of simulated distributions that falls below a certain threshold level of cumulated cash flow. Such a technique could also be used to estimate the expected effect of various hedging strategies on the probability of distress.

One of the advantages of using simulation techniques in this context is their ability to incorporate any special properties of the cash flow that are not normal. The VaR approach assumes that the gains and losses from risky positions are not dependent. This assumption is not likely to be real when it is applied to operational cash flows of a non-financial company. There is a high probability that the poor cash realised flow today will negatively affect cash flow tomorrow. Simulation techniques have an ability to anticipate and build the interdependence of cash flows in the probability analysis that a company will face financial distress (Stulz, 1996).

2.1.4 Corporate Risk Management Strategies

Corporate risk management can be conducted in two rather distinct ways. Either the firm can engage in activities which together result in less volatility than they would exhibit individually, or the firm can engage in financial transactions that will have a similar effect. The first approach is to embark upon a diversification strategy in the portfolio of businesses operated by the firm. A second strategy of conducting corporate risk management is the firm's engagement in financial transactions. In the place of diversification strategy, firms, concerned about the volatility of earnings, have turned to the financial markets. This is because the financial markets have developed more direct approaches to risk management that transcend the need to directly invest in activities that reduce volatility. The task of managing corporate risks has been facilitated by the increasing availability of a variety of instruments to transfer financial price risks to other parties. This dissertation explores which corporate management strategies are employed in the analysed Croatian and Slovenian companies and it gives the evaluation of their importance.

2.1.4.1 Diversification Strategy

This is a strategy that is sometimes promoted in the management literature. Corporate diversification is often justified on the grounds that it reduces risk, or volatility in rates of return, by reducing a firm's exposure to the cyclicality of any single industry. The theoretical rationale for this concept is borrowed from the modern portfolio theory (Markowitz, 1952). However, diversification based upon conglomerate activity, while once a popular strategy, has fallen out of favour. During the 1950s and 1960s many corporations undertook massive diversification programs. In a few decades the trend has reversed, with a study by Comment and Jarrell (1995) documenting and confirming a return to specialisation. This push toward focus apparently resulted from the view that unrelated diversification actually decreases firm value. Theoretical arguments suggest that diversification has both value-enhancing and value-reducing effects. Consistent with observed trends in diversification activity, theoretical arguments developed during the late 1960s and early 1970s have generally addressed the benefits of diversification, whereas more recent papers have addressed the costs.

The potential benefits of operating different lines of business within one firm include greater operating efficiency, less incentive to forego positive net present value projects, greater debt capacity and lower taxes. It was argued that, because multidivisional firms create a level of management concerned with coordination of specialised divisions, they are more efficient and thus more profitable than their lines of business would be separately. Weston (1970) has stated that resource allocation is more efficient in internal than in external capital markets. He therefore has contended that diversified firms allocate resources more efficiently because they create a larger internal capital market. Stulz (1990) has argued that diversified firms, by creating a larger internal capital market, reduce the underinvestment problem (Myers, 1977). These internal capital market arguments predict that diversified companies make more positive net present value investments than their segments would make as separate firms.

Another potential benefit of diversification arises from combining businesses with imperfectly correlated earnings streams, which results in the greater debt capacity of diversified firms in comparison with single-line businesses of a similar size (Lewellen, 1971). One way in which increased debt capacity creates value is by increasing interest tax shields. Thus, diversified firms are predicted to have higher leverage and lower tax payments than their businesses would show if operated separately. A further tax advantage arises from the tax code's asymmetric treatment of gains and losses. Majd and Myers (1987) have argued that undiversified firms are at a significant tax disadvantage because tax is paid to the government when income is positive, but the government does not pay the firm when income is negative. This disadvantage is reduced, but not eliminated, by the tax code's carry-back and carry-forward provisions. The Majd and Myers (1987) analysis has predicted that, as long as one or more segments of a conglomerate experience losses in some years, a conglomerate pays less taxes than its segments would pay separately.

Apart from benefits that have been presented, diversification can create various costs. The potential costs of diversification include the use of increased resources to undertake value-decreasing investments, cross-subsidies that allow poor segments to drain resources from the better-performing segments, and misalignment of incentives between central and divisional managers. Stulz (1990) has argued that diversified firms will invest too much in lines of business with poor investment opportunities. Jensen's (1986; 1988) assertion that managers of firms with unused borrowing power and large free cash flows are more likely to undertake value-decreasing investments has a similar implication. To the extent that lines of business have an access to more free cash flows as part of a diversified firm than on their own, he has predicted that diversified firms invest more in negative net present value projects than their segments would if operated independently.

Meyer, Milgrom and Roberts (1992) have made a related argument regarding the cross-subsidisation of failing business segments. Since a failing business cannot have a value below zero if operated on its own, but can have a negative value if it is a part of a conglomerate that provides cross-subsidies, they have predicted that unprofitable lines of business create greater value losses in conglomerates than they would as independent firms. Finally, Myerson (1982) and Harris, Kriebel and Raviv (1982) have discussed the information asymmetry costs that arise between central management and divisional managers in decentralised firms. These costs are higher in conglomerates than in focused firms to the extent that information is more dispersed within the firm, leading to the prediction that diversified firms are less profitable than their lines of business would be separately.

It could be said that there are no clear conclusions about the overall value effect of diversification. Berger and Ofek (1995) have used segment-level data to estimate the valuation effect of diversification and to examine the potential sources of value gains or losses. They compared the sum of the imputed stand-alone values of the segments of diversified companies to the actual values of those companies, and documented that diversified firms have values that average 13 per cent to 15 per cent below the sum of the imputed values of their segments. Authors have found additional support for the conclusion that diversification reduces value by documenting that the segments of diversified firms have lower operating profitability than single-line businesses. They have identified overinvestment in segments by industries with limited investment opportunities as one source of the value loss. An additional source of loss in value is cross-subsidisation of poorly performing divisions by better-performing divisions. Two potential benefits of diversification are increased interest tax shields resulting from higher debt capacity and the ability of multi-segment firms to immediately realise tax savings by offsetting losses in some segments against profits in others. Berger and Ofek's (1995) estimate of the tax saving, however, is only 0.1 per cent of sales, far too small to offset the documented value loss.

The papers discussed have not distinguished between related and unrelated diversification. Some authors have argued that related diversified firms perform better than conglomerates. Nayyar (1993) has discussed that benefits from a positive reputation in an existing business and from economies of scope are available from related but not from unrelated diversification. The resulting prediction is that the valuation effect of diversification is more positive for related than unrelated lines of business. Lubatkin and Chatterjee's findings (1994) have questioned the accuracy of this rationale. Instead of a linear relationship between corporate diversification and stock return risk, they have found a curvilinear relationship, suggesting that there is an optimal level of diversification for firms. It appears that risk, however measured, is best minimised by some midrange level of diversification, such as a constrained strategy, in which opportunities to share tangible and intangible assets are numerous.

Unrelated firms were found to be associated with high levels of risk, suggesting that diversification intended to spread and thus reduce risk may be accomplishing the opposite. The unsystematic risk findings highlight this point because, everything else being the same, unrelated-diversified firms should show the lowest levels of such risk because they combine businesses whose cash flows are weakly correlated. But the unrelated firms that have been analysed by Lubatkin and Chatterjee's (1994) have shown high levels of unsystematic risk, in spite of an offsetting positive portfolio effect. The systematic risk findings suggest that corporations can achieve a reduction in risk that stockholders can not achieve on their own. This reduction in systematic risk enhances a firm's future performance, for low systematic risk implies a low cost of capital.

Lubatkin and Chatterjee's (1994) findings are therefore contrary to the popular portfolio theory. Firms that diversify in a constrained manner are able to realise synergies that other diversification types can not achieve, and these synergies help to protect the firm from macroeconomic uncertainties. Their results have important implications and suggest that diversifying into new markets only for the purpose of hedging may actually increase corporate risks. It could be concluded that it is better for corporate managers to focus their attention on building competitive advantages in each market in which they participate, and that can be accomplished through a constrained diversification strategy.

In addition to using diversification strategies, a firm could manage its risk exposure through operational hedging. An example of an operational hedging policy would be to locate production in a country where significant sales revenues in the local currency are expected. Multinational corporations often sell products in various countries with prices denominated in corresponding local currencies. The effect of unexpected changes in exchange rates and foreign demand conditions on domestic currency value of sales revenues are hedged by similar changes in the domestic currency value of local production costs. Operational hedging is a way to conduct a multinational diversification strategy, which provides a reason for direct foreign investments by firms, and may further explain the existence of multinational firms with production facilities at several foreign locations.

The costs of implementing a financial hedge are likely to be smaller than those of implementing an operational hedge. After all, in order to implement an operational hedge, a firm may be required to open a production plant in another country, whereas to implement a financial hedge may simply require a contact with the firm's bank. Therefore, the question regarding the advantages of operational hedging policies versus a financial hedge emerges. Chowdhry and Howe (1999) have argued that one of the advantages of an operational hedge is that it allows the firm to match domestic currency production costs and revenues more closely.

In their paper they have proven that, if the quantity of foreign currency revenues the firm is expected to generate is certain, it is easy to hedge the exchange risk exposure associated with it by using a forward contract. This eliminates the associated transaction exposure completely with a relatively simple financial hedge. However, fluctuating foreign currency cash flows represents an additional source of uncertainty for many multinationals. For certain products, demand conditions can change dramatically from year to year, inducing large changes in foreign currency revenues. If the quantity of foreign currency revenues is uncertain (and not perfectly correlated with the exchange rate), no financial contract (which must be agreed upon *ex ante*) that is contingent only on *ex post* observable variables such as the exchange rate, can completely eliminate the exchange risk.

The Chowdhry and Howe (1999) results are also consistent with the prediction that firms often seem to use financial instruments to hedge short-term exposures but not long-term exposures. This prediction is based on the argument that demand uncertainty will be smaller for shorter horizons than for longer horizons, as firms will be able to forecast their sales more accurately in the short term. Their analysis thus confirms that firms are likely to use financial instruments to a greater extent to hedge short-term exposures and rely on operational hedging more heavily to hedge long-term exposures.

2.1.4.2 Derivatives Instruments

One prominent definition of a derivatives contract is a bilateral contract or payment exchange whose market value is determined by the value of a specific, underlying asset or underlying reference rate or index. To be more precise, derivatives are defined as products that exist in "zero net supply" - that is for every long (buyer) there must be a short (seller). This definition eliminates debt and equity securities, leaving only contracts that are based on the value of securities and on other prices, rates, and indexes (Santomero, 1995). The notional contractual cash-flows associated with derivative instruments can also be used to offset or match the risk associated with a known series of the firm's operating cash flows. At first glance, the list of derivative products looks very long. Forwards, futures, options, swaps, caps and floors are just some of the more frequently used derivatives, and new ones are being designed all the time. However, as discussed by Froot, Scharfstein and Stein (1994), all these products are derived from just two basic building blocks: forwards and options.

It should be noted that, before derivatives markets were truly developed, the means for dealing with corporate risks were few, and thus financial risks were largely outside managerial control. A few exchange-traded derivatives existed, but they allowed corporate users to hedge only certain financial risks, in limited ways and over fairly short time horizons. The derivatives markets were highly incomplete. Firms were often forced to resort to the operational alternatives like establishing plants abroad to minimise exchange-rate risks, or to the natural hedging by trying to match the currency structure of their assets and liabilities.

Allen and Santomero (1998) have written that, during the 1980s and 1990s, commercial and investment banks introduced a broad selection of new products designed to help corporate managers in handling financial risks. At the same time, the derivatives exchanges, which successfully introduced interest rate and currency derivatives in the 1970s, have become vigorous innovators, continually adding new products, refining existing ones, and finding new ways to increase liquidity. Markets for derivative instruments such as forwards and futures, swaps and options, and innovative combinations of these basic financial instruments[8], have developed and grown at a breathtaking pace, and many corporations have become active

[8] E.g. cylinder options, compound options, hindsight options, synthetic options, synthetic forwards, participating forwards, forward exchange agreements, break forwards, etc.

participants in derivatives markets. It could be said that the derivatives revolution began. Since then, the range and quality of both exchange-traded and OTC derivatives, together with the depth of the market for such instruments, have expanded intensively.

The emergence of the modern and innovative derivative markets allowed corporations to insulate themselves from financial risks, or to modify them. Using derivatives, a corporation is increasingly able to determine the environment in which it will operate, and to create for itself a private "derivative reality," a synthetic world released from risks that a corporation considers undesirable (Hu, 1995; 1996). Therefore, under these new conditions, shareholders and stakeholders increasingly expect management to be able to identify and manage exposures to corporate risks.

While companies have been using derivatives for many years, little has been known about the extent or pattern of their use because, until recently, firms have not been required to publicly report their derivatives activity. Unfortunately, the use of derivatives by companies only appears to receive attention in response to special cases of huge derivative-related losses. Well known cases of Procter&Gamble or Metallgesellschaft are two of the most frequently cited examples (Mello and Peterson, 1995a; Shirreff, 2004). It should be emphasised that without a clear set of risk-management goals, using derivatives can be dangerous. The most important fact regarding the losses incurred is that both Procter&Gamble and Metallgesellschaft lost substantial amounts of money because they took positions in derivatives that did not fit well with their corporate strategies (Froot, Scharfstein and Stein, 1994).

Santomero (1995) and Froot, Scharfstein and Stein (1994) have argued that those "bad" realisations have led investors, creditors, and regulators to become increasingly concerned about how firms use these instruments. The normal beneficial use of derivative instruments in the daily risk management activities of companies receives much less attention in the financial press. However, empirical evidence that documents the patterns of use or firms' attitudes and policies regarding derivative use, as well as the effect of derivatives on firms' risk, exists and is presented in this sub-section. Several studies have investigated whether firms systematically reduce or increase their corporate risk with derivatives. Such research is important because the possibility that firms use derivatives to increase their risk exposures has been a principal concern guiding regulatory agencies in their considerations of derivatives regulation.

Hentschel and Kothari (2001) have focused on intensive users of derivatives and found that even for firms that hold large derivatives positions relative to overall firm size, they could not detect an economically significant link between derivatives and increased volatility. Their results are inconsistent with the hypothesis that firms use derivatives to speculate on a large scale. In particular, the analysed sample reveals no association between the volatility of a firm's stock prices and the size of the firm's derivatives position. That is not to say that firms cannot take large risks with derivatives, or that no firms alter their exposures or volatilities through derivatives. However, the Hentschel and Kothari (2001) findings have shown that these effects are currently small for most firms, even those with large derivatives positions.

The findings by Hentschel and Kothari are supported by Allayannis and Ofek (2001) who have examined whether firms use foreign currency derivatives for hedging or for speculative purposes. Using a sample of S&P 500 non-financial firms for 1993, they have found evidence that firms use currency derivatives for hedging rather than for speculating in the foreign exchange market, as their use significantly reduces the exchange-rate exposure that firms face. This is proven by strong negative association between foreign currency derivative use and firm exchange-rate exposure.

The results of Allayannis and Ofek (2001) complement those in Guay (1999) and those in Tufano (1996). In a sample of 254 non-financial corporations that begin using derivatives, Guay (1999) has found that the firm risk, measured in several ways, declines over the period following the initiation of a derivatives program. New users of derivatives experience statistically and economically significant reductions in stock-return volatility, interest-rate exposure, and exchange-rate exposure when compared to matched samples of control firms that do not use derivatives.

Tufano (1996) has examined commodity hedging activities in the gold mining industry. Most of the 48 North American gold mines studied in his paper are not well diversified, thus their gold price risk management involves hedging (the shedding of all exposure through the sale of gold at fixed prices) or insurance (the shedding of downside exposure, for instance through the purchase of put options). Tufano's (1996) study has proven that there are no firms that used these financial transactions to increase gold price exposure; thus, it appears that the financial risk management programs produce risk reduction, rather than risk enhancement (or speculation). Taken together, evidence from the analysed studies is consistent with firms using derivatives for hedging purposes, on average, and not to increase shareholder risk.

Several surveys have investigated derivative usage for risk management purposes. A survey conducted by Bodnar, Hayt and Marston (1998) has revealed that at least 50 per cent of US non-financial companies are using some form of financial engineering to manage interest rate, foreign exchange, or commodity price risk, with usage heavily tilted toward large firms. With regard to the type of hedging instrument, forward (72 per cent) and OTC options (37 per cent) are more commonly used than exchange-traded futures and options (17 per cent and 14 per cent, respectively). The US firms indicate that their key motive behind financial hedging is to decrease the volatility of the cash flows, however stabilising accounting earnings is a close second. Foreign exchange risk is the most commonly hedged risk using derivatives, followed by interest rate risk. Additionally, the authors have found that risk management decisions and activities are largely centralised and the hedging horizon for financial derivatives is typically less than one year.

Bodnar and Gebhardt (1998) have compared derivatives usage between US and German firms using the responses from the 1995 Wharton Survey (Bodnar *et.al.*, 1995) and an identical survey of German public firms. Their results have indicated that more German firms than US firms use derivatives. This result could be explained by the fact that, at the time a survey was conducted, Germany was a smaller and more open economy in comparison with the US, which resulted in greater exposure of its firms to financial risk, especially to the foreign exchange risk. Survey results have clearly indicated that both US and German non-financial companies stick primarily with simple foreign-exchange instruments. Currency forwards are by far the most important instruments in both countries. Moreover, the use of over-the-counter instruments (forwards, swaps and options) dominates the exchange-traded instruments. With US companies the use of futures is considerably higher than in Germany. Interest rate derivatives are a close second in terms of frequency to foreign currency derivatives. The most commonly used interest rate derivative both in Germany and the US is the swap from floating to fixed-rate debt. Among the second and third most commonly used forms of interest rate derivatives are namely forwards and OTC options. Exchange-traded interest rate instruments are not popular among firms in both countries. There is a lower frequency of commodity derivative use among firms. The survey results indicated that US firms use a broader array of commodity derivatives than German firms. German firms, it appears, tend to use primarily forwards to hedge commodity risk. US firms are more likely to favour futures, swaps, or options for commodity hedges than are German firms.

Commercial banks are the primary source for derivative transactions for the majority of US firms, while universal banks are the primary source for derivative transactions for the majority of German firms. US firms use investment banks and insurance companies as a very important source for derivative transaction, while very few German firms use them as counterparties. The authors concluded that the general pattern of usage across industry and firm size is very comparable for the two analysed countries. Bodnar and Gebhardt (1998) have suggested that the determinants of derivative use are primarily driven by economic considerations such as activities and firm characteristics and not the result of corporate culture or other country-specific differences. Although this study provides comparative information on risk management practices inside and outside the US setting, it is not a sophisticated comparison between US and non-US firms. The two samples are matched across industries, but they are different with respect to size and industry distribution.

Bodnar, Jong and Macrae (2003) have surveyed the risk management activities of firms in the Netherlands using a survey identical to that used in the 1998 Wharton Survey (Bodnar, Hayt and Marston, 1998). They compared survey results with the results from US firms. The unique feature of this study is that the results are compared in a more precise way using a weighting scheme for the US results across both a firm size and industry classification that produces a US sample with the same size and industry characteristics as the Dutch sample. Bodnar, Jong and Macrae's (2003) results have indicated that Dutch firms use derivatives more often to hedge financial risk than US firms for all size and industry classes, with an emphasis on foreign exchange risk management - a result that is driven by the fact that the Dutch economy is much more open than the US economy.

While US firms also rely on commercial banks for derivatives, they have a much wider array of counter-parties for derivatives transactions, such as investment banks, other finance firms, insurance companies or exchanges. The survey results suggest a general pattern of Dutch firms showing a stronger preference than US firms for over-the-counter instruments that come from banks. This result is similar to the results obtained in Bodnar and Gebhardt (1998). The common reason in both countries for not using derivatives is insufficient exposure to financial risk. This might suggest that these firms are naturally hedged, in that their revenues and costs in foreign currency are reasonably balanced, thereby reducing the total foreign currency exposure to a tolerable level without using derivatives. Also, some of the foreign exchange exposure may be shed by means other than using derivatives. Operational hedging, for instance, by moving factories to countries where foreign currency revenues are incurred, or financing in the foreign currency, may be alternative strategies to using derivatives. Bodnar and Gebhardt (1998) as well as Bodnar, Jong and Macrae (2003) have argued that the characteristics of Dutch and German firms could be found in other continental European countries and may act as a baseline from which to generalise. Therefore, the analysed surveys also suggest a broader comparison between US and European firms.

Jesswein (1995) has examined the extent to which US-based corporations have adopted innovations in foreign exchange risk management and how their adoptions are affected by both the firm’s risk management approach and the characteristics of the new instruments. Among his principal findings are the following. *First,* among the various products, a forward contract remains the hedging vehicle of choice, and the popularity of forward contracts has not been threatened by the introduction of more sophisticated instruments. The next group of more popular products is foreign currency swaps and over-the-counter currency options. Though falling in the same category, the exchange-traded products have substantially smaller percentages of adoption. The greater use of over-the-counter products is probably attributable to their flexibility and convenience. Since the respondent firms are mostly large corporations that can trade in wholesale markets, custom-made over-the-counter products are likely to fit their specific needs better. Use of "exotic, third-generation" products, by contrast, is quite limited.

Although the innovations of the third generation have received much attention in the academic literature, their adoption is less common, as would be expected. The likely explanation is that most of their business needs are already well covered by the more common plain-vanilla products such as forward contracts, over-the-counter options, and currency swaps. *Second,* Jesswein (1995) has also found that an overwhelming majority of the respondent firms said that currency risk management is a worthwhile activity. Among these respondents, there also appeared to be a decided preference for "active" or "view-driven" risk management as opposed to a full-cover or variance-minimising hedging approach. *Finally,* the product attributes of greatest value to corporate users appear to be simplicity, liquidity and flexibility. Also important, however, is the compatibility of an instrument with the firm's approach. Jesswein (1995) has concluded his paper with an argument that investment bankers intent on stimulating greater corporate use of third-generation products may want to focus more of their efforts on reducing the difficulty of entry and exit for their products, and on increasing understanding of them by corporate treasurers.

2.1.4.2.1 Risks of Derivatives Use

The continuing discussion of risks and regulation in derivative markets illustrates that there is little agreement on what the risks are, or whether regulation is a useful tool for their control. One source of confusion is the sheer profusion of names describing the risks arising from derivatives. Besides the "price risk" of potential losses on derivatives from changes in interest rates, foreign exchange rates, or commodity prices, there is "default risk" (sometimes referred to as "counterparty risk"), "liquidity (or funding) risk," "legal risk," "settlement risk" and "operations risk." Last, but not least, is "systematic risk" – the notion of problems in derivatives markets spreading throughout the financial system that seems to be at the heart of many regulatory concerns.

Hentschel and Smith (1997) have argued that the possibility of a widespread default throughout the financial system caused by derivatives has been exaggerated, principally due to the failure to appreciate the low default risk associated with individual derivative contracts.

They provide a parametric model of hedging in which they show that firms that use derivatives have lower default probabilities on these derivatives than they do on their debt. Based on this insight and empirical evidence on bond default rates, they have computed a conservative default probability for derivatives, and estimated that the expected annual loss due to default on a 10 million USD interests rate swap is unlikely to exceed 25 USD. Given these small default rates, Hentschel and Smith (1997) have shown that the systematic risk - the probability of a widespread default - is even smaller. They have proven that, to the extent that derivatives are being used primarily to hedge rather than to speculate, the default probability associated with derivatives is less than half the default probability on debt issued by the same firms.

Hentschel and Smith (1997) have concluded that default and systematic risks are not the major problems in derivative markets, and argue that many firms are exposed to agency risk, a reference to the principal-agent conflicts from which they arise. This risk arises when employees in the derivatives area (the agents) have decision rights over derivatives and are not working towards the general corporate objectives set by the senior management and shareholders (the principals). In many instances, the magnitudes of the derivative losses and, hence, the underlying derivative positions came as surprises to the senior management and shareholders. This is an internal control problem that financial accounting standards simply cannot solve, so the authors have suggested that careful control and supervision is critically important for derivatives, because employees should be properly monitored on account of their misaligned incentives relative to the firm.

Hentschel and Smith (1997) have argued that the main cause of this principal-agent conflict lies in the compensation systems attributed to employees with decision rights over derivatives transactions. Firms that pay large bonuses based on short-term performance can encourage excessive risk-taking by employees. Authors warned that the primary problem in linking pay to derivative profits is the limited liability of employees. Although employees can participate in the upside, they usually have insufficient resources to share large negative outcomes. This asymmetry induces option-like features in compensation planes based on trading profits. As a solution to the problem, Hentschel and Smith (1997) have suggested compensation systems on the basis of long-term performance, which reduces these option-like features that would otherwise encourage traders to take riskier positions.

It could be concluded that firms are changing the way in which they manage their derivatives operations to account of these risk issues. As firms gather more experience with these compensations and control systems, control of these problems is likely to improve. The proper balancing of decision rights, incentives and control should be a major firm-internal concern for firms with derivatives activity. Due to the several well-known cases that we have already mentioned in this sub-section, where huge derivative-related losses occurred, there is more oversight at the level of the corporate board and companies have been devoting more resources to ensure that hedging programs are better controlled.

2.1.4.3 Hedge substitutes

Instead of managing risk through hedging, firms could pursue alternative activities that substitute for financial risk management strategies. Although they are not considered as a special kind of risk management strategy, it should be noted that the literature has argued that alternative financial policies, usually referred to as "hedge substitutes", can also reduce a firm's risk without requiring the firm to directly engage in risk management activities. Firms could adopt conservative financial policies such as maintaining low leverage, a low dividend pay-out ratio, or carrying large cash balances to protect them against potential financial difficulties (a form of negative leverage). Greater use of these substitute risk management activities should be associated with less financial risk management activities.

Thus, a firm with a relatively conservative capital structure and dividend policy is "hedging" against adverse business conditions since any future earnings shortfall can be compensated more easily by, for example, drawing down cash available from a large cash balance (Froot, Scharfstein and Stein, 1993; Nance, Smith and Smithson, 1993). This is confirmed by Tufano (1996) who has found that firms with lower cash balances manage more gold price risk. Pulvino (1998) and Harford (1999) have discussed that cash reserves can provide a valuable source of funds for investments when current internally generated funds fall short and external financing is costly. Smith and Warner (1979) and Nance, Smith and Smithson (1993) have proven that firms also could reduce the probability of default by investing in more liquid or less risky assets or by imposing dividend restrictions. More liquid assets or lower dividend-payout ratios help to assure bondholders that funds will be available to pay fixed claims - the more times these fixed claims are covered, the lower are the expected costs due to financial distress and agency costs.

A question should be raised regarding the management choice to select such a conservative capital structure. If the reasoning behind their decision lies in the inability to predict financial prices trends, they should reconsider their decision. What they have done is use low leverage instead of different kinds of hedging instruments to protect against the risk in those economic variables. It should be emphasised that reducing the debt-equity ratio can be unattractive because it also reduces debt-related tax shields and increases the firm’s tax liability. An alternative management strategy would be to take on more debt and then hedge those risks directly, for example, in the derivatives markets.

Structured debt[9], also referred to as hybrid debt (e.g. putable or convertible bonds), can be seen as another example of "hedge substitutes" (see: Nance, Smith and Smithson, 1993; Smith and Stulz, 1985). A firm that issues structured debt can achieve the identical market exposure by issuing debt and entering into a derivatives contract. Some complex debt instruments are designed in part to furnish investors with securities that "they cannot obtain elsewhere". For example, commodity-linked bonds typically contain embedded long-dated forwards or options on commodity prices that are not available on organised exchanges. Investors may be willing to "pay up" for structured debt that allows them to take such positions, thereby reducing the issuer's funding costs (Smithson and Chew, 1992).

Another potential benefit of managing price risks with structured debt is that it avoids the corporate costs associated with the use of derivatives like the costs of building expertise in derivatives markets, the costs of managing the counterparty credit risk, the costs of managing the funding and operational risks associated with all derivatives. Additionally, structured debt has the potential to reduce the costs of dealing with financial distress by reducing the agency problems between management and investors. Management could address the agency problems by using straight debt together with derivatives instead of structured debt. But the additional advantage of structured debt in such circumstances is that it reduces the costs incurred by creditors in monitoring the borrower's hedging activity (e.g. see: Culp, 1994).

In addition to the structured debt, the firm could use preferred stock rather than straight debt (Nance, Smith and Smithson, 1993; Smith and Stulz, 1985). Preferred stock reduces the probability of financial distress, but it does not produce tax shields as debt financing does. It is important to understand that convertible debt helps control conflicts of interest among stockholders and bondholders and thereby reduces incentives to hedge, while preferred stock

[9] Structured debt effectively combines straight debt with one or more "embedded" derivatives contracts that often correspond to a corporate exposure to interest rate, currency, or commodity price risks. Structured debt can be synthetically replicated by, and is best understood as, a contract whose payoff features combine debt with a derivatives transaction.

reduces the probability of financial distress. Although similar to debt, preferred stock pays periodic dividends and firms can omit a preferred dividend payment without being forced into bankruptcy. In contrast, bankruptcy filing is virtually inevitable if an interest payment on debt is not met.

The empirical evidence does not clearly support the thesis regarding the use of structured debt and preferred stock as hedging substitutes. While Smith and Stulz (1985) and Nance, Smith and Smithson (1993) have proven a negative relationship between hedging and the firm's use of convertible debt and preferred stock, Geczy, Minton and Schrand (1997) and Froot, Scharfstein and Stein (1993) have argued that the relationship is positive because convertible debt and preferred stock are hidden financial leverage, which constrains a firm's access to external funds. This prediction is based on the Froot, Scharfstein and Stein (1993) argument that firms that are more financially constrained are exposed to greater underinvestment costs.

2.2 Theoretic Rationales for Corporate Risk Management

One of the most important implications of modern capital market theory is that diversified shareholders should care only about the systematic component of total risk. On the surface it would appear that this implies that managers of firms who are acting in the best interests of shareholders should be indifferent about hedging of risks that are unsystematic. However, it is apparent that managers are constantly engaged in hedging activities that are directed at the reduction of unsystematic risk. If the design and execution of such hedging strategies are costly, it would seem that these activities would not be in the interests of diversified shareholders. Two classes of explanations or determinants for management concern with hedging of non-systematic risk have appeared in the literature. The first class of explanations focuses on risk management as a means to maximise shareholder value, and the second focuses on risk management as a means to maximise managers' private utility. This section presents and discusses the theories related to these arguments and their empirical implications.

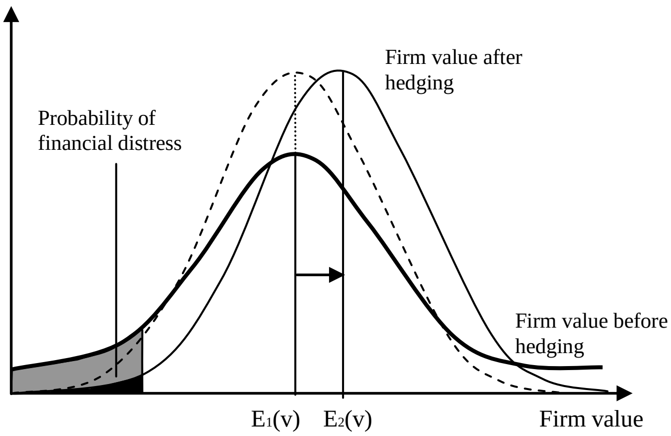
2.2.1 Shareholder Maximisation Hypothesis

2.2.1.1 Cost of Financial Distress

One of the possible explanations for managers' choices of risk management activities on behalf of their firms is based on the fact that non-systematic risk does affect the probability that a firm will go bankrupt or experience financial distress. If financial distress generates real costs for the firm as a whole, then shareholders will be interested in hedging this risk (Campbell and Kracaw, 1987). Additionally, the cost of financial distress is one of the reasons why firm performance and market value might be directly associated with volatility (Mayers and Smith, 1982; Stulz, 1985; Smith and Stulz, 1985; Shapiro and Titman, 1998; Haushalter 2000). In the MM world, financial distress is assumed to be costless. Hence, altering the probability of financial distress does not affect firm value. If financial distress is costly, firms have incentives to reduce its probability, and hedging is one method by which a firm can reduce the volatility of its earnings. Costs of financial distress include the legal and administrative costs of bankruptcy, as well as the agency, moral hazard, monitoring and contracting costs which can erode firm value even if formal default is avoided (Myers, 1984). By reducing the variance of a firm's cash flows or accounting profits, hedging decreases the probability, and thus the expected costs, of financial distress.

The literature is filled with such stories. The classic paper by Warner (1977) was the first to present empirical evidence of the cost of bankruptcy, but some other studies, such as Weiss (1990), have continued to reinforce its importance. Smith and Stulz (1985) used the same argument to justify a desire for reduced volatility. The authors were on firm ground, as there is ample evidence that financial distress leads to substantially increased costs associated with bankruptcy proceedings, legal costs, and perhaps most importantly, the diversion of management attention from creating real economic value.

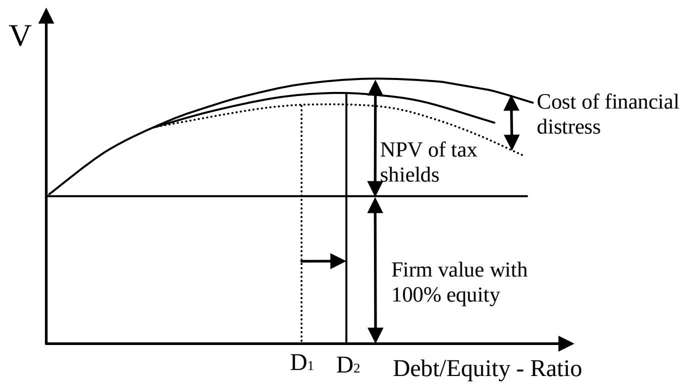
Graph 2.2. Hedging and the cost of financial distress



Source: Bartram, 2000

While the reduction of financial distress costs increases firm value, it augments shareholder value even further by simultaneously raising the firm's potential to carry debt. It is known that corporate debt creates a fixed cost that can be used as a competitive weapon (see e.g.: Brander and Lewis, 1986; Maksimovic, 1988). This follows from the fact that interest payments of debt are made out of pre-tax income creating a tax shield of debt financing. As is shown in graph 2.3., corporate risk management lowers the cost of financial distress, which leads to a higher optimal debt ratio (or lower financing costs), and the tax shields of the additional debt capital further increases the value of the firm. However, shareholders must account for hedging costs when they decide among alternative hedging strategies (Smith and Stulz, 1985).

Graph 2.3. Hedging and the higher optimal debt ratio



Source: Smith and Stulz, 1985

Dobson and Soenen (1993) have argued that foreign exchange hedging will lower the probability of corporate bankruptcy. By extending the longevity of corporations, hedging will tend to ameliorate the moral-hazard-agency-problem. Moral hazard arises from conflicts of interest among corporate stakeholders, for example management and debtholders. By reducing the probability of bankruptcy and thereby increasing the perceived duration of contractual relations between stakeholders, foreign exchange hedging increases the power of reputation to enforce contracts. They have also proven that when a firm undertakes international capital projects, uncertainty exists concerning the domestic currency value of the future cash flows from these projects. Foreign exchange hedging reduces this uncertainty by smoothing the future cash flow stream. Although this uncertainty is largely unsystematic, it does not just impact firm risk. It also directly impacts firm value. If projects are financed by debt, then the smoothing of the cash flow stream tends to lower the firm's cost of debt.

Bessembinder's (1991) model focuses on simple debt contracts and the senior claim, but the analysis can be extended to any obligation with higher legal priority than equity. He has shown that hedging increases value by improving contracting terms. The hedging instrument specifically evaluated in his study is a forward contract, but the analysis also applies to other financial contracts, such as options and swaps, which alter the cash flow distribution so that there is a reduced likelihood of small cash flow realisations. Hedges provide net cash inflows in those states where the firm's cash flows are low, bonding its ability to meet commitments in additional states. Bessembinder's (1991) has proven that hedging can secure value-increasing changes in contracting terms with creditors, customers, employees and suppliers if the contracts with these parties have initially positive Net Present Value (NPV).

When exploring corporate hedging behaviour, scholars are particularly interested in the relationship between hedging and leverage, since theoretical considerations suggest that both affect expected costs of financial distress and agency costs. Greater leverage exacerbates those costs, but greater hedging ameliorates them, suggesting a positive linkage. Dolde (1995) has controlled for financial risks differences by conducting a survey of Fortune 500 firms in 1992, and presents statistically significant evidence that leverage and hedging are positively related. He also constructed a direct measure of expected costs of financial distress and found some evidence that hedging measures interact with and mitigate the effects of leverage.

Haushalter (2000) has found that the use of commodity derivatives is to be related to the reduction of expected bankruptcy costs, which should increase firm value. He examined the hedging activities of oil and gas producers and has documented a wide variation in hedging policies among analysed companies. The tests conducted have found that this variation is associated with several differences in the firms' characteristics. Among oil and gas producers that hedge, the extent of hedging is related to proxies for financing costs. Conditional on a company hedging, the fraction of production hedged is increasing in the debt ratio, is greater for companies that pay out a smaller fraction of income in dividends, and is less for those that do have a debt rating. This finding is consistent with theories of the transaction cost of financial distress.

Mian (1996) has investigated all three types (commodity, interest rate and currency) of hedging activities for a sample of 3,022 firms. He has found no significant difference in leverage between hedgers and nonhedgers. Examination of the type of risk hedged yields results that are different from the two-way classification (hedgers vs. nonhedgers). The evidence indicates that interest-rate hedgers have higher leverage and longer-term debt as compared with nonhedgers of interest-rate risk. In contrast, currency-price hedgers have lower leverage and shorter-term debt as compared with nonhedgers of currency-price risk. Leverage is positively correlated with interest-rate hedging and negatively correlated with currency-price hedging. Mian’s (1996) evidence has shown that lumping interest-rate hedging and currency-price hedging into one broad category essentially “averages out” the negative correlation between leverage and currency-price hedging, and the positive correlation between leverage and interest-rate hedging.

It could be concluded that the link between hedging and financial leverage supports the notion that hedging can reduce financing costs and it is also consistent with the predictions of Stulz (1996), who has argued that corporate hedging can be viewed as a technique that allows managers to substitute debt for equity. If financial distress is costly and if there is an advantage to having debt in the capital structure, hedging may be used as a means to increase debt capacity. As a result, a company's risk management policy should be made jointly with its financing policy. If hedging and financing policies are made jointly, evidence in the literature survey presented in this paper indicates that studies of corporate financing decisions need to consider corporate hedging policies as well. In particular, a company that faces relatively high costs of financing and hedges may choose the same capital structure as a firm with lower costs of financing that does not hedge. Without controlling for hedging, the relation between capital structure and the determinants of the costs of financing will be missed.

2.2.1.2 The Agency Cost of Debt

Besides being in a position to know more about the firm's prospects than investors, management also sometimes has the power to take actions that transfer value from bondholders to shareholders. The first agency conflict considered is usually referred to as the underinvestment problem. Jensen and Smith (1985) have argued that when a substantial portion of the value of the firm is composed of future investment opportunities, a firm with outstanding risky bonds can have incentives to reject positive net present value projects if the benefit from accepting the project accrues to the bondholders. In this example, the manager of a levered firm has an incentive to limit the scale of investment because the additional returns from further investment accrue primarily to bondholders.

The second agency conflict considered is usually referred to as the asset substitution problem, also known as the risk shifting problem, which is encountered by a corporation in selecting among mutually exclusive investment projects. Jensen and Smith (1985) have observed that the value of the stockholders' equity rises and the value of the bondholders' claim is reduced when the firm substitutes high-risk for low-risk projects. Once a corporation has obtained debt financing, it is well known that by switching from a relatively safe investment project to a riskier one, the corporation can increase the value of its equity at the expense of its bondholders. This phenomenon can be explained by the fact that the residual claims of shareholders can be interpreted as a call option on the assets of the firm (see e.g.: Black and Scholes, 1973). The value of the option will increase as the underlying assets' volatility increases. Thus management – acting in the interests of shareholders – will tend to prefer capital projects with volatile cash flow streams.

Jensen and Meckling (1976), Myers (1977) and Smith and Warner (1979) have indicated that actions available to the firm after bonds are sold can reduce the value of the bonds. Unless protected against these forms of managerial opportunism, creditors can be expected to reduce the price they are willing to pay for the bonds. This reduction in price (or increase in required yield), necessary to compensate creditors for managerial opportunism and combined with the costs of writing and enforcing covenants, are collectively described by economists as the "agency costs of debt". Some of these actions are prevented by provisions in debt covenants (Mayers and Smith, 1982; 1987). But it should be noted that debt covenants could be welfare-reducing as they limit the degree of management freedom and possibly obstruct the realisation of profitable yet risky investment alternatives.

According to Dobson and Soenen (1993), there are three sound reasons based on agency costs why management should hedge corporate risk. First, hedging reduces uncertainty by smoothing the cash flow stream, thereby lowering the firm's cost of debt. Since the agency cost is borne by management, assuming informational asymmetry between management and bondholders, hedging will increase the value of the firm. Therefore, management will rationally choose to hedge. Second, given the existence of debt financing, cash flow smoothing through risk hedging will tend to reduce the risk-shifting agency problem. Finally, hedging reduces the likelihood of financial distress and thereby increases duration of contractual relations between shareholders. By fostering corporate reputation acquisition, hedging contributes directly to the amelioration of the moral-hazard agency problem.

MacMinn and Han (1990) have argued that, by smoothing cash flows, hedging will tend to ameliorate the risk-shifting agency problem. Thus the existing claimholders of the firm are motivated to include provisions in the debt contract limiting the opportunities to transfer wealth from the bondholders. Debt indentures frequently contain covenants requiring the firm to maintain certain types of hedging activity. The analysis by Mayers and Smith (1982) suggests that these provisions reduce the incentive of the firm's other claimholders to accept certain risk-increasing negative net present value projects after the sale of the bond issue. Since potential wealth transfers from bondholders to the firm's other claimholders are increased the larger the fixed claims in the capital structure, Mayers and Smith (1982) have argued that the probability of inclusion of hedging covenants will increase with the firm's debt/equity ratio.

The nature of the firm's investment opportunity set affects the conflict between the firm's fixed and residual claimholders. Myers (1977) has shown that issuance of claims with higher priority than equity (senior claims) creates incentives for the firm's equity holders to ‘‘underinvest''. A profitable project may be rejected by management if the expected payoff is sufficient to cover the cost of debt only, thus leaving no residual cash flow for shareholders. Hedging mitigates this problem by decreasing the number of states in which the firm would default on bond payments. Corporate risk management represents a means to eliminate or alleviate conflict of interests between debt holders and stockholders, and the associated welfare loss resulting from non-realised value-increasing investments by reducing the volatility of firm value.

Bessembinder (1991) has shown that corporate hedging reduces incentives to underinvest, effectively bonding the firm's equity holders to undertake additional positive NPV investment. He has argued that the hedge shifts individual future states from default to nondefault outcomes, increasing the number of future states in which equity holders are the residual claimants. As a result, the sensitivity of senior claim value to incremental investment is reduced. Bessembinder (1991) also noted that the hedge results in equity holders receiving a larger proportion of the incremental benefits from new projects, which increases their willingness to provide funds for additional capital investment, as well as increasing their value due to avoided agency costs.

Minton and Schrand (1999) have also documented that companies with more cash flow variation have lower levels of investment and higher costs associated with external capital. They conclude that cash flow volatility can lead companies to underinvest. Haushalter, Randall and Lie (2002) have argued that equity values reflect this potential underinvestment. Their empirical tests have shown that the sensitivity of an oil producer's value to changes in oil price uncertainty is related to proxies for the likelihood that the producer will encounter costly market imperfections, such as financial distress and underinvestment. They conclude that by reducing the expected costs from these market imperfections, corporate risk management can increase shareholder value. MacMinn (1987) has shown that an appropriately selected insurance portfolio will increase the safety of debt and allow stockholders to capture all the additional returns from further investment. The model has shown that the corporation has an incentive to purchase insurance because it may eliminate or reduce the bankruptcy and/or agency costs.

2.2.1.3 Capital Market Imperfections and Costly External Financing

Smith and Stulz (1985) have demonstrated how the reduction in expected bankruptcy cost (due to a lower probability of entering bankruptcy) can increase the firm’s value, *ceteris paribus*. In addition, the lower probability of financial distress can help the firm make sales or invest in future profitable projects which would have otherwise been lost. Cash flow is crucial to the investment process, and the investment process is a key factor for corporate value creation. Cash flow can often be disrupted by movements in external factors such as exchange rates, commodity prices and interest rates, potentially compromising a company's ability to invest.

This theory examines the role of capital market imperfections in determining the demand for corporate hedging. The main hypothesis is that, if access to external financing (debt and/or equity) is costly, firms with investment projects requiring funding will hedge their cash flows to avoid a shortfall in their funds, which could precipitate a costly visit to the capital markets. An interesting empirical insight based on this rationale is that firms which have substantial growth opportunities and face high costs when raising funds under financial distress will have an incentive to hedge more of their exposure than the average firm. This rationale has been explored by numerous scholars, among others by Stulz (1990), Lessard (1990), Shapiro and Titman (1998), Froot, Scharfstein and Stein (1993), Getzy, Minton and Schrand (1997) and Haushalter, Randall and Lie (2002).

Froot, Scharfstein and Stein (1993) have accepted the basic paradigm of the financial distress model, but they rationalised the cost of bad outcomes by reference to Myers' (1977) debt overhang argument. In their model, external financing is more costly than internally generated funds due to numerous capital market imperfections (see: Myers and Majluf, 1984). These may include discrete transaction costs to obtain external financing, imperfect information as to the riskiness of the investment opportunities present in the firm, or the high cost of the potential future bankruptcy state. At the same time, the firm has an investment opportunity set which can be ordered in terms of net present value. The existence of the capital market imperfections results in underinvestment in some states, where internally generated funds fall short of the amount of new investment that would be profitable in the absence of these imperfections. Stated in another way, the volatility of profitability causes the firm to seek external financing to exploit investment opportunities when profits are low.

The cost of such external finance is higher than the internal funds due to the market's higher cost structure associated with the factors enumerated above. This, in return, reduces optimal investment in low profit states. The cost of volatility in such a model is the forgone investment in each period that the firm is forced to seek external funds. Recognising this outcome, the firm embarks upon volatility reducing strategies, which have the effect of reducing the variability of earnings. Hence, risk management is optimal in that it allows the firm to obtain the highest expected shareholder value. All else being equal, the more difficulty a company has in obtaining outside financing, the more costly a shortfall in cash flow will be and the greater is the value that hedging provides. Froot, Scharfstein and Stein (1993) have supported this theory with reference to evidence offered by Hoshi, Kashyap and Scharfstein (1991) which presented evidence that internal cash flow is, in fact, correlated to corporate investment.

Haushalter, Randall and Lie (2002) have conducted empirical tests of the theory that shareholders of financially constrained firms can benefit from corporate risk management. Their analysis of 68 oil producers for the period 1992 to 1994 has shown that the point at which a company encounters a cash shortfall varies across firms according to firm-specific characteristics. For many firms, in particular those with stable cash flows, minimal financial obligations, and therefore significant financial flexibility, the expected costs of underinvestment and financial distress are trivial. However, firms with higher levels of financial leverage, and therefore decreased financial flexibility, face a greater likelihood of encountering the costs of market imperfections. Overall, their findings indicate that capital markets incorporate the anticipated costs from cash flow variability into stock prices. These findings also support Smith and Stulz (1985), Froot, Scharfstein and Stein (1993) and Mello and Parsons (2000), who suggested that the benefits that shareholders realise from reducing cash flow variability by managing risks are associated with the likelihood that the firm will encounter underinvestment or bankruptcy.

The Haushalter, Randall and Lie (2002) results complement and extend the findings of other corporate risk management studies. Specifically, Geczy, Minton and Schrand (1997), Graham and Rogers (1999) and Haushalter (2000) show that companies that are more likely to face market imperfections manage risks more extensively. The Haushalter, Randall and Lie (2002) results indicate that these are the types of companies that can realise the greatest benefits from reducing cash flow uncertainty. Therefore, in a broad sense, observed risk management policies are consistent with shareholder value maximisation.

Getzy, Minton and Schrand (1997) conducted a research on the 372 of the Fortune 500 nonfinancial firms in 1990 and proven the hypothesis that hedging is used to reduce variability in the level of investments. They have found that firms with greater growth opportunities and tighter financial constraints (low accessibility to internal and external financing) are more likely to use currency derivatives. This result is consistent with the notion that firms use derivatives to reduce the variation in cash flows or earnings that might otherwise preclude firms from investing in valuable growth opportunities. This result was confirmed by Allayannis and Ofek (2001) as well. Their study has proven that, similarly to Getzy, Minton and Schrand (1997)**,** firms with larger R&D expenditures are more likely to use currency derivatives.

A study by Gay and Nam (1998) has utilised better proxies for corporate investments in comparison with Getzy, Minton and Schrand (1997) and employed a more rigorous methodology for studying the relationship between financial derivatives and the underinvestment problem. Their results have provided strong support for the hypothesis that corporate hedging activity is carried out to minimise the underinvestment problem. Gay and Nam (1998) have found that firms with enhanced investment opportunity sets increase their use of derivatives as their levels of internally generated cash decline. They also show that when internally generated cash flows are positively correlated with investment opportunities, firms use fewer derivatives. The Gay and Nam (1998) results clearly support the shareholder value maximisation hypothesis. These results indicate that firms act in a manner consistent with the predictions of Froot, Scharfstein and Stein (1993) – minimising the underinvestment problem.

Risk managers spend much of their time examining the factors that cause cash flows to fluctuate. This is important work, since low cash flows may throw budgets into disarray, distract managers from productive work, defer capital expenditure or delay debt repayments. By avoiding these deadweight losses, risk managers can rightly claim they add to shareholder value. Consistent with this claim that cash flow volatility is costly, Minton and Schrand (1999) have documented that cash flow volatility is associated both with lower investment and with higher costs of accessing external capital. They have shown that higher cash flow volatility is associated with lower average levels of investment in capital expenditures, R&D, and advertising. This association suggests that firms do not use external capital markets to fully cover cash flow shortfalls, but rather permanently forgo investment.

Fazzari, Hubbard and Petersen (1988), Hoshi, Kashyap and Scharfstein (1991), Kaplan and Zingales (1997) and Lamont (1997) all found a negative relation between annual investment levels and liquidity, but could not distinguish whether firms with volatile cash flows time their investment decisions to match internal cash flow realisations or actually decrease their overall level of investment. Opposite to them, the findings of Minton and Schrand (1999) have revealed a negative relation between volatility, measured over a period, and the average level of investment measured over the same period, suggesting that firms that experience shortfalls ultimately forgo investment.

Another perspective related to Froot, Scharfstein and Stein (1993) pertains to the Myers and Majluf (1984) "pecking order" concept of financing. Hedging, by its ability to decrease the variability of cash flow, enables the firm to reduce the number of states of nature where it must obtain external financing (and thus hedging can help avoid sending a potentially negative signal to external investors). It is also important to note that although firms facing binding financial constraints can benefit from hedging, reducing firms' dependence on the capital market does not automatically translate into an increase in shareholder wealth. In fact, Tufano (1998) has pointed out that hedging can lead to overinvestment. If hedging enables managers to take on projects without facing scrutiny from the capital markets, it can enable managers to finance projects that benefit managers, but reduce shareholders' wealth. Tufano (1998) has concluded that, although firms facing financial constraints hedge more extensively, this relation does not imply that hedging increases shareholder value.

2.2.1.4 Taxes

Smith and Stulz (1985) have argued that the structure of the tax code can make it beneficial for firms to take positions in futures, forward, or option markets. If a firm's effective tax function is linear (the firm faces a constant effective marginal tax rate), its expected tax liability is unaffected by the volatility of taxable income. But if effective marginal corporate tax rates are an increasing function of the corporation's pre-tax value, or to put it differently, if a firm faces a convex tax function, then the after-tax value of the firm is a concave function of its pre-tax value. If hedging reduces the variability of pre-tax firm values, then the expected tax liability is reduced and the expected post-tax value of the firm is increased, as long as the cost of the hedge is not too large. By reducing the effective long-run average tax rate, activities which reduce the volatility in reported earnings will enhance shareholder value. The more convex the effective tax schedule is, the greater is the reduction in expected taxes.

Froot, Scharfstein and Stein (1993) have argued that the logic of this thesis is straight-forward - convexity implies that a more volatile earnings stream leads to higher expected taxes than a less volatile earnings stream. Convexity in the tax function is quite plausible for some firms, particularly those which face a significant probability of negative earnings and are unable to carry forward 100 per cent of their tax losses to subsequent periods.

Statutory progressivity causes the tax schedule to be convex. In addition to statutory progressivity, tax preference items (for example, tax loss carry forwards, foreign tax credits, and investment tax credits) also make the effective tax schedule convex (Zimmerman, 1988). Tax preference items, which are subtracted from pre-tax income, indirectly create convexity in the tax liability (concavity in a firm value), because the present value of unused preference items decreases as they are carried forward to future periods. Reducing variance through hedging increases the expected value of tax benefits because the probability of using preference items increases with the level of a firm's taxable income. The tax code generally specifies that if the firm's pretax income falls below a certain level, the value of tax preference items is reduced by either the loss of the tax shield or postponement of its use (Gurel and Pyle, 1984). Hence, Nance, Smith and Smithson (1993) have concluded that the tax benefit is greater if the firm has more tax preference items.

Graham and Smith (1996) have used simulation methods in their paper to investigate convexity induced by tax-code provisions. The authors have explored how uncertainty about future taxable income interacts with major provisions of the tax code, including statutory progressivity, tax-loss carry-backs and carry-forwards, investment tax credits, and the alternative minimum tax. From their analysis of more than 80,000 COMPUSTAT firm-year observations, they found that in approximately 50 per cent of the cases, corporations face convex effective tax functions and thus have tax-based incentives to hedge. In approximately 25 per cent of the cases, firms face linear tax functions. The remaining firms face concave effective tax functions (which provide a tax-based disincentive to hedge). Among the analysed firms facing convex tax functions, roughly one-quarter of the firms have potential tax savings from hedging that appear material - in extreme cases exceeding 40 per cent of the expected tax liability. For the remaining firms, the tax savings are fairly small - average tax savings from a five percent reduction in the volatility of taxable income are about 5.4 per cent of expected tax liabilities base.

Applied methods also allowed Graham and Smith (1996) to break down the basic structure of the tax code to examine the incremental impact of statutory progressivity, net operating loss, carry-backs and carry-forwards, investment tax credits, the alternative minimum tax, and uncertainty in taxable income. They found that much of the convexity is induced by the asymmetric treatment of profits and losses in the tax code. Carry-back and carry-forward provisions effectively allow firms to smooth their losses, thereby reducing tax-function curvature at its most convex points and making the function convex over a broader range of taxable income. In contrast, the alternative minimum tax and investment tax credits have only a modest effect on the convexity of the tax function.

Mayers and Smith (1982) have proven that firms with more convex tax schedules (e.g., due to large tax loss carry-forwards or very low net income) are more likely to engage in hedging activities. The evidence in Mian's study (1996) is mixed with respect to the hypothesis that hedging decisions are motivated by tax saving strategies. Consistent with the tax hypotheses, Mian has found the incidence of foreign tax credit (as a proxy for tax shield) to be generally associated with a higher likelihood of hedging. Inconsistent with the tax hypothesis, there is no robust relation between hedging and the incidence of progressivity in the tax schedule, and between hedging and the incidence of tax loss carry forwards.

It could be argued that, when judging the importance of the magnitude of the potential tax benefits, for firms with convex effective tax functions, the tax savings of hedging are not mutually exclusive from the hedging benefits of controlling underinvestment problems, increased debt capacity, or reduced agency cost of various classes of the firm's claimholders. Thus, the total benefit of hedging is the sum across these motives. Therefore, with the appropriate choice of hedging instruments, a firm can simultaneously manage the impact on its value, reported income, and taxable income.

2.2.2 Managerial Utility Maximisation Hypothesis

Shareholders hire managers because they have specialised knowledge and skills that increase the value of the firm. Managers cannot use their expertise unless they have some discretion in the choice of their actions. Yet it should be emphasised that, unless faced with proper incentives, managers will not maximise shareholder wealth. Firm managers have limited ability to diversify their own personal wealth position, associated with stock holdings and their career earnings from their own employment position. Therefore managers prefer stability to volatility because, other things being equal, such stability improves their own wealth, at little or no expense to other stakeholders. To avoid this problem, the managerial compensation contract must be designed in such a way that, when managers increase the value of the firm, they also increase their own expected utility.

This rationale was first proposed by Stulz (1984). This argument can be traced back to the literature on the theory of agency. In this area, the relationship between firm performance and managerial remuneration is clearly developed in such papers as Ross (1973). Ross (1973) has argued that an agency relationship has arisen between two (or more) parties when one, called an agent, acts for, on behalf of, or as representative for the other, called a principal, in a particular domain of decision problems.

Jensen and Meckling (1976) and Fama (1980) have discussed the conflict of interest between the owners and the managers of a corporation. They assume that the contracting parties form rational expectations and seek to maximise their individual expected utilities within the effective constraints implied by their contracts. Thus conflicts of interests arise among the contracting parties whenever discretionary behaviour is authorised. Jensen and Meckling (1976) demonstrated that incentives exist to write contracts which maximise the current market value of the firm. Conflicts of interest between the owners and the managers can provide a basis for the corporate demand for hedging.

Amihud and Lev (1981) have argued that two versions of motive for corporate risk reduction exist. In the first one, managers seek to reduce the probability of bankruptcy in order to enhance their job security and preserve their investment in firm-specific human capital. For example, the manager's working life is limited while the corporate form gives the firm an indefinite life. This difference in time horizons produces an incentive conflict. The second version of the agency motive for corporate risk reduction maintains that if risk-averse managers are compensated on the basis of their firm's earnings, they prefer a stable earnings stream. The manager's claim on the firm has a life which is related to the life of his job. If his compensation package includes a bonus based on reported earnings, postponing selected expenditures until after retirement can increase his expected compensation. In this context, Holmstrom (1979) has discussed that managers may take a variety of risk reducing actions at the expense of shareholders.

A manager's behaviour is predictable and will be anticipated by the owners of the corporation, therefore his overall compensation is going to be adjusted to reflect the manager's anticipated actions. Because the adjustment will include anticipated avoidable costs, managers have incentives to make believable promises not to engage in these activities by allowing monitoring and offering to bond their actions (Mayers and Smith, 1982). In both versions, the agency problem arises because managers care about total risk (systematic risk as well as business risk). Shareholders, however, care only about the systematic component of total risk, since they can diversify their portfolios to compensate for business risk.

Fatemi and Luft (2002) have argued that, under such conditions, the managerial risk aversion hypothesis predicts that the managers will engage in full cover hedging. That is, they will attempt to eliminate deviations below, as well as those above the mean of the probability distribution of the firm's net cash flows. This pattern of risk management may be further strengthened by managerial compensation schemes that encourage the achievements of static performance targets. Therefore, the managerial risk aversion hypothesis assumes that risk management strategies are implemented, principally, to enhance the position of the firm's management. This brings into focus the agency costs arising from the conflicts between management and shareholders. In analysing this problem, it should be emphasised that full cover hedging eliminates desirable (upper tail) outcomes as well as all the undesirable (lower tail) outcomes. As such, full cover hedging does not enhance the firm's or shareholder value. The benefits derived from it accrue only to the management. In its extreme form, Fatemi and Luft (2002) have emphasised that the full cover hedging can be used to protect the management at the expense of the shareholder.

Smith and Stulz (1985) have claimed that managers' compensation plans can influence their hedging choices. Specifically, the incorporation of option-like provisions in managers' compensation increases the incentives for managers to take risks. The expected utility of managerial wealth has the shape of a convex function of the firm's expected profits when managers own unexercised options. Therefore, they have concluded that the more option-like features there are in the compensation plans, the less managers will hedge. In this case, managers can choose to increase the risk of the firm in order to increase the value of their options. For instance, bonus plans that make a payment to managers only if accounting earnings exceed some target number will induce managers to hedge less since this payment is a convex function of accounting earnings. Results of some empirical studies have confirmed this hypothesis (e.g., see Tufano, 1996; Gay and Nam, 1998), while, in contrast, Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings. However, it will generally not be efficient to eliminate all incentives to hedge. While presenting the shareholder maximisation hypothesis in previous sections of our thesis, it has been shown that hedging is a value-increasing strategy. Moreover, a compensation plan that eliminates all hedging incentives would be costly to negotiate and implement.

Smith and Stulz's prediction is confirmed by Tufano (1996) who examined commodity hedging activities in the gold mining industry on the sample of the 48 North American gold mines. He has found that firms' use of commodity derivatives is negatively related to the number of options their managers and directors hold, and positively related to the value of their stock holdings. This evidence is consistent with theories of managerial risk aversion, but such use of derivatives may not add to the value of a firm. One must be careful not to over-interpret the results of a single-industry study of a few dozen observations per year. With this in mind, Tufano's (1996) study has suggested that risk management practices in the gold mining industry appear to be associated with both firm and managerial characteristics, although theories of managerial risk aversion seem more informative than those of shareholder value maximisation.

A very different managerial theory of hedging, based on asymmetric information, is put forward by Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992), who focus on managers' reputations. They have argued that managers may prefer to engage in risk management so as to better communicate their skills to the labour market. Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992) have argued that younger executives are more willing to embrace new concepts like risk management, than are their older colleagues. Managerial tenure might play a similar role, because it is possible that short-tenure financial managers would have less developed reputations than longer-tenure managers. Therefore, they would have an incentive to signal their quality through hedging. To the extent these assumptions are correct, firms with younger managers and those whose managers have shorter tenures on the job would be more willing to manage risk.

Contrary to the Breeden and Viswanathan (1996) predictions regarding the managers tenure, May (1995) has argued that managers' years with the firm should be negatively related to the firm risk characteristics, therefore creating a greater incentive to hedge. This is because managerial skills become more firm-specific as time spent with the firm increases. May (1995) has assumed that, if diversification reduces human capital risk, firms whose managers have more years vested are more likely to pursue hedging strategies.

Tufano (1996) has tested these assumptions and found that there is no meaningful relationship between CEO and CFO age and the extent of risk management activity, except a negative relationship between CFO age and risk management. The lack of association between age and risk management might be the result of age acting as a factor that influences both risk aversion and predilection to use sophisticated financial instruments. However, the association of tenure with risk management is stronger. Tufano (1996) has proven that firms whose CFOs have fewer years in their current job are more likely to engage in greater risk management activities, confirming the hypothesis that newer executives are more willing to engage in risk management activities than are their counterparts with long-tenures.

Thus, the results can be seen as consistent with the Breeden and Viswanathan (1996) theory. However, their model would seem to apply to CEOs as well as CFOs – the finding that the tenure of the CEO is not related to the level of risk management is a warning not to over-interpret these results. However, Tufano's (1996) finding supports the general contention that managerial motives may be relevant in creating corporate risk management policy. On the other hand, the result could also reflect the fact that firms wishing to implemen financial risk management tend to hire new financial managers who are skilled in the appropriate tools and techniques.

2.3 Conclusion

The relevance of corporate risk management function and its influence on the company's value, as well the theoretical rationales for hedging and their empirical implications were presented in this chapter. For a long time it was believed that corporate risk management is irrelevant to the value of the firm and the arguments in favour of the irrelevance were based on the Capital Asset Pricing Model (Sharpe, 1964; Lintner, 1965; Mossin, 1966) and the Modigliani-Miller theorem (Modigliani and Miller, 1958). One of the most important implications of the CAPM is that diversified shareholders should care only about the systematic component of total risk, which leads to the conclusion that managers of firms who are acting in the best interests of shareholders should be indifferent about hedging of risks that are unsystematic. Business risk management is unnecessary from the perspective of the CAPM, and if the design and execution of such hedging strategies are costly, it would seem that these activities would not be in the interests of diversified shareholders (Shapiro and Titman, 1998).

Miller and Modigliani's "M&M" proposition supports CAPM findings due to a argument that, in the "frictionless" M&M framework, management cannot increase a firm's value by changing either capital structure or hedging policy. These are purely financial transactions that do not affect the value of a company's operating assets. The conditions underlying the the M&M propositions also imply that decisions to hedge corporate exposures to interest rates, exchange rates and commodity prices are completely irrelevant because stockholders already protect themselves against such risks by holding well-diversified portfolios.

However, it is apparent that managers are constantly engaged in hedging activities that are directed at the reduction of unsystematic risk. In the real world, financial managers and treasurers give a great deal of thought to matters of capital structure and securities design. Additionally, the corporate use of derivatives in hedging interest rate, currency, and commodity price risks is widespread and growing. It has only been for two decades that both scholars and practitioners have realised that managing corporate risk lies at the heart of a competitive corporate strategy, and that the management of corporate risk is central to organisational evolution.

As an explanation for this clash between theory and practice, imperfections in the capital market are used to argue for the relevance of corporate risk management function. It is well known that the M&M propositions were intended to hold only under a restrictive set of conditions, the most important of which are that there are no costs associated with bankruptcy or financial distress, no taxes or transactions costs, that corporate investment decisions are not influenced by financing choices, including decisions to hedge various price risks, that reliable information about the firm's future earnings prospects is costlessly available to all investors and managers alike, and that individuals and firms have equal access to all security markets, including the ability to issue identical securities on the same terms (Culp, 1994).

Based on seminal work by Mayers and Smith (1982) in the area of the corporate demand for insurance, researchers such as Stulz (1984), Smith and Stulz (1985), and Shapiro and Titman (1998) have examined why large, diversified firms actively engage in hedging activities. These authors argued that the earlier theories are applicable to individuals and small, closely held firms but could not be used as a solid theoretical rationale for hedging by large corporations. The authors demonstrated several theories of hedging which overcome the irrelevancy arguments of modern portfolio and corporate finance theory. Most of these theories rely on the introduction of some frictions into the M&M model, and argue that market imperfections enable firms to add value through hedges that cannot be exactly duplicated by individual investors.

The first theory suggests that, by reducing the volatility of cash flows, firms can decrease the costs of financial distress (Mayers and Smith, 1982; Myers, 1984; Stulz, 1984; Smith and Stulz, 1985; Shapiro and Titman, 1998). In the MM world, financial distress is assumed to be costless. Hence, altering the probability of financial distress does not affect firm value. If financial distress is costly, firms have incentives to reduce its probability, and hedging is one method by which a firm can reduce the volatility of its earnings. By reducing the variance of a firm's cash flows or accounting profits, hedging decreases the probability, and thus the expected costs, of financial distress. Additionally, Smith and Stulz (1985) have argued that, while the reduction of financial distress costs increases firm value, it augments shareholder value even further by simultaneously raising the firm's potential to carry debt. Corporate risk management lowers the cost of financial distress, which leads to a higher optimal debt ratio, and the tax shields of the additional debt capital further increase the value of the firm. This theory has been empirically proven by, among others, Campbell and Kracaw (1987), Bessembinder (1991), Dolde (1995), Mian (1996) and Haushalter (2000).

The second theory suggests that, by reducing the volatility of cash flows, firms can decrease agency costs (see: Jensen and Meckling, 1976). According to Dobson and Soenen (1993) there are three sound reasons based on agency costs why management should hedge corporate risk. First, hedging reduces uncertainty by smoothing the cash flow stream, thereby lowering the firm's cost of debt. Since the agency cost is borne by management, assuming informational asymmetry between management and bondholders, hedging will increase the value of the firm. Therefore, management will rationally choose to hedge. Second, given the existence of debt financing, cash flow smoothing through exchange risk hedging will tend to reduce the risk-shifting as well as the underinvestment problems (see: Jensen and Smith, 1985). Finally, hedging reduces the probability of financial distress and thereby increases the duration of contractual relations between shareholders. By fostering the acquisition of corporate reputation, hedging contributes directly to the amelioration of the moral-hazard agency problem. The results of MacMinn (1987), MacMinn and Han (1990), Bessembinder (1991), Minton and Schrand (1999) and Haushalter, Randall and Lie (2002) support this hedging rationale.

Another theory that focuses on risk management as a means to maximise shareholder value argue that, by reducing the volatility of cash flows, firms can decrease expected taxes. This rationale is put forward by Smith and Stulz (1985), who have argued that the structure of the tax code can make it beneficial for firms to take positions in futures, forward, or option markets. If a firm faces a convex tax function, then the after-tax value of the firm is a concave function of its pre-tax value. If hedging reduces the variability of pre-tax firm values, then the expected tax liability is reduced and the expected post-tax value of the firm is increased, as long as the cost of the hedge is not too large. By reducing the effective long-run average tax rate, activities which reduce the volatility in reported earnings will enhance shareholder value. The more convex the effective tax schedule is, the greater is the reduction in expected taxes. This rationale has been supported by Zimmerman (1988), Froot, Scharfstein and Stein (1993), Nance, Smith and Smithson (1993), Mian (1996) and Graham and Smith (1996).

In addition, reducing cash flow volatility can improve the probability of having sufficient internal funds for planned investments eliminating the need either to cut profitable projects or bear the transaction costs of obtaining external funding. The main hypothesis is that, if access to external financing (debt and/or equity) is costly, firms with investment projects requiring funding will hedge their cash flows to avoid a shortfall in their funds, which could precipitate a costly visit to the capital markets. An interesting empirical insight based on this rationale is that firms which have substantial growth opportunities and face high costs when raising funds under financial distress will have an incentive to hedge more of their exposure than the average firm. This rationale has been explored by numerous scholars, among others by Smith and Stulz (1985), Stulz (1990), Lessard (1990), Shapiro and Titman (1998), Hoshi, Kashyap and Scharfstein (1991), Froot, Scharfstein and Stein (1993), Getzy, Minton and Schrand (1997), Gay and Nam (1998), Graham and Rogers (1999), Minton and Schrand (1999), Haushalter (2000), Mello and Parsons (2000), Allayannis and Ofek (2001) and Haushalter, Randall and Lie (2002).

Another line of reasoning that differs from the shareholders value maximisation hypothesis refers to the managerial utility maximisation hypothesis. It this chapter it has been argued that a firm's managers have limited ability to diversify their own personal wealth position, associated with stock holdings and their earnings' capitalisation. Therefore, they will have an incentive to hedge their own wealth at the expense of the shareholders. Usually that kind of hedging is not conducted to improve the value of the company's stockholders but to improve the managers' own wealth. To avoid this problem, managerial compensation contracts must be designed so that when managers increase the value of the firm, they also increase their expected utility. This can usually be obtained by adding option-like provisions to managerial contracts. This rationale was firstly proposed by Stulz (1984) and has been further explored by Smith and Stulz (1985). The results of some empirical studies have confirmed this hypothesis (e.g. see: Tufano, 1996; Gay and Nam, 1998), while, in contrast, Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings.

A different managerial theory of hedging, based on asymmetric information, has been presented by Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992), who have focused on managers' reputations. In both of these models, it is argued that managers may prefer to engage in risk management activities in order to better communicate their skills to the labour market. Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992) have argued that younger executives and those with shorter tenures have less developed reputations than older and longer-tenure managers. Therefore, they are more willing to embrace new concepts like risk management with the intention of signalling their management quality.

In this chapter we have also argued that the choice of a risk management strategy depends to a great extent on the information available to the financial manager regarding the future expectations of commodity price, interest rates and exchange rate movements (e.g. see: Working, 1962; March and Shapira, 1987; Stulz, 1996; Miller and Reuer, 1996). Efficient risk management does not imply minimisation of all the risks that a corporation is exposed to by forming a perfect hedge. It implies the choice of a strategy that will allow a company to protect its cash flow from severe outcomes, while leaving a possibility of realising extra earnings though financial price changes that has positive impact on the company's cash flows. Companies which have a competitive advantage in collecting information and which leave certain risky positions open could increase their value due to a strategy of selective risk management.

We have concluded that corporate risk management can be conducted in two rather distinct ways. Either the company can embark upon a diversification strategy in the portfolio of businesses operated by the firm, or the company can engage in financial transactions that will have a similar effect. However, diversification based upon conglomerate activity, while once a popular strategy, has fallen out of favour. During the 1950s and 1960s many corporations undertook massive diversification programs. In a few decades the trend has reversed, with a study by Comment and Jarrell (1995) documenting and confirming a return to specialisation. This push toward focus apparently resulted from the evidence that unrelated diversification actually decreases firm value (see: Myerson, 1982; Harris, Kriebel and Raviv, 1982; Stulz, 1990; Jensen, 1986; 1988; Milgrom and Roberts, 1992; Berger and Ofek, 1995). In addition to using diversification strategies, a firm could manage its risk exposure through operational hedging. Operational hedging is a way of conducting a multinational diversification strategy, which provides a reason for direct foreign investment by firms, and may further explain the existence of multinational firms with production facilities at several foreign locations (Chowdhry and Howe, 1999).

In the place of diversification strategy and operational hedging, firms, concerned about the volatility of earnings, have turned to the financial markets, due to the fact that the financial markets have developed more direct approaches to risk management that transcend the need to directly invest in activities that reduce volatility. The task of managing corporate risks has been facilitated by the increasing availability of a variety of instruments to transfer financial price risks to other parties. Allen and Santomero (1998) have written that, during the 1980s and 1990s, commercial and investment banks have introduced a broad selection of new products designed to help corporate managers in handling financial risks. At the same time, the derivatives exchanges, which successfully introduced interest rate and currency derivatives in the 1970s, have become vigorous innovators, continually adding new products, refining existing ones, and finding new ways to increase liquidity. Markets for derivative instruments such as forwards and futures, swaps and options, and innovative combinations of these basic financial instruments, have developed and grown at a breathtaking pace, and many corporations have become active participants in derivatives markets. Since then, the range and quality of both exchange-traded and OTC derivatives, together with the depth of the market for such instruments, have expanded intensively.

It should be also noted that, instead of managing risk through hedging, firms could pursue alternative financial policies, usually referred to as “hedge substitutes”, which can also reduce a firm’s risk without requiring the firm to directly engage in risk management activities. Firms could adopt conservative financial policies (e.g.: low leverage, low dividend pay-out ratio, large cash balances) to protect them against potential hardship (see: Froot, Scharfstein and Stein, 1993; Nance, Smith and Smithson, 1993; Tufano, 1996; Pulvino, 1998; Harford, 1999). Structured debt as well as preferred stock can be seen as another example of “hedge substitutes” (see: (Smith and Stulz, 1985; Smithson and Chew, 1992; Nance, Smith and Smithson, 1993; Culp, 1994). In studies presented in this chapter it has been argued that the likelihood of the firm employing off-balance-sheet hedging instruments is lower the more hedging substitutes are employed by a company.

On the basis of the presented arguments that arise from the literature survey, we have created our research hypothesis. We have tested whether the decision to hedge or not, and the decision to hedge with derivatives made by Croatian and Slovenian non-financial companies, is a function of six factors – financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility maximisation and hedge substitutes. We have also tested the assumption that corporate risk management is more developed or has different rationales among Slovenian than among Croatian companies. In addition, the thesis has explored which hedging strategies and instruments are employed in order to give a consistent view of existing practices of corporate risk management in the analysed Croatian and Slovenian companies. The evidence on empirical implications of hedging theories and practices is presented in Chapters 4, 5 and 6.

3. RESEARCH METHODS AND DATA SOURCES

3.1 Introduction

In this chapter we provide a review of the methodology used in the most recent empirical studies conducted on corporate risk management, as well as the methodology of our research. The methodology review is presented in a way that follows our research hypothesis. The different variables used as proxies to test the research hypothesis in the analysed papers are presented in section 3.2. This review has helped us to create our own set of variables which is presented in section 3.3, where we also explain the limitations we had in creating our research variables due to data unavailability.

The analysis of variables is followed by section 3.4, where a review of the sampling process and data collection together with the econometric and statistical analysis used in the previous studies is presented in sub-section 3.4.1. This again was a base for the econometric analysis conducted in our thesis which is presented in sub-section 3.4.2. In the univariate analysis, we have employed t-test to determine whether the means of two unrelated samples differ. Additionally, we have conducted the Pearson test of correlation because variables in the model are of an interval/ratio nature (Bryman and Cramer, 1997). The analysis was conducted for two different groups. In the first group, we have explored differences between a sub-sample of hedgers and nonhedgers, while in the second group we investigated differences between companies that are derivative users and those companies that do not use derivatives.

In the multivariate analysis, we have chosen binomial (or binary) logistic regression because it is a form of regression which is used when the dependent variable is a dichotomy (limited, discrete and not continuous) and the independents are of any type. With a categorical dependent variable, discriminant function analysis is usually employed if all of the predictors are continuous and nicely distributed; logit analysis is usually employed if all of the predictors are categorical; while logistic regression is chosen if the predictor variables are a mix of continuous and categorical variables and/or if they are not nicely distributed (logistic regression makes no assumptions about the distributions of the predictor variables) (Hosmer and Lemeshow, 1989; Rice, 1994; Allison, 1999; Menard, 2002). In our logistic model we have tested if the decision to hedge or not, as well as the decision to hedge with derivatives, is a function of the six factors - financial distress costs, agency costs, capital market imperfections, taxes, managerial utility, and hedge substitutes.

Finally, the data description and the process of collecting research data are presented in section 3.5. Here we explain the sampling process for Croatia and Slovenia. Both samples contain the largest non-financial companies, and criteria for selecting companies in the samples were similar for both countries. Empirical research was conducted on the large non-financial companies due to the fact that these companies have access to derivatives markets and should have developed risk management function. Financial firms were excluded from the sample because most of them are also market makers, hence their motivation in using derivatives may be different from the motivations of non-financial firms. We also explain the data collecting process. Data were collected from two sources: from annual reports and notes to the financial statements for the fiscal year 2005, and through the survey. In our research we have relied more on the survey data than on the annual reports for several reasons, which are also explained in section 3.5. We conclude the chapter with section 3.6.

3.2 Variables Used in the Analysed Literature

3.2.1 Shareholder Maximisation Hypothesis

3.2.1.1 Cost of Financial Distress

Geczy, Minton and Schrand (1997) have used two measures of borrowing capacity as proxies for a firm's prehedging probability of financial distress: the interest coverage ratio, and the long-term debt ratio defined as the book value of the long-term debt divided by the market value of assets. They have argued that the lower a firm's coverage ratio and the higher its long-term debt ratio, the greater is the probability of financial distress. To check the robustness of the results obtained by using long-term debt as a proxy for financial distress, they have used another measure - a firm's Standard & Poor's credit rating. This measure had a dichotomous nature and was scaled one if a firm had credit rating grade and zero otherwise.

Haushalter (2000) has employed two measures for the degree of a firm's financial leverage: 1) the ratio of the book value of short-term and long-term debt to the market value of assets (Allayannis and Ofek, 2001, have used the same measure in their study), and 2) the book value of short-term and long-term debt to the book value of assets. The results of analysis were qualitatively similar when he used these alternative measures. Allayannis and Weston (2001) have measured firm's leverage as a ratio of the long-term debt scaled by the shareholders' equity. Hoyt and Khang (2000) have employed the debt-to-equity ratio calculated as the book value of long-term debt divided by the sum of the long-term debt and market value of equity.

Shapiro and Titman (1998) have extended the cost of financial distress to include the deterioration of valuable relationship with buyers and suppliers who value long-term access to the firm. To measure the relative likelihood of financial distress, Tufano (1996) has collected data on firms' cash costs and leverage. As a proxy for cash costs he has taken the per-ounce costs of producing gold, excluding non-cash items as well as financing costs. Leverage has been measured as the book value of debt dividend by the total market value of financial claims (market value of equity plus book value of preferred stock and debt). He has predicted the positive relationship between the decision to manage risk and both cash costs and leverage.

Mian (1996) has computed leverage as the year-end ratio of the book value of debt to the sum of market value of common equity and the book value of preferred equity. Nance, Smith and Smithson (1993) have employed two variables to measure leverage: 1) the firm's debt-size ratio computed as the ratio of the book value of long-term debt to a firm's size measured by the sum of the book value of the firm's debt plus the market value of its equity; and 2) the coverage of fixed claims computed as earnings before interest and taxes to the total interest expense. The first measure is predicted to be positively related to the decision to hedge, and the second one is predicted to be negatively related, meaning that firms with a higher debt-size ratio and smaller interest cover will have more incentives to hedge.

Tufano (1996) and Hoyt and Khang (2000) have employed a regulation in different industry sectors as a proxy for the incentive contracting hypothesis which predicts that hedging is less likely in the regulated utilities industries (e.g. firms in electric, gas, and sanitary services), due to the fact that regulation makes it easier for fixed claim holders to observe managerial action. As a consequence, the authors have predicted that firms in regulated industries face lower contracting costs and, therefore, they have less of an incentive to hedge. In both studies, a dummy variable was employed to indicate whether the firm is included in the utility industry.

3.2.1.2 The Agency Cost of Debt

Geczy, Minton and Schrand (1997) have used two proxies to measure informational asymmetry: the percentage of institutional ownership of the sample firms, and the number of investment firms with analysts following the sample firms. They have predicted that that a larger analyst following and a greater share of ownership by institutional investors are positively related to the availability of information, and thus negatively related to the probability of hedging. Haushalter (2000) has employed a firm's Standard & Poor's credit rating to test whether firms are facing fewer informational asymmetries due to the fact that they have undergone more capital market scrutiny. He has predicted that firms with a credit rating hedge less extensively.

Costs also play a role in a firm's decision to hedge. Froot, Scharfstein and Stein (1993) have argued that firms for which external financing is more costly would be more likely to use risk management. It is reasonable to predict that informational asymmetries or transaction costs for small firms are greater than for larger ones – at least for financial activities. Therefore, theory predicts a negative relation between firm size and the decision to hedge. Tufano (1996) has measured firm size using two proxies: 1) the total market value of financial claims (market value of equity plus the book value of debt and preferred stock), and 2) the number of ounces of proven and probable reserves, which is a common measure of firm size in the gold-mining industry.

Geczy, Minton and Schrand (1997) have used the size of a company as a proxy for economies of scale in the costs of hedging. The size of a company is measured as the market value of assets, defined as the natural logarithm of market value of equity plus book value of total liabilities and preferred stocks minus the book value of equity. This measure was also used by DeMarzo and Duffie (1991), while Nance, Smith and Smithson (1993) and

Haushalter (2000) have used a similar proxy where firm size is computed as the sum of the book value of the firm's debt plus the market value of its equity. Haushalter (2000) has used an alternative measure of firm value calculated as the book value of assets (also employed by Hoyt and Khang (2000)), and got qualitatively similar results with both measures. Mian (1996) has used the book value of assets minus the book value of common equity plus the market value of common equity, while Allayannis and Ofek (2001) have employed the logarithm of total assets as a proxy for firm size. Allayannis and Weston (2001) have constructed three alternative measures: 1) the logarithm of total assets, 2) the logarithm of total sales, and 3) the logarithm of capital expenditures, and have obtained very similar results with all of them.

Several previous empirical studies (e.g., Nance, Smith and Smithson, 1993; Dolde, 1995; Mian, 1996; Géczy, Minton and Schrand, 1997; Allayannis and Weston, 2001) have found that firms with more assets are more likely to hedge. These studies contend that the positive correlation between size and hedging can be attributed to significant economies of scale in information and transaction costs of hedging. Based on this argument, a firm's size should be positively related to the probability that the firm hedges.

3.2.1.3 Capital Market Imperfection and Costly External Financing

Froot, Scharfstein and Stein (1993) have formalised the Smith and Stulz (1985) financial distress explanation for optimal hedging by endogenising bankruptcy costs. They have argued that without hedging, firms are more likely to pursue suboptimal investment projects. Geczy, Minton and Schrand (1997) have predicted a positive association between potential underinvestment costs and benefits of hedging. They have used three variables as proxies for the growth opportunities: 1) research and development expenditures to its sales, 2) a firm's capital expenditures for property, plant and equipment to the firm's size measured as the book value of the firm's debt and outstanding preferred stock plus the firm's equity, and 3) the book value of a firm's common equity scaled by its market value.

Allayannis and Ofek (2001) have used the same measures in their study as proxies for growth options in the firm's investment opportunity. Allayannis and Weston (2001) have employed research and development expenditures and firm's capital expenditures for property, plant and equipment scaled by firm's sales as measures of investment growth. Nance, Smith and Smithson (1993) have employed research and development expenditures by the firm size as a proxy for growth opportunities. Haushalter (2000) has measured investment opportunities as the ratio of investment expenditures divided by the market value of assets. All of them have predicted a positive relation between investment opportunities and the benefits of hedging. Tufano (1996) has also predicted a positive relationship between measures of investment spending and the decision to hedge. He has taken 1) exploration expenditures scaled by firm value measured by the market value of equity plus book value of preferred stock and debt, and 2) the dollar value of acquisitions attempted over the prior three years scaled also by the firm value as proxies for investment opportunities.

Mian (1996), Nance, Smith and Smithson (1993) and Hoyt and Khang (2000) have used the ratio of market to the book value of total assets (market-to-book ratio) to capture the distinction between assets in place and growth opportunities. This ratio was calculated as the market value of the firm's equity plus the book value of liabilities divided by the book value of total assets. The basic assumption behind the use of this variable is that firms with more growth options will have market values greater than their book values and therefore, and as predicted by Froot, Scharfstein Stein (1993), will have more incentives to hedge. Another variable that Mian (1996) has employed to test the capital market imperfection hypothesis is the size of the company measured by the book value of assets minus the book value of common equity plus the market value of common equity. The degree of hedging is predicted to be negatively correlated with the size of the company due to the fact that fixed costs associated with capital market visits are likely to make financing more expensive for smaller firms.

3.2.1.4 Taxes

Smith and Stulz (1985) have demonstrated that hedging increases the expected value of an equity-holder's ownership claim when a progressive statutory corporate tax schedule creates concavities in a firm's expected profit function. Additionally, tax preference items indirectly create convexities in the tax liabilities (concavity in the firm value), so they need to be taken into account as well. Geczy, Minton and Schrand (1997) have measured the availability of tax preference items using the book value of net operating loss carry-forwards outstanding scaled by total assets. Nance, Smith and Smithson (1993) have constructed three variables to measure a firm's effective tax function: 1) the book value of the tax loss carry forwards, 2) the book value of the investment tax credits, and 3) a binary variable that indicates whether the variation in the firm's historical pretax income makes it likely that it would be in the convex region of the tax code.

Tufano (1996) has used the tax loss carry-forward measure scaled by the firm's value. Mian (1996) has used a dummy variable that equals one if a firm uses tax loss carry-forwards and tax credits, and zero if a firm does not use tax preference items. Hoyt and Khang (2000) have employed investment tax credits plus tax loss carry-forwards divided by the total firm's assets as a measure of the tax shield. All of them have predicted that firms with greater tax preference items, and more convex tax schedules, will have more incentives to hedge.

3.2.2 Managerial Utility Maximisation Hypothesis

The Geczy, Minton and Schrand (1997) empirical tests have included a set of hypotheses that are very comprehensive. They have organised the various theories into a single framework by discussing the incentives for derivative use from the perspectives of managers, bondholders and equity holders. Smith and Stulz (1985) were the first to predict a positive relation between managerial wealth invested in the company and the use of derivatives. Geczy, Minton and Schrand (1997) have tested this hypothesis and have measured the managerial wealth derived from the shares by the log of the market value of common shares beneficially owned by officers and directors as a group. Haushalter (2000) has employed identical measure in his study, as well as the percentage of the firm's outstanding shares held by officers and directors (the measure also used by Hoyt and Khang, 2000).

Allayannis and Ofek (2001) have used the total number of shares held by managers scaled by total shares outstanding to test theories related to managerial risk aversion. Tufano (1996) has collected the number of shares and the number of options owned by officers and directors in order to test whether managerial risk aversion is a driver of corporate risk management decisions. He has used the log of the dollar value of shares as a proxy of manager wealth invested in a firm to reflect that, while the predicted relationship between this proxy and a decision to hedge is positive, risk aversion should decline as managers' wealth increases.

On the basis of the Smith and Stulz (1985) prediction of a negative relation between managerial option holdings and derivatives use, Geczy, Minton and Schrand (1997) have tested this hypothesis by using the log of the market value of the shares obtainable by using outstanding options as a measure for managerial ownership of options. Haushalter (2000) has used four different measures for managerial option holding. All of them were predicted to be negatively correlated with the extent of hedging. The first one was the number of options held by officers and directors that are exercisable within 60 days. The second measure was the number of options held by officers and directors that are exercisable within 60 days, divided by the number of officers and directors. A third proxy was the ratio of the sum of exercisable and unexercisable options divided by the number of officers and directors, and the fourth one was the ratio of the value of stock options awarded to the CEOs as salary bonuses. Allayannis and Ofek (2001) have used the total number of options held by managers scaled by the total number of shares to test theories related to managerial risk aversion.

As a proxy for option holding, Tufano (1996) has used the number of options outstanding. He has employed two additional measures that proxy for manager age and tenure, which should reflect the risk aversion of the manager. It is predicted that managers who are more risk averse would be more likely to manage risk. Unfortunately, there is no direct measure of the degree of risk aversion. Tufano (1996) has employed age and tenure which might serve as proxies, in that older managers facing retirement might prefer to minimise fluctuations in their own portfolios, while managers who do not have a long tenure in the analysed company are more likely to adopt new ideas like corporate risk management. Therefore, Tufano (1996) has predicted that firms with younger managers and those whose managers have shorter tenures on the job would be more inclined to manage risk. Contrary to Tufano's (1996) predictions regarding the managers' tenure, May (1995) has argued, by using the same measure as Tufano (1996), that managers' years with the firm should be negatively associated with firm risk attributes, therefore creating a greater incentive to hedge.

3.2.3 Alternative Financial Policy as a Substitute for Hedging

While Smith and Stulz (1985) and Nance, Smith and Smithson, (1993) have proven a negative relationship between hedging and the firm's use of convertible debt and preferred stock, Geczy, Minton and Schrand (1997) and Froot, Scharfstein and Stein (1993) have predicted a positive relationship due to the fact that convertible debt and preferred stock are hidden financial leverage, which constraints a firm's access to external funds. This prediction is based on the Froot, Scharfstein and Stein (1993) argument that firms that are more financially constrained are exposed to greater underinvestment costs. Geczy, Minton and Schrand (1997) have used the book value of convertible debt and book value of preferred equity as proxies for hedging substitutes. Nance, Smith and Smithson (1993) used the book value of convertible debt and preferred stock both divided by the size of the company as measures for hedging substitutes.

Nance, Smith and Smithson (1993) have also argued that firms can reduce the expected financial distress and agency costs associated with long-term debt by maintaining greater short-term liquidity, and have used current ratio and dividend price ratio as measures for this hypothesis. Geczy, Minton and Schrand (1997) have used two variables as proxies for a firm's short-term liquidity: the quick ratio (Tufano (1996) has used this measure as well), defined as cash and short-term investment divided by current liabilities, and the dividend payout ratio defined as the common dividend per share divided by earnings per share (used also by Haushalter (2000)). They have predicted that the greater a firm's quick ratio and the lower its dividend payout ratio, the lower its need to hedge to reduce the expected financial distress and agency cost of straight debt.

Mian (1996) has employed year-end ratio of current assets to current liabilities as a measure of corporate liquidity. Haushalter (2000) has calculated the level of cash holding using the ratio of cash and marketable securities to the market value of total assets. Mian (1996), Tufano (1996) and Haushalter (2000) have predicted a negative relation between numbered measures representing alternative financial policy and a decision to hedge. On the other hand, Froot, Scharfstein and Stein (1993) have predicted a positive association between liquidity and hedging, which results from the interpretation of liquidity not as a substitute for hedging, but as a measure of the availability of internal funds.

3.3 Research Variables

3.3.1 Dependent Variables

In this work, as a measure for a company's hedging, we have employed a dependent variable in the form of a binary variable which presents a dichotomous measure. The dependent variable is coded as "1" for those firms that manage foreign exchange, interest rate or commodity price risk, and "0" for those firms that do not manage financial risks. In the first group of companies, named "hedgers" we included not only companies that use derivatives instruments as an instrument of corporate risk management, but also companies that use other types of hedging strategies like debt with embedded options, operational hedging, natural hedging, international diversification of business etc. The majority of the earlier empirical studies on risk management such as Nance, Smith and Smithson (1993), Mian (1996), Geczy, Minton and Schrand (1997), Allayannis and Weston (2001) and Cummins, Phillips and Smith (2001) have used a dichotomous variable that equalled one if a firm has used derivatives and zero if it has not.

Because of the decision to include all financial risk management activities, our dichotomous variable should not be subject to the inaccurate categorisation of functionally-equivalent financial position. This has allowed us to disentangle derivatives activity from risk management activity, which is a major advantage of our approach. However, it should be emphasised that the use of a binary dependent variable is problematic because it does not fully describe the extent of a firm's hedging activity. That is, a firm which hedges 1 per cent or 100 per cent of its risk exposure is treated the same in the model when a binary variable is employed.

Additionally, we have expanded our analysis only to companies that use derivatives as risk management instruments. As we have already explained, among companies that manage financial risks, there is a substantial number of hedgers who do not use derivatives, but manage risk exposure with some other instruments like natural hedge, matching liabilities and assets, operational hedging etc. By separating derivative users from companies that do not use derivatives, our intention was to show whether there are some statistically significant differences between these two samples, and to explore whether some specific company's characteristics affect the decision to hedge by using derivative instruments. We have created the two samples by taking together companies that manage risks but not with derivatives and companies that do not manage financial risks at all in the first sample, while in the second sample we have analysed only those companies that manage financial risks with derivatives. The dependent variable is coded as a "1" for those firms that manage foreign exchange, interest rate or commodity price risk by derivative instruments and "0" for those firms that do not use derivatives, as well as those companies that do not manage financial risks at all.

Regarding the analysis of derivative users, a second dependent variable that we planned to employ and which should correct the disadvantages of a binary dependent variable, was a continuous measure. As a proxy for company's hedging, we wanted to use a notional value of forward contracts, options and other derivatives divided by the market value of the company's assets. This measure is the aggregate notional value of all reported derivative contracts deflated by the market value of assets measured at the beginning of the year for which derivative information is collected.

Using the notional value as a dependent variable has several advantages over using a binary variable to indicate whether or not a firm uses derivatives (e.g. see: Tufano (1996) or

Allayannis and Ofek (2001), who have employed a continuous variable). For example, by using this continuous measure, we would be able to test hypotheses on the determinants of the amount of hedging, and examine the impact of a firm's derivative use on its risk exposure. However, a disadvantage of this measure is that the notional principal of the derivatives positions only gives a rough indication of the size of the exposures (eg. see Hentschel and Kothari, 2001). Consequently, the reported notional principal values have to be interpreted with care

Unfortunately, we were not able to collect information on the notional value of derivatives used in the analysed companies. We asked financial managers to provide us with this information, but the majority of them were not willing to disclose it. Therefore, in our analysis, we used only dichotomous measures as our dependent variable.

3.3.2 Explanatory Variables

There is no widely accepted measure of shareholder maximisation hypothesis. Therefore, to examine the relation between hedging and our first four research assumptions that relate to the shareholder maximisation hypothesis, we have characterised the cost of financial distress, agency cost of debt, taxes and underinvestment problem by employing the following firm-specific explanatory variables: firm's size, dividend policy, investment policy, tax policy, credit rating, liquidity, and capital structure. On the other hand, in order to test the managerial utility maximisation hypothesis, we have employed several explanatory variables that represent the level of managerial firm-specific wealth invested in a company as managerial ownership of the firm's common equity or stock options, as well as managers' age and human capital vested in the firm.

3.3.2.1 Cost of Financial Distress

To examine the hypotheses regarding the reduction in the transaction costs of financial distress, we have used the size of the company and the firm's leverage. The size of a company is measured using two alternative proxies: 1) the book value of assets (Haushalter, 2000; Hoyt and Khang, 2000; Allayannis and Weston, 2001; Allayannis and Ofek, 2001), and 2) the book value total sales revenues (Allayannis and Weston, 2001). Several previous empirical studies (e.g., Nance, Smith and Smithson, 1993; Dolde, 1995; Mian, 1996; Géczy, Minton and Schrand, 1997; Allayannis and Weston, 2001) have found that firms with more assets are more likely to hedge. These studies contend that the positive correlation between size and hedging can be attributed to significant economies of scale in information and the transaction costs of hedging. Based on this argument, a firm's size should be positively related to the probability that the firm hedges.

Contrary to the predicted positive relation between size and the decision to hedge, few scholars have predicted the degree of hedging to be negatively correlated with the size of a company (Froot, Scharfstein and Stein, 1993; Haushalter, 2000; Hoyt and Khang, 2000). The issue of high costs of implementing a risk management program is particularly relevant for the relation between hedging policy and firm size. An additional argument regarding the negative relationship between hedging and size is put forward by Weiss (1990). He has argued that, everything else being equal, companies with fewer total assets are likely to have greater informational asymmetries with potential public investors. Additionally, the direct costs of bankruptcy are proportionally greater for companies with fewer assets; therefore smaller firms are expected to hedge more. We believe that the argument is stronger in the case of the significant economies of scale in information and transaction costs of hedging, so we predict a positive relation between a company's size and the decision to hedge.

Besides measuring the reduction in the transaction costs of financial distress, leverage was also used as a proxy for the impact of fixed claims in the capital structure. We have constructed several different measures for the degree of a firm's financial leverage. First, we have defined financial leverage as the ratio of the book value of short-term and long-term debt to the book value of assets (Allayannis and Ofek, 2001). Alternative measures for the degree of financial leverage are the ratio of the book value of long-term debt to the book value of assets (Tufano, 1996; Nance, Smith and Smithson, 1993; Geczy, Minton and Schrand, 1997), the ratio of the book value of long-term debt to the book value of equity (Hoyt and Khang, 2000; Allayannis and Weston, 2001; Mian, 1996), and the interest cover ratio defined as earnings before interest and taxes to the total interest expense (Geczy, Minton and Schrand, 1997; Nance, Smith and Smithson, 1993).

A number of studies argue that firms with higher leverage are more likely to face binding financial constraints (e.g. see: Mayers and Smith, 1982; Myers, 1984; Stulz, 1985; Smith and Stulz, 1985; Campbell and Kracaw, 1987; Weiss, 1990; Shapiro and Titman, 1998), so we have used financial leverage as a proxy for probability of insolvency. It could be expected that companies with greater volatility of cash-flows or accounting earnings, and which are also highly leveraged, will benefit from risk management activity. We predict that the coefficients on all variables mentioned above and the decision to hedge will be positive, apart from the interest coverage ratio which is predicted to be negatively related, meaning that firms with smaller interest cover will have more incentives to hedge.

3.3.2.2 The Agency Cost of Debt

A binary variable is used to indicate whether a firm is rated by the rating agencies. The variable is coded as "1" for companies that have credit rating and "0" otherwise. Everything else being equal, firms with credit rating have undergone more capital market scrutiny and are thus assumed to face fewer informational asymmetries than ones with no rated debt. Moreover, because companies typically receive credit ratings only if they issue public debt, those that have a credit rating are the ones most likely to have access to the public debt market (Barclay and Smith, 1995). Firms with a credit rating are predicted to hedge less extensively, while firms with greater informational asymmetry will benefit greatly from risk management activity (DeMarzo and Duffie, 1991; Haushalter, 2000).

Tufano (1996) has argued that outside block-holders are primarily well-diversified institutional investors and, therefore, they are less likely to act like risk-averse poorly diversified investors. A measure of outside block-holders that we have employed, which is a proxy for informational asymmetry, is the percentage of firm's stocks owned by institutional investors (DeMarzo and Duffie, 1991; Geczy, Minton and Schrand, 1997). Institutional investors include banks, brokerage firms, insurance companies, mutual funds, and pension funds. Geczy, Minton and Schrand (1997) have predicted that a greater share of institutional investors' ownership is positively related to the availability of information, and thus negatively related to the probability of hedging. Therefore, we predict that the coefficient on this variable is negative with the decision to hedge.

3.3.2.3 Capital Market Imperfection and Costly External Financing

The level of cash holdings is accounted for using the ratio of cash and marketable securities to the market value of total assets as a proxy for the level of cash reserves. Similarly to Pulvino (1998), Harford (1999), Opler *et al.* (1999) and Hoyt and Khang (2000) who have discussed that cash reserves can provide a valuable source of funds for investments when current internally generated funds fall short and external financing is costly, Froot, Scharfstein and Stein (1993) have predicted a positive association between liquidity and hedging, which results from the interpretation of liquidity not as a substitute for long-term debt, but as a measure of the availability of internal funds. Since hedging reduces the probability of cash insolvency, the proxy we have used is expected to be positively related to the amount of hedging.

An additional variable related to financial contracting costs is the investment (growth) opportunities. Myers (1977) and Smith and Watts (1992) have argued that firm value also depends on future investment opportunities. Because hedgers are more likely to have larger investment opportunities (see e.g.: Froot, Scharfstein and Stein (1993) for theoretical arguments, or Getzy, Minton and Schrand (1997) for empirical evidence), such control is important. Nance, Smith, and Smithson (1993) came to one noteworthy result that high R&D firms are more likely to hedge. There are a couple of reasons why this might be expected in the context of the Froot Scharfstein and Stein (1993) model. First, it may be more difficult for R&D-intensive firms to raise external finance, either because their (principally intangible) assets are not good collateral, or because there is likely to be more asymmetric information about the quality of their new projects. Second, R&D "growth options" are likely to represent valuable investments whose appeal is not correlated with easily hedgeable risks, such as interest rates. Thus, common sense would imply more hedging for R&D firms. Bessembinder (1991) has also shown that hedging activities are predicted to be greater in firms where growth opportunities constitute a larger proportion of firm value, because reductions in agency costs are most valuable for these firms.

We have measured investment opportunities as the ratio of investment expenditures to the book value of assets (Haushalter, 2000; Froot, Scharfstein and Stein, 1993; DeMarzo and Duffie, 1991; Geczy, Minton and Schrand, 1997; Smith and Stulz, 1985). Growth opportunities are also measured as a ratio of investment expenditures to the value of total sales (Froot, Scharfstein and Stein 1993; DeMarzo and Duffie, 1991; Geczy, Minton and Schrand, 1997; Smith and Stulz, 1985; Dolde, 1995), or as a ratio of research and development expenditures to the book value of total assets (Allayannis and Weston, 2001; Nance, Smith and Smithson, 1993). Myers (1977; 1984) has suggested that expected bankruptcy costs and underinvestment costs are increasing in the value of a firm's investment opportunities. Based on this argument, the firm's decision to hedge is predicted to be positively correlated with measures for investment (growth) opportunities.

3.3.2.4 Tax Incentives to Hedge

To examine the tax hypothesis, we have used several measures of the firm's effective tax function: (1) total value of the tax loss carry-forwards and tax-loss carry-backs (Nance, Smith and Smithson, 1993), (2) total value of the tax loss carry-forwards plus tax-loss carry-backs to the total assets (Smith and Stulz, 1985; Geczy, Minton and Schrand, 1997; Tufano, 1996), (3) investment tax credits used to offset income tax payable (Nance, Smith and Smithson, 1993), and finally (4) a dummy variable that is equal to 1 if a firm has tax loss carry-forwards, tax-loss carry-backs or investment tax credits, and 0 otherwise (Allayannis and Ofek, 2001).

Smith and Stulz (1985) and Graham and Smith (1999) have agued that the characteristics of the tax code enable corporations to potentially increase their value by hedging. If a corporation's taxable income falls in this progressive region, its expected tax liability is a convex function of its taxable income. Based on this theory, a corporation facing an increasing marginal tax rate can reduce its expected tax liability by reducing the variability of its taxable income. Initially, one might expect that corporations face a convex tax function only under unusual circumstances. However, provisions of the tax code, such as tax-loss carry-backs, tax-loss carry-forwards, and investment tax credits, can have a significant impact on a firm's taxable income. Therefore, the coefficients on all variables mentioned above are predicted to be positive.

3.3.2.5 Managerial Utility Maximisation Hypothesis

The level of a manager's firm-specific wealth is represented in two ways: (1) by the book value of the firm's equity owned by officers and directors (Tufano, 1996; Geczy, Minton and Schrand, 1997), and (2) by the fraction of the firm's outstanding shares held by officers and directors (Hoyt and Khang, 2000; Haushalter, 2000). The incentives for managers to hedge should be increasing in both these variables (Smith and Stulz, 1985).

The extent to which options are used in managers' compensation is gauged using a binary variable that equals one if managers of a firm own stock options and zero otherwise. We predict this proxy to be negatively correlated with the extent of hedging. Variables that are employed in other studies (see e.g.: Smith and Stulz (1985); Haushalter (2000); Tufano (1996); Geczy, Minton and Schrand (1997)), such as the number of options (total option holdings) held by officers and directors, the number of options (total option holdings) held by officers and directors divided by the number of officers and directors, or a logarithm of the market value of shares that could be owned by managers and directors by exercising their options, are better measures for testing this hypothesis, but are not available as public information in the case of Croatian and Slovenian companies. Therefore, we were unable to use them and we needed to employ an alternative measure.

We have employed two additional measures that proxy for risk aversion of the manager; manager age and tenure or human capital vested in the firm. It is predicted that managers who are more risk-averse would be more likely to manage risk. Tufano (1996) has argued that older managers facing retirement might prefer to minimise fluctuations in their own portfolios, while managers who do not have a long tenure in the analysed company are more likely to adopt new ideas like corporate risk management. Therefore, as Tufano (1996) has predicted, we also predict that firms with younger managers and those whose managers have shorter tenures on the job would be more inclined to manage risk. This hypothesis is in contrast to May (1995) who has predicted that firms whose managers have more years vested are more likely to pursue hedging strategies due to the fact that managerial skills become more firm-specific as the time spent with the firm increases.

3.3.2.6 Alternative Financial Policy as a Substitute for Hedging

To examine hypotheses about the substitutes for hedging we planned to employ two measures. The first was the firm's use of convertible debt defined as the book value of convertible debt divided by firm's assets (Nance, Smith and Smithson, 1993; Geczy, Minton and Schrand, 1997; Smith and Stulz, 1985). The second measure was the firm's use of preferred stock defined as the book value of preferred stock divided by the firm's assets (Nance, Smith and Smithson, 1993; Geczy, Minton and Schrand, 1997; Smith and Stulz, 1985). A negative relationship between hedging and the firm's use of convertible debt and preferred stock was predicted. Unfortunately, these measures were excluded from the analysis due to the fact that there were few companies (less than 5 per cent of the total sample) in both countries which finance themselves by preferred stock and convertible debt. Therefore, these variables were not suitable for testing our hypothesis regarding hedge substitutes.

The problem addressed above has not stopped us from testing the predicted influence of hedge substitutes on the company's decision to hedge or not to hedge. We have employed several alternative measures suggested in previous studies. Cummins, Phillips and Smith

(2001) in their article have also considered the possibility that publicly traded and privately held stock companies may behave differently with regard to risk management. The owners of closely held firms are likely to have a high degree of control over managerial behaviour and, hence, should be able to align the managers' interests with their own. Generally, the authors expect the owners of such firms to prefer value-maximisation. However, it is also possible that they may exhibit a degree of risk aversion, to the extent that the wealth of the shareholders is sub-optimally diversified because of their holdings in the company. To test for differences between publicly traded and closely held stock firms, we specify a dummy variable equal to one if the firm is a publicly traded company and zero otherwise. If closely held firms tend to be risk-averse, the coefficient of the publicly held company dummy variable is predicted to be negative. However, if closely held companies primarily pursue value-maximisation, this variable will be statistically insignificant.

The company’s dividend payout ratio has been included in the regressions as a proxy for dividend policy. This variable is defined as annual dividends paid to common stockholders as a fraction of income after interest and tax (Haushalter, 2000; Geczy, Minton and Schrand, 1997). We have assumed that the lower the firm’s dividend payout ratio, the lower is its need to hedge to reduce the expected financial distress and agency cost of straight debt (Nance, Smith and Smithson, 1993).

Additionally, a company’s quick ratio has been used as a proxy for the firm’s liquidity, defined as money and short term securities divided by short-term liabilities (Smith and Stulz, 1985; Froot, Scharfstein and Stein, 1993). Another measure of a firm’s liquidity is the liquidity ratio calculated as short-term assets divided by short-term liabilities. The coefficient on both variables is predicted to be negative (Nance, Smith and Smithson, 1993).

3.3.2.7 Summary of Empirical Predictions

Based on the arguments that arise from the analysed papers presented in this chapter as well as in the previous chapters, in our thesis we propose several hypotheses. First we argue that hedging can increase the value of the firm by reducing the costs associated with financial distress, the agency costs of debt, expected taxes and capital market imperfections. These premises are known as the shareholder maximisation hypothesis and are tested in the first four assumptions.

1) The argument of reducing the transaction costs of financial distress implies that the benefits of hedging should be greater the larger the fraction of fixed claims in the firm's capital structure and the smaller the firm. However the informational and transactional scale economies argument implies that larger firms will be more likely to hedge; so the predicted impact of size is indeterminate. We believe that the argument is stronger in the case of the significant economies of scale in information and transaction costs of hedging. Therefore, we predict a positive relation between a company's size and decision to hedge, as well as company's leverage and decision to hedge.

2) The agency cost of debt argument implies that the benefits of hedging should be greater the higher the firm's leverage and asymmetric information problem.

3) The capital market imperfection argument implies that the benefits of hedging should be greater the more growth options there are in the firm's investment opportunity set.

4) The tax hypothesis suggests that the benefits of hedging should be greater the higher the probability that the firm's pre-tax income is in the progressive region of the tax schedule, and the greater the value of the firm's tax loss carry-forwards, investment tax credits and other provisions of the tax code.

The next group of assumptions regards the managerial utility maximisation hypothesis. We argue that, due to the fact that a firm's managers have limited ability to diversify their own personal wealth position associated with the stock holdings and the capitalisation of their career earnings, they have strong incentives to hedge. Usually that kind of hedging is not conducted to improve the value of company's stockholders but to improve managers' own wealth. To avoid this problem, managerial compensation contracts need to be designed so that when managers increase the value of the firm, they also increase their expected utility. This can usually be achieved by adding option-like provisions to managerial contracts.

5) The managerial utility maximisation hypothesis predicts that managers with greater stock ownership would prefer more risk management, while those with greater option holdings would prefer less risk management. Additionally, firms with younger managers and those whose managers have shorter tenures on the job would be more inclined to manage risk.

We have also tested a hypothesis regarding the alternative financial policies that are considered substitutes for corporate hedging because they reduce expected taxes, transaction costs, or agency costs. Regarding this hypothesis, we argue as follows.

6) Instead of managing risk through hedging, firms could pursue alternative activities that substitute for financial risk management strategies. The substitutes for hedging imply that the likelihood of the firm employing off-balance-sheet hedging instruments is lower the more convertible debt the firm issues, the more preferred stock the firm issues, the more liquid are the firm's assets, and the lower the firm's dividend payout is.

The last group of assumptions regards risk management practices in Croatia vs Slovenia. Therefore, in order to test the hypothesis that financial risk management, as one of the most important objectives of modern corporate strategy, is more developed or has different rationales among Slovenian than among Croatian companies, we propose the following research propositions:

7) Slovenian companies have more advanced risk management practices than Croatian companies, measured by the total number of companies that use derivative instruments to manage their risk exposures.

8) Slovenian companies have more advanced risk management practices than Croatian companies, measured by the implementation of more sophisticated risk management strategies. To distinguish less and more sophisticated risk management strategies, we took the use of different derivatives instruments as an example of more advanced risk management strategies with an emphasis on structured derivatives use, while instruments like natural hedge or international and business diversification we have classified as less sophisticated risk management strategies.

3.4 Statistical Analysis of Collected Data

3.4.1 Statistical Analysis Used in the Previous Empirical Studies

Getzy, Minton and Schrand (1997) have conducted both univariate and multivariate analysis in their study. Using a sample that represented 372 of the Fortune 500 U.S. industrial non-financial firms with the highest sales for the fiscal year 1990, they have presented summary statistics for proxy variables, and tests of differences between the means of these variables for users and nonusers of currency derivatives. They have proven that user firms are statistically different from non-user firms with respect to variables that are proxies for investment growth opportunities. Additionally, currency derivative users' quick ratios are statistically lower that those of nonusers. Users also have larger managerial option holdings, and more informational asymmetry than nonusers, as measured by institutional ownership or analyst following.

The Getzy, Minton and Schrand (1997) univariate tests have suggested that users of currency derivatives are not statistically different from nonusers with respect to managerial wealth, substitutes for hedging, or tax preference items, while results related to the proxies for financial distress are mixed. Although the long-term debt ratios of currency derivatives users are statistically lower than those of nonusers, the interest coverage ratios of the two groups are not statistically different. Regarding the size of the analysed companies as a proxy for the cost of implementing a derivative strategy, on average, user firms are statistically larger that nonuser firms.

Getzy, Minton and Schrand (1997) have estimated logit regression to distinguish between the possible explanations for derivatives use. The dependent variable was equal to one if a firm has used currency derivatives and zero in the firm has not used them. Due to the fact that multiple proxies were available to measure some firm characteristics, they have estimated separate logit regressions, using all possible combinations of variables representing each predicted construct. The results on all regressions were qualitatively similar. They have also conducted the Pearson correlation tests to identify possible correlations between the independent variables.

Getzy, Minton and Schrand (1997) have proven that financial constraints provide incentives for hedging. Higher quick ratios that indicate more internally available funds imply a significantly lower probability of using currency derivative instruments. The results also suggested that potential underinvestment costs, measured by the ratio of research and development expenditures to sales, provide incentives for hedging. Finally, the costs associated with implementing a derivatives strategy also play a role in a firm's decision to use currency derivatives. The logit results have not supported DeMarzo and Duffie's (1991) information asymmetry explanation for hedging, as evidenced by the positive coefficient on the standardised number of analyst firms. Additionally, the results do not support the Smith and Stulz (1985) tax or managerial contracting cost explanations for corporate hedging, due to the fact that proxies used for these variables in the logit regression are not statistically significant.

Allayannis and Ofek (2001) have used a more complex econometric analysis by using a two-stage framework known as the Cragg's model to examine what determines corporations' level of derivative use. This two-stage process allows a separate examination of a firm's decision to hedge from its decision on how much to hedge. In the first stage, using all firms, they have employed a binominal probit model in which the decision to hedge is related to variables that are broadly consistent with theories of optimal hedging and controls for exchange-rate exposure. Allayannis and Ofek (2001) have obtained similar results to those of Getzy, Minton and Schrand (1997). Using a sample of S&P 500 non-financial firms for the year 1993 (the total sample consisted of 378 firms), they have found that firm size, research and development expenditures, and controls for exposure (foreign income and trade) are important determinants in a firm's decision to use foreign currency derivatives. Results are robust to the alternative time intervals, exchange-rate indexes, different regression model (weighted least squares and probit models) and the alternative sample (US manufacturing firms with available data in COMPUSTAT). None of the other variables employed in the paper were significant in explaining a firm's decision to manage risks. In the second stage of their estimation, Allayannis and Ofek (2001) have estimated truncated regression by using the notional amount of currency derivatives for those firms which have chose to hedge. As noted, the probit model does not accommodate the possibility that a firm's hedging policy depends on two decisions which could have different determinants. In an effort to disentangle these relations, they have used a variant of the tobit model proposed by Cragg (1971). The Cragg model applies when the probability of a nonlimit outcome (e.g., the decision to hedge production) is determined separately from the level of the nonlimit outcome (e.g., the fraction of production to hedge). Therefore, this model is a combination of a binomial probit (i.e., the decision equation) and a conditional regression (i.e., the regression equation for nonzero outcomes). The second stage of research has enabled them to find out that exposure factors (foreign sales and foreign trade) are the sole determinants of the degree of hedging.

Haushalter (2000) has examined the risk management activities of 100 oil and gas producers for the years 1992 to 1994. He has investigated whether the fraction of production that an oil and gas producer hedges against price fluctuations is related to its financing policy, tax status, compensation policy, ownership structure, and operating characteristics. He has provided detailed descriptive statistics (1st and 3rd quartile, mean, median, minimum and maximum, as well as a standard deviation) for the firms in the sample regarding the dependent and control variables. In his univariate analysis, he has employed the Wicoxon test for difference in medians, as well as correlation analysis (Pearson correlation coefficient).

To investigate the characteristics of a firm related to its hedging policy, Haushalter (2000) has estimated cross-sectional tobit regression. He has chosen tobit model because there were a significant number of zero observations for the fraction of production hedged, and this model implies that the observed value of the dependent variable is censored as zero. For each of the independent variables, the author has examined the assumptions of homoskedasticity of the error terms using chi-square tests. Tobit analysis is a standard procedure for dealing with censored dependent variables, where the variable is continuous for some observations but equal to zero (or some other constant) for others, A criticism of tobit model is that it measures the participation decision and the volume decision simultaneously, i.e.; it forces variables to have the same signs with respect to the decision to participate and the volume of transactions, given that participation takes place. To the extent that there are reasons, like those noted earlier, why some variables in the participation and volume regressions should have opposite signs, the tobit model would be mis-specified. Therefore, in the second stage of his analysis, Haushalter (2000) has adopted a second approach in order to separate the decision to hedge production from the fraction of production hedged.

The author has used a variant of a tobit model proposed by Cragg (1971), that does allow different parameter values for the participation and volume decisions. Cragg's framework is quite general and allows a variety of assumptions concerning the underlying probability distributions entering into the participation and volume decisions. Here the author has adopted an approach, explained previously in Allayannis and Ofek (2001), which assumes the possibility that a firm's hedging policy depends on two decisions that could have different determinants. The explanatory power of this approach is substantially greater in comparison to the probit or the tobit models. The differences between the results from the conditional regressions and those using the tobit model have suggested that there are substantial differences between the determinants of the decision to hedge and the decision of how much to hedge. Because the tobit model considered the combined effects of these decisions, it has not revealrd all the determinants of a firm's hedging policy. Therefore, Cragg's model has shown as more appropriate for this kind of analysis.

Tufano (1996) has studied the 48 North American gold mine companies in the analysed period 1991-1993. He has conducted t-test of the differences in the means among firms employing different levels of risk management, as well as a nonparametric Wilcoxon signed-rank test of the differences between distributions. The univariate test of means has suggested that analysed firms that employ moderate levels of hedging are barely distinguishable from firms that do not hedge at all, apart from carrying higher cash balances. The Wilcoxon signed-rank test has shown that the non-hedgers might be less leveraged and explore less than hedgers. Univariate analysis has proven that firms that hedge extensively differ from those employing moderate levels of risk management – their managers hold greater equity stakes as expected, but they hold more options as well, contrary to what Smith and Stulz (1985) have predicted. The univariate test cannot reveal significant differences in firms' characteristics, therefore Tufano (1996) has conducted multivariate tests.

He has employed a one-sided tobit model, regressing the extent of risk management activities against the different firm characteristics. Regression analysis has shown that the shareholders maximisation hypothesis of corporate risk management has no predictive power in the case of the gold-mining industry. There is no relationship between the risk management decision and either the likelihood of financial distress, convexities in the firm's tax schedules or the investment opportunities. In contrast, the managerial utility maximisation hypothesis seems to be very important in the case of risk management decision in the gold-mining industry. As predicted by Smith and Stulz (1985), firms whose managers hold more options manage less gold price risk, while firms whose managers have more wealth invested in the firm's stock manage more gold price risk. Additionally, firms whose CFOs have fewer years in their current job are more likely to engage in greater risk management, which is consistent with Breeden and Viswanathan (1996), who have argued that newcomers prefer to hedge to signal their managerial quality.

Mian (1996) has obtained data on hedging from 1992 annual reports for a sample of 3022 COMPUSTAT firms. He has analysed firms in the sample by dividing them into the following categories: hedgers vs. nonhedgers, and then for each hedger in the sample data are obtained on whether the firm hedged currency risk, interest rate risk, and/or commodity price risk. He has applied both univariate and multivariate analysis to test the research hypothesis. He has performed a test of differences in means and correlation analysis for each financial characteristic between hedgers and nonhedgers, interest rate hedgers and nonhedgers of interest rate risk, as well as between currency price hedgers and nonhedgers of currency price risk. Both t-test and correlation analysis have shown that hedgers and interest rate hedgers have lower market-to-book ratio. There was no such a result in the case of currency price hedgers and nonhedgers of currency price risk.

Analysis has also shown that hedging is significantly less likely among regulated utilities as regards all three analysed samples. The evidence on foreign tax credits is consistent with the tax-based rationale for hedging, while the evidence on both tax loss carry-forwards and progressivity is inconsistent with tax-based explanations. Examination of firm value has revealed that hedgers of all types are significantly larger when compared with nonhedgers. In order to test the strength of these results, Mian (1996) has conducted a regression analysis using a logistic model.

Logistic regression has shown that the probability of hedging is negatively related to the market-to-book ratio and failed to provide support for the contracting cost and capital market imperfections model. Additionally, the absence of a significant relation between hedging and two out of three measures for presence of tax shield incentive of hedging, has suggested that the association between hedging and the incidence of tax shield is not robust, and that research data provide only weak support for the prediction of the tax hypothesis. The only strong result was found between hedging and firm size, suggesting that the decision to hedge is more influenced by the economies of scale in risk management activities than by financial distress costs or cost associated with raising external capital. Mian (1996) has also found no significant difference in leverage between hedgers and nonhedgers. He also found that hedgers issue longer-term debt, have lower liquidity, higher dividend yield, and higher dividend payout, which is consistent with the theory of hedging substitutes.

Nance, Smith and Smithson (1993) have conducted a univariate test by employing comparison of means for hedgers and nonhedgers. T-statistic has shown that hedgers have significantly more investment tax credits and more of the range of their pretax income in the progressive region of the tax schedule, but there was no significant difference in tax loss carry-forwards. Hedgers also were significantly larger and had larger research and development expenditures. However, the means reflected no significant difference regarding the leverage or the ratio of book-to-market value. Regarding the leverage, it should be noticed that the hypothesis that firms with more leverage have a greater incentive to hedge assumes that the firm's investment opportunities are fixed. Smith and Watts (1992) have proven that firms with more investment options employ lower leverage, and have greater incentive to hedge. It could be concluded that the influence leverage has on hedging activity is indeterminate. Greater leverage implies more hedging to control the underinvestment problem, but, since greater leverage is associated with fewer investment options, greater leverage implies less hedging. Univariate analysis conducted by Nance, Smith and Smithson (1993) has also proven that firms that use the hedging instruments have significantly less liquid assets and higher dividend yields. However, there is no significant difference in the use of convertible debt and preferred stock.

Nance, Smith and Smithson (1993) have employed a logistic regression to provide evidence on conditional relations. They have chosen logit model because their dependent variable was of a dichotomous nature (it is coded one for firms which were hedgers, and zero otherwise). The original logit model has shown a low power due to the fact that the sample size was small relative to the number of parameters estimated. Nance, Smith and Smithson (1993) have used 12 right-hand side variables, while there were only 65 observations. Additionally, a problem of multicollinearty existed between independent variables; of the 66 Pearson correlation coefficients reported, 29 were statistically different from zero. To increase the power of their model, Nance, Smith and Smithson (1993) have grouped twelve right-hand size independent variables into five classes regarding the hypothesis they were testing – two variables measured leverage, three variables reflected aspects of the firm's effective tax function, two variables proxy growth options in the investment opportunity set, one measured firm size, while four variables reflected alternatives to hedging. Logit model has included as right side variables only one variable from each of these five classes of variables. In this way, Nance, Smith and Smithson (1993) have constructed and tested 48 different logit regression equations, which has increased the power of the tests of the hypothesised relations.

The results of the restricted logit regressions have proven that the analysed firms are more likely to hedge if they have more tax credit and if more of the range of the firms' pretax income is in the convex region of the tax schedule, confirming the hypothesis regarding reduction of expected tax liabilities. Additionally, larger firms with more growth opportunities which face a higher probability of financial distress are more likely to hedge. Also, firms that have more preferred stock in their capital structure, more liquid assets and lower dividends are less likely to hedge, which is consistent with the hedging substitute hypothesis.

3.4.2 Univariate and Multivariate Statistical Analysis

At the beginning of our analysis, we have presented summary statistics for the proxy variables, which have given an insight into corporate characteristics of firms in the sample. Then, by using t-test, we have tested the differences between means for the two independent separate samples: hedgers and nonhedgers as well as users and nonusers of derivative instruments. T-test enables a calculation of statistically significant differences between small and mutually unrelated parametric samples. In other words, it points to those differences that are not random. Additionally, correlation analysis was conducted by calculating Pearson's correlation coefficient as a measure of linear correlation because variables in the model are of interval/ratio nature (Bryman and Cramer, 1997).

Binominal logistic regression was estimated to distinguish among the possible rationales of the decision to hedge and/or to use derivatives as corporate risk management instruments.

We have chosen binomial (or binary) logistic regression because it is a form of regression which is used when the dependent variable is a dichotomy (limited, discrete and not continuous) and the independents are of any type. With a categorical dependent variable, discriminant function analysis is usually employed if all of the predictors are continuous and nicely distributed; logit analysis is usually employed if all of the predictors are categorical; and logistic regression is often chosen if the predictor variables are a mix of continuous and categorical variables and/or if they are not nicely distributed (logistic regression makes no assumptions about the distributions of the predictor variables) (Hosmer and Lemeshow, 1989; Rice, 1994; Allison, 1999; Menard, 2002).

Logistic regression can be used to predict a dependent variable on the basis of independents and to determine the percentage of variance in the dependent variable explained by the independents. Logistic regression applies maximum likelihood estimation after transforming the dependent into a logit variable (the natural log of the odds of the dependent occurring or not). In this way, logistic regression estimates the probability of a certain event occurring (Tabachnick and Fidell, 1996). Logistic regression has many analogies to OLS regression: logit coefficients correspond to b coefficients in the logistic regression equation, the standardised logit coefficients correspond to beta weights, and a pseudo R^2 statistic is available to summarise the strength of the relationship (Press and Wilson, 1978). Unlike OLS regression, however, logistic regression does not assume linearity of relationship between the independent variables and the dependent, does not require normally distributed variables, does not assume homoscedasticity, normally distributed error terms are not assumed, does not require that the independents be interval or unbounded, and in general has less stringent requirements.

It does, however, require that observations are independent and that the logit of the independent variables is linearly related to the dependent, as well as assuming no multicollinearity between independents, no outliers, meaningful coding, inclusion of all relevant variables in the regression model and exclusion of irrelevant variables and large samples. The success of the logistic regression can be assessed by looking at the classification table, showing correct and incorrect classifications of the dichotomous, ordinal, or polytomous dependent. Also, goodness-of-fit tests such as model chi-square are available as indicators of the model's appropriateness, as is the Wald statistic to test the significance of individual independent variables (Press and Wilson, 1978; Hosmer and Lemeshow, 1989; Rice, 1994; Estrella, 1998; Menard, 2002).

The "logit" model:

$$\ln[p/(1-p)] = \boldsymbol{a} + \boldsymbol{B}X + e \text{ or}$$

$$[p/(1-p)] = \exp(\boldsymbol{a} + \boldsymbol{B}X + e)$$

where:

- ln - the natural logarithm, $\log_{exp}$, where exp=2.71828…
- Y - a dummy dependent variable, =1 if event happens, =0 if event doesn't happen,
- p - the probability that the event Y occurs, p(Y=1)
- p/(1-p) - the "odds ratio"
- ln[p/(1-p)] - the log odds ratio, or "logit"
- ***a*** - the coefficient on the constant term,
- ***B*** - the coefficient(s) on the independent variable(s),
- X - the independent variable(s),
- e - the error term.

The logistic regression model is simply a non-linear transformation of the linear regression. The "logistic" distribution is an S-shaped distribution function which is similar to the standard-normal distribution (which results in a probit regression model) but easier to work with in most applications (the probabilities are easier to calculate). The logit distribution constrains the estimated probabilities to lie between 0 and 1 (Allison, 1999). Apart from the fact that the dependent variable in our research is discrete and not continuous, we have chosen logistic regression because it enables the researcher to overcome many of the restrictive assumptions of OLS regression as well. Because multiple proxies are available to measure some firm characteristics, we have estimated separate logistic regressions, using all possible combinations of variables representing each predicted construct.

3.5 Data Description

A considerable part of the material presented in this thesis is the result of an analysis of existing literature, or literature survey. An extensive list of the prevailing theoretical and empirical literature regarding the determinants, rationales and practices of corporate risks management have been presented in Chapter 2.

Apart from the literature survey, we have conducted an empirical research and collected our own data set. Research hypotheses were tested on the two different samples. The first sample contains the large Croatian non-financial companies and the second includes the large Slovenian non-financial companies. Criteria for selecting companies in the samples were similar for both countries. The Croatian companies needed to meet two out of three conditions required by the Croatian Accounting Law[10] that relate to large companies - 1) a value of total assets higher than 108 million kuna, (2) income in the last 12 months higher than 216 million kuna, and/or (3) annual number of employees higher than 250. The Slovenian companies were included in the sample if they met two out of three conditions required by Slovenian Company Law[11] related also to large companies - 1) a value of total assets higher than 3,400

[10] In Croatian: Zakon o računovodstvu, Narodne novine 146/05
[11] In Slovene: Zakon o gospodarskih družbah, Uradni list 15/05

million tolars, (2) operating income in the last 12 months higher than 6,800 million tolars, and/or (3) annual number of employees higher than 250.

We have used a list of the biggest 400 Croatian companies in the year 2005 published by The Business Herald[12] and included 157 companies in the sample that met the required criteria. In the case of Slovenian companies, we have used the GVIN[13] and AJPES[14] electronic data bases that offer a list of all existing companies on the Slovenian market, and on the basis of the selected criteria we have chosen 189 companies for further analysis. The primary advantage of these samples is that the evidence can be generalised to a broad class of firms in different industries. Empirical research was conducted on the big non-financial companies due to the fact that these companies have access to derivatives markets and should have developed risk management function. Financial firms are excluded from the sample because most of them are also market makers, hence their motivation in using derivatives may be different from the motivations of non-financial firms.

The greatest challenge of this research was to find an appropriate data set, because the analysed companies have not been very public about their risk management activities. Data were collected from two sources: from annual reports and notes to the financial statements for the fiscal year 2005, and through our survey. We relied more on the survey data than on the annual reports for several reasons. *Firstly,* we wanted to explore perceptions of financial or

[12] The Business Herald is the leading Croatian business newspaper.
[13] www.GVIN.com is intended for both synthetic business overview of individual companies or industries and for extremely sophisticated analysis. GVIN.com data cover 3 main information domains: market information, Slovenian companies, and management and governance. In our research we have used domain Slovenian companies, which enabled us to look into more than 220,000 companies and select our research sample. Domain Slovenian companies offer data regarding a company's contact details, bank accounts, tax and registry number, information whether the company is active and whether it has the status of a tax payer. Information is also available for newly established companies.
[14] AJPES (Agency of the Republic of Slovenia for Public Legal Records and Related Services) performs various statistical tasks and tasks related to the provision of information such as: collection, processing and communication of data from annual reports prepared by business entities, collection and processing of financial account statistics, publication of annual reports returned by companies and sole proprietors via the AJPES webportal. AJPES also carries out different kinds of statistical research (e.g. on the revenues and expenses of legal entities, payments for investments made by legal entities, their salaries and overdue unsettled liabilities, etc.).

risk managers regarding the risk management policies and strategies in their companies. Also, we wanted to find out what are the reasons why companies that classified themselves as non-hedgers do not manage risks. These data we could not find in the annual reports.

Secondly, a part of the data that we have used as explanatory variables was not reported in the annual reports, therefore we needed to find them by using different sources. The last and the most important reason for relying on survey data was that not all of the analysed Croatian and Slovenian companies were obliged to report risk management activities in notes to the financial statements. This obligation refers only to those companies that are listed on the stock-exchange, while many companies in our sample are not public joint-stock companies. Therefore, annual reports could not be the only data source in the case of our research and we needed to rely on a survey.

A survey questionnaire was addressed to the firm's chief financial officer or, if there was no such position, to the financial controller or the treasurer. The implicit assumption was that these are the persons most likely to have the relevant information. The methodological framework of the questionnaire was constructed on the basis of the literature review presented in Chapter 2, which refers to parameters of corporate risk management. The questionnaire has covered three broad areas; foreign exchange rate risk management, interest rate risk management and commodity price risk management. Additionally, a part of the questionnaire referred to those companies that classified themselves as non-hedgers in order to search for reasons not to manage financial risks.

A draft of a questionnaire was sent to several scholars specialised in Corporate Finance, Risk Management and Market Research, and a pilot research was conducted among MBA students at the Faculty of Business and Economics University of Zagreb. After we had received their feedback and had taken their suggestions into consideration, the questionnaire gained its final shape. The number of questions was decreased, and the structure of a few questions was improved, aiming to avoid their wrong interpretation by participants, as well as to encourage a total return rate of questionnaires. The questionnaire consisted of 41 questions. No question was open-ended, meaning that managers were asked to check from a fixed set of possible answers to the one (or the ones) they agreed with (they are always given the option, however, of formulating their own answer if the ones we have offered do not apply).

The questionnaire was mailed at the beginning of September 2006 to the Croatian and Slovenian managers involved in the financial risk management decision. The questionnaires were addressed to a specific individual. It should be emphasised that the problem with a survey is that the person who fills in the questionnaire out does not necessarily have the relevant information or the motivation to provide careful and truthful answers. Moreover, questions are not always interpreted correctly. We tried to gauge accuracy in different ways. First, we wanted to make sure that the people who completed the questionnaire had the information we were interested in. This is why the questionnaire was sent to the chief financial officer or to the controller and the treasurer of the firm. Then we asked firms to tell us who actually filled out the questionnaire. In the vast majority of the cases (more than 90 per cent), the answering person is indeed, at least apparently, the CFO, the treasurer or the controller. Unless people who complete the questionnaire are dishonest or careless, we should therefore have received accurate information.

In order to encourage willingness to participate, the respondents were promised a copy of the summarised results. In the case of Croatia, only 19 companies answered by the end of September, and we therefore sent a follow-up letter to the Croatian non-respondents. Sending a follow-up letter encouraged a response rate from 12 per cent to 31 per cent. In the case of Slovenian companies, 41 companies answered on the questionnaire without any additional contact with potential respondents, creating a response rate of 22 per cent, which is considered an adequate response rate in comparison to other studies (e.g. the response rate of the 1998 Wharton survey of derivate usage, as reported in Bodnar, Hayt and Marston (1998) is 21 per cent).

3.6 Conclusion

In this chapter we have provided a review of the methodology used in the most recent empirical studies conducted on corporate risk management, as well as the methodology of our research. The variables used as proxies to test different hypothesis in the analysed papers have been presented in section 3.2., where we have shown how different variables that proxy for the cost of financial distress, agency cost of debt, capital market imperfection and costly external financing, taxes, hedging substitutes and the managerial utility maximisation hypothesis have been used to test whether these rationales influence corporate hedging decisions.

This review has helped us to create our own set of research variables, which we have presented in the section 3.3, where we also explain the limitations we had due to data unavailability. We have employed a dependent variable in a form of a binary variable which presents a dichotomous measure. The dependent variable is coded as a “1” for those firms that manage foreign exchange, interest rate or commodity price risk, and “0” for those firms that do not manage financial risks. In the first group of companies, named “hedgers”, we included not only the companies that use derivatives instruments as an instrument of corporate risk management, but also the companies that use other types of hedging strategies like debt with embedded options, operational hedging, natural hedging, international diversification of business etc.

The majority of the earlier empirical studies on risk management such as Nance, Smith and Smithson (1993), Mian (1996), Geczy, Minton and Schrand (1997), Allayannis and

Weston (2001) and Cummins, Phillips and Smith (2001) have used a dichotomous variable that equalled one if a firm has used derivatives and zero if it has not. Because of the decision to include all financial risk management activities, our dichotomous variable should not be a subject to the inaccurate categorisation of functionally equivalent financial position. This allowed us to disentangle derivatives activity from risk management activity, which is a major advantage of our approach.

Additionally, we have expanded our analysis only to the companies that use derivatives as risk management instruments. As we have already explained, among companies that manage financial risks, there is a substantial number of hedgers who do not use derivatives, but manage risk exposure with some other instruments like natural hedge, matching liabilities and assets, operational hedging etc. By separating derivative users from companies that do not use derivatives, our intention was to show are there some statistically significant differences between these two samples, and to explore whether some specific company's characteristics affect the decision to hedge by using derivative instruments.

To examine the relation between hedging and the assumptions that relate to the shareholder maximisation hypothesis, we have characterised the cost of financial distress, agency cost of debt, taxes and underinvestment problem by employing the following firm-specific explanatory variables: firm's size, dividend policy, investment policy, tax policy, credit rating, liquidity, and capital structure. On the other hand, in order to test the managerial utility maximisation hypothesis, we have employed several explanatory variables that represent the level of managerial firm-specific wealth invested in a company such as managerial ownership of a firm's common equity or stock options, as well as managers' age and human capital vested in the firm.

The analysis of variables is followed by section 3.4., where a review of sampling process and data collection as well as the econometric and statistical analysis used in the previous studies is presented in sub-section 3.4.1. This again was a base for the econometric analysis conducted in our thesis, which has been presented in sub-section 3.4.2. *Firstly,* we have presented summary statistics for the proxy variables, which has given an insight into the corporate characteristics of the firms in the samples. *Secondly,* we have tested the differences between means of independent variables for hedgers and non-hedgers as well as derivative users and nonusers by using t-test. T-test enables a calculation of statistically significant differences between small and mutually unrelated parametric samples. In other words, it points to those differences that are not random. *Additionally,* a correlation analysis was conducted by using the Pearson test of correlation as a measure of linear correlation. *Finally,* in our multivariate analysis, binominal logistic regression was estimated to distinguish between the possible explanations for the decision to hedge and to use derivatives. We have chosen binomial (or binary) logistic regression because it is a form of regression which is used when the dependent variable is a dichotomy (limited, discrete and not continuous) and the independents are of any type. In our logistic model we have tested whether the decision to hedge or not, as well as the decision to hedge with derivatives, is a function of the six factors - financial distress costs, agency costs, capital market imperfections, taxes, managerial utility, and hedge substitutes. Because multiple proxies were available to measure some firm characteristics, we have estimated separate logistic regressions, using all possible combinations of variables representing each predicted construct.

Finally, data description and a process of collecting research data have been presented in section 3.5. Here we have explained the sampling process for Croatia and Slovenia. Both samples contained the biggest non-financial companies, and the criteria for selecting companies in the samples were similar for both countries. The Croatian companies needed to meet two out of three conditions required by the Croatian Accounting Law[15] that relate to

[15] In Croatian: Zakon o računovodstvu, Narodne novine 146/05

large companies, while the Slovenian companies were included in the sample if they have met two out of three conditions required by the Slovenian Company Law[16] related also to large companies. We have used a list of the biggest 400 Croatian companies in the year 2005 published by The Croatian Business Herald and included 157 companies in the sample that have met the required criteria. In the case of the Slovenian companies, we have used GVIN and AJPES[17] electronic data bases that offer a list of all existing companies on the Slovenian market, and on the basis of selected criteria, we have chosen 189 companies for further analysis. The primary advantage of these samples is that the evidence can be generalised to a broad class of firms in different industries. Empirical research was conducted on large non-financial companies because these companies have acess to derivatives markets and should have developed risk management function. Financial firms are excluded from the sample because most of them are also market makers, hence their motivation in using derivatives may be different from the motivations of non-financial firms.

Data were collected from two sources: from annual reports and notes to the financial statements for the fiscal year 2005, and through our survey. A survey questionnaire was addressed to the firm's chief financial officer or, if there was no such position, to the financial controller or the treasurer. The questionnaire covered three broad areas; foreign exchange rate risk management, interest rate risk management and commodity price risk management. Additionally, a part of the questionnaire referred to those companies that classified themselves as non-hedgers in order to search for reasons not to manage financial risks. The questionnaire was mailed at the beginning of September 2006 to the Croatian and Slovenian managers involved in the financial risk management decision. The questionnaires were addressed to a specific individual. We asked firms to tell us who actually filled out the questionnaire. In the vast majority of cases (more than 90 per cent), the answering person is indeed, at least

[16] In Slovene: Zakon o gospodarskih družbah, Uradni list 15/05
[17] See section 3.5. for detailed explanation of GVIN and AJPES databases.

apparently, the CFO, the treasurer or the controller. Unless people who complete the questionnaire are dishonest or careless, we should therefore have received accurate information.

In order to encourage willingness to participate, the respondents were promised a copy of the summarised results. A follow-up letter was also sent to non-responding Croatian companies at the end of September 2006, which has encouraged a response rate from 12 per cent to 31 per cent, while 41 Slovenian companies answered the questionnaire without any additional contact with the potential respondents, creating the response rate of 22 per cent. An adequate response rate is the problem that has been often raised in research based on a survey. We believe that the achieved response rates regarding both the Croatian and Slovenian samples are satisfactory for statistical generalisation (e.g. the response rate of the 1998 Wharton survey of derivate usage, as reported in Bodnar, Hayt and Marston (1998) is 21 per cent). However, it is important to mention that the inability to compare the survey results to the data of non-responding companies should be treated as a limitation of our research.

4. CORPORATE RISK MANAGEMENT IN CROATIAN COMPANIES

4.1 Introduction

In this chapter we present the research results on risk management practices in Croatian companies. In section 4.2. summary statistics of companies' characteristics are presented. The aim of the section is to provide a detailed description of risk management practices for large Croatian non-financial companies. We have explored how many companies manage financial risks, whether they manage all three types of financial risks and what kind of risk management instruments they use. We also asked financial managers about the intensity of influence of financial risks on the performance of their companies. Managers were questioned about the scope of the risk management policy, the firm's hedging horizon, the corporate risk management goals and the use of VaR or Monte Carlo analysis or some other type of simulation techniques as measures of the firm's risk exposure. Additionally, we have explored which financial institutions and intermediaries are the most important in providing risk management instruments and what are the reasons why Croatian companies do not manage corporate risks or use derivative instruments.

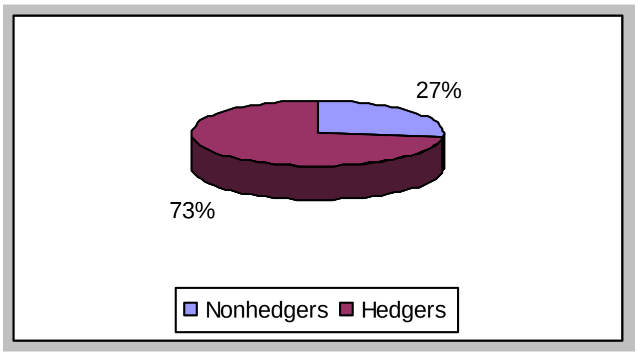
In section 4.3. results of univariate analysis have been presented. The analysis was conducted for two different groups. In the first group, we explored differences between sub-samples of hedgers and nonhedgers, while in the second group we investigated the differences between companies that are derivative users and those companies that do not use derivatives. In both cases, we have employed the Pearson test of correlation as well as t-test for two unrelated means to determine whether the means of two unrelated samples differ regarding the size of the company, financial leverage, growth opportunities, managerial shareholdings, taxes, alternative financial policy as substitutes for hedging and institutional investors' ownership.

In section 4.4. we present the results of multivariate analysis for Croatian companies. The variables tested in our multivariate regression model are based on the determinants we have presented in the literature review as the key rationales of corporate hedging decision. The reviewed papers have suggested that, if corporate hedging decisions are capable of increasing firm values, they can do so for reasons such as the following: the reduction of the probability or costs of financial distress, taxes or transactions costs, the costs associated with information “asymmetries” by signalling management's view of the company's prospects to investors, and the reduction of “agency” problems (conflicts of interest among management, shareholders, and creditors). We have employed logistic regression where we have tested the hypothesis that the decision to hedge or not, as well as the decision to hedge with derivatives, is a function of the six factors - financial distress costs, agency costs, capital market imperfections, tax incentives to hedge, managerial utility and hedge substitutes. The analysis presented in this chapter should produce a reasonable picture of risk management practices as well as rationales in the analysed Croatian firms.

4.2 Descriptive Statistics

A survey has revealed that 73.5 per cent of respondents are using some form of financial risks hedging to manage interest-rate, foreign exchange, or commodity price risk, while 26.5 per cent of them do not manage financial risks at all. Results of univariate and multivariate analysis in which we analyse hedgers and nonhedgers separately are presented in sections 4.3. and 4.4.

Graph 4.1. Croatian hedgers and nonhedgers



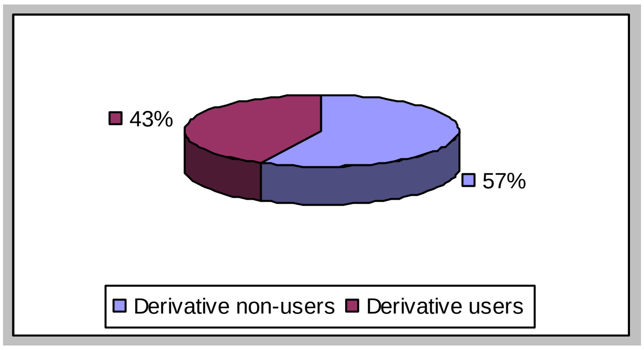
Source: Croatian survey data

Additionally, we have expanded our analysis to companies that use or do not use derivatives as risk management instruments. Thus, among companies that manage financial risks, there is a substantial number of hedgers who do not use derivatives, but manage risk exposure with some other instruments like natural hedge, operational hedging, hedge substitutes, etc. By separating derivative users from companies that do not use derivatives, our intention was to show are there some statistically significant differences between these two samples, and to explore whether some specific company's characteristics affect the decision to hedge by using derivative instruments. We have created the two samples by taking together companies that manage risks but not with derivatives and companies that do not manage financial risks at all in the first sample, while in the second sample we have analysed only those companies that manage financial risks with derivatives.

In this section we present only descriptive statistics, while results of univariate and multivariate analysis in which we analyse derivative users and nonusers separately are presented in sections 4.3. and 4.4. It can be seen that fifteen companies (41 per cent of companies that declare themselves as hedgers) manage corporate risks, but do not use derivatives as a risk management instrument. In other words, 43 per cent of the responding Croatian companies use derivative instruments for managing corporate risks (see graph 4.2.).

This result is similar to the findings of Bodnar, Hayt and Marston (1998) who have revealed that 50 per cent of US non-financial companies are using some form of financial engineering to manage interest rate, foreign exchange, or commodity price risk. However, it should be noted that the time difference needs to be taken into account. We believe that the use of derivatives has grown since 1998 in the US as well as globally, therefore results of our survey cannot be directly compared to those of Bodnar, Hayt and Marston (1998).

Graph 4.2. Croatian companies that use derivatives as risk management instrument

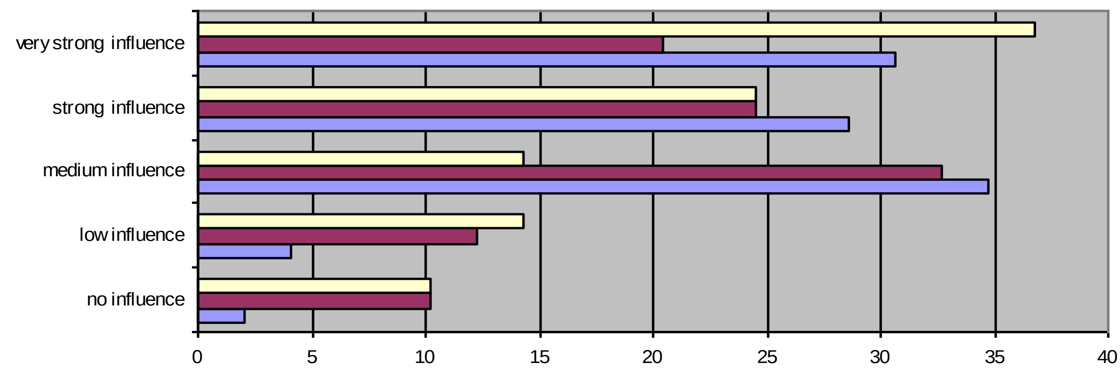


Source: Croatian survey data

In the survey questionnaire we asked financial managers about the intensity of influence of all three types of financial risks on the performance of their companies. Results showed that the price risk and currency risk have the highest influence - 61.2 per cent of financial managers claim that price risk has a strong or very strong influence on the company performance, while 59.2 per cent of them think the same for currency risk. These numbers are followed by 44.9 per cent of managers who claim that the influence of interest-rate risk is strong or very strong. On the basis of their answers, both hedgers and nonhedgers, it could be concluded that Croatian companies are highly exposed to all three types of financial risk.

We believe that these findings could be explained by the fact that Croatia is a small and relatively open economy, which results in great exposure of companies to financial risks, especially to foreign exchange risk and commodity price risk due to the high dependence of the Croatian economy on international trade, especially on import activity. Exposure to the interest-rate risk is a result of external financing through borrowing activity. Miloš (2004) has argued that the majority of Croatian companies are highly dependent on bank loans as the most important instrument of external corporate financing, while raising capital through debt securities is very rare among Croatian companies. However, our results have shown that the long-term debt-to-assets ratio as a measure of corporate indebtedness ranges from 0 to 72.5 per cent, while the mean value for Croatian companies is 21.7 per cent. Graham and Campbell (2001) have argued that companies are highly leveraged if the debt-to-assets ratio exceeds 30 per cent, therefore it could be concluded that Croatian companies in the sample are not highly leveraged, which may explain why interest-rate risk has been ranged as less important in comparison with currency and commodity price risks.

Graph 4.3. Financial risks influence on the Croatian companies' performance



	no influence	low influence	medium influence	strong influence	very strong influence
commodity price risk	10,20408163	14,28571429	14,28571429	24,48979592	36,73469388
interest-rate risk	10,20408163	12,24489796	32,65306122	24,48979592	20,40816327
currency risk	2,040816327	4,081632653	34,69387755	28,57142857	30,6122449

currency risk   interest-rate risk   commodity price risk

Source: Croatian survey data

When we asked companies if they manage all three types of financial risks, 23 out of 36 companies that declare themselves as hedgers claimed that they manage currency, interest rate and price risk, while 13 companies manage some but not all types of financial risks.

Regarding the use and importance of different risk management instruments in risk management strategy, we have presented results in tables 4.1., 4.2. and 4.3. It could be concluded that the currency structure match of assets and liabilities is the most important instrument in managing currency risk. In respect to the use of derivatives, the currency forward is the most important and frequently used instrument, followed by currency swap as the second most important derivative instrument. Other derivatives such as currency futures, stock-exchange and OTC options, and structured derivatives are not frequently used by Croatian companies. As well, hybrid securities and operational hedging are not important currency risk management instruments.

Table 4.1. Currency risk management instruments used by Croatian hedgers

Instrument	**Per cent of hedgers that use the instrument**	**Per cent of companies that use the instrument**	**Importance 1-3 (frequencies of companies that use the instrument)**		
			1 = less important	**2 = important**	**3 = very important**
1. Matching currency structure of assets and liabilities (e.g. debt in foreign currency)	88.2	61	1	14	15
2. Currency forward	44.1	30.6	3	5	7
3. Currency futures	5.9	4.1		2	
4. Currency swap	14.7	10.2	2	1	2
5. Stock-Exchange Currency option	0	0			
6. OTC (over-the-counter) currency option	5.9	4.1	2		
7. Structured derivatives (e.g. currency swaption)	0	0			
8. Hybrid securities (e.g. convertible bonds or preferred stocks)	2.9	2.0		1	
9. Operational hedging (International diversification – moving part of the business abroad)	8.8	6.1	1	2	
10. Other instruments - avoidance of operations in volatile currencies	2.9	2.0		1	

Source: Croatian survey data

Interest rate risk in Croatian companies is hedged most frequently by matching maturity of assets and liabilities. Again, forward contract and swap are the most important derivative instruments in risk management strategy, but in contrast to currency risk management, interest rate swap is more important than interest rate forward and is used by 27.6 per cent of companies that declare themselves as hedgers. Similarly to currency risk management, other derivative instruments do not play an important role in managing interest rate risk, but hybrid securities that are considered as substitutes for hedging have gained importance in comparison with currency risk management.

Table 4.2. Interest-rate risk management instruments used by Croatian hedgers

	Instrument	**Per cent of hedgers that use the instrument**	**Per cent of companies that use the instrument**	**Importance 1-3 (frequencies of companies that use the instrument)**		
				1 = less important	**2 = important**	**3 = very important**
1.	Matching maturity of assets and liabilities	89.7	53.1	1	8	17
2.	Interest rate forward	13.8	8.2	1	2	1
3.	Interest rate futures	0	0			
4.	Interest rate swap	27.6	16.3	5	3	8
5.	Stock-Exchange interest rate option	3.6	2.0		1	
6.	OTC (over-the-counter) interest rate option	0	0			
7.	Structured derivatives (e.g. cap, floor, collar, corridor or swaption)	3.6	2.0	1		
8.	Hybrid securities (e.g. convertible bonds or preferred stocks)	10.7	6.1	2	1	
9.	Other instruments – combining debt with fixed and fluctuating interest-rates	3.6	2.0		1	

Source: Croatian survey data

There is a lower frequency of commodity risk management amongst Croatian companies. Price risk management is usually hedged naturally by managing assets and liabilities. Among derivatives instruments the commodity forward is the most important, but not as popular as the currency forward. For the first time, futures contracts are used as representatives of standardised derivative instruments traded on the financial market. Contrary to the findings presented while analysing currency and interest-rate risk, the commodity swap has not been used at all, and the same is true of other derivative instruments. Business diversification through mergers, acquisitions, and other business combinations is quite important in managing price risk and has been used by 28.6 per cent of the analysed Croatian companies.

Table 4.3. Price risk management instruments used by Croatian hedgers

Instrument	Per cent of hedgers that use the instrument	Per cent of companies that use the instrument	Importance 1-3 (frequencies of companies that use the instrument)		
			1 = less important	**2 = important**	**3 = very important**
1. Managing assets and liabilities	96.4	55.1	1	6	20
2. Commodity forward	14.3	8.2		2	2
3. Commodity futures	7.1	4.1		1	1
4. Commodity swap	0	0			
5. Stock-Exchange commodity option	0	0			
6. OTC (over-the-counter) commodity option	0	0			
7. Structured derivatives (combination of swaps, future contacts and options)	0	0			
8. Business diversification through mergers, acquisitions, and other business combinations	28.6	16.3	2	2	4
9. Other instruments – like market diversification or long term contracts with suppliers where prices of goods are fixed	10.7	6.1	1	1	1

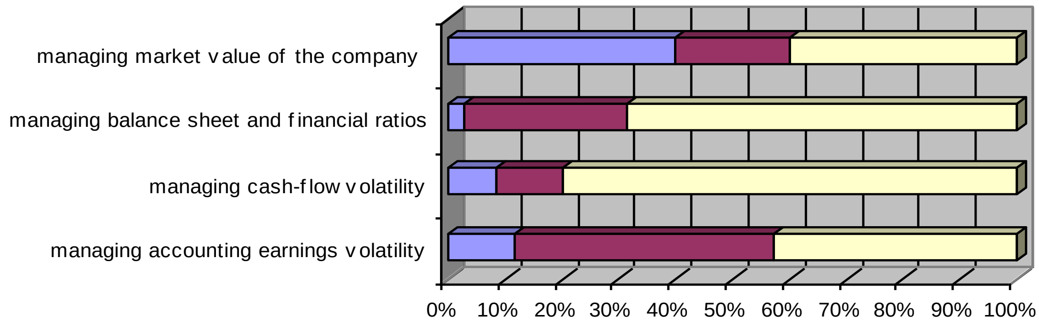
Source: Croatian survey data

The results of the survey clearly indicate that Croatian non-financial companies stick primarily with simple risk management instruments like natural hedging. Where derivatives are used, forwards and swaps are by far the most important instruments, which leads to the conclusion that the use of over-the-counter instruments dominates the exchange-traded instruments. Additionally, there is a lower frequency of commodity price risk management use among firms in comparison with interest-rate and currency risks. These findings are consistent to Bodnar *et.al.* (1995), Jesswein (1995), Bodnar, Hayt and Marston (1998), Bodnar and Gebhardt (1998) as well as to Bodnar, Jong and Macrae (2003).

Regarding the scope of corporate risk management policy, 88.9 per cent of hedgers claim that they use selective hedging, while 11.1 per cent of them manage financial risks completely. Among the analysed Croatian companies, there appeared to be a decided preference for active or “view-driven” risk management as opposed to a full-cover or variance-minimising hedging approach. Only 36 per cent of the companies that manage financial risks have a documented policy regarding the use of financial risk management instruments, while the majority of hedgers manage risks without an official policy. Additionally, only 8.3 per cent of hedgers use Value-at-Risk as a measure of risk exposure, while 11.1 per cent of them use Monte Carlo analysis or some other type of simulation techniques as measures of risk exposure. The survey has revealed that 71 per cent of analysed companies manage risk for transaction with maturity up to a year’s time. Therefore, it could be concluded that the hedging horizon for financial risk management is typically less than one year

An important issue in corporate risk management is defining its goals. The theoretical financial literature strongly recommends focusing on cash flows or on the value of the company. A focus on accounting numbers is generally discarded (Bodnar and Gebhardt, 1998). However, the results of the Croatian survey have shown that the primary goal of hedging is managing volatility of cash flows, but that Croatian firms focus also on managing balance sheet and financial ratios. Some 80 per cent of respondents indicate that their key motive behind financial hedging is to decrease the volatility of cash flows; however, stabilising balance sheet and financial ratios is a close second (68.6 per cent respectively). Only 40 per cent of them claim that the market value of the company is the primary goal of corporate risk management. It should be emphasised that there is a strong link between the Croatian financial accounting and tax accounting. As a result of those institutional features, we believe that there is a strong focus on accounting earnings in all business decisions and consequently also in hedging decisions.

Graph 4.4. Corporate risk management goals in Croatian companies



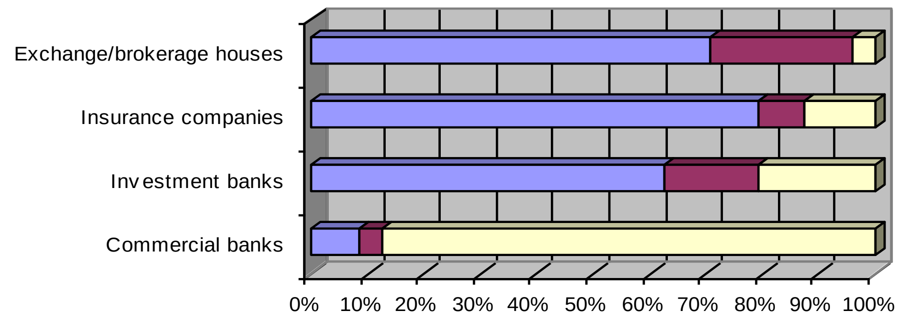
	managing accounting earnings volatility	managing cash-flow volatility	managing balance sheet and financial ratios	managing market value of the company
high importance	42,8	80	68,6	40
medium importance	45,7	11,4	28,6	20
low importance	11,5	8,6	2,9	40

low importance medium importance high importance

Source: Croatian survey data

Commercial banks are by far the primary source for derivatives transactions for 87.5 per cent of Croatian hedgers. Investment banks, insurance companies and exchange/ brokerage houses are not a very important source for derivative transaction, and very few Croatian firms use them as counterparties.

Graph 4.5. Importance of different counterparties in providing risk management instruments



	Commercial banks	Investment banks	Insurance companies	Exchange/brokerage houses
high importance	87,5	20,8	12,5	4,2
medium importance	4,2	16,7	8,3	25
low importance	8,4	62,5	79,1	70,9

Source: Croatian survey data

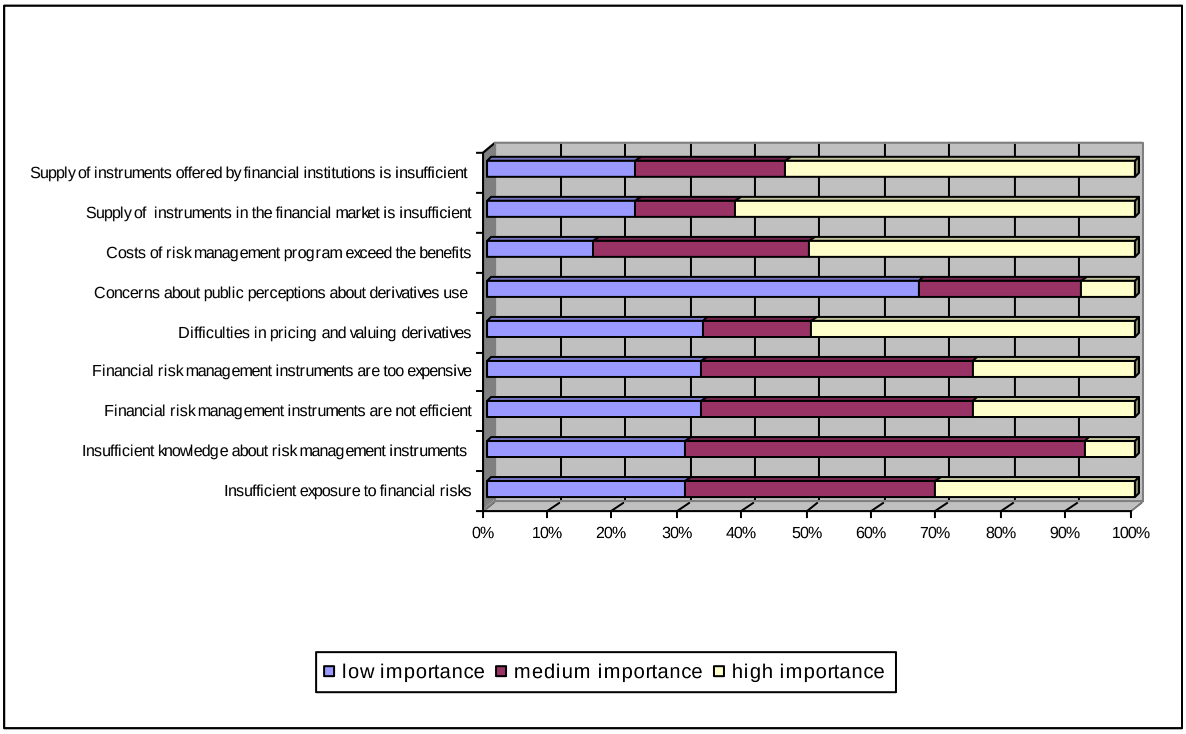
The most important reasons why companies do not use derivatives as risk management instruments, judged by financial managers' opinion, are as follows. Some 61.6 per cent of managers argued that the supply of risk management instruments traded on domestic financial market is insufficient, while 53.9 per cent of them claimed the same for instruments offered by financial institutions (commercial and investment banks, etc.). Very important reasons that have influenced decision not to hedge financial risks are the costs of establishing and maintaining risk management programmes that exceed the benefits of it, as well as difficulties in pricing and valuing derivatives (50 per cent of financial managers numbered these two reasons as very important).

Other reasons like concerns about perceptions of derivatives use by investors, regulators and the public, insufficient exposure to financial risks, insufficient knowledge about financial risk management instruments, and inefficiency and high costs of risk management instruments are not very important reasons why companies in Croatia do not hedge. On the basis of the respondents answers and informal interviews conducted at the 3rd Annual

Conference of the Croatian Association of Corporate Treasurers held in September 2006, it could be concluded that, despite the fact that there is an increasing number of non-financial companies which are aware of the importance of corporate risk management, a lack of suitable instruments offered to them by domestic financial industry becomes a leading factor why many companies do not use derivatives when managing risks.

This problem has the strongest impact on the shipbuilding industry. Anecdotal evidence collected through contacts with managers in a few Croatian shipbuilding companies has revealed that they are highly exposed to foreign exchange risk due to the sales revenues being denominated in the US dollars, while operating cost are in the Croatian national currency. Unfortunately, providers of currency risk management instruments (mainly commercial banks) are not able or willing to offer them adequate instruments which would protect their cash-flows from the currency risk that emerges from their specific economic position.

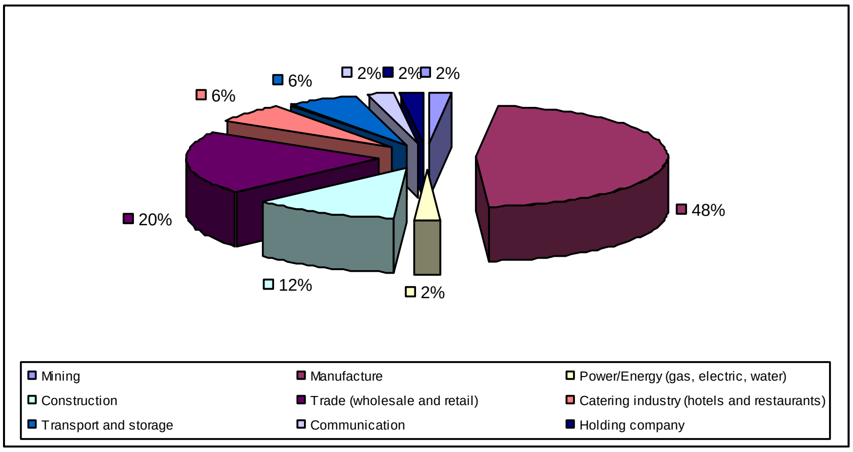
Graph 4.6. Reasons why Croatian companies do not use derivative instruments



Source: Croatian survey data

Regarding the industry structure of respondents, it can be seen from graph 4.7. that the majority of analysed companies (48 per cent) are manufacturers, followed by the trade companies, which hold a share of 20 per cent. 12 per cent of companies are from the construction and building sector, while the rest of them belong to other industry sectors.

Graph 4.7. Industry structure of the analysed Croatian companies



Source: Croatian survey data

Around 60 per cent of the responding companies were established more than 20 years ago. Taking into account that the length of a company's existence is often taken as a measure of the company's reputation (e.g. see: Diamond (1991a); Petersen and Rajan (1994); Bolton and Freixas (2000) and Hege (2002)), it could be concluded that, among the analysed companies, the majority of them are companies with the best reputation on the Croatian market and are market leaders. Therefore it is expected that the companies in the sample have a developed corporate risk management function, as this function is one of the most important objectives of modern corporate strategy.

4.2.1 Descriptive Statistics of Independent Variables

In this sub-section we present descriptive statistics of the variables we have used in our univariate analysis as well as in the logistic regression model. From the tables presented below, it can be seen that the majority of companies do not have credit rating, or tax incentives to hedge, while 51 per cent of respondents are public companies and are listed on the stock-exchange.

Table 4.4. Credit rating of Croatian companies

	Frequency	Percent
Do not have credit rating	39	79.6
Have credit rating	10	20.4
Total	49	100.0

Source: Croatian survey data

Table 4.5. Tax incentives of Croatian companies (tax loss carried forward, tax loss carried back and/or investment tax credits)

	Frequency	Percent
Do not have tax incentives	31	63.3
Have tax incentives	18	36.7
Total	49	100.0

Source: Croatian survey data

Table 4.6. Croatian companies listed on the stock-exchange

	Frequency	Percent
No	24	49.0
Yes	25	51.0
Total	49	100.0

Source: Croatian survey data

Descriptive statistics of other company characteristics like the value of total assets, total sales, debt-to-equity ratio, dividend pay-out ratio, liquidity ratio, which were used as independent variables in the univariate and multivariate analysis, are shown in table 4.7. We have presented minimal and maximal values as well as averages. The value of total assets ranges from Euro 3,117,000 to 3,796,086,000, with a mean value of Euro 262,189,670. The value of total sales revenues ranges from Euro 162,000 to 1,304,680,000, with a mean value of Euro 129,032,610.

The long-term debt-to-assets ratio ranges from 0 to 72.5 per cent, while the mean value is 21.7 per cent. Ownership by institutional investors ranges from 0 per cent to 72.5 per cent, but the average share is quite small and amounts to 6.78 per cent. The dividend pay-out ratio also ranges from 0 to 98 per cent, with the average value of 15.5 per cent. A very significant difference within the companies in the sample could be seen in the value of liquidity ratio which ranges from 0.02 to 25.61. It could be concluded that there is substantial variation in many of these variables, and that the results have shown a wide variation in financing policies and size within the sample.

Regarding the managers' characteristics, the average share of stock ownership that managers hold in their companies is 19.3 per cent, while the maximum is 100 per cent. It could be concluded that the analysed Croatian companies are to a great extent owned by their managers. This is due to the Croatian privatisation process as well as to the ESOP programmes that have been employed in the Croatian corporate sector. Some 45 per cent of managers are between 46 and 55 years old, while the average managers' tenure in the company is 12.35 years.

The gender structure is almost equal – 49 per cent are females, while 51 per cent of managers are males, which could be considered as interesting information in respect to world trends, which show that the position of financial manager is among the 20 leading occupations of employed women. This argument is confirmed by the fact that, in the year 2004, 55.7 per cent of financial managers in the US were women (see: www.dol.gov/wb/stats/main.htm). Traditionally, the functions of financial managers in Croatian companies were performed by men, but the data collected in our research show that this trend is changing. Managers are well educated persons – 74 per cent of them hold a bachelor's degree, 18 per cent hold master's or PhD, while 47 per cent of respondents have completed training in risk management. In respect of their education and knowledge, managers in the analysed companies should be able to realise the importance of the risk management function to the success of their companies as well as being capable of implementing and developing it.

Table 4.7. Descriptive statistics of independent variables – Croatian sample

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Total assets	49	3,117	3,796,086	262,189.67	599,929.59	4.848	.340
Total sales revenues	49	162	1,304,680	129,032.61	213,620.29	4.321	.340
Debt-to-assets ratio	49	.0569	1.6767	.536147	.310749	1.001	.340
Long-term debt-to-assets ratio	48	.0000	.7240	.217236	.182465	1.112	.343
Long-term debt-to-equity ratio	48	-3.1860	22.9220	1.592013	4.072219	4.042	.343
Interest cover ratio	44	-13.7689	120.2259	9.966513	23.660138	3.692	.357
Share owned by institutional investors	48	.0000	.7250	0.06776	.145301	2.983	.343
Cash & cash equivalents-to-assets ratio	48	.0006	.3599	0.07488	0.0874973	1.522	.343
Investment expenditures-to-assets ratio	49	.0000	.5642	0.0885203	0.0105411	2.501	.340
Investment expenditures-to-sales ratio	49	.0000	4.1468	.229198	.609356	5.830	.340
R&D expenditures-to-assets ratio	47	.0000	.0546	0.0454177	0.0109967	3.030	.347
Total value of tax loss carry-forward and carry backs	49	.00	988,041	41,355.8980	159,879.3119	5.029	.340
Total value of tax loss carry-forward and carry backs-to-total assets	49	.0000	31.1823	.714151	4.451312	6.962	.340
Investment tax credits	48	.00	9,660	298.3125	1,438.9671	6.187	.343
Value of equity owned by managers	49	.0	108,566.0	7,010.596	18,523.473	4.239	.340
Share of the company owned by management	49	.000	1.000	.19263	.33858	1.775	.340
Managers tenure	49	2	38	12.35	10.36	1.095	.340
Dividend pay-out ratio	43	.00	.98	.1550	.2663	1.605	.361
Quick ratio	48	.0009	6.2500	.547654	1.044173	3.947	.343
Liquidity ratio	49	.0216	25.6076	2.680185	3.959613	4.443	.340
Share of the company owned by foreign investors	49	.0000	1.0000	.245890	.370236	1.171	.340

(Variables that are presented in absolute values are in Euro 000)

Source: Croatian survey data

4.3 Univariate Analysis

In this section, results of univariate analysis for the Croatian sample have been presented. We have employed t-test to determine if the means of two unrelated samples differ. Additionally, we have conducted the Pearson test of correlation because variables in the model are of an interval/ratio nature (Bryman and Cramer, 1997). The analysis has been conducted for two different groups. In the first group, we have explored differences between the sub-samples of hedgers and nonhedgers, while in the second group we have investigated differences between companies that are derivative users and those companies that do not use derivatives.

Table 4.8 presents summary statistics for the proxy variables described in the previous sections, while table 4.9 presents tests of differences between the means of these variables for hedgers and nonhedgers. According to a mean comparison test conducted for the sub-sample of hedgers/nonhedgers, our univariate test has discovered that hedgers are statistically different from nonhedgers with respect to variable that proxy for alternative financial policy as substitutes for hedging. Hedgers have a statistically greater quick ratio as a measure of short-term liquidity. We argued in chapter 2 that, although hedge substitutes are not considered as a special kind of risk management strategy, alternative financial policies can also reduce a firm’s risk without requiring the firm to directly engage in risk management activities. Firms could adopt conservative financial policies such as maintaining low leverage and a low dividend pay-out ratio or carrying large cash balances to protect them against potential financial difficulties (a form of negative leverage). Greater use of these substitute risk management activities should be associated with less financial risk management activities. Therefore, the coefficient on quick ratio is predicted to be negative (see: Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Contrary to our prediction as well as to the findings of the cited studies, our results show a positive relation between the decision to hedge and this explanatory variable, suggesting that companies that are more liquid are more likely to hedge. Therefore, our assumption regarding hedging substitutes should be rejected in the case of the Croatian companies.

Another statistically significant variable is company ownership by foreign investors. Although other scholars have not examined this hypothesis, the specific economic situation in Croatia and the high value of foreign direct investments in the last five years has prompted us to examine whether foreign ownership of a company plays an important role in the decision to hedge risks. Our t-test has shown that hedgers have a statistically higher share owed by foreign investors in comparison with nonhedgers, which is confirmed with the correlation analysis (see table 4.12., Pearson correlation coefficient = 312). This result could be explained by the fact that investing companies which have headquarters in various countries (major investors in the Croatian business sector are companies from Austria, Germany, Italy, etc.), have enforced employment of corporate risk management in the acquired Croatian companies.

The univariate tests suggest that hedgers are not statistically different from nonhedgers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items, or managerial utility. Hedgers and nonhedgers do not differ regarding the size of the company, financial leverage, growth opportunities, managerial shareholdings, ownership by institutional investors etc. In other words, on the basis of the univariate results, we should reject all research assumptions regarding the shareholder maximisation hypothesis and the managerial utility maximisation hypothesis. Additionally, we should reject our hypothesis regarding alternative activities that substitute for financial risk management strategies. Our findings predict the opposite sign to what we have assumed, suggesting that companies that are more liquid have more incentives to hedge.

Table 4.8. Group statistics Croatian hedgers/non-hedgers

	Hedgers/Nonhedgers	N	Mean	Std. Deviation	Std. Error Mean
Total assets	Companies that do not manage financial risks	13	116,660.15	169,885.68	47,117.81
	Companies that manage financial risks	36	314,742.00	687,747.11	114,624.52
Total sales revenues	Companies that do not manage financial risks	13	58,597.77	44,758.38	12,413.74
	Companies that manage financial risks	36	154,467.42	243,697.19	40,616.20
Debt-to-assets ratio	Companies that do not manage financial risks	13	.624141	.296878	8.23392E-02
	Companies that manage financial risks	36	.504371	.313527	5.22544E-02
Debt rating	Companies that do not manage financial risks	13	7.692E-02	.2774	7.692E-02
	Companies that manage financial risks	36	.2500	.4392	7.319E-02
Long-term debt-to-assets ratio	Companies that do not manage financial risks	13	.227984	.177947	4.93537E-02
	Companies that manage financial risks	35	.213244	.186513	3.15264E-02
Long-term debt-to-equity ratio	Companies that do not manage financial risks	13	1.855125	4.423624	1.226892
	Companies that manage financial risks	35	1.494286	3.997587	.675716
Interest cover ratio	Companies that do not manage financial risks	13	14.194680	27.878622	7.732139
	Companies that manage financial risks	31	8.193411	21.920321	3.937006
Share owned by institutional investors	Companies that do not manage financial risks	13	3.54154E-02	8.47931E-02	2.35174E-02
	Companies that manage financial risks	35	7.94486E-02	.161575	2.73112E-02
Cash & cash equivalents-to-assets ratio	Companies that do not manage financial risks	13	6.22790E-02	7.98069E-02	2.21345E-02
	Companies that manage financial risks	35	7.95655E-02	9.08391E-02	1.53546E-02
Investment expenditures-to-assets ratio	Companies that do not manage financial risks	13	4.55073E-02	4.59472E-02	1.27435E-02
	Companies that manage financial risks	36	.104053	.116531	1.94218E-02
Investment expenditures-to-sales ratio	Companies that do not manage financial risks	13	5.22958E-02	5.73013E-02	1.58925E-02
	Companies that manage financial risks	36	.293079	.701630	.116938
R&D expenditures-to-assets ratio	Companies that do not manage financial risks	13	3.12318E-03	9.76239E-03	2.70760E-03
	Companies that manage financial risks	34	5.08416E-03	1.15245E-02	1.97644E-03
Total value of tax loss carry-forward and carry backs	Companies that do not manage financial risks	13	86,849.3077	271,609.6296	75,330.9574
	Companies that manage financial risks	36	24,927.7222	93,360.1516	15,560.0253
Total value of tax loss carry-	Companies that do not manage financial risks	13	2.474096	8.627105	2.392728

forward and carry backs-to-total assets	Companies that manage financial risks	36	7.86145E-02	.300018	5.00030E-02
Investment tax credits	Companies that do not manage financial risks	13	743.0769	2,679.2019	743.0769
	Companies that manage financial risks	35	133.1143	474.5025	80.2056
Tax incentives-dummy	Companies that do not manage financial risks	13	.5385	.5189	.1439
	Companies that manage financial risks	36	.3056	.4672	7.786E-02
Value of equity owned by managers	Companies that do not manage financial risks	13	3,354.685	5,429.100	1,505.761
	Companies that manage financial risks	36	8,330.786	21,300.245	3,550.041
Share of the company owned by management	Companies that do not manage financial risks	13	.34574	.44983	.12476
	Companies that manage financial risks	36	.13734	.27567	4.5945E-02
Managers ownership of stock options	Companies that do not manage financial risks	12	8.33E-02	.29	8.33E-02
	Companies that manage financial risks	36	.11	.32	5.31E-02
Managers age	Companies that do not manage financial risks	13	3.31	.95	.26
	Companies that manage financial risks	36	3.28	.91	.15
Managers tenure	Companies that do not manage financial risks	13	15.15	9.21	2.55
	Companies that manage financial risks	36	11.33	10.69	1.78
Dividend pay-out ratio	Companies that do not manage financial risks	12	4.358E-02	.1305	3.767E-02
	Companies that manage financial risks	31	.1982	.2935	5.271E-02
Company listed on the stock-exchange	Companies that do not manage financial risks	13	.38	.51	.14
	Companies that manage financial risks	36	.56	.50	8.40E-02
Quick ratio	Companies that do not manage financial risks	13	.187749	.252538	7.00414E-02
	Companies that manage financial risks	35	.681333	1.190270	.201192
Liquidity ratio	Companies that do not manage financial risks	13	1.675826	1.754851	.486708
	Companies that manage financial risks	36	3.042870	4.464996	.744166
Share of the company owned by foreign investors	Companies that do not manage financial risks	13	5.58154E-02	.177023	4.90973E-02
	Companies that manage financial risks	36	.314528	.398721	6.64536E-02

Source: Croatian survey data

Table 4.9. Independent samples t-test Croatian hedgers/non-hedgers

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	Upper
Total assets	Equal variances assumed	1.928	.171	-1.021	47	.313	-198,081.85	194,037.16	-588,434.26	192,270.57
	Equal variances not assumed			-1.598	44.151	.117	-198,081.85	123,930.90	-447,824.09	51,660.40
Total sales revenues	Equal variances assumed	2.835	.099	-1.401	47	.168	-95,869.65	68,439.64	-233,552.44	41,813.15
	Equal variances not assumed			-2.257	40.806	.029	-95,869.65	42,470.89	-181,653.75	-10,085.55
Debt-to-assets ratio	Equal variances assumed	.170	.682	1.196	47	.238	.119770	.100102	-8.160819E-02	.321149
	Equal variances not assumed			1.228	22.368	.232	.119770	9.75206E-02	-8.228224E-02	.321823
Debt rating	Equal variances assumed	10.376	.002	-1.324	47	.192	-.1731	.1307	-.4361	8.994E-02
	Equal variances not assumed			-1.630	34.007	.112	-.1731	.1062	-.3889	4.271E-02
Long-term debt-to-assets ratio	Equal variances assumed	.014	.906	.246	46	.807	1.47397E-02	5.98659E-02	-.105764	.135244
	Equal variances not assumed			.252	22.471	.804	1.47397E-02	5.85637E-02	-.106567	.136046
Long-term debt-to-equity ratio	Equal variances assumed	.685	.412	.270	46	.788	.360839	1.335894	-2.328176	3.049853
	Equal variances not assumed			.258	19.743	.799	.360839	1.400663	-2.563334	3.285011
Interest cover ratio	Equal variances assumed	1.480	.231	.764	42	.449	6.001269	7.856053	-9.852887	21.855425
	Equal variances not assumed			.692	18.531	.498	6.001269	8.676749	-12.190565	24.193103
Share owned by institutional investors	Equal variances assumed	2.258	.140	-.932	46	.356	-4.403319E-02	4.72600E-02	-.139163	5.10962E-02
	Equal variances not assumed			-1.222	40.314	.229	-4.403319E-02	3.60412E-02	-.116858	2.87911E-02
Cash & cash equivalents-to-assets ratio	Equal variances assumed	.286	.595	-.604	46	.549	-1.728653E-02	2.86130E-02	-7.488153E-02	4.03085E-02
	Equal variances not assumed			-.642	24.339	.527	-1.728653E-02	2.69388E-02	-7.284454E-02	3.82715E-02

Investment expenditures-to-assets ratio	Equal variances assumed	3.763	.058	-1.753	47	.086	-5.854539E-02	3.33946E-02	-.125727	8.63598E-03
	Equal variances not assumed			-2.520	46.491	.015	-5.854539E-02	2.32293E-02	-.105290	-1.180053E-02
Investment expenditures-to-sales ratio	Equal variances assumed	2.783	.102	-1.228	47	.226	-.240784	.196139	-.635365	.153797
	Equal variances not assumed			-2.040	36.269	.049	-.240784	.118013	-.480064	-1.503154E-03
R&D expenditures-to-assets ratio	Equal variances assumed	.828	.368	-.543	45	.590	-1.960984E-03	3.61375E-03	-9.239450E-03	5.31748E-03
	Equal variances not assumed			-.585	25.557	.564	-1.960984E-03	3.35223E-03	-8.857404E-03	4.93544E-03
Total value of tax loss carry-forward and carry backs	Equal variances assumed	4.667	.036	1.202	47	.235	61,921.5855	51494.2900	-41,671.5640	165,514.7349
	Equal variances not assumed			.805	13.038	.435	61,921.5855	76,921.1774	-104,207.7188	228,050.8898
Total value of tax loss carry-forward and carry backs-to-total assets	Equal variances assumed	12.825	.001	1.695	47	.097	2.395482	1.413014	-.447136	5.238100
	Equal variances not assumed			1.001	12.010	.337	2.395482	2.393251	-2.818459	7.609423
Investment tax credits	Equal variances assumed	8.352	.006	1.315	46	.195	609.9626	463.7890	-323.5962	1,543.5215
	Equal variances not assumed			.816	12.281	.430	609.9626	747.3930	-1,014.3489	2,234.2741
Tax incentives-dummy	Equal variances assumed	2.018	.162	1.497	47	.141	.2329	.1556	-8.0139E-02	.5460
	Equal variances not assumed			1.423	19.482	.170	.2329	.1636	-.1090	.5748
Value of equity owned by managers	Equal variances assumed	2.627	.112	-.827	47	.412	-4,976.101	6,013.516	-17,073.735	7,121.533
	Equal variances not assumed			-1.290	44.523	.204	-4,976.101	3,856.178	-12,745.138	2,792.936
Share of the company owned by management	Equal variances assumed	10.182	.003	1.957	47	.056	.20839	.10646	-5.78067E-03	.42257
	Equal variances not assumed			1.567	15.379	.137	.20839	.13295	-7.43788E-02	.49117
Managers ownership of stock options	Equal variances assumed	.297	.588	-.267	46	.790	-2.78E-02	.10	-.24	.18
	Equal variances not assumed			-.281	20.683	.781	-2.78E-02	9.88E-02	-.23	.18
Managers age	Equal variances assumed	.101	.752	.100	47	.921	2.99E-02	.30	-.57	.63
	Equal variances not assumed			.099	20.619	.922	2.99E-02	.30	-.60	.66
Managers tenure	Equal variances assumed	.003	.955	1.143	47	.259	3.82	3.34	-2.91	10.55

	Equal variances not assumed			1.227	24.528	.232	3.82	3.11	-2.60	10.24
Dividend pay-out ratio	Equal variances assumed	14.493	.000	-1.749	41	.088	-.1546	8.838E-02	-.3331	2.388E-02
	Equal variances not assumed			-2.387	40.007	.022	-.1546	6.478E-02	-.2855	-2.3677E-02
Company listed on the stock-exchange	Equal variances assumed	.686	.412	-1.047	47	.300	-.17	.16	-.50	.16
	Equal variances not assumed			-1.045	21.190	.308	-.17	.16	-.51	.17
Quick ratio	Equal variances assumed	4.531	.039	-1.473	46	.147	-.493584	.334999	-1.167903	.180735
	Equal variances not assumed			-2.317	41.033	.026	-.493584	.213036	-.923808	-6.336032E-02
Liquidity ratio	Equal variances assumed	1.276	.264	-1.069	47	.291	-1.367044	1.279344	-3.940752	1.206664
	Equal variances not assumed			-1.537	46.520	.131	-1.367044	.889195	-3.156360	.422273
Share of the company owned by foreign investors	Equal variances assumed	23.723	.000	-2.249	47	.029	-.258712	.115035	-.490133	-2.729163E-02
	Equal variances not assumed			-3.131	44.749	.003	-.258712	8.26233E-02	-.425150	-9.227469E-02

Source: Croatian survey data

Regarding the univariate analysis of another sub-sample where we have explored statistically significant differences between companies that use derivative instruments and those which do not use them, table 4.10 presents summary statistics for the proxy variables, while table 4.11 presents tests of differences between the means of these variables for derivative users and nonusers. According to a mean comparison test, our univariate test has discovered that derivative users are statistically different from nonusers with respect to variables that are proxies for alternative financial policy as substitutes for hedging as well as for capital market imperfection and costly external financing**.** Derivative users have a statistically greater quick ratio as well as a greater ratio of investment expenditures to the book value of assets. This finding suggests that these two groups differ with respect to proxies for short-term liquidity and investment (growth) opportunities.

Similarly to the analysis of hedgers and nonhedgers, a company's quick ratio has been used as a proxy for the firm's liquidity and the coefficient on this variable is predicted to be negative (Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Our results show a positive relation between the decision to use derivatives and the value of the quick ratio, suggesting that companies that have a higher quick ratio have more incentives to use derivatives. Consistent with these results, the correlation (see table 4.12.) between quick ratio and hedging is positive (Pearson correlation coefficient = 0.383).

Another statistically significant variable is the company's ratio of investment expenditures to the book value of assets. Our t-test has shown that derivative users have a statistically higher value for this ratio, which is confirmed by the correlation analysis (Pearson rho = 384), suggesting that there is a positive relation between the value of a company's investment and the decision to use derivatives. This result is consistent with our prediction that the benefits of hedging should be greater the more growth options there are in the firm's investment opportunity set, and with the findings of Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001). Other variables that have been used to test the agency cost of debt and capital market imperfection hypothesis have not shown statistically significant differences between analysed derivative users and nonusers.

The conducted t-tests and correlation analysis suggest that derivative users are not statistically different from nonusers with respect to other research assumptions regarding the cost of financial distress, agency cost of debt, tax preference items, or managerial utility. It could be concluded that, similarly to the findings in the case of hedgers and nonhedgers, we should reject all research assumptions regarding the managerial utility maximisation hypothesis and the shareholder maximisation hypothesis – apart from capital market imperfection and costly external financing. Additionally, we should reject our hypothesis regarding alternative activities that substitute for financial risk management strategies. Our findings predict the opposite sign to what we assumed, suggesting that companies that are more liquid are using derivatives, while those that are less liquid do not use these risk management instruments.

Table 4.10. Group statistics Croatian derivative users/non-users

	Derivative users	N	Mean	Std. Deviation	Std. Error Mean
Total sales revenues	No	28	84,206.71	63,909.92	12,077.84
	Yes	21	188,800.48	312,158.22	68,118.51
Debt-to-assets ratio	No	28	.582110	.240959	4.55369E-02
	Yes	21	.474863	.382717	8.35156E-02
Debt rating	No	28	.1786	.3900	7.371E-02
	Yes	21	.2381	.4364	9.524E-02
Long-term debt-to-assets ratio	No	27	.191917	.145948	2.80877E-02
	Yes	21	.249789	.220388	4.80926E-02
Long-term debt-to-equity ratio	No	27	1.147994	3.094295	.595497
	Yes	21	2.162896	5.090634	1.110867
Interest cover ratio	No	25	8.333333	21.029445	4.205889
	Yes	19	12.115435	27.185952	6.236885
Total assets	No	28	160,155.68	319,735.99	60,424.42
	Yes	21	398,235.00	831,730.83	181,498.55
Share owned by institutional investors	No	28	7.37571E-02	.163385	3.08769E-02
	Yes	20	5.87950E-02	.118968	2.66019E-02
Cash & cash equivalents-to-assets ratio	No	28	5.68881E-02	7.27744E-02	1.37531E-02
	Yes	20	.100078	.101324	2.26567E-02
Investment expenditures-to-assets ratio	No	28	5.38305E-02	4.76998E-02	9.01442E-03
	Yes	21	.134773	.140231	3.06009E-02
Investment expenditures-to-sales ratio	No	28	9.26423E-02	.148749	2.81108E-02
	Yes	21	.411272	.894634	.195225
R&D expenditures-to-assets ratio	No	28	2.53515E-03	7.57482E-03	1.43151E-03
	Yes	19	7.49889E-03	1.44041E-02	3.30453E-03
Total value of tax loss carry-forward and carry backs	No	28	57,943.1429	203,101.8061	38,382.6336
	Yes	21	19,239.5714	68,997.1212	15,056.4062
Total value of tax loss carry-	No	28	1.162172	5.884587	1.112083

forward and carry backs-to-total assets	Yes	21	.116788	.387347	8.45261E-02
Investment tax credits	No	28	486.2857	1,870.5861	353.5075
	Yes	20	35.1500	157.1956	35.1500
Tax incentives-dummy	No	28	.4643	.5079	9.598E-02
	Yes	21	.2381	.4364	9.524E-02
Value of equity owned by managers	No	28	3,035.222	4,481.846	846.989
	Yes	21	12,311.095	27,289.985	5,955.163
Share of the company owned by management	No	28	.23624	.37290	7.0472E-02
	Yes	21	.13450	.28495	6.2182E-02
Managers ownership of stock options	No	27	7.41E-02	.27	5.14E-02
	Yes	21	.14	.36	7.82E-02
Managers age	No	28	3.39	.96	.18
	Yes	21	3.14	.85	.19
Managers tenure	No	28	13.36	10.52	1.99
	Yes	21	11.00	10.26	2.24
Dividend pay-out ratio	No	25	.1810	.2950	5.900E-02
	Yes	18	.1190	.2234	5.266E-02
Company listed on the stock-exchange	No	28	.54	.51	9.60E-02
	Yes	21	.48	.51	.11
Quick ratio	No	28	.213558	.337625	6.38050E-02
	Yes	20	1.015388	1.462970	.327130
Liquidity ratio	No	28	2.372922	4.736564	.895126
	Yes	21	3.089869	2.651937	.578700
Share of the company owned by foreign investors	No	28	.186129	.346019	6.53914E-02
	Yes	21	.325571	.394560	8.61000E-02

Source: Croatian survey data

Table 4.11. Independent samples t-test Croatian derivative users/non-users

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	**Sig.**	**T**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	Upper
Total sales revenues	Equal variances assumed	8.651	.005	-1.731	47	.090	-104,593.76	60,423.09	-226,149.35	16,961.82
	Equal variances not assumed			-1.512	21.262	.145	-104,593.76	69,180.96	-248,355.70	39,168.17
Debt-to-assets ratio	Equal variances assumed	2.393	.129	1.201	47	.236	.107247	8.92948E-02	-7.239080E-02	.286885
	Equal variances not assumed			1.127	31.591	.268	.107247	9.51234E-02	-8.661123E-02	.301106
Debt rating	Equal variances assumed	.992	.324	-.502	47	.618	-5.9524E-02	.1185	-.2979	.1788
	Equal variances not assumed			-.494	40.398	.624	-5.9524E-02	.1204	-.3028	.1838
Long-term debt-to-assets ratio	Equal variances assumed	6.740	.013	-1.092	46	.280	-5.787235E-02	5.29809E-02	-.164517	4.87726E-02
	Equal variances not assumed			-1.039	33.016	.306	-5.787235E-02	5.56940E-02	-.171181	5.54358E-02
Long-term debt-to-equity ratio	Equal variances assumed	1.485	.229	-.854	46	.397	-1.014902	1.188266	-3.406757	1.376953
	Equal variances not assumed			-.805	31.166	.427	-1.014902	1.260414	-3.584977	1.555173
Interest cover ratio	Equal variances assumed	.179	.674	-.521	42	.605	-3.782101	7.262880	-18.439187	10.874984
	Equal variances not assumed			-.503	32.979	.618	-3.782101	7.522516	-19.087151	11.522948
Total assets	Equal variances assumed	3.283	.076	-1.388	47	.172	-238,079.32	171,537.50	-583,168.25	107,009.61
	Equal variances not assumed			-1.245	24.457	.225	-238,079.32	191,292.53	-632,498.04	156,339.40
Share owned by institutional investors	Equal variances assumed	.973	.329	.348	46	.729	1.49621E-02	4.29430E-02	-7.147772E-02	.101402
	Equal variances not assumed			.367	45.968	.715	1.49621E-02	4.07559E-02	-6.707685E-02	9.70011E-02
Cash & cash equivalents-to-assets ratio	Equal variances assumed	3.639	.063	-1.721	46	.092	-4.318938E-02	2.50983E-02	-9.370964E-02	7.33089E-03
	Equal variances not assumed			-1.630	32.478	.113	-4.318938E-02	2.65042E-02	-9.714558E-02	1.07668E-02

Investment expenditures-to-assets ratio	Equal variances assumed	16.483	.000	-2.851	47	.006	-8.094286E-02	2.83946E-02	-.138065	-2.382023E-02
	Equal variances not assumed			-2.537	23.491	.018	-8.094286E-02	3.19011E-02	-.146859	-1.502668E-02
Investment expenditures-to-sales ratio	Equal variances assumed	5.869	.019	-1.857	47	.070	-.318630	.171584	-.663813	2.65527E-02
	Equal variances not assumed			-1.615	20.831	.121	-.318630	.197239	-.729012	9.17523E-02
R&D expenditures-to-assets ratio	Equal variances assumed	7.425	.009	-1.541	45	.130	-4.963742E-03	3.22078E-03	-1.145072E-02	1.52323E-03
	Equal variances not assumed			-1.378	24.807	.180	-4.963742E-03	3.60127E-03	-1.238361E-02	2.45613E-03
Total value of tax loss carry-forward and carry backs	Equal variances assumed	2.533	.118	.836	47	.407	38,703.5714	46,298.6630	-54,437.3246	131,844.4675
	Equal variances not assumed			.939	34.835	.354	38,703.5714	41,230.1095	-45,012.1637	122,419.3065
Total value of tax loss carry-forward and carry backs-to-total assets	Equal variances assumed	2.641	.111	.811	47	.422	1.045384	1.289597	-1.548952	3.639719
	Equal variances not assumed			.937	27.312	.357	1.045384	1.115290	-1.241782	3.332549
Investment tax credits	Equal variances assumed	4.500	.039	1.073	46	.289	451.1357	420.6140	-395.5163	1,297.7878
	Equal variances not assumed			1.270	27.533	.215	451.1357	355.2508	-277.1193	1,179.3908
Tax incentives-dummy	Equal variances assumed	9.460	.003	1.637	47	.108	.2262	.1382	-5.1856E-02	.5042
	Equal variances not assumed			1.673	46.061	.101	.2262	.1352	-4.5968E-02	.4983
Value of equity owned by managers	Equal variances assumed	14.694	.000	-1.773	47	.083	-9,275.874	5,231.725	-19,800.747	1,248.999
	Equal variances not assumed			-1.542	20.811	.138	-9,275.874	6,015.094	-21,791.867	3,240.119
Share of the company owned by management	Equal variances assumed	2.683	.108	1.042	47	.303	.10174	9.7654E-02	-9.47142E-02	.29820
	Equal variances not assumed			1.083	46.971	.285	.10174	9.3983E-02	-8.73329E-02	.29081
Managers ownership of stock options	Equal variances assumed	2.374	.130	-.762	46	.450	-6.88E-02	9.02E-02	-.25	.11
	Equal variances not assumed			-.735	35.831	.467	-6.88E-02	9.36E-02	-.26	.12
Managers age	Equal variances assumed	.189	.666	.948	47	.348	.25	.26	-.28	.78
	Equal variances not assumed			.963	45.503	.340	.25	.26	-.27	.77
Managers tenure	Equal variances assumed	.059	.810	.785	47	.437	2.36	3.00	-3.69	8.40

	Equal variances not assumed			.788	43.801	.435	2.36	2.99	-3.68	8.39
Dividend pay-out ratio	Equal variances assumed	1.739	.195	.749	41	.458	6.200E-02	8.274E-02	-.1051	.2291
	Equal variances not assumed			.784	40.861	.438	6.200E-02	7.909E-02	-9.7733E-02	.2217
Company listed on the stock-exchange	Equal variances assumed	.024	.878	.405	47	.688	5.95E-02	.15	-.24	.36
	Equal variances not assumed			.404	43.056	.688	5.95E-02	.15	-.24	.36
Quick ratio	Equal variances assumed	13.681	.001	-2.809	46	.007	-.801830	.285498	-1.376507	-.227154
	Equal variances not assumed			-2.406	20.452	.026	-.801830	.333294	-1.496086	-.107575
Liquidity ratio	Equal variances assumed	.076	.784	-.623	47	.536	-.716946	1.150394	-3.031241	1.597348
	Equal variances not assumed			-.673	43.927	.505	-.716946	1.065901	-2.865229	1.431337
Share of the company owned by foreign investors	Equal variances assumed	2.093	.155	-1.315	47	.195	-.139443	.106076	-.352841	7.39553E-02
	Equal variances not assumed			-1.290	39.895	.205	-.139443	.108117	-.357973	7.90875E-02

Source: Croatian survey data

Table 4.12. Pearson correlation coefficients – Croatian sample

		Hedgers/Nonhedgers	Derivative users	Investment expenditures-to-assets ratio	Quick ratio	Share of the company owned by foreign investors
Hedgers/Nonhedgers	Pearson Correlation Sig. (2-tailed) N	1.000 . 49	.520** .000 49	.248 .086 49	.212 .147 48	.312* .029 49
Derivative users	Pearson Correlation Sig. (2-tailed) N	.520** .000 49	1.000 . 49	.384** .006 49	.383** .007 48	.188 .195 49
Investment expenditures-to-assets ratio	Pearson Correlation Sig. (2-tailed) N	.248 .086 49	.384** .006 49	1.000 . 49	.146 .321 48	-.102 .487 49
Quick ratio	Pearson Correlation Sig. (2-tailed) N	.212 .147 48	.383** .007 48	.146 .321 48	1.000 . 48	.047 .753 48
Share of the company owned by foreign investors	Pearson Correlation Sig. (2-tailed) N	.312* .029 49	.188 .195 49	-.102 .487 49	.047 .753 48	1.000 . 49

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Source: Croatian survey data

4.4 Multivariate Analysis

The variables tested in our multivariate regression model are based on the determinants we have presented in the literature review as the key rationales of corporate hedging decisions. The reviewed papers have suggested that, if corporate hedging decisions are capable of increasing firm values, they can do so for reasons such as the following: the reduction of the probability or costs of financial distress, taxes or transactions costs, the costs associated with information “asymmetries” by signalling management's view of the company's prospects to investors, and the reduction of “agency” problems (conflicts of interest between management, shareholders, and creditors), including distortions of management's incentives to undertake all value-adding investments. Thus, the decision to hedge or not, as well as the decision to hedge with derivatives, is a function of six factors - financial distress costs, agency costs, capital market imperfections, taxes, managerial utility, and hedge substitutes.

Of these main factors, the first five are expected to have a positive influence on the firm's decision to hedge (Amihud and Lev, 1981; Mayers and Smith, 1982; Stulz, 1985; Smith and Stulz, 1985; Jensen and Smith, 1985; Campbell and Kracaw, 1987; MacMinn, 1987; Fazzari, Hubbard and Petersen, 1988; MacMinn and Han, 1990; Breeden and Viswanathan, 1990; Bessembinder's, 1991; Hoshi, Kashyap and Scharfstein, 1991; DeMarzo and Duffie, 1992; Dobson and Soenen, 1993; Froot, Scharfstein and Stein, 1993; Nance, Smith and Smithson, 1993; Dolde, 1995; May, 1995; Mian, 1996; Stulz, 1996; Tufano, 1996; Haushalter, 1997; Getzy, Minton and Schrand, 1997; Lamont, 1997; Kaplan and Zingales, 1997; Shapiro and Titman, 1998; Gay and Nam, 1998; Minton and Schrand, 1999; Graham and Smith, 1999; Haushalter 2000; Mello and Parsons, 2000; Allayannis and Ofek, 2001; Haushalter, Randall and Lie, 2002; Fatemi and Luft; 2002). That is, higher values for factors related to financial distress costs, agency costs, capital market imperfections, taxes and managerial utility are expected to be associated with a greater likelihood that the firm will engage in hedging activities. The sixth factor (hedge substitutes), however, is expected to have a negative influence on the firm's hedging decision (Smith and Warner, 1979; Smith and Stulz; 1985; Nance, Smith and Smithson, 1993; Culp, 1994; Tufano, 1996; Pulvino, 1998; Harford, 1999). The relationship between the decision to hedge and its potential determinants can be expressed in the format of a general function as follows:

$$\text{Hedge} = f\,(FC, AC, CMI, T, MU, HS) \quad (1)$$

where:

- Hedge - binary variable which takes on a value of 1 if the firm hedges and 0 if the firm does not hedge with these instruments
- BC - the firm's probability of financial distress or bankruptcy
- AC - agency costs of debt facing the firm
- CMI - capital market imperfections and costly external financing
- T - the convexity of the firm's tax function
- MU - level of managerial wealth invested in the company
- HS - the extent of alternative hedging-related financial policies or hedge substitutes utilised by the firm.

Here we present the results of our analysis on two separate decisions conducted on Croatian non-financial companies. *First,* we examine the influence of factors presented above on the decision to hedge or not to hedge corporate risks, and *second*, we explore the influence of these factors on the corporate decision to use derivative instruments when managing corporate risks.

4.4.1 Decision to Hedge Corporate Risks

Table 4.13 reports multivariate analysis results relating the probability of hedging to the determinants of hedging. The predetermined independent variables include total sales revenues as a proxy for size and financial costs, debt rating as a proxy for agency cost of debt, investment expenditures to assets as a proxy for capital market imperfections, total value of tax loss carry-forwards as a proxy for tax incentives, share of the company value owned by management as a proxy for managerial utility, and quick ratio as a proxy for hedge substitutes. The underlined variables represent those independent variables which appear to be the most consistent in reporting statistically significant *t*-values, and which appear to be most consistent and relevant in the stepwise construction of logistic models. Apart from the model discussed in this sub-section, as we have created multiple proxies available to measure some firm characteristics, we have estimated separate logistic regressions using all possible combinations of variables representing each predicted construct.

Inclusion of all relevant variables in the regression model is very important due to the fact that, if relevant variables are omitted, the common variance they share with included variables may be wrongly attributed to those variables, or the error term may be inflated. Additionally, we excluded from our analysis the variables that that have not contributed to the strengths of the logistic model in predicting the decision to hedge (regarding the –2 Log Likelihood statistics and Goodness of fit tests). Exclusion of all irrelevant variables is very important because their presence in the model can cause the common variance they share with included variables to be wrongly attributed to the irrelevant variables. The greater the correlation of the irrelevant variable(s) with other independents, the greater the standard errors of the regression coefficients for these independents (http://www2.chass.ncsu.edu/garson/pa765/logistic.htm). The dependent variable is coded 1 if the firm hedges corporate risks and 0 otherwise.

The model can be expressed as:

Hedge = f (Total sales revenues, Debt rating, Investment expenditures to assets, Total value of tax loss carry-forwards, Share of the company value owned by management, Quick ratio)

Table 4.13. Multivariate results for Croatian hedgers vs nonhedgers

```
      Total number of cases:      49 (Unweighted)
      Number of selected cases:   49
      Number of unselected cases: 0

      Number of selected cases:                 49
      Number rejected because of missing data:  1
      Number of cases included in the analysis: 48


Dependent Variable Encoding:

Original       Internal
Value          Value
       0       0
       1       1


Dependent Variable.   HEDGERS    Hedgers/Nonhedgers

Beginning Block Number 0.  Initial Log Likelihood Function

-2 Log Likelihood   56.072249

* Constant is included in the model.


Beginning Block Number 1.  Method: Enter

Variable(s) Entered on Step Number
1..       FINCOST2  Total sales revenues
          AGCOST1   Credit rating
          CMI2      Investment expenditures-to-assets ratio
          TAX1      Total value of tax loss carry-forward and carry backs
          SUBSTIT3  Quick ratio
          MNGUTIL2  Share of the company owned by management

Estimation terminated at iteration number 7 because
Log Likelihood decreased by less than .01 percent.

-2 Log Likelihood        26.268
 Goodness of Fit         26.163
 Cox & Snell - R^2         .463
 Nagelkerke - R^2          .671
```

	Chi-Square	df	Significance
Model	29.805	6	.0000
Block	29.805	6	.0000
Step	29.805	6	.0000

---------- Hosmer and Lemeshow Goodness-of-Fit Test-----------

	HEDGERS = Companies that d		HEDGERS = Companies that m		
Group	Observed	Expected	Observed	Expected	Total
1	5.000	4.767	.000	.233	5.000
2	4.000	3.494	1.000	1.506	5.000
3	1.000	2.490	4.000	2.510	5.000
4	1.000	1.221	4.000	3.779	5.000
5	2.000	.744	3.000	4.256	5.000
6	.000	.259	5.000	4.741	5.000
7	.000	.022	5.000	4.978	5.000
8	.000	.003	5.000	4.997	5.000
9	.000	.000	5.000	5.000	5.000
10	.000	.000	3.000	3.000	3.000

	Chi-Square	df	Significance
Goodness-of-fit test	5.1031	8	.7465

Classification Table for HEDGERS
The Cut Value is .50

		Predicted		
		Nonhedgers	Hedgers	Percent Correct
		0	1	
Observed				
Nonhedgers	0	9	4	69.23%
Hedgers	1	3	32	91.43%
			Overall	85.42%

----------------- Variables in the Equation ------------------

Variable	B	S.E.	Wald	df	Sig	R
FINCOST2	1.64E-05	1.162E-05	2.0035	1	.1569	.0079
AGCOST1	9.2589	4.3783	4.4721	1	.0345	.2100
CMI2	47.3943	22.4482	4.4575	1	.0347	.2093
TAX1	-1.1E-06	6.311E-06	.0278	1	.8675	.0000
SUBSTIT3	1.5195	1.2838	1.4008	1	.2366	.0000
MNGUTIL2	-8.5670	3.9033	4.8172	1	.0282	-.2241
Constant	-2.5073	1.3908	3.2500	1	.0714	

95% CI for Exp(B)

Variable	Exp(B)	Lower	Upper
FINCOST2	1.0000	1.0000	1.0000
AGCOST1	10498.017	1.9692	55965179
CMI2	3.829E+20	29.8620	4.909E+39
TAX1	1.0000	1.0000	1.0000
SUBSTIT3	4.5699	.3691	56.5870
MNGUTIL2	.0002	.0000	.3999

No outliers found. No casewise plot produced.

Source: Croatian survey data

From the regression model presented in table 4.13 it can be seen that the corporate decision to hedge is related to company debt rating, investment expenditures-to-assets ratio and share of the company owned by management. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to hedge or not to hedge corporate risks.

Company credit rating is a proxy for the agency cost of debt. In our research assumptions we argue that firms with a credit rating hedge less extensively because the severity of agency cost of debt is related to the extent of informational asymmetries present in the firm, and that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. Our evidence is inconsistent with the predictions derived from the agency cost of debt model, because the relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge more intensively. This is contrary to the findings of DeMarzo and Duffie (1991) and Haushalter (2000), who have proven that firms with a credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry benefit greatly from risk management activity. An alternative variable that has been used as proxy for agency cost (the share of the company owned by institutional investors) has not shown as relevant for making the decision to hedge.

Investment expenditures-to-assets ratio is a proxy for capital market imperfections and costly external financing. This variable, which controls for company's investment (growth) opportunities, is very important in the model because it tests the prediction that hedgers are more likely to have larger investment opportunities (e.g. see: Froot, Scharfstein and Stein (1993) for theoretical arguments, or Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001) for empirical evidence). Bessembinder (1991) has also shown that hedging activities are predicted to be greater in firms where growth opportunities constitute a larger proportion of firm value, because reductions in agency costs are most valuable for these firms. Therefore, we argue that the firm's decision to hedge is predicted to be positively correlated with measures for investment (growth) opportunities. The results of our logistic model support our prediction and show a statistically significant positive relation between the decision to hedge and investment expenditures-to-assets ratio. When we conducted a robustness test regarding this result by employing other variables that were used as proxies for capital market imperfections and costly external financing hypothesis (cash and cash equivalents-to-assets ratio, investment expenditures to sales and R&D expenditures-to-assets ratio), they were not statistically significant in our model. These findings suggest that the association between hedging and the capital market imperfections is not robust. Overall, the data, at best, provide very weak support for the prediction of the tested hypothesis.

The third variable that is statistically significant in our model is the fraction of the firm's outstanding shares held by the company's management. Smith and Stulz (1985) were the first to predict a positive relation between managerial wealth invested in the company and the use of derivatives. We argue that, due to the fact that firm's managers have limited ability to diversify their own personal wealth position associated with stock holdings and their earnings' capitalisation, they have strong incentives to hedge. Usually that kind of hedging is not conducted to improve the value of company's stockholders but to improve the managers' own wealth. The managerial utility maximisation hypothesis predicts that managers with greater stock ownership would prefer more risk management, while those with greater option holdings would prefer less risk management. Our results show a negative relation between the decision to hedge and the share of the company owned by management, which leads to the conclusion that firms that have a greater fraction of outstanding shares held by the company's management have less incentives to hedge. This is contrary to our prediction and to the findings of Tufano (1996), who has found that firms whose managers have more wealth invested in the firm's stocks manage more corporate risk. Additionally, it needs to be emphasised that Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings. Other variables that were employed as proxies for the managerial utility hypothesis (value of company share owned by management, managers' ownership of stock options, manager's age and tenure) were not statistically significant in the model.

Overall, it could be concluded that evidence based on the empirical relation between the decision to hedge and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility and hedge substitutes, fails to provide any support for any of the tested hypotheses but one - capital market imperfections and costly external financing measured by investment expenditures-to-assets ratio. Regarding this result, we need to emphasise that the association between hedging and capital market imperfections is not robust to other variables employed as proxies for testing this hypothesis.

Table 4.14. Pearson correlation coefficients for independent variables in the regression – Croatian hedgers/nonhedgers

		Total sales revenues	Debt rating	Investment expenditures-to-assets ratio	Total value of tax loss carry-forward and carry backs	Share of the company owned by management	Quick ratio
Total sales revenues	Pearson Correlation Sig. (2-tailed) N	1.000 . 49	.194 .181 49	-.072 .625 49	-.034 .818 49	-.094 .520 49	.176 .232 48
Debt rating	Pearson Correlation Sig. (2-tailed) N	.194 .181 49	1.000 . 49	-.160 .272 49	.058 .691 49	.092 .529 49	-.019 .896 48
Investment expenditures-to-assets ratio	Pearson Correlation Sig. (2-tailed) N	-.072 .625 49	-.160 .272 49	1.000 . 49	-.136 .352 49	.180 .215 49	.146 .321 48
Total value of tax loss carry-forward and carry backs	Pearson Correlation Sig. (2-tailed) N	-.034 .818 49	.058 .691 49	-.136 .352 49	1.000 . 49	-.038 .795 49	-.003 .985 48
Share of the company owned by management	Pearson Correlation Sig. (2-tailed) N	-.094 .520 49	.092 .529 49	.180 .215 49	-.038 .795 49	1.000 . 49	-.180 .221 48
Quick ratio	Pearson Correlation Sig. (2-tailed) N	.176 .232 48	-.019 .896 48	.146 .321 48	-.003 .985 48	-.180 .221 48	1.000 . 48

Source: Croatian survey data

To test the non-existence of multicollinearity as one of the important assumptions of logistic regression, we have calculated Pearson correlation coefficients between the independent variables employed (see: table 4.14). To the extent that one independent is a linear function of another independent, the problem of multicollinearity will occur in logistic regression. As the independents increase in correlation with each other, the standard errors of the logit (effect) coefficients will become inflated. Multicollinearity does not change the estimates of the coefficients, only their reliability (http:// www2.chass.ncsu.edu/garson/pa765/ logistic.htm). From the data presented in the table 4.14. it could be concluded that there is no correlation between variables, therefore the calculated logit coefficient in our model should be reliable.

4.4.2 Decision to Use Derivatives as Risk Management Instruments

Table 4.15 presents the results of multivariate analysis for a company's decision to use derivatives as risk management instruments. Again, the predetermined independent variables include total sales revenues as a proxy for size and financial costs, debt rating as a proxy for agency cost of debt, investment expenditures to assets as a proxy for capital market imperfections, total value of tax loss carry-forwards as a proxy for tax incentives, share of the company value owned by management as a proxy for managerial utility, and quick ratio as a proxy for hedge substitutes. The underlined variables represent those independent variables which appear to be the most consistent in reporting statistically significant *t*-values and which appear to be most consistent and relevant in the stepwise construction of logistic models. The dependent variable is coded 1 if the firm uses derivatives as corporate risk management instruments and 0 otherwise. Apart from the model discussed in this sub-section, as we have created multiple proxies available to measure some firm characteristics, we have estimated separate logistic regressions using all possible combinations of variables representing each predicted construct.

The model can be expressed as:

Derivative use = f (Total sales revenues, Debt rating, Investment expenditures to assets, Total value of tax loss carry-forwards, Share of the company value owned by management, Quick ratio)

Table 4.15. Multivariate results for Croatian derivative users/nonusers

```
Total number of cases:       47 (Unweighted)
Number of selected cases:    47
Number of unselected cases: 0

Number of selected cases:                47
```

```
      Number rejected because of missing data:  1
      Number of cases included in the analysis: 46


Dependent Variable Encoding:

Original       Internal
Value          Value
       0       0
       1       1

Dependent Variable..   DERIVATI   Derivative users

Beginning Block Number  0.  Initial Log Likelihood Function

-2 Log Likelihood   62.371137

* Constant is included in the model.

Beginning Block Number  1.  Method: Enter

Variable(s) Entered on Step Number
1..       FINCOST2  Total sales revenues
          AGCOST1   Credit rating
          CMI2      Investment expenditures-to-assets ratio
          TAX1      Total value of tax loss carry-forward and carry backs
          MNGUTIL2  Share of the company owned by management
          SUBSTIT3  Quick ratio


Estimation terminated at iteration number 6 because
Log Likelihood decreased by less than .01 percent.


 -2 Log Likelihood       29.583
 Goodness of Fit         37.988
 Cox & Snell - R^2         .510
 Nagelkerke - R^2          .687

                     Chi-Square    df Significance

 Model                   32.788     6        .0000
 Block                   32.788     6        .0000
 Step                    32.788     6        .0000


---------- Hosmer and Lemeshow Goodness-of-Fit Test-----------


    DERIVATI = No               DERIVATI = Yes



Group   Observed    Expected    Observed    Expected     Total

    1      5.000       4.903        .000        .097     5.000
    2      4.000       4.729       1.000        .271     5.000
    3      5.000       4.497        .000        .503     5.000
    4      5.000       4.389        .000        .611     5.000
    5      4.000       4.025       1.000        .975     5.000
    6      2.000       2.767       3.000       2.233     5.000
```

```
    7      2.000       1.362       3.000       3.638     5.000
    8       .000        .310       5.000       4.690     5.000
    9       .000        .017       6.000       5.983     6.000


                    Chi-Square    df Significance

Goodness-of-fit test     4.6679     7        .7004
--------------------------------------------------------------

Classification Table for DERIVATI
The Cut Value is .50
                   Predicted

                  No      Yes     Percent Correct
                    N   ⇔     Y
Observed       ⇳⇩⇩⇩⇩⇩⇩⇩⇳⇩⇩⇩⇩⇩⇩⇩⇩⇳
   No      N   ⇔    24   ⇔     3   ⇔    88.89%
               ⇳⇩⇩⇩⇩⇩⇩⇩⇳⇩⇩⇩⇩⇩⇩⇩⇩⇳
   Yes     Y   ⇔     5   ⇔    14   ⇔    73.68%
               ⇳⇩⇩⇩⇩⇩⇩⇩⇳⇩⇩⇩⇩⇩⇩⇩⇩⇳

                         Overall  82.61%

----------------- Variables in the Equation ------------------

Variable          B       S.E.     Wald     df     Sig       R

FINCOST2    3.17E-06 4.859E-06    .4247     1    .5146   .0000
AGCOST1       2.1261    1.5174   1.9633     1    .1612   .0000
CMI2         21.8602    8.2232   7.0668     1    .0079   .2850
TAX1        -9.6E-07 8.020E-06    .0145     1    .9043   .0000
MNGUTIL2     -2.8989    2.0566   1.9869     1    .1587   .0000
SUBSTIT3      3.3228    1.4111   5.5445     1    .0185   .2384
Constant     -3.5885    1.1014  10.6146     1    .0011

                        90% CI for Exp(B)
Variable       Exp(B)      Lower     Upper

FINCOST2       1.0000    1.0000    1.0000
AGCOST1        8.3823     .6909  101.6950
CMI2        3.117E+09 4163.9202 2.334E+15
TAX1           1.0000    1.0000    1.0000
MNGUTIL2        .0551     .0019    1.6223
SUBSTIT3      27.7367    2.7228  282.5519

No outliers found.  No casewise plot produced.
```

Source: Croatian survey data

From the regression model presented in table 4.15, it can be seen that the corporate decision to use derivative instruments is related only to two variables - investment expenditures-to-assets ratio and quick ratio. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to use derivatives.

Investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant positive relation with the decision to use derivatives. This result is consistent with results of multivariate analysis regarding the decision to hedge corporate risks, where it has been shown that companies with higher investment-to-assets ratio have more incentives to hedge. Additionally, the result is consistent with results of univariate analysis for sample derivative users/nonusers, where t-test has revealed that derivative users have a statistically higher value of this ratio, which is confirmed by the correlation analysis (Pearson rho = 0.384), suggesting that there is a positive relation between the value of a company's investment and the decision to use derivatives.

The results of our logistic model support our prediction that the firm's decision to hedge is predicted to be positively correlated with measures for investment (growth) opportunities. This is consistent with findings of Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001). Again, as in the case of sample hedgers/nonhedgers, we have conducted a robustness test regarding this result by employing other variables that were used as proxies for the capital market imperfections and costly external financing hypothesis (cash and cash equivalents-to-assets ratio, investment expenditures to sales and R&D expenditures-to-assets ratio). Results for alternative regression variables were not statistically significant. These findings suggest that the association between hedging and capital market imperfections is not robust. It should be emphasised that the data provide very weak support for the prediction of the tested hypothesis.

Another variable that is statistically significant is quick ratio as a measure of a company's liquidity and substitute for hedging. Consistent with the findings of univariate analysis conducted for samples hedgers/nonhedgers as well as derivative users/nonusers, the multivariate analysis results show a positive relation between the decision to use derivatives and the value of the quick ratio, suggesting that companies that have a high quick ratio have more incentives to use derivatives. The coefficient on this variable is predicted to be negative (Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999), therefore we should reject the hypothesis because the sign of relationship is contrary to what we have predicted. Other variables that were employed to test the hypothesis for hedging substitutes (dividend pay-out ratio, stock-exchange quotation and liquidity ratio) were not significant in the model.

4.5 Conclusion

The Croatian survey has revealed that 73.5 per cent of respondents are using some form of financial engineering to manage interest-rate, foreign exchange or commodity price risk; while 43 per cent use derivatives among other instruments of corporate risk management. This result is similar to the findings of Bodnar, Hayt and Marston (1998) who have revealed that 50 per cent of US non-financial companies are using some form of financial engineering to manage interest rate, foreign exchange, or commodity price risk.

Survey results have shown that price risk and currency risks have the highest influence - 61.2 per cent of financial managers claim that price risk has strong or very strong influence on the company performance, and 59.2 per cent of them think the same for currency risk. These numbers are followed by 44.9 per cent of managers who claim that the influence of interest-rate risk is strong and very strong. Therefore, it could be concluded that Croatian companies are highly exposed to all three types of financial risks. We believe that these findings could be explained by the fact that Croatia is very small and relatively open economy, which results in great exposure of companies to financial risks, especially to the foreign exchange risk and commodity price risk due to the high dependence of the Croatian economy on international trade, especially on import activity. Exposure to the interest-rate risk is a result of external financing through borrowing activity. However, our results have shown that the long-term debt-to-assets ratio as a measure of corporate indebtedness, ranges from 0 to 72.5 per cent, while the mean value for Croatian companies is 21.7 per cent. This result leads to the conclusion that Croatian companies in the sample are not highly leveraged (Graham and Campbell, 2001), which may explain why interest-rate risk has been ranged as less important in comparison with currency and commodity price risks.

Regarding the use and importance of different risk management instruments in risk management strategy, the survey revealed that the currency structure match of assets and liabilities is the most important instrument in managing currency risk. In respect of the use of derivatives, the currency forward is the most important and frequently used instrument, followed by currency swap as the second most important derivative instrument. Other derivatives like currency futures, stock-exchange and OTC options and structured derivatives are not frequently used by Croatian companies. As well, hybrid securities and operational hedging are not important currency risk management instruments.

Interest rate risk in Croatian companies is hedged most frequently by matching maturity of assets and liabilities. Again, forward contract and swap are the most important derivative instruments in risk management strategy, but contrary to currency risk management, interest rate swap is more important than interest rate forward and is used by 27.6 per cent of companies that declare themselves as hedgers. Similarly to currency risk management, other derivative instruments do not play an important role in managing interest rate risk, but hybrid securities that are considered as substitutes for hedging have gained importance in comparison with currency risk management.

There is a lower frequency of commodity risk management among the analysed Croatian companies. Price risk management is usually hedged naturally by managing assets and liabilities. Among derivatives instruments, the commodity forward is the most important, but not as popular as the currency forward. For the first time, futures contracts are used as representatives of standardised derivative instruments traded on the financial market. Contrary to findings presented while analysing currency and interest-rate risk, the commodity swap has not been used at all, nor have other derivative instruments. Business diversification through mergers, acquisitions and other business combinations is quite important in managing price risk and has been used by 28.6 per cent of the analysed Croatian companies.

Survey results have clearly indicated that Croatian non-financial companies stick primarily with simple risk management instruments like natural hedging. In the case of derivatives use, forwards and swaps are by far the most important instruments, which leads to the conclusion that the use of over-the-counter instruments dominates exchange-traded instruments. Additionally, there is a lower frequency of commodity price risk management use among firms in comparison with interest-rate and currency risks. These findings are consistent with Bodnar *et al.* (1995), Jesswein (1995), Bodnar, Hayt and Marston (1998), Bodnar and Gebhardt (1998) as well as with Bodnar, Jong and Macrae (2003).

Amongst the Croatian companies analysed, there appeared to be a decided preference for "active" or "view-driven" risk management as opposed to a full-cover or variance-minimising hedging approach. Only 36 per cent of the companies that manage financial risks have a documented policy regarding the use of financial risk management instruments, while the majority of hedgers manage risks without an official policy. Additionally, only 8.3 per cent of hedgers use Value-at-Risk as a measure of risk exposure, while 11.1 per cent of them use the Monte Carlo analysis or some other type of simulation techniques as measures of risk exposure. The survey has revealed that 71 per cent of the analysed companies manage risk for transaction with maturity up to a year's time. Therefore, it could be concluded that the hedging horizon for financial risk management is typically less than one year.

An important issue in corporate risk management is defining its goals. The results of the Croatian survey have shown that the primary goal of hedging is managing volatility of cash flows, but that Croatian firms focus also on managing balance sheet and financial ratios. Commercial banks are by far the primary source for derivatives transactions for 87.5 per cent of Croatian hedgers. Investment banks, insurance companies and exchange/ brokerage houses are not a very important source for derivative transaction, and very few Croatian firms use them as counterparties.

Amongst the most important reasons why companies do not use derivatives, financial managers have addressed the following problems: the supply of risk management instruments traded on domestic financial market or offered by financial institutions is insufficient, the costs of establishing and maintaining risk management programs exceed the benefits of it, as well as difficulties in pricing and valuing. Other reasons such as concerns about perceptions of derivatives use by investors, regulators and the public, insufficient exposure to financial risks, insufficient knowledge about financial risk management instruments, and the inefficiency and high costs of risk management instruments are not very important reasons why companies in Croatia do not hedge.

On the basis of the respondents' answers and informal interviews conducted at the 3rd Annual Conference of the Croatian Association of Corporate Treasurers held in September 2006, it could be concluded that, in spite of the fact that there is an increasing number of non-financial companies which are aware of corporate risk management importance, a lack of suitable instruments offered to them by the domestic financial industry becomes a leading factor why many companies do not use derivatives when managing risks. This problem has the strongest impact on the shipbuilding industry. Anecdotal evidence collected through contacts with managers in a few Croatian shipbuilding companies has revealed that they are highly exposed to foreign exchange risk due to the sales revenues being denominated in US dollars while operating costs are in the Croatian national currency. Unfortunately, providers of currency risk management instruments (mainly commercial banks) are not able or willing to offer them adequate instruments which would protect their cash-flows from the currency risk that emerges from their specific economic position.

According to a mean comparison test for Croatian hedgers and nonhedgers, the hedgers are statistically different from nonhedgers with respect to variable that proxy for alternative financial policy as substitutes for hedging. Hedgers have a statistically greater quick ratio as a measure of short-term liquidity. The coefficient on quick ratio is predicted to be negative (see: Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Contrary to our prediction as well as to the findings of the cited studies, our results show a positive relation between the decision to hedge and this explanatory variable, suggesting that companies that are more liquid are more likely to hedge.

Another statistically significant variable is company ownership by foreign investors. Although other scholars have not examined this hypothesis, the specific economic situation of Croatia and the high value of foreign direct investments in the last five years have prompted us to examine whether foreign ownership of a company plays an important role in the decision to hedge risks. Our t-test has shown that hedgers have a statistically higher share owed by foreign investors in comparison with nonhedgers, which is confirmed by the correlation analysis. This result could be explained by the fact that foreign investors have enforced the employment of a corporate risk management strategy in the acquired Croatian companies.

The univariate tests suggest that hedgers are not statistically different from nonhedgers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items, or managerial utility. Hedgers and nonhedgers do not differ regarding the size of the company, financial leverage, growth opportunities, managerial shareholdings, ownership by institutional investors, etc. In other words, on the basis of the univariate results, we should reject all research assumptions regarding the shareholder maximisation hypothesis as well as the managerial utility maximisation hypothesis. Additionally, we should reject our hypothesis regarding alternative activities that substitute for financial risk management strategies. Our findings predict the opposite sign to what we have assumed, suggesting that companies that are more liquid have more incentives to hedge.

Regarding the univariate analysis of companies that use derivative instruments and those which do not use them, according to t-test, our analysis has discovered that these two groups differ with respect to proxies for short-term liquidity and investment (growth) opportunities. Derivative users have a statistically greater quick ratio as well as a greater ratio of investment expenditures to the book value of assets. Similarly to the analysis of hedgers and nonhedgers, the company's quick ratio has been used as a proxy for the firm's liquidity and the coefficient on this variable is predicted to be negative (Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Our results show positive a relation between the decision to use derivatives and the value of quick ratio, suggesting that companies that have a high quick ratio have more incentives to use derivatives. This result is confirmed by the correlation analysis.

Another statistically significant variable is the company's ratio of investment expenditures to the book value of assets. Our t-test has shown that derivative users have a statistically higher value of this ratio, which is confirmed by the correlation analysis, suggesting that there is a positive relation between the value of a company's investment and the decision to use derivatives. This result is consistent with our prediction that the benefits of hedging should be greater the more growth options there are in the firm's investment opportunity set and to the findings of Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001). Other variables that have been used to test the agency cost of debt and capital market imperfection hypothesis have not shown statistically significant differences between analysed derivative users and nonusers.

The conducted t-tests and correlation analysis suggest that derivative users are not statistically different from nonusers with respect to other research assumptions regarding the cost of financial distress, agency cost of debt, tax preference items, or managerial utility. It could be concluded that, similarly to the findings in the case of the Croatian hedgers and nonhedgers, we should reject all research assumptions regarding the managerial utility maximisation hypothesis as well as the shareholder maximisation hypothesis – apart from capital market imperfection and costly external financing. Additionally, we should reject our hypothesis regarding alternative activities that substitute for financial risk management strategies. Our findings predict the opposite sign to what we have assumed, suggesting that companies that are more liquid are using derivatives, while those that are less liquid do not use these risk management instruments.

The multivariate regression model has shown that the corporate decision to hedge is related to company debt rating, investment expenditures-to-assets ratio and share of the company owned by management. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to hedge or not to hedge corporate risks.

Company credit rating is a proxy for the agency cost of debt. In our research assumptions we argue that firms with a credit rating hedge less extensively because the severity of agency cost of debt is related to the extent of informational asymmetries present in the firm, and that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. Our evidence is inconsistent with the predictions derived from the agency cost of debt model (see DeMarzo and Duffie (1991) and Haushalter (2000) who have proven that firms with a credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry benefit greatly from risk management activity, because the relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge more intensively.

The investment expenditures-to-assets ratio is a proxy for capital market imperfections and costly external financing. We argue that the firm's decision to hedge is predicted to be positively correlated with measures for investment (growth) opportunities (e.g. see: Froot, Scharfstein and Stein (1993) for theoretical arguments, or Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001) for empirical evidence). The results of our logistic model support our prediction and show a statistically significant positive relation between the decision to hedge and the investment expenditures-to-assets ratio. When we conducted a robustness test regarding this result by employing other variables that were used as proxies for capital market imperfections and costly external financing hypothesis, they were not statistically significant in our model. These findings suggest that the association between hedging and capital market imperfections is not robust. Overall, the data provide very weak support for the prediction of the tested hypothesis.

The third variable that is statistically significant in our model is the fraction of the firm's outstanding shares held by the company's management. We argue that, due to the fact that a firm's managers have limited ability to diversify their own personal wealth position associated with stock holdings and their earnings' capitalisation, they have strong incentives to hedge. Our results show a negative relation between the decision to hedge and the share of the company owned by management, which leads to the conclusion that firms that have a greater fraction of outstanding shares held by the company's management have less incentives to hedge. This is contrary to our prediction, and to the evidence of Tufano (1996), who has found that firms whose managers have more wealth invested in the firm's stock manage more corporate risk. Additionally, it needs to be emphasised that Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings. Other variables that were employed as proxies for the managerial utility hypothesis (value of company share owned by management, managers' ownership of stock options, manager's age and tenure) were not statistically significant in the model. Therefore we should reject the hypothesis regarding managerial utility.

Regarding the results of multivariate analysis for a company's decision to use derivatives as risk management instruments, it can be seen that the corporate decision to use derivative instruments is related only to two variables - investment expenditures-to-assets ratio and quick ratio. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to use derivatives.

The investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant positive relation with the decision to use derivatives. This result is consistent with results of multivariate analysis regarding the decision to hedge corporate risks, where it has been shown that a company with a higher investment-to-assets ratio has more incentives to hedge. Additionally, the result is consistent with results of univariate analysis for sample derivative users/nonusers, where t-test has revealed that derivative users have a statistically higher value of this ratio, which is confirmed with the correlation analysis suggesting that there is a positive relation between the value of a company's investment and decision to use derivatives.

The results of our logistic analysis support our prediction that the firm's decision to hedge is predicted to be positively correlated with measures for investment (growth) opportunities. Again, as in the case of sample hedgers/nonhedgers, we have conducted a robustness test regarding this result by employing other variables that were used as proxies for capital market imperfections and costly external financing hypothesis. Results for alternative regression variables were not statistically significant. These findings suggest that the association between hedging and capital market imperfections is not robust. It should be emphasised that the data provide very weak support for the prediction of the tested hypothesis.

Another variable that is statistically significant is quick ratio as a measure of the company's liquidity and substitute for hedging. Consistently with the findings of univariate analysis conducted for samples hedgers/nonhedgers as well as derivative users/nonusers, multivariate analysis results show positive a relation between the decision to use derivatives and the value of quick ratio, suggesting that companies that have high quick ratio have more incentives to use derivatives. The coefficient on this variable is predicted to be negative (e.g. see Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999), therefore we should reject the hypothesis because the sign of relationship is contrary to what we predicted.

Overall, it could be concluded that evidence based on the empirical relation between Croatian companies' decision to hedge as well as their decision to use derivatives and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility as well as hedge substitutes, fails to provide any support for any of the tested hypotheses but one - capital market imperfections and costly external financing measured by investment expenditures-to-assets ratio. Regarding this result, we need to emphasise that the association between hedging and capital market imperfections is not robust to other variables employed as proxies for testing this hypothesis; therefore it should be interpreted with care.

5. CORPORATE RISK MANAGEMENT IN SLOVENIAN COMPANIES

5.1 Introduction

In this chapter we present the research results on risk management practices in Slovenian companies. In section 5.2 summary statistics of companies' characteristics are presented. The aim of the section is to provide a detailed description of risk management practices for large Slovenian non-financial companies. We have explored how many companies manage financial risks, whether they manage all three types of financial risks and what kind of risk management instruments they use. We also asked financial managers about the intensity of influence of financial risks to the performance of their companies. Managers were questioned about the scope of the risk management policy, the firm's hedging horizon, corporate risk management goals and the use of VaR or Monte Carlo analysis or some other type of simulation techniques as measures of the firm's risk exposure. Additionally, we have explored which financial institutions and intermediaries are the most important in providing risk management instruments and what are the reasons why Slovenian companies do not manage corporate risks or use derivative instruments.

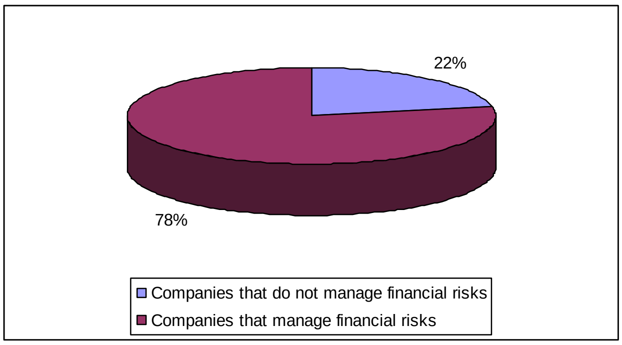
In section 5.3 the results of univariate analysis have been presented. The analysis has been conducted for two different groups. In the first group, we have explored differences between sub-samples of hedgers and nonhedgers, while in the second group we have investigated differences between companies that are derivative users and those companies that do not use derivatives. In both cases, we have employed the Pearson test of correlation as well as t-test for two unrelated means to determine if the means of two unrelated samples differ regarding the size of the company, financial leverage, growth opportunities, managerial shareholdings, taxes, alternative financial policy as substitutes for hedging and institutional investors' ownership.

In section 5.4 we present the results of multivariate analysis for the Slovenian companies. The variables tested in our multivariate regression model are based on the determinants we have presented in the literature review as the key rationales of corporate hedging decision. The reviewed papers have suggested that, if corporate hedging decisions are capable of increasing firm values, they can do so for reasons such as the following: the reduction of the probability or costs of financial distress, taxes or transactions costs, the costs associated with information "asymmetries" by signalling management's view of the company's prospects to investors, and the reduction of "agency" problems (conflicts of interest among management, shareholders, and creditors). We have employed logistic regression where we have tested the hypothesis that the decision whether or not to hedge and the decision to hedge with derivatives is a function of six factors - financial distress costs, agency costs, capital market imperfections, tax incentives to hedge, managerial utility and hedge substitutes. The analysis presented in this chapter should produce a reasonable picture of risk management practices and rationales in the analysed Slovenian firms.

5.2 Descriptive Statistics

The Slovenian survey has revealed that 78 per cent of respondents use some form of financial engineering to manage interest-rate, foreign exchange, or commodity price risk, while 21.9 per cent of them do not manage financial risks at all. Results of univariate and multivariate analysis in which we analyse hedgers and nonhedgers separately are presented in sections 5.3 and 5.4.

Graph 5.1. Slovenian hedgers and nonhedgers

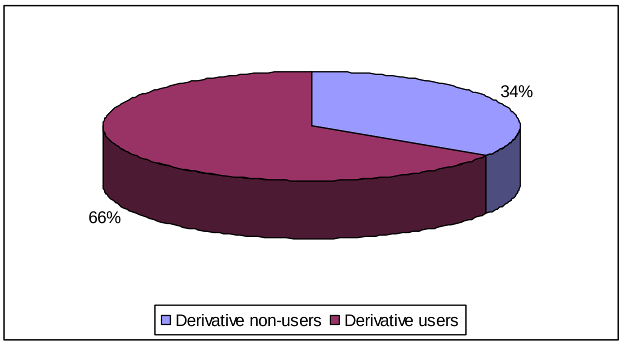


Source: Slovenian survey data

Additionally, by using the same approach as in the analysis of Croatian companies, we have expanded our analysis to the Slovenian companies that use or do not use derivatives as risk management instruments. Among the companies that manage financial risks, there is a substantial number of hedgers who do not use derivatives, but manage risk exposure with some other instruments like natural hedge, operational hedging, hedge substitutes, etc. By separating derivative users from companies that do not use derivatives, we have explored whether there are statistically significant differences between these two samples, and whether some specific company's characteristics affect the decision to hedge by using derivative instruments. We have created the two samples by taking together companies that manage risks but not with derivatives and companies that do not manage financial risks at all in the first sample, while in the second sample we have analysed only those companies that manage financial risks with derivatives.

In this section we present only descriptive statistics, and it can be seen that five companies or 35 per cent of companies that declare themselves as hedgers manage corporate risks, but do not use derivatives as a risk management instrument. It could be concluded that 65.9 per cent of the analysed Slovenian companies use derivatives as risk management instruments. If this result is compared to the findings of the Croatian survey, which showed that 43 per cent of the responding Croatian companies use derivative instruments for managing corporate risks, it could be concluded that the Slovenian companies use derivatives more frequently than their counterparts in Croatia. In comparison to Bodnar, Hayt and Marston (1998) whose survey has revealed that 50 per cent of the US non-financial companies are using some form of financial engineering to manage financial risks, the conclusion would be the same as in the case of Croatia. However, it should be noted that the time difference needs to be taken into account. We believe that the use of derivatives has grown since 1998 in the US as well as globally, therefore results of our survey cannot be directly compared to those of Bodnar, Hayt and Marston (1998).

Graph 5.2. Slovenian companies that use derivatives as risk management instruments



Source: Slovenian survey data

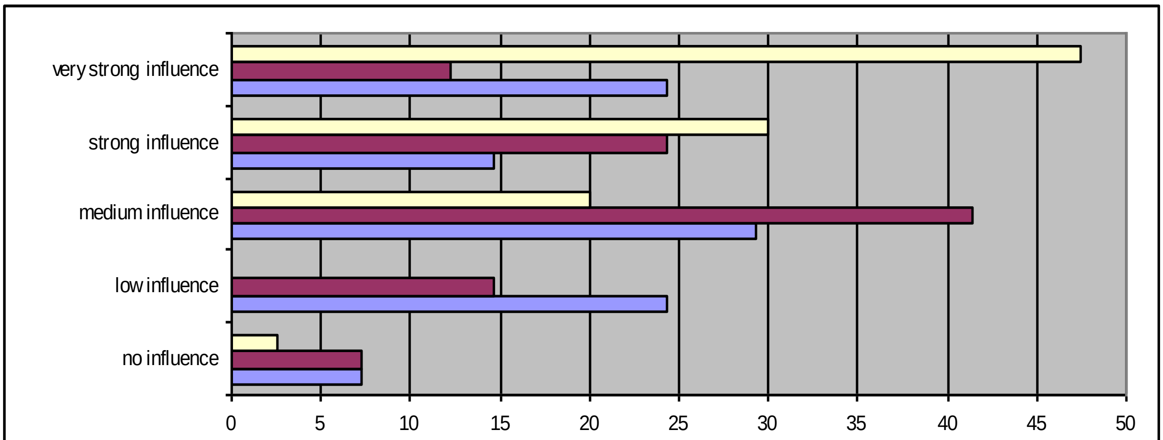
In the survey questionnaire we asked financial managers about the intensity of influence of all three types of financial risks to the performance of their companies. The results showed that the price risk has the highest influence – 77.5 per cent of financial managers claim that price risk has strong or very strong influence on the company’s performance. This number is followed by 39 per cent of managers who think the same for currency risk, while 36.6 per cent of them claim that the influence of interest-rate risk is strong or very strong. On the basis of their answers, both hedgers and nonhedgers, it could be concluded that the Slovenian companies are highly influenced by the price risk, while currency and interest-rate risk exposure have lower impact on the companies' performance.

We believe that these findings could be explained by the fact that Slovenia is a small and open economy, which results in high dependence on international trade. A balanced level of trade, with exports and imports each exceeding 50 per cent of annual GDP on a regular basis, characterises Slovenia's small economy (The Economist Intelligence Unit Limited publications, 2006). High exposures to the commodity price risk can be explained by the fact that Slovenia is oriented to trade with EU members – roughly two-thirds of Slovenia's trade is with the EU. On the highly competitive market, prices of goods are volatile, therefore companies that compete on that market need to be prepared for these conditions and protect their risky positions.

Exposure to foreign-exchange risk was not so high in 2006 and it is expected to be further decreased in 2007, as Slovenia has introduced the Euro as an official currency. Slovenia's major trade partners are Germany, Italy, France and Austria, so the majority of transactions are now denominated in one currency since Slovenia entered the Euro Zone. This contributes to the lowering of risk in business transactions as companies no longer have to worry about their currency risk exposures, which should additionally enhance the trade between Slovenia and its partners. In respect to the currency risk management instruments that have been used in Slovenian companies, it could be expected that their importance will decrease sharply, especially for the ones that have their value attached to the Euro or Slovenian tolar.

Exposure to interest-rate risk is a result of external financing through borrowing activity. However, our results have shown that the long-term debt-to-assets ratio ranges from 0 to 30.69 per cent, while the mean value is 12.13 per cent. Graham and Campbell (2001) have argued that companies are highly leveraged if the debt-to-assets ratio exceeds 30 per cent, therefore it could be concluded that the Slovenian companies in the sample are not highly leveraged, which may explain why interest-rate risk has been ranged as less important in comparison with commodity price risks.

Graph 5.3. Financial risks influence on Slovenian companies' performance



	no influence	low influence	medium influence	strong influence	very strong influence
commodity price risk	2,5	0	20	30	47,5
interest-rate risk	7,317073171	14,63414634	41,46341463	24,3902439	12,19512195
currency risk	7,317073171	24,3902439	29,26829268	14,63414634	24,3902439

Source: Slovenian survey data

When we asked companies if they manage all three types of financial risks, 24 out of 32 companies that declare themselves as hedgers claimed that they manage currency, interest rate and price risk, while 8 companies manage some both not all types of financial risks.

Regarding the use and importance of different risk management instruments in the risk management strategy, we have presented the results in tables 5.1, 5.2 and 5.3. It could be concluded that currency structure netting of assets and liabilities is the most important instrument in managing currency risk. In respect to the use of derivatives, the currency forward is the most important and frequently used instrument, followed by currency swap as the second most important derivative instrument. Currency futures and structured derivatives have greater importance in comparison with Croatian companies, as well as operational hedging. Other derivatives such as stock-exchange and OTC options and hybrid securities are not important currency risk management instruments.

Table 5.1. Currency risk management instruments used by Slovenian hedgers

Instrument	Per cent of hedgers that use the instrument	Per cent of companies that use the instrument	Importance 1-3 (frequencies of companies that use the instrument)		
			1 = less important	2 = important	3 = very important
11. Matching currency structure of assets and liabilities (e.g. debt in foreign currency)	75.9	53.7	0	11	12
12. Currency forward	44.8	31.7	2	6	4
13. Currency futures	17.2	12.2	1	3	1
14. Currency swap	24.1	17.1	0	3	4
15. Stock-Exchange Currency option	6.9	4.9	1	1	
16. OTC (over-the-counter) currency option	3.4	2.4		1	
17. Structured derivatives (e.g. currency swaption)	13.8	9.8		3	1
18. Hybrid securities (e.g. convertible bonds or preferred stocks)	0	0		0	
19. Operational hedging (International diversification – moving part of the business abroad)	27.6	19.5	2	2	4

Source: Slovenian survey data

Interest rate risk in the Slovenian companies is hedged most frequently by matching maturity of assets and liabilities. Forward contract, swap and structured derivatives are the most important derivative instruments in risk management strategy, but in contrast to currency risk management, interest rate swap is more important than interest rate forward and is used by 27.6 per cent of companies that declare themselves as hedgers. Structured derivatives are important instrument of interest-rate risk management as well, and are used in 20.7 per cent of companies. These instruments are even more important than interest-rate forward. Regarding the use of other derivative instruments such as interest-rate options, futures or hybrid securities, they do not play an important role in managing interest rate risk.

Table 5.2. Interest-rate risk management instruments used by Slovenian hedgers

Instrument	Per cent of hedgers that use the instrument	Per cent of companies that use the instrument	Importance 1-3 (frequencies of companies that use the instrument)		
			1 = less important	2 = important	3 = very important
10. Matching maturity of assets and liabilities	82.8	58.5	1	10	13
11. Interest rate forward	17.2	12.2	1	1	3
12. Interest rate futures	3.4	2.4		1	
13. Interest rate swap	27.6	19.5	1	4	3
14. Stock-Exchange interest rate option	3.4	2.4		1	
15. OTC (over-the-counter) interest rate option	3.4	2.4			1
16. Structured derivatives (e.g. cap, floor, collar, corridor or swaption)	20.7	14.6	1	2	3
17. Hybrid securities (e.g. convertible bonds or preferred stocks)	0	0			

Source: Slovenian survey data

Price risk management in the Slovenian companies is usually hedged naturally by managing assets and liabilities. Among derivatives instruments the commodity forward and commodity futures are equally important, followed by commodity swap and standardised options. In the case of commodity risk management, structured derivatives as well as OTC options are not important instruments. Business diversification through mergers, acquisitions, and other business combinations is quite important in managing price risk and has been used by 25 per cent of the analysed Slovenian companies.

Table 5.3. Price risk management instruments used by Slovenian hedgers

Instrument	Per cent of hedgers that use the instrument	Per cent of companies that use the instrument	Importance 1-3 (frequencies of companies that use the instrument)		
			1 = less important	2 = important	3 = very important
10. Managing assets and liabilities	71.4	48.8	1	4	15
11. Commodity forward	14.3	9.8	1	1	2
12. Commodity futures	14.3	9.8	1	1	2
13. Commodity swap	10.7	7.3		2	1
14. Stock-Exchange commodity option	7.1	4.9		1	1
15. OTC (over-the-counter) commodity option	3.6	2.4		1	
16. Structured derivatives (combination of swaps, future contacts and options)	3.6	2.4			1
17. Business diversification through mergers, acquisitions, and other business combinations	25	17.1		6	1

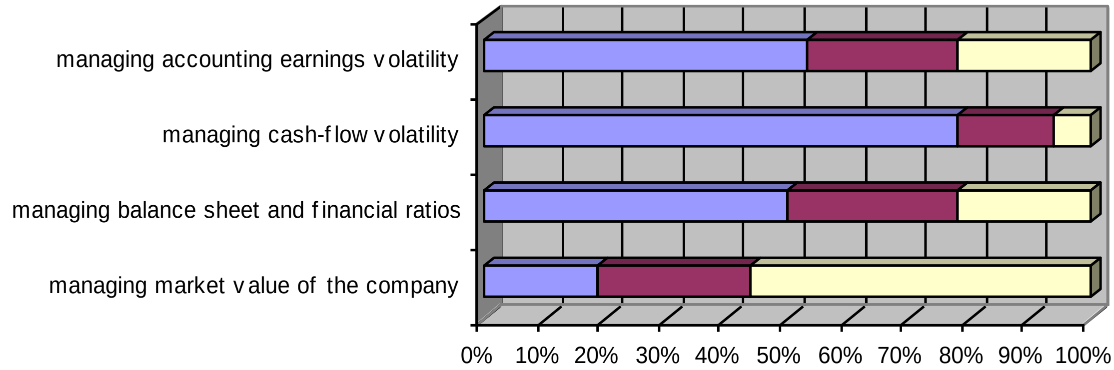
Source: Slovenian survey data

The survey results have clearly indicated that the Slovenian non-financial companies manage financial risks primarily with simple risk management instruments such as natural hedging, but it should be noted that the use of derivatives is also frequent - not only plain vanilla instruments like forwards and swaps, but structured derivatives as well.

Regarding the scope of the corporate risk management policy, 87.5 per cent of hedgers claim that they use selective hedging, while 12.5 per cent of them manage financial risks completely. Among the analysed Slovenian companies, there appeared to be a decided preference for "active" or "view-driven" risk management as opposed to a full-cover or variance-minimising hedging approach. 56.3 per cent of respondents that manage financial risks have a documented policy regarding the use of financial risk management instruments, while the rest of them manage risks without an official policy. Additionally, 18.8 per cent of hedgers use Value-at-Risk as a measure of risk exposure, while only 12.5 per cent of them use Monte Carlo analysis or some other type of simulation techniques as measures of risk exposure. The survey has revealed that 49 per cent of the analysed Slovenian companies manage risk for transaction with maturity up to a year’s time, 19 per cent of them have a hedging horizon of two years, in 16 per cent of companies the hedging horizon is five years, while 16 per cent of respondents manage risk for transaction with maturity longer than five years.

An important issue in corporate risk management is defining its goals. The theoretical financial literature strongly recommends focusing on cash flows or on the value of the company. A focus on accounting numbers is generally discarded. However, the results of the Slovenian survey have shown that the primary goal of hedging is managing the volatility of cash flows, but that the Slovenian firms focus also on accounting earning volatility as well as managing balance sheet and financial ratios. Some 78.2 per cent of respondents indicate that their key motive behind financial hedging is to decrease the volatility of the cash flows; however, stabilising accounting earnings volatility and balance sheet and financial ratios are second by importance (53.1 and 50 per cent respectively). Only 18.8 per cent of them claim that the market value of the company is the primary goal of corporate risk management. It should be emphasised that there is a strong link between the Slovenian financial accounting and tax accounting. As a result of those institutional features, we believe that there is a strong focus on accounting earnings in all business decisions and consequently also in hedging decisions.

Graph 5.4. Corporate risk management goals in Slovenian companies

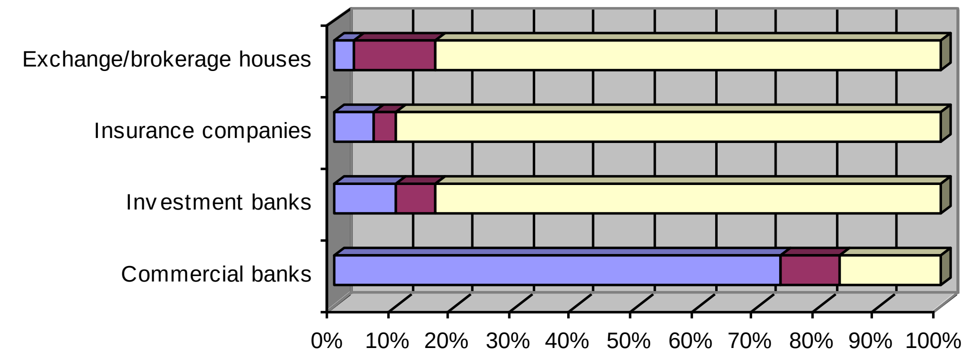


	managing market value of the company	managing balance sheet and financial ratios	managing cash-flow volatility	managing accounting earnings volatility
low importance	56,2	21,9	6,3	21,9
medium importance	25	28,1	15,6	25
high importance	18,8	50	78,2	53,1

Source: Slovenian survey data

Commercial banks are by far the primary source for derivatives transactions for 73.4 per cent of the Slovenian hedgers. Investment banks, insurance companies as well as exchange/brokerage houses are not a very important source for derivative transaction, and very few Slovenian firms use them as counterparties.

Graph 5.5. Importance of different counterparties in providing risk management instruments



	Commercial banks	Investment banks	Insurance companies	Exchange/brokerage houses
low importance	16,6	83,3	90	83,4
medium importance	10	6,7	3,3	13,3
high importance	73,4	10	6,7	3,3

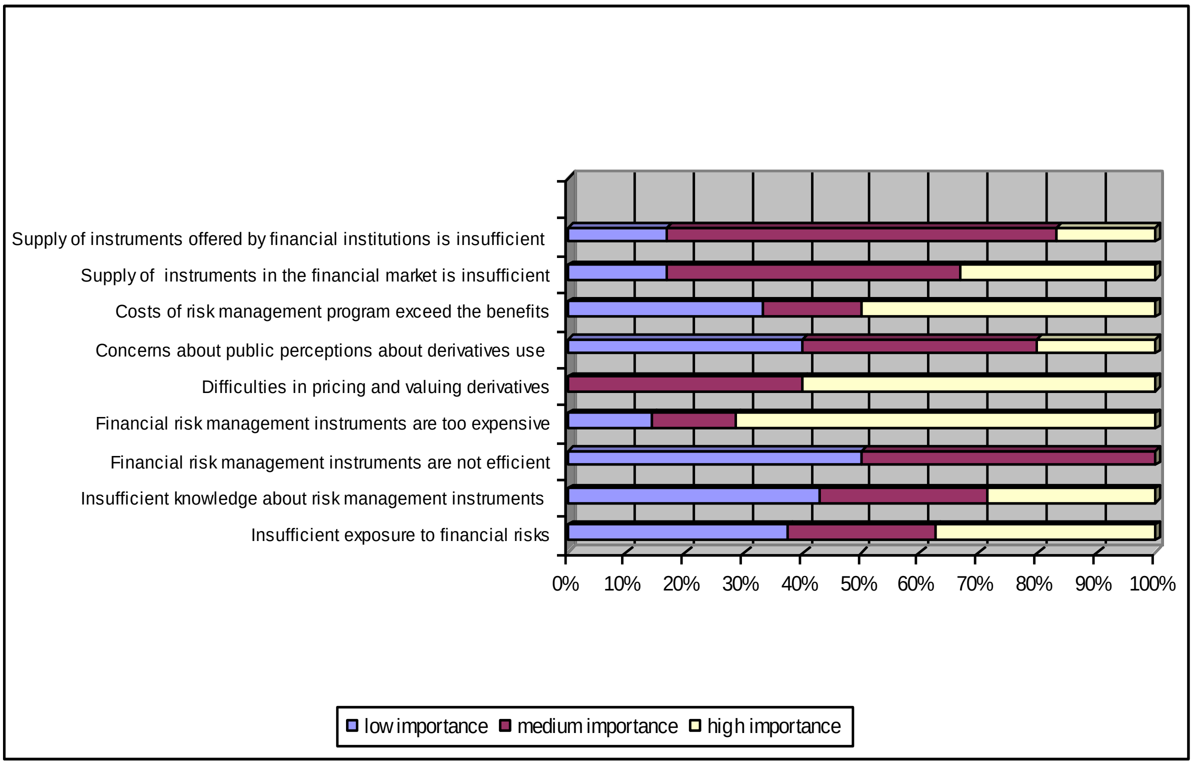
high importance medium importance low importance

Source: Slovenian survey data

The most important reasons why companies do not use derivatives as risk management instruments, judged by financial managers' opinion, are as follows. Some 71.4 per cent of managers have argued that financial risk management instruments are too expensive, while 60 per cent of them have named difficulties in pricing and valuing derivatives. Very important reasons that have influenced decision not to hedge financial risks are the costs of establishing and maintaining risk management programmes that exceed the benefits of it, as well as insufficient exposure to financial risks.

Insufficient supply of instruments offered by financial institutions or traded on the financial market, together with inefficiency of financial risk management instruments, are reasons of medium importance that affect the decision not to hedge financial risks. Other reasons such as concerns about perceptions of derivatives use by investors, regulators and the public as well as insufficient knowledge about financial risk management instruments are not very important reasons why the Slovenian companies do not hedge.

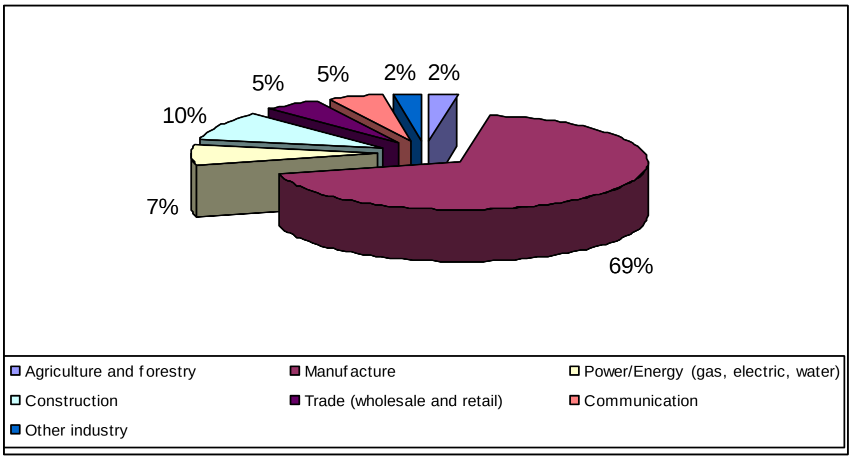
Graph 5.6. Reasons why Slovenian companies do not use derivative instruments



Source: Slovenian survey data

Regarding the industry structure of respondents, it can be seen from graph 5.7. that the majority of analysed companies (69 per cent) are manufacturers, while the rest of them belong to other industry sectors such as construction, energy, trade, communications etc.

Graph 5.7. Industry structure of analysed Slovenian companies



Source: Slovenian survey data

Around 81 per cent of the responding companies were established more than 20 years ago. Taking into account that the length of the company's existence is often taken as a measure of its reputation (e.g. see: Diamond (1991a); Petersen and Rajan (1994); Bolton and Freixas (2000) and Hege (2002)), it could be concluded that, among the analysed companies, the majority of them are companies with the best reputation on the Slovenian market and are market leaders. Therefore, it is expected that companies in the sample have a developed corporate risk management function as this function is one of the most important objectives of modern corporate strategy.

5.2.1 Descriptive Statistics of Independent Variables

In this sub-section we present descriptive statistics of the variables we have used in our univariate analysis as well as in the logistic regression model. From the tables presented below, it can be seen that the majority of analysed the Slovenian companies (60 per cent) have credit rating, as well as tax incentives to hedge (67.5 per cent), while only 14.6 per cent of respondents are public companies and they are listed on the stock-exchange.

Table 5.4. Credit rating of Slovenian companies

	Frequency	**Percent**
Do not have credit rating	16	40
Have credit rating	24	60
Total	40	100.0

Source: Slovenian survey data

Table 5.5. Tax incentives of Slovenian companies (tax loss carried forward, tax loss carried back and/or investment tax credits)

	Frequency	**Percent**
Do not have tax incentives	13	32.5
Have tax incentives	27	67.5
Total	40	100.0

Source: Slovenian survey data

Table 5.6. Slovenian companies listed on the stock-exchange

	Frequency	**Percent**
No	35	85.4
Yes	6	14.6
Total	41	100.0

Source: Slovenian survey data

Descriptive statistics of other company characteristics such as the value of total assets, total sales, debt-to-equity ratio, dividend pay-out ratio, liquidity ratio, which were used as independent variables in the univariate and multivariate analysis, are shown in table 5.7. We have presented minimal and maximal values as well as averages. The value of total assets ranges from Euro 12,194,000 to 1,179,145,000, with a mean value of Euro 151,222,000. The value of total sales revenues ranges from Euro 14,094,000 to 1,754,016,000, with a mean value of Euro 141,072,390.

Long-term debt-to-assets ratio ranges from 0 to 30.69 per cent, while the mean value is 12.13 per cent. Ownership by institutional investors ranges from 0 per cent to 100 per cent, but the average share is 17.68 per cent. The dividend pay-out ratio also ranges from 0 to as much as 160 per cent, with an average value of 23.72 per cent. A very significant difference within the companies in the sample could be seen in the value of liquidity ratio which ranges from -10.86 to 20.00, together with the interest cover ratio that ranges from -95.08 to 564.36. It could be concluded that there is substantial variation in many of these variables, and that the results have shown a wide variation in financing policies and size within the sample.

Regarding the managers characteristics, it could be concluded that the average share of stock ownership held by managers in their companies is 4.88 per cent, while the maximum is 100 per cent. 90 per cent of managers do not own options on company's stocks, 37 per cent of them are between 46 and 55 years old, while 55 per cent of financial managers are 45 or younger. The average managers' tenure in the company is 15.14 years. The gender structure is slightly dominated by females (57 to 43 per cent), which could be considered as very interesting information in respect to the world trends, which shown that the position of a financial manager is among the 20 leading occupations of employed women. This argument is confirmed by the fact that, in the year 2004, 55.7 per cent of financial managers in the US were women (see: www.dol.gov/wb/stats/main.htm). Slovenia has an even higher share of female managers in the year 2006.

Managers are well educated persons – 74 per cent of them hold a bachelor's degree, 18 per cent hold a master's or PhD, while 67 per cent of respondents have completed training in risk management. In respect to their education and knowledge, managers in the analysed companies should be able to realise the importance of risk management function to the success of their companies as well as being capable of implementing and developing it.

Table 5.7. Descriptive statistics of independent variables - Slovenian sample

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Total assets	41	12,194	1,179,145	151,221.51	236,982.42	3.089	.369
Total sales revenues	41	14,094	1,754,016	141,072.39	275,470.64	5.286	.369
Debt-to-assets	41	.0456	.9967	.406892	.206677	.284	.369
Long-term debt-to-assets ratio	41	.0000	.3069	.121320	9.21496E-02	.407	.369
Long-term debt-to-equity ratio	41	.0000	.8407	.280353	.261797	.861	.369
Interest cover ratio	40	-95.0833	564.3571	19.742316	91.284027	5.677	.374
Share owned by institutional investors	40	.00	100.00	17.6833	28.3987	1.786	.374
Cash & cash equivalents-to-assets ratio	41	.0003	.2499	3.62719E-02	5.23842E-02	2.480	.369
Investment expenditures-to-assets ratio	41	.0000	.2336	7.19644E-02	5.62824E-02	.744	.369
Investment expenditures-to-sales ratio	41	.0000	.7295	8.43506E-02	.119113	4.251	.369
R&D expenditures-to-assets ratio	35	.0000	.0591	1.19042E-02	1.65807E-02	1.422	.398
Total value of tax loss carry-forward and carry backs	40	.00	1,696.00	42.4400	268.1548	6.325	.374
Total value of tax loss carry-forward and carry backs-to-total assets	40	.0000	.0500	1.25292E-03	7.90787E-03	6.325	.374
Investment tax credits	38	.00	26,978.00	2,656.2105	5,196.7128	3.571	.383
Value of equity owned by managers	41	.0	78,375.0	2,505.265	12,247.611	6.244	.369
Share of the company owned by management	39	.00	100.00	4.8815	17.9650	4.705	.378
Managers age	40	2	5	3.25	.95	.023	.374
Managers tenure	38	3	37	15.14	9.73	.675	.383
Dividend pay-out ratio	38	.00	160.00	23.7161	38.0949	1.873	.383
Quick ratio	41	-.5976	3.0000	.221750	.534335	3.828	.369
Liquidity ratio	41	-10.8570	20.0000	1.896927	3.696341	2.075	.369
Share of the company owned by foreign investors	40	.00	100.00	23.0070	40.1712	1.291	.374

(Variables that are presented in the absolute values are in Euro 000)

Source: Slovenian survey data

5.3 Univariate Analysis

In this section, the results of univariate analysis for the Slovenian companies have been presented. We have employed t-test to determine if the means of two unrelated samples differ. Additionally, we have conducted the Pearson test of correlation because variables in the model are of an interval/ratio nature (Bryman and Cramer, 1997). The analysis has been conducted for two different groups. In the first group, we have explored differences between sub-samples of hedgers and nonhedgers, while in the second group we have investigated differences between companies that are derivative users and those companies that do not use derivatives.

Tables 5.8 and 5.10 present summary statistics for the proxy variables described in the previous sections, while table 5.9 presents tests of differences between the means of these variables for hedgers and nonhedgers. Table 5.11 presents the same results but for the sample derivative users and nonusers. According to a mean comparison test conducted for the sample of hedgers/nonhedgers, as well as for derivative users and nonusers, our univariate test has discovered that hedgers and derivative users are statistically different from nonhedgers and derivative nonusers with respect only to the coefficient of the publicly held company dummy variable that proxies for alternative financial policy as substitutes for hedging. On the basis of the mean comparison test, a positive relation is predicted between the decision to hedge or use derivatives as risk management instruments and the coefficient of the publicly held company dummy variable. This finding leads to the conclusion that companies that list their shares on the stock-exchange have more incentives to hedge and use derivatives as risk management instruments. This result has not been supported by the correlation analysis (see table 5.12).

Cummins, Phillips and Smith (2001) have considered the possibility that publicly traded and privately held stock companies may behave differently with respect to risk management.

Generally, they have expected that the owners of closely held firms may exhibit a degree of risk aversion, to the extent that the wealth of the shareholders is sub-optimally diversified because of their holdings in the company. They have predicted that, if closely held firms tend to be risk-averse, the coefficient of the publicly held company dummy variable is predicted to be negative.

Our univariate test has revealed the coefficient of the publicly traded company dummy variable to be positive, suggesting that publicly held companies tend to be risk-averse, while privately held companies do not act in a risk-averse manner and do not hedge. Therefore, our assumption connected to the different behaviour of the publicly traded and privately held stock companies with regard to risk management should be rejected. We believe the explanation for this result can be found in the fact that, regardless to the opinion that the ownership of publicly traded companies is well diversified, research results have shown that even 64.7 per cent of the analysed Slovenian companies are owned by the major shareholder, meaning that there is one owner who has more than 50 per cent of a company's shares and has a power to control the business. Therefore, it can be argued that the major shareholder has poorly diversified wealth and therefore acts in risk-averse manner. Another explanation for the positive coefficient of the publicly held company dummy variable could be found in the fact that publicly traded companies, which act in a risk-averse manner tend to signal good news to investors on the financial market as well as to all company's stakeholders, because a company that manages its risk exposures is seen as a less risky investment or a better rated business partner. However, to the best of our knowledge, we cannot support this argument by theoretical or empirical evidence, meaning that this second explanation is based only on our opinion.

Other variables that test the hypothesis regarding the alternative financial policies as substitutes for hedging are not statistically significant. The univariate tests also suggest that hedgers and derivative users are not statistically different from nonhedgers and derivative nonusers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items, or managerial utility. Hedgers and nonhedgers do not differ regarding the size of company, financial leverage, growth opportunities, managerial shareholdings, ownership by institutional investors, liquidity, dividend-pay-out ratio etc. In other words, on the basis of the univariate analysis, both t-test and Pearson correlation coefficient, we should reject all research assumptions regarding the shareholder maximisation hypothesis as well as managerial utility maximisation hypothesis.

Table 5.8. Group statistics Slovenian hedgers/nonhedgers

	Hedgers/Nonhedgers	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Total assets	Nonhedgers	9	61,371.78	80,503.13	26,834.38
	Hedgers	32	176,491.75	260,365.08	46,026.48
Total sales revenues	Nonhedgers	9	40,950.33	25,668.20	8,556.07
	Hedgers	32	169,231.72	306,620.39	54,203.34
Debt-to-assets ratio	Nonhedgers	9	.441924	.252914	8.43047E-02
	Hedgers	32	.397039	.195327	3.45293E-02
Long-term debt-to-assets ratio	Nonhedgers	9	.125330	.105724	3.52413E-02
	Hedgers	32	.120193	8.98127E-02	1.58768E-02
Long-term debt-to-equity ratio	Nonhedgers	9	.246852	.211561	7.05203E-02
	Hedgers	32	.289775	.276528	4.88837E-02
Interest cover ratio	Nonhedgers	9	4.660217	17.324346	5.774782
	Hedgers	31	24.120990	103.269150	18.547687
Debt rating	Nonhedgers	9	.5556	.5270	.1757
	Hedgers	31	.6129	.4951	8.893E-02
Share owned by institutional investors	Nonhedgers	9	12.9778	32.8452	10.9484
	Hedgers	31	19.0494	27.4259	4.9258
Cash & cash equivalents-to-assets ratio	Nonhedgers	9	3.59765E-02	5.59756E-02	1.86585E-02
	Hedgers	32	3.63549E-02	5.22701E-02	9.24014E-03
Investment expenditures-to-assets ratio	Nonhedgers	9	8.02815E-02	5.51659E-02	1.83886E-02
	Hedgers	32	6.96252E-02	5.72387E-02	1.01185E-02
Investment expenditures-to-sales ratio	Nonhedgers	9	.128244	.228290	7.60968E-02
	Hedgers	32	7.20055E-02	6.43498E-02	1.13755E-02
R&D expenditures-to-assets ratio	Nonhedgers	9	9.51924E-03	1.93990E-02	6.46634E-03
	Hedgers	26	1.27298E-02	1.58338E-02	3.10527E-03
Total value of tax loss carry-forward and carry backs	Nonhedgers	9	.1778	.5333	.1778
	Hedgers	31	54.7097	304.6106	54.7097
Total value of tax loss carry-forward and carry backs-to-total	Nonhedgers	9	1.11747E-05	3.35240E-05	1.11747E-05

assets	Hedgers	31	1.61343E-03	8.98318E-03	1.61343E-03
Investment tax credits	Nonhedgers	9	984.4444	914.0728	304.6909
	Hedgers	29	3,175.0345	5,854.0947	1,087.0781
Tax incentives-dummy	Nonhedgers	9	.7778	.4410	.1470
	Hedgers	31	.6452	.4864	8.736E-02
Value of equity owned by managers	Nonhedgers	9	575.337	1,682.404	560.801
	Hedgers	32	3,048.057	13,836.097	2,445.900
Share of the company owned by management	Nonhedgers	9	6.2778	18.2776	6.0925
	Hedgers	30	4.4627	18.1648	3.3164
Managers ownership of stock options	Nonhedgers	9	.11	.33	.11
	Hedgers	31	9.68E-02	.30	5.40E-02
Managers age	Nonhedgers	9	3.11	.93	.31
	Hedgers	31	3.29	.97	.17
Managers tenure	Nonhedgers	9	12.33	6.67	2.22
	Hedgers	29	16.02	10.45	1.94
Dividend pay-out ratio	Nonhedgers	9	14.6811	22.1772	7.3924
	Hedgers	29	26.5200	41.7466	7.7522
Company listed on the stock-exchange	Nonhedgers	9	.00	.00	.00
	Hedgers	32	.19	.40	7.01E-02
Quick ratio	Nonhedgers	9	.162216	.272903	9.09677E-02
	Hedgers	32	.238494	.589803	.104263
Liquidity ratio	Nonhedgers	9	2.202866	2.053383	.684461
	Hedgers	32	1.810881	4.062842	.718216
Share of the company owned by foreign investors	Nonhedgers	9	44.2889	52.5219	17.5073
	Hedgers	31	16.8284	34.4515	6.1877

Source: Slovenian survey data

Table 5.9. Independent samples t-test Slovenian hedgers/nonhedgers

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total assets	Equal variances assumed	2.606	.115	-1.298	39	.202	-115,119.97	88,658.26	-294,448.23	64,208.28
	Equal variances not assumed			-2.161	38.444	.037	-115,119.97	53,277.77	-222,934.27	-7,305.68
Total sales revenues	Equal variances assumed	2.206	.145	-1.243	39	.221	-128,281.39	103,237.53	-337,099.00	80,536.23
	Equal variances not assumed			-2.338	32.486	.026	-128,281.39	54,874.48	-239,991.50	-16,571.27
Debt-to-assets ratio	Equal variances assumed	.102	.751	.571	39	.571	4.48853E-02	7.86465E-02	-.114192	.203963
	Equal variances not assumed			.493	10.831	.632	4.48853E-02	9.11019E-02	-.156012	.245783
Long-term debt-to-assets ratio	Equal variances assumed	.355	.555	.146	39	.885	5.13743E-03	3.52021E-02	-6.606547E-02	7.63403E-02
	Equal variances not assumed			.133	11.455	.897	5.13743E-03	3.86526E-02	-7.952561E-02	8.98005E-02
Long-term debt-to-equity ratio	Equal variances assumed	1.159	.288	-.430	39	.669	-4.292319E-02	9.98000E-02	-.244788	.158941
	Equal variances not assumed			-.500	16.549	.623	-4.292319E-02	8.58063E-02	-.224335	.138489
Interest cover ratio	Equal variances assumed	.693	.410	-.558	38	.580	-19.460773	34.873127	-90.057728	51.136183
	Equal variances not assumed			-1.002	34.869	.323	-19.460773	19.425880	-58.902685	19.981140
Debt rating	Equal variances assumed	.246	.623	-.302	38	.765	-5.7348E-02	.1901	-.4422	.3275
	Equal variances not assumed			-.291	12.408	.776	-5.7348E-02	.1969	-.4848	.3701
Share owned by institutional investors	Equal variances assumed	.130	.720	-.560	38	.579	-6.0716	10.8489	-28.0340	15.8908
	Equal variances not assumed			-.506	11.442	.623	-6.0716	12.0055	-32.3715	20.2284
Cash & cash equivalents-to-assets ratio	Equal variances assumed	.229	.635	-.019	39	.985	-3.784256E-04	2.00167E-02	-4.086596E-02	4.01091E-02
	Equal variances not assumed			-.018	12.216	.986	-3.784256E-04	2.08212E-02	-4.565522E-02	4.48984E-02

Investment expenditures-to-assets ratio	Equal variances assumed	.034	.854	.497	39	.622	1.06564E-02	2.14385E-02	-3.270709E-02	5.40198E-02
	Equal variances not assumed			.508	13.264	.620	1.06564E-02	2.09887E-02	-3.459534E-02	5.59081E-02
Investment expenditures-to-sales ratio	Equal variances assumed	6.435	.015	1.261	39	.215	5.62384E-02	4.46150E-02	-3.400398E-02	.146481
	Equal variances not assumed			.731	8.360	.485	5.62384E-02	7.69424E-02	-.119868	.232345
R&D expenditures-to-assets ratio	Equal variances assumed	.035	.852	-.495	33	.624	-3.210569E-03	6.48491E-03	-1.640423E-02	9.98309E-03
	Equal variances not assumed			-.448	11.913	.662	-3.210569E-03	7.17330E-03	-1.885259E-02	1.24315E-02
Total value of tax loss carry-forward and carry backs	Equal variances assumed	1.213	.278	-.532	38	.598	-54.5319	102.4807	-261.9931	152.9293
	Equal variances not assumed			-.997	30.001	.327	-54.5319	54.7100	-166.2645	57.2007
Total value of tax loss carry-forward and carry backs-to-total assets	Equal variances assumed	1.205	.279	-.530	38	.599	-1.602252E-03	3.02223E-03	-7.720437E-03	4.51593E-03
	Equal variances not assumed			-.993	30.003	.329	-1.602252E-03	1.61347E-03	-4.897374E-03	1.69287E-03
Investment tax credits	Equal variances assumed	3.333	.076	-1.108	36	.275	-2,190.5900	1,976.8168	-6,199.7603	1,818.5802
	Equal variances not assumed			-1.940	31.883	.061	-2,190.5900	1,128.9709	-4,490.5583	1,09.3783
Tax incentives-dummy	Equal variances assumed	3.093	.087	.734	38	.467	.1326	.1807	-.2331	.4984
	Equal variances not assumed			.776	14.178	.451	.1326	.1710	-.2337	.4989
Value of equity owned by managers	Equal variances assumed	.887	.352	-.530	39	.599	-2,472.720	4,663.208	-11,904.949	6,959.509
	Equal variances not assumed			-.985	33.981	.331	-2,472.720	2,509.367	-7,572.472	2,627.031
Share of the company owned by management	Equal variances assumed	.430	.516	.263	37	.794	1.8151	6.9130	-12.1919	15.8221
	Equal variances not assumed			.262	13.125	.798	1.8151	6.9367	-13.1561	16.7863
Managers ownership of stock options	Equal variances assumed	.059	.809	.123	38	.903	1.43E-02	.12	-.22	.25
	Equal variances not assumed			.116	12.043	.910	1.43E-02	.12	-.25	.28
Managers age	Equal variances assumed	.065	.800	-.491	38	.626	-.18	.36	-.92	.56
	Equal variances not assumed			-.504	13.551	.622	-.18	.36	-.94	.59
Managers tenure	Equal variances assumed	5.464	.025	-.992	36	.328	-3.68	3.71	-11.22	3.85

	Equal variances not assumed			-1.248	21.290	.225	-3.68	2.95	-9.82	2.45
Dividend pay-out ratio	Equal variances assumed	2.000	.166	-.811	36	.423	-11.8389	14.6036	-41.4563	17.7785
	Equal variances not assumed			-1.105	26.213	.279	-11.8389	10.7118	-33.8487	10.1709
Company listed on the stock-exchange	Equal variances assumed	13.355	.001	-1.406	39	.168	-.19	.13	-.46	8.23E-02
	Equal variances not assumed			-2.675	31.000	.012	-.19	7.01E-02	-.33	-4.45E-02
Quick ratio	Equal variances assumed	.495	.486	-.374	39	.710	-7.627812E-02	.203811	-.488526	.335970
	Equal variances not assumed			-.551	29.629	.586	-7.627812E-02	.138369	-.359014	.206457
Liquidity ratio	Equal variances assumed	.003	.960	.278	39	.783	.391984	1.411030	-2.462093	3.246062
	Equal variances not assumed			.395	26.900	.696	.391984	.992129	-1.644052	2.428021
Share of the company owned by foreign investors	Equal variances assumed	9.610	.004	1.862	38	.070	27.4605	14.7514	-2.4021	57.3231
	Equal variances not assumed			1.479	10.082	.170	27.4605	18.5686	-13.8676	68.7886

Source: Slovenian survey data

Table 5.10. Group statistics Slovenian derivative users/nonusers

	Use of derivatives as risk management instrument	N	Mean	Std. Deviation	Std. Error Mean
Total assets	No	14	76,360.71	85,313.71	22,801.05
	Yes	27	190,038.22	279,605.99	53,810.20
Total sales revenues	No	14	56,293.00	41,068.07	10,975.90
	Yes	27	185,032.07	331,699.32	63,835.56
Debt-to-assets ratio	No	14	.393805	.265307	7.09062E-02
	Yes	27	.413677	.174304	3.35449E-02
Long-term debt-to-assets ratio	No	14	.108051	9.31918E-02	2.49066E-02
	Yes	27	.128201	9.26152E-02	1.78238E-02
Long-term debt-to-equity ratio	No	14	.228968	.210634	5.62943E-02
	Yes	27	.306997	.284781	5.48062E-02
Interest cover ratio	No	14	8.836979	15.193103	4.060528
	Yes	26	25.614421	113.033780	22.167748
Debt rating	No	13	.4615	.5189	.1439
	Yes	27	.6667	.4804	9.245E-02
Share owned by institutional investors	No	14	8.7000	26.4743	7.0756
	Yes	26	22.5204	28.7077	5.6300
Cash & cash equivalents-to-assets ratio	No	14	2.56379E-02	4.62252E-02	1.23542E-02
	Yes	27	4.17858E-02	5.53250E-02	1.06473E-02
Investment expenditures-to-assets ratio	No	14	7.46868E-02	5.87955E-02	1.57138E-02
	Yes	27	7.05527E-02	5.60257E-02	1.07821E-02
Investment expenditures-to-sales ratio	No	14	.105883	.184947	4.94292E-02
	Yes	27	7.31856E-02	6.59223E-02	1.26868E-02
R&D expenditures-to-assets ratio	No	13	7.37605E-03	1.63859E-02	4.54464E-03
	Yes	22	1.45800E-02	1.64768E-02	3.51287E-03
Total value of tax loss carry-forward and carry backs	No	13	.1231	.4438	.1231
	Yes	27	62.8148	326.3954	62.8148
Total value of tax loss carry-forward and carry backs-to-total assets	No	13	7.73631E-06	2.78937E-05	7.73631E-06

	Yes	27	1.85245E-03	9.62563E-03	1.85245E-03
Investment tax credits	No	13	1,837.1538	2,020.5632	560.4034
	Yes	25	3,082.1200	6,248.2241	1,249.6448
Tax incentives-dummy	No	13	.7692	.4385	.1216
	Yes	27	.6296	.4921	9.471E-02
Value of equity owned by managers	No	14	1,075.104	2,491.098	665.774
	Yes	27	3,246.829	15,033.301	2,893.160
Share of the company owned by management	No	14	11.8500	29.2860	7.8270
	Yes	25	.9792	1.4999	.3000
Managers ownership of stock options	No	13	7.69E-02	.28	7.69E-02
	Yes	27	.11	.32	6.16E-02
Managers age	No	14	3.21	.89	.24
	Yes	26	3.27	1.00	.20
Managers tenure	No	14	13.61	8.49	2.27
	Yes	24	16.04	10.46	2.14
Dividend pay-out ratio	No	12	14.9692	22.2420	6.4207
	Yes	26	27.7531	43.3181	8.4954
Company listed on the stock-exchange	No	14	.00	.00	.00
	Yes	27	.22	.42	8.15E-02
Quick ratio	No	14	7.37278E-02	.294294	7.86535E-02
	Yes	27	.298502	.614843	.118327
Liquidity ratio	No	14	1.119036	3.844879	1.027587
	Yes	27	2.300277	3.624028	.697445
Share of the company owned by foreign investors	No	14	28.8286	46.5021	12.4282
	Yes	26	19.8723	36.9289	7.2424
	Yes	27	1.00	.00	.00

Source: Slovenian survey data

Table 5.11. Independent samples t-test Slovenian derivative users/nonusers

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	Upper
Total assets	Equal variances assumed	4.263	.046	-1.478	39	.147	-113,677.51	76,917.78	-269,258.41	41,903.39
	Equal variances not assumed			-1.945	33.984	.060	-113,677.51	58,441.64	-232,447.32	5,092.31
Total sales revenues	Equal variances assumed	3.249	.079	-1.438	39	.158	-128,739.07	89,537.09	-309,844.94	52,366.79
	Equal variances not assumed			-1.988	27.512	.057	-128,739.07	64,772.29	-261,525.22	4,047.07
Leverage-debt-to-assets	Equal variances assumed	2.744	.106	-.289	39	.774	-1.987285E-02	6.88608E-02	-.159157	.119411
	Equal variances not assumed			-.253	18.995	.803	-1.987285E-02	7.84407E-02	-.184054	.144309
Long-term debt-to-assets ratio	Equal variances assumed	.003	.958	-.659	39	.514	-2.014973E-02	3.05654E-02	-8.197417E-02	4.16747E-02
	Equal variances not assumed			-.658	26.279	.516	-2.014973E-02	3.06272E-02	-8.307237E-02	4.27729E-02
Long-term debt-to-equity ratio	Equal variances assumed	1.654	.206	-.903	39	.372	-7.802939E-02	8.64204E-02	-.252831	9.67723E-02
	Equal variances not assumed			-.993	34.035	.328	-7.802939E-02	7.85669E-02	-.237691	8.16319E-02
Interest cover ratio	Equal variances assumed	1.488	.230	-.549	38	.586	-16.777442	30.534883	-78.592080	45.037197
	Equal variances not assumed			-.744	26.648	.463	-16.777442	22.536569	-63.047253	29.492370
Debt rating	Equal variances assumed	1.345	.253	-1.233	38	.225	-.2051	.1664	-.5419	.1317
	Equal variances not assumed			-1.199	22.203	.243	-.2051	.1710	-.5597	.1494
Share owned by institutional investors	Equal variances assumed	2.655	.112	-1.491	38	.144	-13.8204	9.2699	-32.5863	4.9455
	Equal variances not assumed			-1.528	28.692	.137	-13.8204	9.0422	-32.3223	4.6816
Cash & cash equivalents-to-assets ratio	Equal variances assumed	.273	.604	-.935	39	.356	-1.614789E-02	1.72797E-02	-5.109931E-02	1.88035E-02
	Equal variances not assumed			-.990	30.947	.330	-1.614789E-02	1.63092E-02	-4.941312E-02	1.71173E-02

Investment expenditures-to-assets ratio	Equal variances assumed	.215	.646	.220	39	.827	4.13409E-03	1.87606E-02	-3.381273E-02	4.20809E-02
	Equal variances not assumed			.217	25.317	.830	4.13409E-03	1.90572E-02	-3.509007E-02	4.33582E-02
Investment expenditures-to-sales ratio	Equal variances assumed	2.035	.162	.830	39	.411	3.26974E-02	3.93820E-02	-4.696036E-02	.112355
	Equal variances not assumed			.641	14.737	.532	3.26974E-02	5.10313E-02	-7.624249E-02	.141637
R&D expenditures-to-assets ratio	Equal variances assumed	1.576	.218	-1.252	33	.219	-7.203927E-03	5.75247E-03	-1.890741E-02	4.49955E-03
	Equal variances not assumed			-1.254	25.435	.221	-7.203927E-03	5.74404E-03	-1.902375E-02	4.61590E-03
Total value of tax loss carry-forward and carry backs	Equal variances assumed	2.047	.161	-.688	38	.496	-62.6917	91.1414	-247.1978	121.8143
	Equal variances not assumed			-.998	26.000	.327	-62.6917	62.8149	-191.8096	66.4262
Total value of tax loss carry-forward and carry backs-to-total assets	Equal variances assumed	2.039	.162	-.686	38	.497	-1.844716E-03	2.68783E-03	-7.285935E-03	3.59650E-03
	Equal variances not assumed			-.996	26.001	.329	-1.844716E-03	1.85247E-03	-5.652514E-03	1.96308E-03
Investment tax credits	Equal variances assumed	2.470	.125	-.696	36	.491	-1,244.9662	1,789.4863	-4,874.2127	2,384.2804
	Equal variances not assumed			-.909	32.033	.370	-1,244.9662	1,369.5489	-4,034.5341	1,544.6018
Tax incentives-dummy	Equal variances assumed	3.786	.059	.869	38	.390	.1396	.1606	-.1856	.4648
	Equal variances not assumed			.906	26.471	.373	.1396	.1541	-.1770	.4562
Value of equity owned by managers	Equal variances assumed	1.089	.303	-.534	39	.597	-2,171.725	4,070.200	-10,404.481	6,061.031
	Equal variances not assumed			-.732	28.666	.470	-2,171.725	2,968.776	-8,246.630	3,903.180
Share of the company owned by management	Equal variances assumed	16.465	.000	1.871	37	.069	10.8708	5.8087	-.8987	22.6403
	Equal variances not assumed			1.388	13.038	.188	10.8708	7.8328	-6.0458	27.7874
Managers ownership of stock options	Equal variances assumed	.452	.505	-.330	38	.744	-3.42E-02	.10	-.24	.18
	Equal variances not assumed			-.347	27.182	.731	-3.42E-02	9.86E-02	-.24	.17
Managers age	Equal variances assumed	.172	.681	-.172	38	.865	-5.49E-02	.32	-.70	.59
	Equal variances not assumed			-.178	29.560	.860	-5.49E-02	.31	-.69	.58
Managers tenure	Equal variances assumed	1.906	.176	-.739	36	.465	-2.43	3.29	-9.11	4.25

	Equal variances not assumed			-.782	32.036	.440	-2.43	3.11	-8.78	3.91
Dividend pay-out ratio	Equal variances assumed	2.966	.094	-.961	36	.343	-12.7839	13.3087	-39.7752	14.2074
	Equal variances not assumed			-1.201	35.438	.238	-12.7839	10.6488	-34.3926	8.8248
Company listed on the stock-exchange	Equal variances assumed	29.830	.000	-1.951	39	.058	-.22	.11	-.45	8.21E-03
	Equal variances not assumed			-2.726	26.000	.011	-.22	8.15E-02	-.39	-5.46E-02
Quick ratio	Equal variances assumed	1.924	.173	-1.288	39	.205	-.224774	.174548	-.577831	.128283
	Equal variances not assumed			-1.582	38.874	.122	-.224774	.142083	-.512194	6.26459E-02
Liquidity ratio	Equal variances assumed	.071	.791	-.970	39	.338	-1.181241	1.218269	-3.645424	1.282941
	Equal variances not assumed			-.951	25.075	.351	-1.181241	1.241920	-3.738633	1.376151
Share of the company owned by foreign investors	Equal variances assumed	2.425	.128	.668	38	.508	8.9563	13.4122	-18.1954	36.1079
	Equal variances not assumed			.623	22.008	.540	8.9563	14.3844	-20.8746	38.7871

Source: Slovenian survey data

Table 5.12. Pearson correlations – Slovenian sample

		Hedgers/Nonhedgers	Use of derivatives as risk management instrument	Company listed on the stock-exchange
Hedgers/Nonhedgers	Pearson Correlation Sig. (2-tailed) N	1.000 . 41	.736** .000 41	.220 .168 41
Use of derivatives as risk management instrument	Pearson Correlation Sig. (2-tailed) N	.736** .000 41	1.000 . 41	.298 .058 41
Company listed on the stock-exchange	Pearson Correlation Sig. (2-tailed) N	.220 .168 41	.298 .058 41	1.000 . 41

** Correlation is significant at the 0.01 level (2-tailed)

Source: Slovenian survey data

5.4 Multivariate Analysis

The variables tested in our multivariate regression model are based on the determinants we have presented in the literature review as the key rationales of corporate hedging decision. The reviewed papers have suggested several potential explanations for corporate hedging and reveal some common themes. Thus, the decision to hedge or not, as well as the decision to hedge with derivatives, is a function of six factors - financial distress costs, agency costs, capital market imperfections, taxes, managerial utility, and hedge substitutes.

Of these main factors, the first five are expected to have a positive influence on the firm's decision to hedge (Amihud and Lev, 1981; Mayers and Smith, 1982; Stulz, 1985; Smith and Stulz, 1985; Jensen and Smith, 1985; Campbell and Kracaw, 1987; MacMinn, 1987; Fazzari, Hubbard and Petersen, 1988; MacMinn and Han, 1990; Breeden and Viswanathan, 1990; Bessembinder's, 1991; Hoshi, Kashyap and Scharfstein, 1991; DeMarzo and Duffie, 1992; Dobson and Soenen, 1993; Froot, Scharfstein and Stein, 1993; Nance, Smith and Smithson, 1993; Dolde, 1995; May, 1995; Mian, 1996; Stulz, 1996; Tufano, 1996; Haushalter, 1997; Getzy, Minton and Schrand, 1997; Lamont, 1997; Kaplan and Zingales, 1997; Shapiro and Titman, 1998; Gay and Nam, 1998; Minton and Schrand, 1999; Graham and Smith, 1999; Haushalter 2000; Mello and Parsons, 2000; Allayannis and Ofek, 2001; Haushalter, Randall and Lie, 2002; Fatemi and Luft; 2002). That is, higher values for factors related to financial distress costs, agency costs, capital market imperfections, taxes and managerial utility are expected to be associated with a greater likelihood that the firm will engage in hedging activities. The sixth factor (hedge substitutes), however, is expected to have a negative influence on the firm's hedging decision (Smith and Warner, 1979; Smith and Stulz; 1985; Nance, Smith and Smithson, 1993; Culp, 1994; Tufano, 1996; Pulvino, 1998; Harford, 1999).

The relationship between the decision to hedge and its potential determinants can be expressed in the format of a general function as follows:

$$\text{Hedge} = f\,(FC, AC, CMI, T, MU, HS) \quad (2)$$

where:

- Hedge - binary variable which takes on a value of 1 if the firm hedges and 0 if the firm does not hedge with these instruments
- BC - the firm's probability of financial distress or bankruptcy
- AC - agency costs of debt facing the firm
- CMI - capital market imperfections and costly external financing
- T - the convexity of the firm's tax function
- MU - level of managerial wealth invested in the company
- HS - the extent of alternative hedging-related financial policies. or hedge substitutes, utilised by the firm.

Here we present the results of our analysis on two separate decisions conducted on Slovenian non-financial companies. *First,* we examine the influence of factors presented above on the decision to hedge or not to hedge corporate risks, and *second,* we explore the influence of these factors on the corporate decision to use derivative instruments when managing corporate risks.

5.4.1 Decision to Hedge Corporate Risks

Table 5.13. reports multivariate analysis results relating the probability of hedging to the determinants of hedging. The predetermined independent variables include total sales revenues as a proxy for size and financial costs, credit rating as a proxy for agency cost of debt, investment expenditures to assets as a proxy for capital market imperfections, total value

of tax loss carry-forwards as a proxy for tax incentives, value of company's equity owned by management as a proxy for managerial utility, and quick ratio as a proxy for hedge substitutes. The underlined variables represent those independent variables which appear to be the most consistent and relevant in the stepwise construction of logistic models. The dependent variable is coded 1 if the firm hedge corporate risks and 0 otherwise.

Apart from the model discussed in this sub-section, as we have created multiple proxies available to measure some firm characteristics, we have estimated separate logistic regressions, using all possible combinations of variables representing each predicted construct. The importance of inclusion of all relevant variables in the regression model, as well as the exclusion of variables that are irrelevant and do not contribute to the strengths of the logistic model in predicting decision to hedge, has been explained in the chapter 4. In constructing the logistic model for the Slovenian companies we have respected the same rules.

The model can be expressed as:

Hedge = f (Total sales revenues, Credit rating, Investment expenditures to assets, Total Value of tax loss carry forwards, Value of company's equity owned by management, Quick ratio)

Table 5.13. Logistic regression results Slovenian Hedgers/Nonhedgers

```
      Total number of cases:      40 (Unweighted)
      Number of selected cases:   40
      Number of unselected cases: 0

      Number of selected cases:                 40
      Number rejected because of missing data:  2
      Number of cases included in the analysis: 38

Dependent Variable Encoding:

Original       Internal
Value          Value
       0       0
       1       1
```

```
Dependent Variable..   HEDGERS    Hedgers/Nonhedgers


Beginning Block Number  0.  Initial Log Likelihood Function

-2 Log Likelihood   39.113641

* Constant is included in the model.


Beginning Block Number  1.  Method: Enter

Variable(s) Entered on Step Number
1..       FINCOST2  Total sales revenues
          AGCOST1   Credit rating
          CMI2      Investment expenditures-to-assets ratio
          TAX1      Total value of tax loss carry-forward and carry backs
          MNGUTIL1  Value of equity owned by managers
          SUBSTIT3  Quick ratio


Estimation terminated at iteration number 9 because
Log Likelihood decreased by less than .01 percent.

 -2 Log Likelihood       16.542
 Goodness of Fit         15.928
 Cox & Snell - R^2         .448
 Nagelkerke - R^2          .697


                      Chi-Square    df   Significance

 Model                   22.571     6        .0010
 Block                   22.571     6        .0010
 Step                    22.571     6        .0010


---------- Hosmer and Lemeshow Goodness-of-Fit Test-----------

    HEDGERS  = Nonhedgers       HEDGERS  = Hedgers

Group   Observed    Expected    Observed    Expected     Total

    1      3.000       3.446       1.000        .554     4.000
    2      3.000       2.702       1.000       1.298     4.000
    3      2.000       1.295       2.000       2.705     4.000
    4       .000        .450       4.000       3.550     4.000
    5       .000        .104       4.000       3.896     4.000
    6       .000        .003       4.000       3.997     4.000
    7       .000        .000       4.000       4.000     4.000
    8       .000        .000       4.000       4.000     4.000
    9       .000        .000       4.000       4.000     4.000
   10       .000        .000       2.000       2.000     2.000


                     Chi-Square    df Significance

Goodness-of-fit test     1.7025     8        .9888
--------------------------------------------------------------
```

```
Classification Table for HEDGERS
The Cut Value is .50
                              Predicted
                       Nonhedgers    Hedgers     Percent Correct
                             N    ⇔       H
Observed              ⇳⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇳⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇳
   Nonhedgers     N   ⇔      6    ⇔       2     ⇔   75.00%
                      ⇳⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇳⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇳
   Hedgers        H   ⇔      2    ⇔      28     ⇔   93.33%
                      ⇳⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇳⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇩⇳
                                         Overall  89.47%


----------------- Variables in the Equation ------------------

Variable           B      S.E.     Wald    df      Sig       R

FINCOST2       .0001 5.504E-05   3.7022     1    .0543   .2086
AGCOST1       1.1796    1.3441    .7701     1    .3802   .0000
CMI2        -32.6534   17.2962   3.5642     1    .0590  -.2000
TAX1           .0041     .0402    .0105     1    .9184   .0000
MNGUTIL1       .0002     .0007    .1312     1    .7172   .0000
SUBSTIT3      5.2395    3.3843   2.3968     1    .1216   .1007
Constant     -2.7620    2.2990   1.4434     1    .2296


                        90% CI for Exp(B)
Variable       Exp(B)     Lower     Upper

FINCOST2       1.0001    1.0000    1.0002
AGCOST1        3.2530     .3565   29.6788
CMI2            .0000     .0000     .0149
TAX1           1.0041     .9399    1.0728
MNGUTIL1       1.0002     .9991    1.0014
SUBSTIT3     188.5728     .7209 49323.669


No outliers found.  No casewise plot produced.
```

Source: Slovenian survey data

The regression model presented in table 5.13. has revealed that there is no statistically significant explanatory variable, therefore it could be concluded that the decision to hedge in the Slovenian companies is not dependent on any of the predicted theories of hedging. Evidence based on empirical relation between decision to hedge and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility and hedge substitutes, fails to provide any support for any of the tested hypotheses. We have tested the robustness of this result by employing separate logistic regressions with all combinations of exploratory variables, and these tests have supported the results of the model presented in table 5.13. It should be emphasised that, in the regression models where outliers have not been controlled, the total sales revenues as a proxy for size was marginally significant (p = 0.0503). When we removed the standardised residuals from the model (which is one of the important assumptions of logistic regressions and the reliability of the results), the total sales revenues were not significant (p = 0.0543).

Table 5.14. Pearson Correlation Coefficient for independent variables in the regression-Slovenian hedgers/nonhedgers

		Quick ratio	Total sales revenues	Debt rating	Investment expenditures-to-assets ratio	Total value of tax loss carry-forward and carry backs	Value of equity owned by managers
Quick ratio	Pearson Correlation Sig. (2-tailed) N	1.000 . 41	-.084 .601 41	.093 .567 40	.208 .191 41	-.061 .710 40	-.044 .786 41
Total sales revenues	Pearson Correlation Sig. (2-tailed) N	-.084 .601 41	1.000 . 41	-.187 .249 40	.064 .693 41	-.060 .712 40	.168 .293 41
Debt rating	Pearson Correlation Sig. (2-tailed) N	.093 .567 40	-.187 .249 40	1.000 . 40	.224 .164 40	.128 .436 39	.121 .457 40
Investment expenditures-to-assets ratio	Pearson Correlation Sig. (2-tailed) N	.208 .191 41	.064 .693 41	.224 .164 40	1.000 . 41	-.097 .552 40	-.032 .841 41
Total value of tax loss carry-forward and carry backs	Pearson Correlation Sig. (2-tailed) N	-.061 .710 40	-.060 .712 40	.128 .436 39	-.097 .552 40	1.000 . 40	-.031 .849 40
Value of equity owned by managers	Pearson Correlation Sig. (2-tailed) N	-.044 .786 41	.168 .293 41	.121 .457 40	-.032 .841 41	-.031 .849 40	1.000 . 41

Source: Slovenian survey data

To test the non-existence of multicollinearity as one of the important assumptions of logistic regression, we have calculated Pearson correlation coefficients between the employed independent variables. From the data presented in table 5.14 it could be concluded that there is no correlation between variables, therefore the calculated logit coefficient in our model is reliable.

5.4.2 Decision to Use Derivatives as Risk Management Instruments

Table 5.15 presents the results of multivariate analysis for a company's decision to use derivatives as risk management instruments. Again, the predetermined independent variables include total sales revenues as a proxy for size and financial costs, credit rating as a proxy for agency cost of debt, investment expenditures to assets as a proxy for capital market imperfections, total value of tax loss carry-forwards as a proxy for tax incentives, value of the company's equity owned by management as a proxy for managerial utility, and quick ratio as a proxy for hedge substitutes. The underlined variables represent those independent variables which appear to be the most consistent and relevant in the stepwise construction of logistic models. The dependent variable is coded 1 if the firm uses derivatives as corporate risk management instruments, and 0 otherwise. Apart from the model discussed in this sub-section, as we have created multiple proxies available to measure some firm characteristics, we have estimated separate logistic regressions, using all possible combinations of variables representing each predicted construct.

The model can be expressed as:

Derivative use = f (Total sales revenues, Credit rating, Investment expenditures to assets, Total value of tax loss carry-forwards, Value of the company's equity owned by management, Quick ratio)

Table 5.15. Logistic regression results Slovenian derivative users/nonusers

```
      Total number of cases:      39 (Unweighted)
      Number of selected cases:   39
      Number of unselected cases: 0

      Number of selected cases:                39
      Number rejected because of missing data:  2
      Number of cases included in the analysis: 37

      Dependent Variable Encoding:

      Original       Internal
      Value          Value
             0       0
             1       1

Dependent Variable..   DERIVATI   Use of derivatives as risk management
instrument


Beginning Block Number  0.  Initial Log Likelihood Function

-2 Log Likelihood   45.03321

* Constant is included in the model.


Beginning Block Number  1.  Method: Enter

Variable(s) Entered on Step Number
1..       FINCOST2  Total sales revenues
          AGCOST1   Credit rating
          CMI2      Investment expenditures-to-assets ratio
          TAX1      Total value of tax loss carry-forward and carry backs
          SUBSTIT3  Quick ratio
          MNGUTIL1  Value of equity owned by managers


Estimation terminated at iteration number 7 because
Log Likelihood decreased by less than .01 percent.

 -2 Log Likelihood       22.911
 Goodness of Fit         23.319
 Cox & Snell - R^2         .450
 Nagelkerke - R^2          .639

                     Chi-Square    df Significance

 Model                   22.123     6        .0012
 Block                   22.123     6        .0012
 Step                    22.123     6        .0012


       ---------- Hosmer and Lemeshow Goodness-of-Fit Test-----------


            DERIVATI = No               DERIVATI = Yes



Group   Observed    Expected    Observed    Expected     Total
```

1	4.000	3.751	.000	.249	4.000
2	3.000	3.231	1.000	.769	4.000
3	1.000	1.913	3.000	2.087	4.000
4	2.000	.930	2.000	3.070	4.000
5	1.000	.535	3.000	3.465	4.000
6	.000	.339	4.000	3.661	4.000
7	.000	.259	4.000	3.741	4.000
8	.000	.036	4.000	3.964	4.000
9	.000	.006	5.000	4.994	5.000

	Chi-Square	df	Significance
Goodness-of-fit test	3.9486	7	.7857

Classification Table for DERIVATI
The Cut Value is .50

		Predicted No (N)	Predicted Yes (Y)	Percent Correct
Observed				
No	N	8	3	72.73%
Yes	Y	2	24	92.31%
			Overall	86.49%

----------------- Variables in the Equation ------------------

Variable	B	S.E.	Wald	df	Sig	R
FINCOST2	2.53E-05	1.039E-05	5.9371	1	.0148	.2957
AGCOST1	2.5205	1.2417	4.1204	1	.0424	.2170
CMI2	-24.3613	11.1995	4.7315	1	.0296	-.2463
TAX1	-4.4433	37.7753	.0138	1	.9064	.0000
SUBSTIT3	4.9059	2.5756	3.6282	1	.0568	.1901
MNGUTIL1	-5.5E-05	.0002	.0792	1	.7784	.0000
Constant	-1.3601	1.2706	1.1459	1	.2844	

		90% CI for Exp(B)	
Variable	Exp(B)	Lower	Upper
FINCOST2	1.0000	1.0000	1.0000
AGCOST1	12.4352	1.6130	95.8680
CMI2	.0000	.0000	.0026
TAX1	.0118	.0000	1.135E+25
SUBSTIT3	135.0866	1.9532	9342.9003
MNGUTIL1	.9999	.9996	1.0003

No outliers found. No casewise plot produced.

Source: Slovenian survey data

From the regression model presented in table 5.15. it can be seen that the corporate decision to use derivative instruments is related to three variables – total sales revenues, investment expenditures-to-assets ratio and credit rating. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to use derivatives.

Total sales revenues are a proxy for the effect of size on the decision to use derivatives as risk management instruments. The regression model has revealed a positive relation between the decision to use derivatives and the size of the company, implying that it is more likely for larger companies to use derivatives. Several previous empirical studies (e.g., Nance, Smith and Smithson, 1993; Dolde, 1995; Mian, 1996; Géczy, Minton and Schrand, 1997; Allayannis and Weston, 2001) have found that firms with more assets are more likely to hedge. These studies contend that the positive correlation between size and hedging can be attributed to significant economies of scale in the information and transaction costs of hedging. Based on this argument, a firm's size should be positively related to the probability that the firm hedges.

Contrary to the predicted positive relation between the size and decision to hedge, a few scholars have predicted the degree of hedging to be negatively related to the size of a company (Froot, Scharfstein and Stein, 1993; Haushalter, 2000; Hoyt and Khang, 2000). The issue of high costs of implementing the risk management programme is particularly relevant for the relation between hedging policy and firm size. An additional argument regarding the negative relationship between hedging and size is put forward by Weiss (1990). He has argued that, everything else being equal, companies with fewer total assets are likely to have greater informational asymmetries with potential public investors. Additionally, the direct costs of bankruptcy are proportionally greater for companies with fewer assets; therefore smaller firms are expected to hedge more.

Our assumption was that the argument is stronger in the case of the significant economies of scale in information and transaction costs of hedging, so we have predicted a positive relation between the company's size and the decision to hedge. Regression results support our hypothesis for the Slovenian companies. It should be noted that the alternative variable that has been used as proxy for company's size (the value of total assets), has not shown as relevant for making the decision to use derivatives. Therefore, our result is not robust to the other control variable.

Another variable that is significant for the decision of Slovenian companies to use derivatives is a company's credit rating as a proxy for the agency cost of debt. In our research assumptions we argue that firms with a credit rating use derivatives as risk management instruments less extensively because the severity of the agency cost of debt is related to the extent of informational asymmetries present in the firm, and that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. Our evidence is inconsistent with the predictions derived from the agency cost of debt model, because the relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge by using derivative instruments more intensively.

This is contrary to the findings of DeMarzo and Duffie (1991) and Haushalter (2000), who have proven that firms with a credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry benefit greatly from risk management activity. On the basis of our findings, we should reject our hypothesis related to the agency cost of debt and asymmetric information problems. An alternative variable that has used as proxy for agency cost (the share of the company owned by institutional investors) has not been shown as relevant for making the decision to hedge.

Finally, investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant negative relation with the decision to use derivatives. The results of our logistic model do not support our prediction that the firm's decision to hedge by using derivatives is predicted to be positively correlated with measures for investment (growth) opportunities. Additionally, this finding is inconsistent with our findings regarding the Croatian companies presented in the previous chapter, as well as with the findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001), who have also proven a positive relation between the decision to hedge and the company's investment (growth) opportunities.

The negative relation found in the case of the Slovenian companies suggest that companies which have less investment (growth) opportunities have more incentives to hedge with derivative instruments. Again, we have conducted a robustness test regarding this result by employing other variables that were used as proxies for capital market imperfections and costly external financing hypothesis (cash and cash equivalents-to-assets ratio, investment expenditures to sales and R&D expenditures-to-assets ratio). The results for alternative regression variables were not statistically significant. These findings suggest that the capital market imperfection hypothesis, which implies that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set, should be rejected in the case of the Slovenian companies. This complements Mian (1996), who has shown that the probability of hedging is negatively related to the market-to-book ratio, and failed to provide support for the contracting cost and capital market imperfections model.

5.5 Conclusion

The Slovenian survey has revealed that 78 per cent of respondents use some form of financial engineering to manage interest-rate, foreign exchange, or commodity price risk. Additionally, among companies that manage financial risks, there is a substantial number of hedgers who do not use derivatives, but manage risk exposure with some other instruments like natural hedge, matching liabilities and assets, operational hedging etc. It could be concluded that 65.9 per cent of the analysed Slovenian companies use derivatives as risk management instruments. In comparison with Bodnar, Hayt and Marston (1998), whose survey has revealed that 50 per cent of US non-financial companies use some form of financial engineering to manage financial risks, it could be concluded that the Slovenian companies use derivatives more frequently than their counterparts in United States. However, it should be noted that the time difference needs to be taken into account. We believe that the use of derivatives has grown since 1998 in US as well as globally, therefore the results of our survey cannot be directly compared with those of Bodnar, Hayt and Marston (1998).

The survey's results have shown that the price risk has the highest influence – 77.5 per cent of financial managers claim that price risk has strong or very strong influence on the company's performance. This number is followed by 39 per cent of managers who think the same for currency risk, while 36.6 per cent of them claim that the influence of interest-rate risk is strong and very strong. On the basis of their answers, both hedgers and nonhedgers, it could be concluded that the Slovenian companies are highly influenced by the price risk, while currency and interest-rate risk exposure have lower impact on the companies' performance.

We believe that these findings could be explained by the fact that Slovenia is a small and open economy, which results in a high dependence on international trade. A balanced level of trade, with exports and imports each exceeding 50 per cent of annual GDP on a regular basis, characterises Slovenia's small economy (The Economist Intelligence, 2006). High exposures to the commodity price risk can be explained by the fact that Slovenia is oriented to trade with the EU members – roughly two-thirds of Slovenia's trade is with the EU. On the highly competitive market, prices of goods are volatile, therefore companies that compete on that market need to be prepared for these conditions and protect their risky positions.

Exposure to foreign-exchange risk was not so high in 2006 and it is expected to be further decreased in 2007 as Slovenia has introduced the Euro as an official currency. Slovenia's major trade partners are Germany, Italy, France and Austria, so the majority of transactions are now denominated in one currency since Slovenia entered the Euro Zone. This contributes to the lowering of risk in business transactions, as companies no longer have to worry about their currency risk exposures, which should additionally enhance the trade between Slovenia and its partners. In respect of the currency risk management instruments that have been used in the Slovenian companies, it could be expected that their importance will decrease sharply, which refers especially to the ones that have their value attached to the Euro or Slovenian tolar. Exposure to interest-rate risk is a result of external financing through borrowing activity. However, our results have shown that the long-term debt-to-assets ratio ranges from 0 to 30.69 per cent, while the mean value is 12.13 per cent. It could be concluded that the Slovenian companies in the sample are not highly leveraged (Graham and Campbell, 2001), which may explain why interest-rate risk has been ranged as less important in comparison with commodity price risks.

Regarding the use and importance of different risk management instruments in risk management strategy, the survey revealed that natural hedge by currency structure match of assets and liabilities is the most important instrument in managing currency risk. In respect of use of derivatives, the currency forward is the most important and frequently used instrument, followed by currency swap as the second most important derivative instrument. Currency futures and structured derivatives have gained importance in comparison with Croatian companies, as well as operational hedging. Other derivatives such as stock-exchange and OTC options, as well as hybrid securities are not important currency risk management instruments.

Interest rate risk in the Slovenian companies is hedged most frequently by matching the maturity of assets and liabilities. Forward contract, swap and structured derivatives are the most important derivative instruments in risk management strategy, but in contrast to currency risk management, interest rate swap is more important than interest rate forward and is used by 27.6 per cent of companies that declare themselves as hedgers. Structured derivatives are important instrument of interest-rate risk management as well, and are used in 20.7 per cent of companies. These instruments are even more important than interest-rate forwards. As to the use of other derivative instruments such as interest-rate options, futures or hybrid securities, they do not play an important role in managing interest rate risk.

Price risk management in the Slovenian companies is usually hedged naturally by managing assets and liabilities. Among derivatives instruments, the commodity forward and commodity futures are equally important, followed by commodity swap and standardised options. In the case of commodity risk management, structured derivatives as well as OTC options are not important instruments. Business diversification through mergers, acquisitions, and other business combinations is quite important in managing price risk and has been used by 25 per cent of the analysed Slovenian companies. The survey’s results have clearly indicated that the Slovenian non-financial companies manage financial risks primarily with simple risk management instruments such as natural hedging, but it should be noted that the use of derivatives is also frequent - not only plain vanilla instruments like forwards and swaps, but structured derivatives as well.

Regarding the scope of corporate risk management policy, 87.5 per cent of hedgers claim that they use selective hedging, while 12.5 per cent of them manage financial risks completely. Among the analysed Slovenian companies, there appeared to be a decided preference for "active" or "view-driven" risk management as opposed to a full-cover or variance-minimising hedging approach. 56.3 per cent of respondents that manage financial risks have a documented policy regarding the use of financial risk management instruments, while the rest of them manage risks without an official policy. Additionally, 18.8 per cent of hedgers use Value-at-Risk as a measure of risk exposure, while only 12.5 per cent of them use Monte Carlo analysis or some other type of simulation techniques as measures of risk exposure.

An important issue in corporate risk management is defining its goals. The results of the Slovenian survey have shown that the primary goal of hedging is managing volatility of cash flows, but that the Slovenian firms focus also on accounting earning volatility as well as managing balance sheet and financial ratios. Commercial banks are by far the primary source for derivatives transactions for 73.4 per cent of the Slovenian hedgers. Investment banks, insurance companies and exchange/brokerage houses are not a very important source for derivative transactions, and very few Slovenian firms use them as counterparties.

Among the most important reasons why companies do not use derivatives, financial managers have addressed the following problems: high costs of financial risk management instruments, difficulties in pricing and valuing derivatives, costs of establishing and maintaining risk management programmes that exceed the benefits of it, and insufficient exposure to financial risks. Insufficient supply of instruments offered by financial institutions or traded on the financial market and the inefficiency of financial risk management instruments are reasons of medium importance that affect the decision not to hedge financial risks. Other reasons such as concerns about perceptions of derivatives use by investors, regulators and the public and insufficient knowledge about financial risk management instruments are not very important reasons why Slovenian companies do not hedge.

According to a mean comparison test conducted for the sample of hedgers/nonhedgers, as well as for derivative users and nonusers, our univariate test has discovered that hedgers and derivative users are statistically different from nonhedgers and derivative nonusers with respect only to the coefficient of the publicly held company dummy variable that proxies for alternative financial policy as substitutes for hedging. On the basis of the mean comparison test, a positive relation is predicted between decision to hedge or use derivatives as risk management instruments and the coefficient of the publicly held company dummy variable, suggesting that publicly held companies tend to be risk-averse, while privately held companies do not act in a risk-averse manner and do not hedge. This is contrary to what we predicted and to the findings of Cummins, Phillips and Smith (2001) who argued that, if closely held firms tend to be risk-averse, the coefficient of the publicly held company dummy variable is predicted to be negative. Therefore, our assumption connected to the different behaviour of the publicly traded and privately held stock companies with regard to risk management should be rejected. This result has not been supported by the correlation analysis.

We believe the explanation for this result can be found in the fact that, regardless to the opinion that the ownership of publicly traded companies is well diversified, research results have shown that even 64.7 per cent of the analysed Slovenian companies are owned by the major shareholder, meaning that there is one owner who has more than 50 per cent of a company’s shares and has a power to control the business. Therefore, it can be argued that the major shareholder has poorly diversified wealth and therefore acts in risk-averse manner. Another explanation for the positive coefficient of the publicly held company dummy variable could be found in the fact that publicly traded companies, which act in a risk-averse manner tend to signal good news to investors on the financial market as well as to all company's stakeholders, because a company that manages its risk exposures is seen as a less risky investment or a better rated business partner. However, to the best of our knowledge, we cannot support this argument by theoretical or empirical evidence, meaning that this second explanation is based only on our opinion.

Other variables that test the hypothesis regarding the alternative financial policies as substitutes for hedging are not statistically significant. In other words, on the basis of the univariate analysis, both t-test and Pearson correlation coefficient, we should reject all the research assumptions regarding the shareholder maximisation hypothesis and the managerial utility maximisation hypothesis. This conclusion is supported by the regression analysis, but only for the sample hedgers vs nonhedgers. The analysis that we conducted by employing separate logistic regressions with all combinations of exploratory variables has revealed that there is no statistically significant explanatory variable, so it could be concluded that the decision to hedge in Slovenian companies is not dependent on any of the predicted theories of hedging.

From the multivariate analysis conducted for a company's decision to use derivatives as risk management instruments, it could be seen that the corporate decision to use derivative instruments is related only to three variables – total sales revenues, investment expenditures-to-assets ratio and credit rating. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to use derivatives. Total sales revenues are a proxy for the effect of size on the decision to use derivatives as risk management instruments. The regression model has revealed a positive relation between the decision to use derivatives and the size of the company, implying that it is more likely for larger Slovenian companies to use derivatives. Several previous empirical studies (e.g., Nance, Smith and Smithson, 1993; Dolde, 1995; Mian, 1996; Géczy, Minton and Schrand, 1997; Allayannis and Weston, 2001) have found that firms with more assets are more likely to hedge. These studies contend that the positive correlation between size and hedging can be attributed to significant economies of scale in information and transaction costs of hedging.

Contrary to the predicted positive relation between size and the decision to hedge, few scholars have predicted the degree of hedging to be negatively related to the size of a company (Weiss, 1990; Froot, Scharfstein and Stein, 1993; Haushalter, 2000; Hoyt and Khang, 2000), due to the issue of high costs of implementing the risk management programme as well as to the greater informational asymmetries with potential public investors and direct costs of bankruptcy. Our assumption was that the argument is stronger in the case of the significant economies of scale in information and transaction costs of hedging, so we have predicted a positive relation between the company's size and the decision to hedge. Regression results support our hypothesis for the Slovenian companies. It should be noted that the alternative variable that has been used as a proxy for company's size (the value of total assets), has not been shown as relevant for making the decision to use derivatives. Therefore, our result is not robust to the other control variable.

Another variable that is significant for a decision of the Slovenian companies to use derivatives is a company's credit rating as a proxy for the agency cost of debt. In our research assumptions we argue that firms with a credit rating use derivatives as risk management instruments less extensively because the severity of agency cost of debt is related to the extent of informational asymmetries present at the firm, and that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. Our evidence is inconsistent with the predictions derived from the agency cost of debt model (see DeMarzo and Duffie, 1991 and Haushalter, 2000), because the relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge by using derivative instruments more intensively. Therefore, we should reject our hypothesis related to the agency cost of debt and asymmetric information problems. An alternative variable that has used as proxy for agency cost (the share of the company owned by institutional investors) has not been shown as relevant for making decision to hedge.

Finally, the investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant negative relation to the decision to use derivatives. The results of our logistic model do not support our prediction that the firm's decision to hedge by using derivatives is positively correlated with measures for investment (growth) opportunities. Additionally, this finding is inconsistent with our findings regarding the Croatian companies presented in the previous chapter, as well as to the findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001), who have also proven a positive relation between the decision to hedge and the company's investment (growth) opportunities.

The negative relation found in the case of the Slovenian companies suggest that companies which have less investment (growth) opportunities have more incentives to hedge with derivative instruments. Again, we have conducted a robustness test regarding this result by employing other variables that were used as proxies for capital market imperfections and costly external financing hypothesis (cash and cash equivalents-to-assets ratio, investment expenditures to sales and R&D expenditures-to-assets ratio). The results for alternative regression variables were not statistically significant. These findings suggest that the capital market imperfection hypothesis, which implies that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set, should be rejected in the case of the Slovenian companies.

6. CROATIA VS SLOVENIA – COMPARATIVE ANALYSIS OF SURVEY RESULTS

6.1 Introduction

Among other research methods that we have employed in this thesis, a comparative analysis is used in this chapter to compare the results of the empirical research conducted on the Croatian and Slovenian companies. Chapter 6 presents a "classic" compare-and-contrast work (Walk, 1998), in which we weight results for both countries equally, trying to find crucial differences as well as commonalities in financial risk management practices presented in chapters 4 and 5. We compare results of descriptive statistics as well as results of both univariate and multivariate analysis. The body of chapter 6 is organised in the point-by-point way, in which the points about Slovenia are presented with comparable points about Croatia.

Here we test the last group of assumptions that refer to risk management practices in Croatia and Slovenia. We explore whether financial risk management, as one of the most important objectives of modern corporate strategy, is more developed or has different rationales among the Slovenian than among Croatian companies. *Firstly,* we propose that the Slovenian companies have more advanced risk management practices in comparison to the Croatian companies, measured by the total number of companies that use derivative instruments to manage their risk exposures.

Secondly, we argue that the Slovenian companies have more advanced risk management practices than the Croatian companies, measured by the implementation of more sophisticated risk management strategies. To distinguish the less and more sophisticated risk management strategies, we took the use of different derivatives instruments as an example of more advanced risk management strategies with an emphasis on structured derivatives use, while instruments like natural hedge, assets and liabilities matching, and international and business diversification we have classified as a less sophisticated risk management strategies.

6.2 Comparative Analysis of Descriptive Statistics

The survey results have revealed that the majority of analysed companies in both countries manage financial risks - 78 per cent Slovenian respondents and 73.5 per cent Croatian respondents claim that they are using some form of financial engineering to manage interest-rate, foreign exchange, or commodity price risk. Regarding the use of derivatives as risk management instrument, 65.9 per cent of the analysed Slovenian companies use derivatives as risk management instruments, while in Croatia only 43 per cent of respondents declare themselves as derivative users. It could be concluded that the Slovenian companies use derivatives more frequently than their counterparts in Croatia. Therefore, our research hypothesis, which argues that the Slovenian companies have more advanced risk management practices than the Croatian companies, measured by the total number of companies that use derivative instruments to manage their risk exposures, should be accepted.

If we compare the results of the Slovenian survey with the findings of Bodnar, Hayt and Marston (1998), who have revealed that 50 per cent of US non-financial companies use some form of financial engineering to manage financial risks, the conclusion would be the same as in the case of Croatia. However, it should be noted that the time difference needs to be taken into account. We believe that the use of derivatives has grown since 1998 in the US as well as globally, therefore the results of our survey cannot be directly compared with those of Bodnar, Hayt and Marston (1998).

In the survey questionnaire we asked financial managers about the intensity of influence of all three types of financial risks to the performance of their companies. The results have shown that the price risk has the highest influence among the Slovenian companies, which can be seen from the fact that 77.5 per cent of financial managers claim that price risk has strong or very strong influence on the company's performance. Price risk is the most influential in the Croatian companies as well – 61.2 companies claim that their performance is highly affected by price fluctuations. We believe that these findings could be explained by the fact that Slovenia and Croatia are small and open economies, which results in a high dependence on international trade. On the highly competitive market, prices of goods are volatile, therefore companies that compete on that market need to be prepared for these conditions and protect their risky positions.

Regarding the currency risk exposure, 59.2 of Croatian managers think that this particular risk has strong or very strong influence on the company performance, while 39 per cent of the Slovenian managers claim the same. This finding leads to the conclusion that the Croatian companies are more affected by currency risk than the Slovenian companies, which could be explained by the fact that the exposure to foreign-exchange risk was not so high in 2006, and it is expected to be further decreased in 2007 as Slovenia has introduced the Euro as an official currency. Slovenia's major trade partners are Germany, Italy, France and Austria, so the majority of transactions are now denominated in one currency since Slovenia entered the Euro Zone (The Economist Intelligence Unit Limited publications, 2006).

Finally, 44.9 per cent of the Croatian companies think that the influence of interest-rate risk is strong or very strong, while 36.6 per cent of their Slovenian counterparts claim the same. Exposure to the interest-rate risk is a result of external financing through borrowing activity. Our results have shown that the average long-term debt-to-assets ratio in the two countries is 12.13 and 21.7 per cent respectively. Croatian companies are more leveraged than Slovenian companies, but according to Graham and Campbell (2001), who have argued that companies are highly leveraged if the debt-to-assets ratio exceeds 30 per cent, it could be concluded that the Slovenian and Croatian companies do not use debt capital heavily. This argument offers an explanation why the interest-rate risk has been ranged as less important in comparison with commodity price and currency risks. Overall, it could be concluded that, regarding the pecking order of financial risk management types and their influence on company's performance, managers in both countries conclude the same. Price risk is the most influential, which is followed by currency risk, while interest-rate risk is the last.

Regarding the risk management instruments that companies use in managing currency risk, it could be concluded that natural hedge or the currency structure match of assets and liabilities is the most important instrument in managing currency risk in both countries. In respect to the use of derivatives, the currency forward is the most important and frequently used instrument, followed by currency swap as the second most important derivative instrument. Currency futures and structured derivatives use in the Slovenian companies have gained importance in comparison with the Croatian companies, as well as operational hedging. Other derivatives such as stock-exchange and OTC options, as well as hybrid securities are not important currency risk management instruments among the Croatian and Slovenian companies. However, it should be emphasised that, in respect of the currency risk management instruments that were used in the Slovenian companies before the Euro was introduced at the beginning of 2007, it is expected that their importance will decrease sharply, especially for those that have their value attached to the Euro or Slovenian tolar.

Interest rate risk in the Slovenian as well as in the Croatian companies is hedged most frequently by matching maturity of assets and liabilities. Again, forward contract and swap are the most important derivative instruments in the risk management strategy, but in contrast to currency risk management, interest rate swap is more important than interest rate forward. Contrary to the findings of the Croatian analysis, structured derivatives are an important instrument of interest-rate risk management among the Slovenian respondents. In comparison with other instruments, structured derivatives are even more important than interest-rate forward. Regarding the use of other derivative instruments like interest-rate options, futures or hybrid securities, in respect to risk management practices in both countries, it could be concluded that they do not play an important role in managing interest rate risk.

Price risk management, in both the Slovenian and Croatian companies, is usually hedged naturally by managing assets and liabilities. Among derivatives instruments, the commodity forward and commodity futures are equally important. For the first time, futures contracts are used as representatives of standardised derivative instruments traded on the financial market. In Slovenia, futures and forwards are followed by commodity swap and standardised options, while in Croatia, contrary to the findings presented while analysing currency and interest-rate risk, the commodity swap has not been used at all, nor have the other derivative instruments. In the case of commodity risk management, structured derivatives as well as OTC options are not important instruments, while business diversification through mergers, acquisitions, and other business combinations is quite important in managing price risk in both countries.

The survey results have clearly indicated that the Croatian and Slovenian non-financial companies manage financial risks primarily with simple risk management instruments such as natural hedging. In the case of derivatives use, forwards and swaps are by far the most important instruments in both countries, but futures as representatives of standardised derivatives together with structured derivatives are more important in the Slovenian than in the Croatian companies. Exchange-traded and OTC options as well as hybrid securities are not important means of financial risk management.

Regarding the scope of corporate risk management policy, the majority of the analysed Slovenian and Croatian companies claim that they use selective hedging (87.5 per cent and 88.9 per cent respectively), while the rest of them manage financial risks completely. It could be concluded that there appeared to be a decided preference for "active" or "view-driven" risk management as opposed to a full-cover or variance-minimising hedging approach. 56.3 per cent of the Slovenian respondents that manage financial risks have a documented policy regarding the use of financial risk management instruments, while 64 per cent of their Croatian counterparts manage risks without an official corporate policy.

Additionally, only 18.8 per cent of the Slovenian and 8.3 per cent of the Croatian hedgers use Value-at-Risk as a measure of risk exposure, while the same can be concluded for 12.5 per cent of the Slovenian and 11.1 per cent of the Croatian companies regarding the use of Monte Carlo analysis or some other type of simulation techniques as measures of risk exposure. The survey has revealed that 49 per cent of the analysed Slovenian companies manage risk for transaction with maturity up to a year's time, and the same can be said for 71 per cent Croatian companies. Therefore, it could be concluded that the hedging horizon for financial risk management in both countries is typically less than one year.

An important issue in corporate risk management is defining its goals. The theoretical financial literature strongly recommends focusing on cash flows or on the value of the company. A focus on accounting numbers is generally discarded. However, the results of the survey have shown that, in spite of the fact that the primary goal of hedging is managing the volatility of cash flows, 53.1 per cent of Slovenian and 68.6 per cent of Croatian firms focus also on accounting earning volatility as well as managing balance sheet and financial ratios. Some 40 per cent of the Croatian companies argue that the market value of the company is the primary goal of corporate risk management, while only 18.8 per cent of the Slovenian respondents claim the same thing. It should be emphasised that there is a strong link between Slovenian and Croatian financial accounting and tax accounting. As a result of those institutional features, we believe that there is a strong focus in both countries on accounting earnings in all business decisions and consequently also in hedging decisions.

Commercial banks are by far the primary source for derivatives transactions for 73.4 per cent of the Slovenian and 87.5 per cent of the Croatian hedgers. Investment banks, insurance companies and exchange/brokerage houses are not a very important source for derivative transactions, and very few analysed firms in both countries use them as counterparties.

Amongst the most important reasons why companies do not use derivatives, the Slovenian financial managers have addressed two problems, which they share with their Croatian counterparts, as the most important reasons why their companies do not hedge - high costs of establishing and maintaining risk management programs that exceed the benefits of it (the explanation offered by Froot, Scharfstein and Stein, 1993; Haushalter, 2000 and Hoyt and Khang, 2000) and difficulties in pricing and valuing derivatives. Apart from these problems, the Slovenian managers have numbered two additional reasons that have stopped them from hedging – the high cost of financial risk management instruments (e.g. see Mian, 1996; Getzy, Minton and Schrand, 1997 and Hushalter, 2000) and insufficient exposure to financial risks.

The Croatian managers have argued that insufficient supply of risk management instruments traded on the domestic financial market or offered by financial institutions is a very important reason why they do not hedge. On the basis of the respondents' answers and informal interviews conducted at the 3rd Annual Conference of the Croatian Association of Corporate Treasurers held in September 2006, we conclude that, in spite of the fact that there is an increasing number of Croatian non-financial companies which are aware of corporate risk management importance, a lack of suitable instruments offered to them by the domestic financial industry becomes a leading factor why many companies do not use derivatives when managing risks. This problem has the strongest impact on the shipbuilding industry. Anecdotal evidence collected through contacts with managers in a few Croatian shipbuilding companies has revealed that they are highly exposed to foreign exchange risk due to sales revenues being denominated in US dollars while operating costs are in the Croatian national currency. Unfortunately, providers of currency risk management instruments (mainly commercial banks) are not able or willing to offer them adequate instruments which would protect their cash-flows from the currency risk that emerges from their specific economic position.

Other reasons such as concerns about perceptions of derivatives use by investors, regulators and the public, and insufficient knowledge about financial risk management instruments are not very important reasons why Slovenian and Croatian companies do not hedge.

6.3 Comparative Analysis of Univariate Results

According to a mean comparison test for Croatian hedgers and nonhedgers, the hedgers are statistically different from nonhedgers with respect to variable that proxy for alternative financial policy as substitutes for hedging. Hedgers have a statistically greater quick ratio as a measure of short-term liquidity. Although hedge substitutes are not considered as a special kind of risk management strategy, alternative financial policies can also reduce a firm's risk without requiring the firm to directly engage in risk management activities. Firms could adopt conservative financial policies such as maintaining low leverage and a low dividend pay-out ratio or carrying large cash balances to protect them against potential financial difficulties (a form of negative leverage). Greater use of these substitute risk management activities should be associated with less financial risk management activities. Therefore, the coefficient on quick ratio is predicted to be negative (see: Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Contrary to our prediction as well as to the findings of the cited studies, our results show a positive relation between the decision to hedge and this explanatory variable, suggesting that companies that are more liquid are more likely to hedge. Therefore, our assumption regarding hedging substitutes should be rejected in the case of the Croatian companies.

Another statistically significant variable is company ownership by foreign investors. T-test has shown that the Croatian hedgers have a statistically higher share owed by foreign investors in comparison with nonhedgers, which is confirmed by the correlation analysis. This finding leads to the conclusion that investing companies which have headquarters in more developed countries have enforced employment of corporate risk management in the acquired Croatian companies.

Other results of univariate tests suggest that hedgers are not statistically different from nonhedgers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items, or managerial utility. Therefore, we should reject all research hypotheses regarding the shareholder maximisation and managerial utility maximisation in the case of the Croatian companies. Additionally, we should reject our hypothesis regarding alternative activities that substitute for financial risk management strategies. Our findings predict the opposite sign to what we assumed, suggesting that the Croatian companies that are more liquid have more incentives to hedge.

Regarding the univariate analysis of the Croatian derivative users vs derivative nonusers, t-test has discovered that derivative users are statistically different from nonusers with respect to variables that are proxies for alternative financial policy as substitutes for hedging as well as for capital market imperfection and costly external financing**.** Derivative users have a statistically greater quick ratio as well as greater ratio of investment expenditures to the book value of assets. This finding suggests that these two groups differ with respect to proxies for short-term liquidity and investment (growth) opportunities. Similarly to the analysis of hedgers and nonhedgers, our results suggest that the Croatian companies that have a higher quick ratio use derivatives more intensively, which is contrary to our predictions and to the findings of Nance, Smith and Smithson (1993), Tufano (1996), Getzy, Minton and Schrand (1997), Pulvino (1998) and Harford (1999). Our result is also confirmed by the Pearson correlation coefficient.

Another statistically significant variable is the company ratio of investment expenditures to the book value of assets. Our t-test has shown that derivative users have a statistically higher value of this ratio, which is confirmed by the correlation analysis, suggesting that there is a positive relation between the value of a company's investment and the decision to use derivatives. This result is consistent with our prediction and with the findings of Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001), who have proven that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set. Other variables that have been used to test the agency cost of debt and capital market imperfection hypothesis has not shown statistically significant differences between analysed derivative users and nonusers.

On the basis of t-tests and correlation analysis results for the Croatian sample, it could be concluded that derivative users are not statistically different from nonusers with respect to other research assumptions regarding the cost of financial distress, agency cost of debt, tax preference items, or managerial utility. Similarly to the findings in the case of the Croatian hedgers and nonhedgers, we should reject all research assumptions regarding the managerial utility maximisation hypothesis as well as shareholder maximisation hypothesis – apart from capital market imperfection and costly external financing.

If we compare the Croatian univariate analysis results with the results of the identical analysis conducted for the Slovenian sample, we come to similar findings and conclusions – that the tested hedging theories have little predictive power regarding the risk management practices in both countries. Univariate tests has discovered that the Slovenian hedgers as well as derivative users are statistically different from nonhedgers and derivative nonusers with respect only to the coefficient of the publicly held company dummy variable that proxies for alternative financial policy as substitutes for hedging. A positive relation between the decision to hedge or to use derivatives and the coefficient of the publicly held company dummy variable leads to the conclusion that companies which list their shares on the stock-exchange have more incentives to hedge and use derivatives as risk management instruments. This result has not been supported by the correlation analysis.

We have predicted that, if closely held firms tend to be risk-averse, the coefficient of the publicly held company dummy variable is predicted to be negative (Cummins, Phillips and Smith, 2001). Our univariate test has revealed the coefficient of the publicly traded company dummy variable to be positive, suggesting that publicly held companies tend to be risk-averse, while privately held companies do not act in a risk-averse manner and do not hedge. Therefore, our assumption connected to the different behaviour of publicly traded and privately held stock companies with regard to risk management should be rejected. Other variables that test the hypothesis regarding the alternative financial policies as substitutes for hedging are not statistically significant.

Other univariate results have shown that the Slovenian hedgers and derivative users are not statistically different from nonhedgers and derivative nonusers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items, or managerial utility, therefore we should reject all research assumptions regarding the shareholder maximisation hypothesis as well as the managerial utility maximisation hypothesis for the Slovenian companies.

For the purpose of our comparative analysis, we have employed additional tests to distinguish between the Croatian and Slovenian companies regarding the corporate risk management practice in non-financial companies. Here we present the results of independent sample t-tests conducted both for regression variables and those that are not in the regression model. T-tests have shown that there are many differences in means between companies' characteristics and risk management practices in the analysed countries that are statistically significant. From the tables presented below, it can be seen that there is a statistically significant difference between the analysed companies regarding the intensity of influence of currency and price risk on the company's performance – the Croatian companies are more affected by the currency risk, while the Slovenian companies are more affected by the price risk. We have offered a reasonable explanation for this result in section 6.1, where we have argued that the Slovenian companies are less exposed to the currency risk due to the fact that two-thirds of Slovenia's trade is with the EU. However, on the highly competitive Euro Zone market, prices of goods are volatile, therefore the Slovenian companies that are doing business on that market need to be prepared for these conditions and protect their risky positions. This is the reason why they are more affected by the commodity price risk.

A very important result of t-test refers to the use of derivative instruments, with an emphasis on structured derivatives use as representatives of more complex and sophisticated risk management instruments. There is statistically significant evidence that the Slovenian companies use all derivatives, especially structured derivatives like swaptions, caps, floors, collars or corridors, as instruments for managing currency and interest-rate risk more intensively than the Croatian companies. Additionally, the Croatian companies use simple risk management instruments like managing assets and liabilities to a greater extent in comparison with the Slovenian companies when managing price risk.

These findings are consistent with our research prediction that the Slovenian companies have more advanced risk management practices than the Croatian companies, measured by the implementation of the more sophisticated risk management strategies. To distinguish the less and more sophisticated risk management strategies, we took the use of different derivatives instruments as an example of more advanced risk management strategies with an emphasis on structured derivatives use, while instruments like natural hedge, assets and liabilities matching and international and business diversification we have classified as less sophisticated risk management strategies. Therefore, in respect of the use of structured derivative instruments and assets and liabilities matching, our research hypothesis should be accepted.

The Croatian companies differ from their Slovenian counterparts in evaluation of balance sheet and financial ratios management as an important risk management goal, and to the company establishment and finished educational programmes in risk management. Balance sheet and financial ratios management is more important to the Croatian companies, while the analysed Slovenian companies have a longer existence on the market, and their financial managers are better educated in respect of the specific knowledge gained at risk management programmes.

In respect of regression variables, there are statistically significant differences in the rating grade, tax incentives to hedge, and stock-exchange quotation. The majority of analysed Slovenian companies have credit rating, together with tax incentives to hedge (which emerges primarily from investment tax credit provision), while only 14.6 per cent of respondents are listed on the stock-exchange. By contrast, the majority of the Croatian companies do not have credit rating or tax incentives to hedge, while 51 per cent of respondents are public companies. Regarding the managers' characteristics, our evidence has shown that there is a difference in the average share of stock ownership that managers hold in their companies. The average share for Croatia is 18.17 per cent, while for Slovenia it is significantly smaller and amounts to only 5 per cent. It can be concluded that the analysed Croatian companies are to a great extent owned by their managers. This is due to the Croatian privatisation process and to the ESOP programmes that have been employed in the Croatian corporate sector.

Additionally, a company's ownership by institutional investors is significantly bigger in the case of Slovenia and comes to 18.14 per cent in comparison with Croatia where the average share of institutional investors' ownership is 6.78 per cent.

Other statistically different variables are debt-to-assets ratio, long-term debt-to-assets ratio and long-term debt-to-equity ratio as proxies for financial leverage and financial distress costs. These variables are significantly higher in the case of Croatia, which leads us to the conclusion that Croatian companies are more dependent on debt financing in comparison with Slovenian companies. Additionally, two proxies for investment (growth) opportunities – cash and cash equivalents-to-assets ratio and R&D expenditures-to-assets have statistically higher vales in the case of the Croatian companies. These findings are interesting, because it could be argued that the Croatian companies have more growth options than their Slovenian counterparts and that they need more debt capital to finance the R&D expenditures.

Table 6.1. Group statistics for the comparative analysis (variables not in regression)

	Country	N	Mean	Std. Deviation	Std. Error Mean
What is the intensity of influence of currency risk on the company's performance?	Croatia	49	3.82	.99	.14
	Slovenia	41	3.24	1.28	.20
What is the intensity of influence of interest-rate risk on the company's performance?	Croatia	49	3.33	1.23	.18
	Slovenia	41	3.20	1.08	.17
What is the intensity of influence of price risk on the company's performance?	Croatia	49	3.63	1.38	.20
	Slovenia	40	4.20	.94	.15
Natural hedge or netting	Croatia	34	.74	.45	.08
	Slovenia	29	.79	.41	.08
Matching currency structure of assets and liabilities	Croatia	34	.88	.33	5.61E-02
	Slovenia	29	.76	.44	8.09E-02
Currency forward	Croatia	34	.44	.50	8.64E-02
	Slovenia	29	.45	.51	9.40E-02
Currency futures	Croatia	34	5.88E-02	.24	4.10E-02
	Slovenia	29	.17	.38	7.14E-02
Currency swap	Croatia	34	.15	.36	6.17E-02
	Slovenia	29	.24	.44	8.09E-02
Stock-Exchange Currency option	Croatia	34	.00	.00	.00
	Slovenia	29	6.90E-02	.26	4.79E-02
OTC (over-the-counter) currency option	Croatia	34	5.88E-02	.24	4.10E-02
	Slovenia	29	3.45E-02	.19	3.45E-02
Structured derivatives (e.g. currency swaption)	Croatia	34	.00	.00	.00
	Slovenia	29	.14	.35	6.52E-02
Hybrid securities (e.g. convertible bonds or preferred stocks)	Croatia	34	2.94E-02	.17	2.94E-02
	Slovenia	29	.00	.00	.00
Operational hedging	Croatia	34	8.82E-02	.29	4.94E-02
	Slovenia	29	.28	.45	8.45E-02
Matching maturity of assets and liabilities	Croatia	29	.90	.31	5.76E-02

	Slovenia	29	.83	.38	7.14E-02
Interest rate forward	Croatia	29	.14	.35	6.52E-02
	Slovenia	29	.17	.38	7.14E-02
Interest rate futures	Croatia	29	.00	.00	.00
	Slovenia	29	3.45E-02	.19	3.45E-02
Interest rate swap	Croatia	29	.28	.45	8.45E-02
	Slovenia	29	.28	.45	8.45E-02
Stock-Exchange interest rate option	Croatia	28	3.57E-02	.19	3.57E-02
	Slovenia	29	3.45E-02	.19	3.45E-02
OTC (over-the-counter) interest rate	Croatia	28	.00	.00	.00
	Slovenia	29	3.45E-02	.19	3.45E-02
Structured derivatives (e.g. cap. floor. collar. corridor or swaption)	Croatia	28	3.57E-02	.19	3.57E-02
	Slovenia	29	.21	.41	7.66E-02
Hybrid securities (e.g. convertible bonds or preferred stocks)	Croatia	28	.11	.31	5.95E-02
	Slovenia	29	.00	.00	.00
Natural hedge or netting	Croatia	28	.68	.48	8.99E-02
	Slovenia	28	.71	.46	8.69E-02
Managing assets and liabilities	Croatia	28	.96	.19	3.57E-02
	Slovenia	28	.71	.46	8.69E-02
Commodity forward	Croatia	28	.14	.36	6.73E-02
	Slovenia	28	.14	.36	6.73E-02
Commodity futures	Croatia	28	7.14E-02	.26	4.96E-02
	Slovenia	28	.14	.36	6.73E-02
Commodity swap	Croatia	28	.00	.00	.00
	Slovenia	28	.11	.31	5.95E-02
Commodity option	Croatia	28	.00	.00	.00
	Slovenia	28	7.14E-02	.26	4.96E-02
OTC (over-the-counter) commodity option)	Croatia	28	.00	.00	.00
	Slovenia	28	3.57E-02	.19	3.57E-02
Structured derivatives (combination of swaps. future contacts	Croatia	28	.00	.00	.00

and options)	Slovenia	28	3.57E-02	.19	3.57E-02
Business diversification through mergers. acquisitions. and other business combinations	Croatia	28	.29	.46	8.69E-02
	Slovenia	28	.25	.44	8.33E-02
Risk management policy scope	Croatia	36	1.89	.32	5.31E-02
	Slovenia	32	1.88	.34	5.94E-02
Company's hedging horizon	Croatia	35	1.63	1.11	.19
	Slovenia	32	1.97	1.15	.20
Importance of accounting earnings volatility management as a risk management aim	Croatia	35	3.29	.96	.16
	Slovenia	32	3.50	1.30	.23
Importance of cash-flow volatility management as a risk management aim	Croatia	35	4.03	1.07	.18
	Slovenia	32	4.16	.92	.16
Importance of balance sheet and financial ratios management as a risk management aim	Croatia	35	4.06	.91	.15
	Slovenia	32	3.41	1.24	.22
Importance of company's market value management as a risk management aim	Croatia	35	2.91	1.40	.24
	Slovenia	32	2.44	1.27	.22
Does a company have documented policy regarding the use of financial risk management instruments?	Croatia	36	.36	.49	8.12E-02
	Slovenia	32	.56	.50	8.91E-02
Does a company use "Value-at-Risk" (VaR) as a measure of risk exposure?	Croatia	36	8.33E-02	.28	4.67E-02
	Slovenia	32	.19	.40	7.01E-02
Does a company use Monte Carlo analysis or some other type of simulation techniques as a measure of risk exposure?	Croatia	36	.11	.32	5.31E-02
	Slovenia	32	.13	.34	5.94E-02
Importance of commercial banks in providing derivative instruments to companies	Croatia	24	4.25	1.03	.21
	Slovenia	30	3.90	1.40	.26
Importance of investment banks in providing derivative instruments to companies	Croatia	24	2.17	1.40	.29
	Slovenia	30	1.63	1.19	.22
Importance of insurance companies in providing derivative instruments to companies	Croatia	24	1.67	1.20	.25
	Slovenia	30	1.40	.86	.16
Importance of exchange/brokerage houses in providing derivative instruments to companies	Croatia	24	1.67	1.01	.21
	Slovenia	30	1.53	.86	.16
Insufficient exposure to financial risks	Croatia	13	2.85	1.28	.36

	Slovenia	8	3.13	1.46	.52
Insufficient knowledge about financial risk management instruments and their use	Croatia	13	2.54	1.20	.33
	Slovenia	7	2.86	1.35	.51
Financial risk management instruments are not efficient	Croatia	12	3.00	1.21	.35
	Slovenia	6	2.17	.98	.40
Financial risk management instruments are too expensive	Croatia	12	2.67	1.15	.33
	Slovenia	7	3.57	.79	.30
Difficulties in pricing and valuing derivatives	Croatia	12	3.33	1.56	.45
	Slovenia	5	3.60	.55	.24
Concerns about perceptions of derivatives use by investors. regulators and public	Croatia	12	2.00	1.04	.30
	Slovenia	5	2.60	1.67	.75
Costs of establishing and maintaining a risk management program exceed the expected benefits	Croatia	12	3.33	1.07	.31
	Slovenia	6	3.17	1.47	.60
Supply of risk management instruments traded on domestic financial market is insufficient	Croatia	13	3.54	1.45	.40
	Slovenia	6	3.33	1.03	.42
Supply of risk management instruments offered by financial institutions is insufficient	Croatia	13	3.46	1.45	.40
	Slovenia	6	3.17	.98	.40
Industry	Croatia	49	5.71	2.10	.30
	Slovenia	41	4.85	2.06	.32
Company establishment	Croatia	49	3.98	1.39	.20
	Slovenia	41	4.59	.87	.14
Number of employees	Croatia	49	3.82	2.30	.33
	Slovenia	41	3.51	2.18	.34
Gender	Croatia	49	1.49	.51	7.22E-02
	Slovenia	40	1.58	.50	7.92E-02
Formal education	Croatia	49	3.12	.56	8.06E-02
	Slovenia	40	3.08	.57	9.05E-02
Finished educational programmes in risk management	Croatia	49	.47	.50	7.20E-02
	Slovenia	40	.68	.47	7.50E-02

Source: Croatian and Slovenian survey data

Table 6.2. Independent samples t-test – the comparative analysis (variables not in regression)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	Upper
What is the intensity of influence of currency risk on the company's performance?	Equal variances assumed	3.839	.053	2.388	88	.019	.57	.24	9.60E-02	1.05
	Equal variances not assumed			2.335	74.653	.022	.57	.25	8.40E-02	1.06
What is the intensity of influence of interest-rate risk on the company's performance?	Equal variances assumed	1.573	.213	.533	88	.595	.13	.25	-.36	.62
	Equal variances not assumed			.540	87.808	.591	.13	.24	-.35	.62
What is the intensity of influence of price risk on the company's performance?	Equal variances assumed	10.175	.002	-2.214	87	.029	-.57	.26	-1.08	-5.81E-02
	Equal variances not assumed			-2.299	84.461	.024	-.57	.25	-1.06	-7.66E-02
Natural hedge or netting	Equal variances assumed	1.149	.288	-.530	61	.598	-.06	.11	-.28	.16
	Equal variances not assumed			-.533	60.621	.596	-.06	.11	-.27	.16
Matching currency structure of assets and liabilities	Equal variances assumed	6.893	.011	1.286	61	.203	.12	9.62E-02	-6.87E-02	.32
	Equal variances not assumed			1.257	51.336	.214	.12	9.84E-02	-7.38E-02	.32
Currency forward	Equal variances assumed	.012	.912	-.056	61	.956	-7.10E-03	.13	-.26	.25
	Equal variances not assumed			-.056	59.363	.956	-7.10E-03	.13	-.26	.25
Currency futures	Equal variances assumed	8.983	.004	-1.430	61	.158	-.11	7.94E-02	-.27	4.52E-02
	Equal variances not assumed			-1.380	45.305	.174	-.11	8.23E-02	-.28	5.21E-02
Currency swap	Equal variances assumed	3.584	.063	-.942	61	.350	-9.43E-02	.10	-.29	.11
	Equal variances not assumed			-.928	54.411	.358	-9.43E-02	.10	-.30	.11
Stock-Exchange Currency option	Equal variances assumed	11.377	.001	-1.562	61	.124	-6.90E-02	4.42E-02	-.16	1.93E-02
	Equal variances not assumed			-1.440	28.000	.161	-6.90E-02	4.79E-02	-.17	2.91E-02

OTC (over-the-counter) currency option	Equal variances assumed	.808	.372	.446	61	.657	2.43E-02	5.46E-02	-8.49E-02	.13
	Equal variances not assumed			.455	60.523	.651	2.43E-02	5.35E-02	-8.27E-02	.13
Structured derivatives (e.g. currency swaption)	Equal variances assumed	29.860	.000	-2.295	61	.025	-.14	6.01E-02	-.26	-1.78E-02
	Equal variances not assumed			-2.117	28.000	.043	-.14	6.52E-02	-.27	-4.44E-03
Hybrid securities (e.g. convertible bonds or preferred stocks)	Equal variances assumed	3.620	.062	.922	61	.360	2.94E-02	3.19E-02	-3.43E-02	9.32E-02
	Equal variances not assumed			1.000	33.000	.325	2.94E-02	2.94E-02	-3.04E-02	8.93E-02
Operational hedging	Equal variances assumed	18.005	.000	-1.985	61	.052	-.19	9.45E-02	-.38	1.37E-03
	Equal variances not assumed			-1.918	45.861	.061	-.19	9.78E-02	-.38	9.33E-03
Matching maturity of assets and liabilities	Equal variances assumed	2.336	.132	.752	56	.455	6.90E-02	9.17E-02	-.11	.25
	Equal variances not assumed			.752	53.589	.455	6.90E-02	9.17E-02	-.11	.25
Interest rate forward	Equal variances assumed	.512	.477	-.357	56	.723	-3.45E-02	9.67E-02	-.23	.16
	Equal variances not assumed			-.357	55.541	.723	-3.45E-02	9.67E-02	-.23	.16
Interest rate futures	Equal variances assumed	4.302	.043	-1.000	56	.322	-3.45E-02	3.45E-02	-.10	3.46E-02
	Equal variances not assumed			-1.000	28.000	.326	-3.45E-02	3.45E-02	-.11	3.62E-02
Interest rate swap	Equal variances assumed	.000	1.000	.000	56	1.000	.00	.12	-.24	.24
	Equal variances not assumed			.000	56.000	1.000	.00	.12	-.24	.24
Stock-Exchange interest rate option	Equal variances assumed	.002	.961	.025	55	.980	1.23E-03	4.96E-02	-9.82E-02	.10
	Equal variances not assumed			.025	54.844	.980	1.23E-03	4.96E-02	-9.83E-02	.10
OTC (over-the-counter) interest rate	Equal variances assumed	4.151	.046	-.982	55	.330	-3.45E-02	3.51E-02	-.10	3.59E-02
	Equal variances not assumed			-1.000	28.000	.326	-3.45E-02	3.45E-02	-.11	3.62E-02
Structured derivatives (e.g. cap. floor. collar. corridor or swaption)	Equal variances assumed	21.357	.000	-2.003	55	.050	-.17	8.55E-02	-.34	9.27E-05
	Equal variances not assumed			-2.026	39.571	.049	-.17	8.45E-02	-.34	-3.96E-04
Hybrid securities (e.g. convertible bonds or preferred stocks)	Equal variances assumed	17.344	.000	1.832	55	.072	.11	5.85E-02	-1.00E-02	.22

	Equal variances not assumed			1.800	27.000	.083	.11	5.95E-02	-1.50E-02	.23
Natural hedge or netting	Equal variances assumed	.326	.571	-.286	54	.776	-3.57E-02	.13	-.29	.21
	Equal variances not assumed			-.286	53.940	.776	-3.57E-02	.13	-.29	.21
Managing assets and liabilities	Equal variances assumed	46.266	.000	2.660	54	.010	.25	9.40E-02	6.16E-02	.44
	Equal variances not assumed			2.660	35.860	.012	.25	9.40E-02	5.94E-02	.44
Commodity forward	Equal variances assumed	.000	1.000	.000	54	1.000	.00	9.52E-02	-.19	.19
	Equal variances not assumed			.000	54.000	1.000	.00	9.52E-02	-.19	.19
Commodity futures	Equal variances assumed	3.059	.086	-.854	54	.397	-7.14E-02	8.36E-02	-.24	9.62E-02
	Equal variances not assumed			-.854	49.615	.397	-7.14E-02	8.36E-02	-.24	9.66E-02
Commodity swap	Equal variances assumed	16.736	.000	-1.800	54	.077	-.11	5.95E-02	-.23	1.22E-02
	Equal variances not assumed			-1.800	27.000	.083	-.11	5.95E-02	-.23	1.50E-02
Commodity option	Equal variances assumed	9.750	.003	-1.441	54	.155	-7.14E-02	4.96E-02	-.17	2.79E-02
	Equal variances not assumed			-1.441	27.000	.161	-7.14E-02	4.96E-02	-.17	3.03E-02
OTC (over-the-counter) commodity option)	Equal variances assumed	4.314	.043	-1.000	54	.322	-3.57E-02	3.57E-02	-.11	3.59E-02
	Equal variances not assumed			-1.000	27.000	.326	-3.57E-02	3.57E-02	-.11	3.76E-02
Structured derivatives (combination of swaps. future contacts and options)	Equal variances assumed	4.314	.043	-1.000	54	.322	-3.57E-02	3.57E-02	-.11	3.59E-02
	Equal variances not assumed			-1.000	27.000	.326	-3.57E-02	3.57E-02	-.11	3.76E-02
Business diversification through mergers. acquisitions. and other business combinations	Equal variances assumed	.352	.555	.297	54	.768	3.57E-02	.12	-.21	.28
	Equal variances not assumed			.297	53.903	.768	3.57E-02	.12	-.21	.28
Risk management policy scope	Equal variances assumed	.122	.728	.175	66	.862	1.39E-02	7.94E-02	-.14	.17
	Equal variances not assumed			.174	64.100	.862	1.39E-02	7.97E-02	-.15	.17
Company's hedging horizon	Equal variances assumed	.219	.642	-1.230	65	.223	-.34	.28	-.89	.21
	Equal variances not assumed			-1.228	64.037	.224	-.34	.28	-.89	.21

Importance of accounting earnings volatility management as a risk management aim	Equal variances assumed	5.553	.021	-.775	65	.441	-.21	.28	-.77	.34
	Equal variances not assumed			-.764	56.777	.448	-.21	.28	-.78	.35
Importance of cash-flow volatility management as a risk management aim	Equal variances assumed	.010	.920	-.521	65	.604	-.13	.24	-.62	.36
	Equal variances not assumed			-.525	64.761	.601	-.13	.24	-.61	.36
Importance of balance sheet and financial ratios management as a risk management aim	Equal variances assumed	3.848	.054	2.468	65	.016	.65	.26	.12	1.18
	Equal variances not assumed			2.434	56.364	.018	.65	.27	.12	1.19
Importance of company's market value management as a risk management aim	Equal variances assumed	.617	.435	1.455	65	.150	.48	.33	-.18	1.13
	Equal variances not assumed			1.462	64.995	.149	.48	.33	-.17	1.13
Does a company have a documented policy regarding the use of financial risk management instruments?	Equal variances assumed	1.386	.243	-1.674	66	.099	-.20	.12	-.44	3.88E-02
	Equal variances not assumed			-1.671	64.479	.100	-.20	.12	-.44	3.94E-02
Does the company use "Value-at-Risk" (VaR) as a measure of risk exposure?	Equal variances assumed	6.765	.011	-1.261	66	.212	-.10	8.26E-02	-.27	6.07E-02
	Equal variances not assumed			-1.237	55.035	.222	-.10	8.42E-02	-.27	6.47E-02
Does the company use Monte Carlo analysis or some other type of simulation techniques as a measure of risk exposure?	Equal variances assumed	.122	.728	-.175	66	.862	-1.39E-02	7.94E-02	-.17	.14
	Equal variances not assumed			-.174	64.100	.862	-1.39E-02	7.97E-02	-.17	.15
Importance of commercial banks in providing derivative instruments to companies	Equal variances assumed	2.308	.135	1.023	52	.311	.35	.34	-.34	1.04
	Equal variances not assumed			1.057	51.710	.295	.35	.33	-.31	1.01
Importance of investment banks in providing derivative instruments to companies	Equal variances assumed	2.592	.113	1.512	52	.137	.53	.35	-.17	1.24
	Equal variances not assumed			1.484	45.161	.145	.53	.36	-.19	1.26
Importance of insurance companies in providing derivative instruments to companies	Equal variances assumed	3.480	.068	.951	52	.346	.27	.28	-.30	.83
	Equal variances not assumed			.916	40.126	.365	.27	.29	-.32	.85
Importance of exchange/brokerage houses in providing derivative instruments to companies	Equal variances assumed	2.054	.158	.525	52	.602	.13	.25	-.38	.64
	Equal variances not assumed			.515	45.415	.609	.13	.26	-.39	.65
Insufficient exposure to financial risks	Equal variances assumed	.251	.622	-.460	19	.651	-.28	.61	-1.55	.99

	Equal variances not assumed			-.445	13.461	.663	-.28	.63	-1.63	1.07
Insufficient knowledge about financial risk management instruments and their use	Equal variances assumed	.049	.828	-.544	18	.593	-.32	.59	-1.55	.91
	Equal variances not assumed			-.525	11.200	.610	-.32	.61	-1.65	1.02
Financial risk management instruments are not efficient	Equal variances assumed	.000	1.000	1.461	16	.163	.83	.57	-.38	2.04
	Equal variances not assumed			1.568	12.212	.142	.83	.53	-.32	1.99
Financial risk management instruments are too expensive	Equal variances assumed	1.641	.217	-1.830	17	.085	-.90	.49	-1.95	.14
	Equal variances not assumed			-2.025	16.415	.059	-.90	.45	-1.85	4.03E-02
Difficulties in pricing and valuing derivatives	Equal variances assumed	7.164	.017	-.368	15	.718	-.27	.73	-1.81	1.28
	Equal variances not assumed			-.521	14.892	.610	-.27	.51	-1.36	.83
Concerns about perceptions of derivatives use by investors. regulators and public	Equal variances assumed	1.582	.228	-.906	15	.379	-.60	.66	-2.01	.81
	Equal variances not assumed			-.744	5.353	.488	-.60	.81	-2.63	1.43
Costs of establishing and maintaining a risk management program exceed the expected benefits	Equal variances assumed	1.016	.329	.275	16	.787	.17	.61	-1.12	1.45
	Equal variances not assumed			.247	7.761	.812	.17	.68	-1.40	1.73
Supply of risk management instruments traded on domestic financial market is insufficient	Equal variances assumed	1.316	.267	.310	17	.760	.21	.66	-1.19	1.60
	Equal variances not assumed			.352	13.560	.730	.21	.58	-1.05	1.46
Supply of risk management instruments offered by financial institutions is insufficient	Equal variances assumed	2.574	.127	.449	17	.659	.29	.66	-1.09	1.68
	Equal variances not assumed			.519	14.140	.612	.29	.57	-.92	1.51
Industry	Equal variances assumed	1.968	.164	1.954	88	.054	.86	.44	-1.47E-02	1.74
	Equal variances not assumed			1.958	85.836	.054	.86	.44	-1.33E-02	1.73
Company establishment	Equal variances assumed	17.711	.000	-2.422	88	.018	-.61	.25	-1.10	-.11
	Equal variances not assumed			-2.520	81.676	.014	-.61	.24	-1.08	-.13
Number of employees	Equal variances assumed	.655	.421	.640	88	.524	.30	.48	-.64	1.25
	Equal variances not assumed			.643	86.571	.522	.30	.47	-.64	1.24

Gender	Equal variances assumed	1.038	.311	-.795	87	.429	-8.52E-02	.11	-.30	.13
	Equal variances not assumed			-.795	83.753	.429	-8.52E-02	.11	-.30	.13
Formal education	Equal variances assumed	.171	.680	.392	87	.696	4.74E-02	.12	-.19	.29
	Equal variances not assumed			.392	82.971	.696	4.74E-02	.12	-.19	.29
Finished educational programmes in risk management	Equal variances assumed	6.027	.016	-1.965	87	.053	-.21	.10	-.41	2.37E-03
	Equal variances not assumed			-1.977	85.219	.051	-.21	.10	-.41	1.14E-03

Source: Croatian and Slovenian survey data

Table 6.3. Group statistics for the comparative Analysis (regression variables)

	Country	N	Mean	Std. Deviation	Std. Error Mean
Hedgers/Nonhedgers	Croatia	49	.73	.45	6.37E-02
	Slovenia	40	.80	.41	6.41E-02
Derivative users	Croatia	49	.43	.50	7.14E-02
	Slovenia	40	.68	.47	7.50E-02
Total assets	Croatia	49	262,189.67	599,929.59	85,704.23
	Slovenia	40	152,230.05	239,912.30	37,933.47
Total sales revenues	Croatia	49	129,032.61	213,620.29	30,517.18
	Slovenia	40	141,978.40	278,918.09	44,100.82
Debt-to-assets ratio	Croatia	49	.536147	.310749	4.43927E-02
	Slovenia	40	.408271	.209119	3.30646E-02
Long-term debt-to-assets ratio	Croatia	48	.217236	.182465	2.63366E-02
	Slovenia	40	.120618	9.32124E-02	1.47382E-02
Long-term debt-to-equity ratio	Croatia	48	1.592013	4.072219	.587774
	Slovenia	40	.279875	.265114	4.19182E-02
Interest cover ratio	Croatia	44	9.966513	23.660138	3.566900
	Slovenia	39	20.184427	92.433938	14.801276

Debt rating	Croatia	49	.2041	.4072	5.817E-02
	Slovenia	39	.5897	.4983	7.979E-02
Share owned by institutional investors	Croatia	48	6.775833	14.520084	2.095794
	Slovenia	39	18.136667	28.622883	4.583329
Cash & cash equivalents-to-assets ratio	Croatia	48	7.48837E-02	8.74973E-02	1.26292E-02
	Slovenia	40	3.47355E-02	5.21076E-02	8.23894E-03
Investment expenditures-to-assets ratio	Croatia	49	8.85203E-02	.105411	1.50587E-02
	Slovenia	40	7.37635E-02	5.57926E-02	8.82159E-03
Investment expenditures-to-sales ratio	Croatia	49	.229198	.609356	8.70508E-02
	Slovenia	40	8.64593E-02	.119853	1.89504E-02
R&D expenditures-to-assets ratio	Croatia	47	4.54176E-03	1.09967E-02	1.60404E-03
	Slovenia	34	1.18867E-02	1.68297E-02	2.88627E-03
Total value of tax loss carry-forward and carry backs	Croatia	49	41,355.8980	159,879.3119	22,839.9017
	Slovenia	39	43.5282	271.5707	43.4861
Total value of tax loss carry-forward and carry backs-to-total assets	Croatia	49	.714151	4.451312	.635902
	Slovenia	39	1.28505E-03	8.00860E-03	1.28240E-03
Investment tax credits	Croatia	48	298.3125	1,438.9671	207.6970
	Slovenia	37	2,673.5135	5,267.2852	865.9363
Tax incentives-dummy	Croatia	49	.3673	.4871	6.958E-02
	Slovenia	39	.6667	.4776	7.647E-02
Value of equity owned by managers	Croatia	49	7,010.596	18,523.473	2,646.210
	Slovenia	40	2,567.896	12,396.986	1,960.136
Share of the company owned by management	Croatia	49	18.16735	32.25816	4.60831
	Slovenia	38	5.01000	18.18804	2.95049
Managers ownership of stock options	Croatia	48	.10	.31	4.46E-02
	Slovenia	39	7.69E-02	.27	4.32E-02
Managers age	Croatia	49	3.29	.91	.13
	Slovenia	39	3.28	.94	.15
Managers tenure	Croatia	49	12.35	10.36	1.48
	Slovenia	37	15.39	9.75	1.60

Dividend pay-out ratio	Croatia	43	15.5116	26.6390	4.0624
	Slovenia	37	24.3570	38.4120	6.3149
Company listed on the stock-exchange	Croatia	49	.51	.51	7.22E-02
	Slovenia	40	.15	.36	5.72E-02
Quick ratio	Croatia	48	.547654	1.044173	.150713
	Slovenia	40	.215218	.539482	8.52996E-02
Liquidity ratio	Croatia	49	2.680185	3.959613	.565659
	Slovenia	40	1.874846	3.740691	.591455
Share of the company owned by foreign investors	Croatia	49	7.502278	21.095962	3.013709
	Slovenia	39	21.032821	38.680690	6.193868

(Variables that are presented in absolute values like total assets, total sales revenues, total value of tax loss carry-forward and carry backs, investment tax credits, value of equity owned by managers, are in 000 Euros)

Source: Croatian and Slovenian survey data

Table 6.4. Independent samples t-test – the comparative analysis (regression variables)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	Upper
Hedgers/Nonhedgers	Equal variances assumed	2.120	.149	-.716	87	.476	-6.53E-02	9.12E-02	-.25	.12
	Equal variances not assumed			-.723	85.976	.472	-6.53E-02	9.04E-02	-.24	.11
Derivative users	Equal variances assumed	3.783	.055	-2.367	87	.020	-.25	.10	-.45	-3.95E-02
	Equal variances not assumed			-2.379	85.009	.020	-.25	.10	-.45	-4.05E-02
Total assets	Equal variances assumed	2.179	.144	1.089	87	.279	109,959.62	100,938.09	-90,665.75	310,585.00
	Equal variances not assumed			1.173	65.552	.245	109,959.62	93,723.86	-77,189.95	297,109.20
Total sales revenues	Equal variances assumed	.285	.595	-.248	87	.805	-12,945.79	52,218.79	-116,736.30	90,844.72
	Equal variances not assumed			-.241	71.898	.810	-12,945.79	53,630.04	-119,857.91	93,966.34
Debt-to-assets ratio	Equal variances assumed	3.998	.049	2.223	87	.029	.127876	5.75271E-02	1.35346E-02	.242217
	Equal variances not assumed			2.310	84.154	.023	.127876	5.53532E-02	1.78031E-02	.237949
Long-term debt-to-assets ratio	Equal variances assumed	12.675	.001	3.033	86	.003	9.66176E-02	3.18519E-02	3.32981E-02	.159937
	Equal variances not assumed			3.201	72.480	.002	9.66176E-02	3.01800E-02	3.64618E-02	.156774
Long-term debt-to-equity ratio	Equal variances assumed	11.424	.001	2.032	86	.045	1.312138	.645630	2.86680E-02	2.595609
	Equal variances not assumed			2.227	47.478	.031	1.312138	.589267	.127001	2.497276
Interest cover ratio	Equal variances assumed	2.359	.128	-.708	81	.481	-10.217913	14.430844	-38.930766	18.494939
	Equal variances not assumed			-.671	42.415	.506	-10.217913	15.224997	-40.934290	20.498463
Debt rating	Equal variances assumed	15.276	.000	-3.996	86	.000	-.3857	9.651E-02	-.5775	-.1938
	Equal variances not assumed			-3.906	72.839	.000	-.3857	9.875E-02	-.5825	-.1889

Share owned by institutional investors	Equal variances assumed	17.096	.000	-2.398	85	.019	-11.360833	4.737053	-20.779363	-1.942303
	Equal variances not assumed			-2.254	53.656	.028	-11.360833	5.039768	-21.466445	-1.255222
Cash & cash equivalents-to-assets ratio	Equal variances assumed	10.251	.002	2.548	86	.013	4.01482E-02	1.57544E-02	8.82955E-03	7.14669E-02
	Equal variances not assumed			2.663	78.404	.009	4.01482E-02	1.50790E-02	1.01307E-02	7.01657E-02
Investment expenditures-to-assets ratio	Equal variances assumed	4.485	.037	.798	87	.427	1.47568E-02	1.84861E-02	-2.198627E-02	5.14999E-02
	Equal variances not assumed			.846	75.635	.400	1.47568E-02	1.74523E-02	-2.000527E-02	4.95189E-02
Investment expenditures-to-sales ratio	Equal variances assumed	5.191	.025	1.457	87	.149	.142739	9.79533E-02	-5.195412E-02	.337432
	Equal variances not assumed			1.602	52.512	.115	.142739	8.90896E-02	-3.599118E-02	.321469
R&D expenditures-to-assets ratio	Equal variances assumed	9.819	.002	-2.375	79	.020	-7.344946E-03	3.09295E-03	-1.350132E-02	-1.188575E-03
	Equal variances not assumed			-2.224	52.912	.030	-7.344946E-03	3.30205E-03	-1.396827E-02	-7.216232E-04
Total value of tax loss carry-forward and carry backs	Equal variances assumed	9.192	.003	1.612	86	.111	41312.3698	25631.5667	-9,641.4984	92,266.2379
	Equal variances not assumed			1.809	48.000	.077	41312.3698	22839.9431	-4,610.4051	87,235.1446
Total value of tax loss carry-forward and carry backs-to-total assets	Equal variances assumed	3.534	.063	.999	86	.321	.712865	.713627	-.705777	2.131508
	Equal variances not assumed			1.121	48.000	.268	.712865	.635903	-.565703	1.991434
Investment tax credits	Equal variances assumed	14.547	.000	-2.988	83	.004	-2,375.2010	795.0177	-3,956.4592	-793.9428
	Equal variances not assumed			-2.667	40.159	.011	-2,375.2010	890.4964	-4,174.7388	-575.6633
Tax incentives-dummy	Equal variances assumed	.439	.509	-2.888	86	.005	-.2993	.1036	-.5053	-9.3319E-02
	Equal variances not assumed			-2.895	82.306	.005	-.2993	.1034	-.5050	-9.3654E-02
Value of equity owned by managers	Equal variances assumed	3.252	.075	1.297	87	.198	4,442.700	3,424.092	-2,363.055	11,248.454
	Equal variances not assumed			1.349	84.000	.181	4,442.700	3,293.108	-2,106.007	10,991.407
Share of the company owned by management	Equal variances assumed	11.831	.001	2.250	85	.027	13.15735	5.84674	1.53246	24.78223
	Equal variances not assumed			2.405	78.341	.019	13.15735	5.47192	2.26434	24.05035
Managers ownership of stock options	Equal variances assumed	.760	.386	.433	85	.666	2.72E-02	6.30E-02	-9.79E-02	.15

	Equal variances not assumed			.439	84.512	.662	2.72E-02	6.21E-02	-9.62E-02	.15
Managers age	Equal variances assumed	.129	.720	.018	86	.985	3.66E-03	.20	-.39	.40
	Equal variances not assumed			.018	80.350	.985	3.66E-03	.20	-.39	.40
Managers tenure	Equal variances assumed	.055	.816	-1.384	84	.170	-3.04	2.20	-7.42	1.33
	Equal variances not assumed			-1.396	79.990	.167	-3.04	2.18	-7.39	1.30
Dividend pay-out ratio	Equal variances assumed	3.091	.083	-1.210	78	.230	-8.8454	7.3114	-23.4012	5.7104
	Equal variances not assumed			-1.178	62.750	.243	-8.8454	7.5087	-23.8516	6.1608
Company listed on the stock-exchange	Equal variances assumed	45.849	.000	3.786	87	.000	.36	9.51E-02	.17	.55
	Equal variances not assumed			3.913	85.645	.000	.36	9.21E-02	.18	.54
Quick ratio	Equal variances assumed	4.382	.039	1.820	86	.072	.332436	.182646	-3.065208E-02	.695524
	Equal variances not assumed			1.920	72.917	.059	.332436	.173178	-1.271365E-02	.677585
Liquidity ratio	Equal variances assumed	.439	.510	.978	87	.331	.805339	.823176	-.830813	2.441491
	Equal variances not assumed			.984	85.115	.328	.805339	.818407	-.821841	2.432519
Share of the company owned by foreign investors	Equal variances assumed	22.054	.000	-2.091	86	.040	-13.530543	6.471624	-26.395706	-.665380
	Equal variances not assumed			-1.964	55.653	.054	-13.530543	6.888137	-27.331039	.269953

(Variables that are presented in absolute values like total assets, total sales revenues, total value of tax loss carry-forward and carry backs, investment tax credits, value of equity owned by managers, are in 000 Euros)

Source: Croatian and Slovenian survey data

6.4 Comparative Analysis of Multivariate Results

The multivariate regression model conducted for the Croatian companies has shown that the corporate decision to hedge is related to company debt rating, investment expenditures-to-assets ratio and share of the company owned by management. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to hedge or not to hedge corporate risks.

Company credit rating is a proxy for the agency cost of debt. In our research assumptions we argue that firms with a credit rating hedge less extensively because the severity of agency cost of debt is related to the extent of informational asymmetries present in the firm, and that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. Our evidence is inconsistent with the predictions derived from the agency cost of debt model (see: DeMarzo and Duffie (1991) and Haushalter (2000), who have proven that firms with a credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry benefit greatly from risk management activity) because the relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have credit rating hedge more intensively.

Investment expenditures-to-assets ratio, which controls for company's investment (growth) opportunities, is very important in the model because it tests our prediction that hedgers are more likely to have larger investment opportunities (e.g. see: Froot, Scharfstein and Stein (1993) for theoretical arguments, or Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001) for empirical evidence). The results of the logistic model support our prediction and show a statistically significant positive relation between the decision to hedge and investment expenditures-to-assets ratio. A robustness test, which was employed by replacing investment expenditures-to-assets ratio with other variables that were used as proxies for capital market imperfections and costly external financing hypothesis, have not shown statistically significant results. These findings suggest that the association between hedging and capital market imperfections is not robust. Overall, the data, at best, provide very weak support for the prediction of the tested hypothesis.

The third variable that is statistically significant in our model is the fraction of the firm's outstanding shares held by company's management. We argue that, due to the fact that a firm's managers have limited ability to diversify their own personal wealth position associated with stock holdings and their earnings' capitalisation, they have strong incentives to hedge. Our results show a negative relation between the decision to hedge and the share of the company owned by management, which leads to the conclusion that firms that have a greater fraction of outstanding shares held by company's management have less incentives to hedge. This is contrary to our prediction, and to the evidence of Tufano (1996), who has found that firms whose managers have more wealth invested in the firm's stocks manage more corporate risk. Additionally, it needs to be emphasised that Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings. Other variables that were employed as proxies for the managerial utility hypothesis (value of company share owned by management, managers' ownership of stock options, managers' age and tenure) were not statistically significant in the model. Therefore we should reject the hypothesis regarding managerial utility.

Overall, it could be concluded that the evidence based on the empirical relation between the decision to hedge made by the Croatian non-financial companies and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility and hedge substitutes, fails to provide any support for any of the tested hypotheses but one - capital market imperfections and costly external financing measured by investment expenditures-to-assets ratio. Regarding this result, we need to emphasise that the association between hedging and capital market imperfections is not robust to other variables employed as proxies for testing this hypothesis.

The regression model conducted for the Slovenian companies has revealed that there is no statistically significant explanatory variable, therefore it could be concluded that the decision to hedge in the Slovenian companies is not dependent on any of the predicted theories of hedging. Evidence based on the empirical relation between the decision to hedge and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility and hedge substitutes, fails to provide any support for any of the tested hypotheses. It should be emphasised that, in the regression models where outliers have not been controlled, the total sales revenues as a proxy for size has been marginally significant ($p = 0.0503$). When we removed the standardised residuals from the model, the total sales revenues has not been significant. We have tested the robustness of this result by employing separate logistic regressions with all combinations of exploratory variables, and these tests have supported the results of the model presented in the section 5.4.

When we used a company's decision to use derivative instruments as a dependent variable, the regression model conducted for the Croatian companies showed that the use of derivative instruments is related only to two variables - investment expenditures-to-assets ratio and quick ratio. Investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant positive relation with the decision to use derivatives. This result is consistent with the results of multivariate analysis regarding the decision to hedge corporate risks in Croatian companies, where it has been shown that companies with a higher investment-to-assets ratio have more incentives to hedge. Additionally, the result is consistent with the results of univariate analysis for the sample Croatian derivative users/nonusers, where t-test and correlation analysis have shown that derivative users have a statistically higher value of this ratio, as well as with the findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001).

This finding supports our prediction that the firm's decision to hedge is predicted to be positively correlated with measures for investment (growth) opportunities. Again, as in the case of sample hedgers/nonhedgers, we have conducted a robustness test regarding this result by employing other variables that were used as proxies for the capital market imperfections and costly external financing hypothesis. The results for alternative regression variables were not statistically significant. These findings suggest that the association between hedging and capital market imperfections is not robust.

In respect of the statistically significant quick ratio as a measure of company's liquidity and substitute for hedging, consistently with the findings of univariate analysis conducted for the samples Croatian hedgers/nonhedgers and for derivative users/nonusers, the multivariate analysis results show a positive relation between the decision to use derivatives and the value of quick ratio, suggesting that companies that have a high quick ratio have more incentives to use derivatives. As we predicted a negative relation for this variable, and our prediction was based on the findings of Nance, Smith and Smithson (1993), Tufano (1996), Getzy, Minton and Schrand (1997), Pulvino (1998) and Harford (1999), we should reject the hypothesis regarding the hedging substitutes. Other variables that were employed to test the hedging substitutes' hypothesis were not significant in the model.

Regarding the corporate decision to use derivative instruments in the Slovenian companies, the regression model has shown that this decision is related to three variables – total sales revenues, investment expenditures-to-assets ratio and credit rating. Other variables that tested the research hypothesis are not statistically significant in the model; therefore they do not influence the decision to use derivatives.

Total sales revenues are a proxy for the effect of size on the decision to use derivatives as risk management instruments. The regression model has revealed a positive relation between the decision to use derivatives and the size of the company, implying that it is more likely for larger Slovenian companies to use derivatives. Several previous empirical studies (e.g., Nance, Smith and Smithson, 1993; Dolde, 1995; Mian, 1996; Géczy, Minton and Schrand, 1997; Allayannis and Weston, 2001) have found that firms with more assets are more likely to hedge. These studies have contended that the positive correlation between size and hedging can be attributed to significant economies of scale in information and transaction costs of hedging.

Contrary to the predicted positive relation between size and the decision to hedge, few scholars have predicted the degree of hedging to be negatively related to the size of a company (Weiss, 1990; Froot, Scharfstein and Stein, 1993; Haushalter, 2000; Hoyt and Khang, 2000) due to the issue of high costs of implementing the risk management program and to the greater informational asymmetries with potential public investors and direct costs of bankruptcy. Our assumption was that the argument is stronger in the case of the significant economies of scale in information and transaction costs of hedging, so we have predicted a positive relation between a company's size and the decision to hedge. The regression results support our hypothesis for the Slovenian companies. It should be noted that the alternative variable that has been used as proxy for the company's size (the value of total assets), has not been shown as relevant for making the decision to use derivatives. Therefore, our result is not robust to the other control variable.

Another variable that is significant for the decision of Slovenian companies to use derivatives is a company's credit rating as a proxy for the agency cost of debt. In our research assumptions we argue that firms with a credit rating use derivatives as risk management instruments less extensively because the severity of agency cost of debt is related to the extent of informational asymmetries present in the firm, and that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. The relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge by using derivative instruments more intensively. This evidence is inconsistent with the findings of DeMarzo and Duffie (1991) and Haushalter (2000), who have proven that firms with a credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry benefit greatly from risk management activity.

Therefore, we should reject our hypothesis related to the agency cost of debt and asymmetric information problems for the Slovenian companies. An alternative variable that has been used as proxy for agency cost (the share of the company owned by institutional investors) has not been shown as relevant for making decision to hedge. It should be emphasised that we have proven the identical result when we analysed the decision of Croatian companies to hedge or not to hedge, where we have found a positive relation with the credit rating variable.

Finally, the investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant negative relation with the decision to use derivatives. The results of our logistic model do not support our prediction that the firm's decision to hedge by using derivatives is positively correlated with measures for investment (growth) opportunities. Additionally, this finding is inconsistent with our findings regarding the Croatian companies, as well as with the findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001), who have also proven a positive relation between the decision to hedge and the company's investment (growth) opportunities.

The negative relation found in the case of the Slovenian companies suggest that companies which have less investment (growth) opportunities have more incentives to hedge with derivative instruments. Again, we have conducted a robustness test regarding this result by employing other variables that were used as proxies for the capital market imperfections and costly external financing hypothesis (cash and cash equivalents-to-assets ratio, investment expenditures to sales and R&D expenditures-to-assets ratio). The results for alternative regression variables were not statistically significant. These findings suggest that the capital market imperfection hypothesis, which implies that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set, should be rejected in the case of the Slovenian companies.

6.5 Conclusion

Comparative analysis of survey results have revealed that the majority of analysed companies in both Croatia and Slovenia are using some form of financial engineering to manage interest-rate, foreign exchange, or commodity price risk. Regarding the use of derivatives as a risk management instrument, it could be concluded that the Slovenian companies use derivatives more frequently than their counterparts in Croatia. Therefore, our research hypothesis, which argues that the Slovenian companies have more advanced risk management practices than the Croatian companies, measured by the total number of companies that use derivative instruments to manage their risk exposures, is accepted.

Regarding the intensity of influence of financial risks on the performance of the analysed companies, the results have shown that the price risk has the highest influence among the

Slovenian as well as the Croatian companies. We believe that these findings could be explained by the fact that Slovenia and Croatia are small and open economies, which results in a high dependence on international trade. On the highly competitive market, prices of goods are volatile, therefore companies that compete on that market need to be prepared for these conditions and protect their risky positions.

In respect of the currency risk exposure, the survey has revealed that the Croatian companies are more affected by currency risk than the Slovenian companies, which could be explained by the fact that the exposure to foreign-exchange risk was not so high in 2006 and it is expected to be further decreased in 2007, as Slovenia has introduced the Euro as an official currency (The Economist Intelligence Unit Limited publications, 2006). Slovenia's major trade partners are Germany, Italy, France and Austria, so the majority of transactions are now denominated in one currency since Slovenia entered the Euro Zone. This contributes to the lowering of risk in business transactions as companies no longer have to worry about their currency risk exposures, which should additionally enhance the trade between Slovenia and its partners. The results of the t-test presented in tables 6.1 and 6.2 have confirmed the results of descriptive statistics and have revealed a statistically significant difference between the analysed companies regarding the intensity of influence of currency and price risk on the company's performance – the Croatian companies are more affected by the currency risk, while the Slovenian companies are more affected by the price risk.

Finally, the interest-rate risk has been ranged as less important in comparison with commodity price and currency risks. The explanation of this result could be found in the fact that the Slovenian and Croatian companies do not use debt capital heavily. The average long-term debt-to-assets ratio in both countries is below 30 per cent – the level of company indebtedness taken as a threshold to distinguish from highly levered companies (Graham and Campbell, 2001). However, the results of the t-test have revealed that debt-to-assets ratio, long-term debt-to-assets ratio and long-term debt-to-equity ratio as proxies for financial leverage and financial distress costs are significantly higher in the case of Croatia, which leads us to the conclusion that the Croatian companies are more leveraged in comparison with the Slovenian companies.

The survey's results have clearly indicated that Croatian and Slovenian non-financial companies manage financial risks primarily with simple risk management instruments such as natural hedging. In the case of derivatives use, forwards and swaps are by far the most important instruments in both countries, but futures as representatives of standardised derivatives and structured derivatives are more important in the Slovenian than in the Croatian companies. Exchange-traded and OTC options as well as hybrid securities are not important means of financial risk management.

The result of the t-test conducted to explore for statistically significant differences between risk management practices in Slovenian and Croatian companies has shown statistically significant evidence that the Slovenian companies use all derivatives, especially structured derivatives such as swaptions, caps, floors, collars or corridors as instruments for managing currency and interest-rate risk more intensively than the Croatian companies. Additionally, the Croatian companies use simple risk management instruments like managing assets and liabilities to a greater extent in comparison with the Slovenian companies when managing price risk.

These findings are consistent with our research prediction that the Slovenian companies have more advanced risk management practices than the Croatian companies, measured by the implementation of more sophisticated risk management strategies. To distinguish the less and more sophisticated risk management strategies, we took the use of different derivatives instruments as an example of more advanced risk management strategies with an emphasis on structured derivatives use, while instruments like natural hedge, assets and liabilities matching, together with international and business diversification we have classified as less sophisticated risk management strategies. Therefore, in respect of the use of structured derivative instruments and assets and liabilities matching, our research hypothesis should be accepted.

Regarding the scope of corporate risk management policy, the majority of the analysed Slovenian and Croatian companies claim that they use selective hedging, but they do not use Value-at-Risk as well as Monte Carlo analysis or some other type of simulation techniques as measures of risk exposure. Regarding the hedging horizon for financial risk management, it is typically less than one year in both countries. Commercial banks are by far the primary source for derivatives transactions. Very few analysed firms in either country use investment banks, insurance companies or exchange/brokerage houses as counterparties. The primary goal of hedging is managing volatility of cash flows, but both Slovenian and Croatian firms focus also on accounting earning volatility as well as managing balance sheet and financial ratios. This result could be explained by the strong link between the Slovenian and Croatian financial accounting and tax accounting. As a result of those institutional features, we believe that there is a strong focus in both countries on accounting earnings in all business decisions and consequently also in hedging decisions. However, the results of the t-test have revealed that the Croatian companies differ from their Slovenian counterparts in the evaluation of balance sheet and financial ratios management as an important risk management goal, so it could be concluded that in the case of Croatia the focus on accounting earnings is even stronger.

Among the most important reasons why companies do not use derivatives, the Slovenian financial managers have addressed two problems, which they share with their Croatian counterparts as the most important reasons why their companies do not hedge – the high costs of establishing and maintaining risk management programmes that exceed the benefits of it (explanation offered by Froot, Scharfstein and Stein, 1993; Haushalter, 2000 and Hoyt and

Khang, 2000), together with difficulties in pricing and valuing derivatives. Apart from these problems, the Slovenian managers have numbered two additional reasons that have stopped them from hedging – the high cost of financial risk management instruments (e.g. see Mian, 1996; Getzy, Minton and Schrand, 1997 and Hushalter, 2000) and insufficient exposure to financial risks.

The Croatian managers have argued that the insufficient supply of risk management instruments traded on domestic financial market or offered by financial institutions is a very important reason why they do not hedge. On the basis of the respondents' answers and informal interviews conducted at the 3rd Annual Conference of the Croatian Association of Corporate Treasurers held in September 2006, we conclude that, in spite of the fact that there is an increasing number of Croatian non-financial companies which are aware of the importance of corporate risk management, a lack of suitable instruments offered to them by the domestic financial industry becomes a leading factor why many companies do not use derivatives when managing risks. This problem has the strongest impact on the shipbuilding industry. Other reasons such as concerns about perceptions of derivatives use by investors, regulators and the public and insufficient knowledge about financial risk management instruments are not very important reasons why the Slovenian and Croatian companies do not hedge.

According to a mean comparison test for Croatian hedgers and nonhedgers, the hedgers are statistically different from nonhedgers with respect to variable that proxy for alternative financial policy as substitutes for hedging. Hedgers have a statistically greater quick ratio as a measure of short-term liquidity. The coefficient on quick ratio is predicted to be negative (see: Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Contrary to our prediction as well as to the findings of the cited studies, our results show a positive relation between the decision to hedge and this explanatory variable, suggesting that companies that are more liquid are more likely to hedge. Therefore, our assumption regarding hedging substitutes should be rejected in the case of the Croatian companies. Additionally, t-test has shown that the Croatian hedgers have a statistically higher share owed by foreign investors in comparison with nonhedgers, which is confirmed by the correlation analysis. This finding leads to the conclusion that investing companies which have their headquarters in more developed countries have enforced employment of corporate risk management in the acquired Croatian companies.

Other results of univariate tests suggest that hedgers are not statistically different from nonhedgers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items, or managerial utility. Therefore, we should reject all research hypotheses regarding shareholder maximisation and managerial utility maximisation in the case of the Croatian companies. Additionally, we should reject our hypothesis regarding alternative activities that substitute for financial risk management strategies. Our findings predict the opposite sign to what we assumed, suggesting that the Croatian companies that are more liquid have more incentives to hedge.

Regarding the univariate analysis of the Croatian derivative users vs derivative nonusers, t-test has discovered that derivative users are statistically different from nonusers with respect to variables that are proxies for alternative financial policy as substitutes for hedging and for capital market imperfection and costly external financing**.** Derivative users have a statistically greater quick ratio and a greater ratio of investment expenditures to the book value of assets. This finding suggests that these two groups differ with respect to proxies for short-term liquidity and investment (growth) opportunities. Similarly to the analysis of hedgers and nonhedgers, our results suggest that the Croatian companies that have a higher quick ratio use derivatives more intensively, which is contrary to our predictions and to the findings of Nance, Smith and Smithson (1993), Tufano (1996), Getzy, Minton and Schrand (1997), Pulvino (1998) and Harford (1999). Our result is also confirmed by the Pearson correlation coefficient.

Another statistically significant variable is the company ratio of investment expenditures to the book value of assets. Our t-test has shown that derivative users have a statistically higher value of this ratio, which is confirmed by the correlation analysis, suggesting that there is a positive relation between the value of a company's investment and the decision to use derivatives. This result is consistent with our prediction and with the findings of Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001), who have proven that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set. Other variables that have been used to test the agency cost of debt and capital market imperfection hypothesis has not shown statistically significant differences between analysed derivative users and nonusers.

On the basis of t-tests and correlation analysis results for the Croatian sample, it could be concluded that derivative users are not statistically different from nonusers with respect to other research assumptions regarding the cost of financial distress, agency cost of debt, tax preference items, or managerial utility. Similarly to the findings in the case of the Croatian hedgers and nonhedgers, we should reject all research assumptions regarding the managerial utility maximisation hypothesis and the shareholder maximisation hypothesis – apart from capital market imperfection and costly external financing.

Comparison of the Croatian univariate analysis results with the findings of the identical analysis conducted for the Slovenian sample has revealed that the tested hedging theories have little predictive power regarding risk management practices in both countries. Univariate tests have discovered that the Slovenian hedgers and derivative users are statistically different from nonhedgers and derivative nonusers with respect only to the coefficient of the publicly held company dummy variable that proxies for alternative financial policy as substitutes for hedging. The positive relation between the decision to hedge or to use derivatives and the coefficient of the publicly held company dummy variable leads to the conclusion that publicly held companies tend to be risk-averse, while privately held companies do not act in a risk-averse manner and do not hedge. This is contrary to what we predicted in our assumption connected to the different behaviour of publicly traded and privately held stock companies with regard to risk management (Cummins, Phillips and Smith, 2001). Therefore, our assumption should be rejected.

We believe the explanation for this result can be found in the fact that, regardless to the opinion that the ownership of publicly traded companies is well diversified, research results have shown that even 64.7 per cent of the analysed Slovenian companies are owned by the major shareholder, meaning that there is one owner who has more than 50 per cent of a company's shares and has a power to control the business. Therefore, it can be argued that the major shareholder has poorly diversified wealth and therefore acts in risk-averse manner. Another explanation for the positive coefficient of the publicly held company dummy variable could be found in the fact that publicly traded companies, which act in a risk-averse manner tend to signal good news to investors on the financial market as well as to all company's stakeholders, because a company that manages its risk exposures is seen as a less risky investment or a better rated business partner. However, to the best of our knowledge, we cannot support this argument by theoretical or empirical evidence, meaning that this second explanation is based only on our opinion.

Other univariate results have shown that the Slovenian hedgers and derivative users are not statistically different from nonhedgers and derivative nonusers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items, or managerial utility, therefore we should reject all research assumptions regarding the shareholder maximisation hypothesis and the managerial utility maximisation hypothesis for the Slovenian companies.

The multivariate regression model for the Croatian companies has revealed that the corporate decision to hedge is related to company debt rating, investment expenditures-to-assets ratio and share of the company owned by management. Company credit rating is a proxy for the agency cost of debt. In our research assumptions we argue that firms with a credit rating hedge less extensively because the severity of agency cost of debt is related to the extent of informational asymmetries present in the firm, and that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. Our evidence is inconsistent with the predictions derived from the agency cost of debt model (see DeMarzo and Duffie, 1991 and Haushalter, 2000) because the relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge more intensively.

The investment expenditures-to-assets ratio, which controls for a company’s investment (growth) opportunities, is very important in the model because it tests our prediction that hedgers are more likely to have larger investment opportunities (e.g. see: Froot, Scharfstein and Stein (1993) for theoretical arguments, or Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001) for empirical evidence). The results of the logistic model support our prediction and show a statistically significant positive relation between the decision to hedge and investment expenditures-to-assets ratio. A robustness test, which were employed by replacing investment expenditures-to-assets ratio with other variables that were used as proxies for capital market imperfections and costly external financing hypothesis, have not shown statistically significant results. These findings suggest that the association between hedging and capital market imperfections is not robust. Overall, the data, at best, provide very weak support for the prediction of the tested hypothesis.

The third variable that is statistically significant in our model is the fraction of the firm's outstanding shares held by the company's management. We argue that, due to the fact that the firm's managers have limited ability to diversify their own personal wealth position associated with stock holdings and their earnings' capitalisation, they have strong incentives to hedge. Our results show a negative relation between the decision to hedge and the share of the company owned by management, which leads to the conclusion that firms that have greater fraction of outstanding shares held by the company's management have less incentives to hedge. This is contrary to our prediction, and to the evidence of Tufano (1996), who has found that firms whose managers have more wealth invested in the firm's stocks manage more corporate risk. Additionally, it needs to be emphasised that Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings. Other variables that were employed as proxies for the managerial utility hypothesis (value of company share owned by management. managers' ownership of stock options, managers' age and tenure) were not statistically significant in the model. Therefore we should reject the hypothesis regarding managerial utility.

Overall, it could be concluded that the evidence based on the empirical relation between the decision to hedge made by Croatian non-financial companies and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility as well as hedge substitutes, fails to provide any support for any of the tested hypothesis but one - capital market imperfections and costly external financing measured by investment expenditures-to-assets ratio. Regarding this result, we need to emphasise that the association between hedging and capital market imperfections is not robust to other variables employed as proxies for testing this hypothesis. The regression model conducted for the Slovenian companies has revealed that there is no statistically significant explanatory variable, therefore it could be concluded the decision to hedge in the Slovenian companies is not dependent on any of the predicted theories of hedging.

When we used the company's decision to use derivative instruments as a dependent variable, the regression model conducted for the Croatian companies showed that the use of derivative instruments is related only to two variables - investment expenditures-to-assets ratio and quick ratio. The investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant positive relation with the decision to use derivatives. This result is consistent with the results of multivariate analysis regarding the decision to hedge corporate risks in Croatian companies, where it has been shown that companies with a higher investment-to-assets ratio have more incentives to hedge. Additionally, the result is consistent with the results of univariate analysis for the sample of Croatian derivative users/nonusers, where t-test and correlation analysis have shown that derivative users have a statistically higher value of this ratio, as well as to the findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001).

This finding supports our prediction that the firm's decision to hedge is predicted to be positively correlated with measures for investment (growth) opportunities. Again, as in the case of sample hedgers/nonhedgers, we have conducted a robustness test regarding this result by employing other variables that were used as proxies for capital market imperfections and costly external financing hypothesis. The results for alternative regression variables were not statistically significant. These findings suggest that the association between hedging and capital market imperfections is not robust.

In respect to the statistically significant quick ratio as a measure of a company's liquidity and substitute for hedging, consistently with the findings of univariate analysis conducted for the samples Croatian hedgers/nonhedgers as well as for derivative users/nonusers, multivariate analysis results show a positive relation between the decision to use derivatives and the value of quick ratio, suggesting that companies that have a high quick ratio have more incentives to use derivatives. As we predicted a negative relation for this variable, and our prediction was based on the findings of Nance, Smith and Smithson (1993), Tufano (1996), Getzy, Minton and Schrand (1997), Pulvino (1998) and Harford (1999), we should reject the hypothesis regarding hedging substitutes. Other variables that were employed to test hedging substitutes' hypothesis were not significant in the model.

Regarding the corporate decision to use derivative instruments in the Slovenian companies, the regression model has shown that this decision is related to three variables – total sales revenues, investment expenditures-to-assets ratio and credit rating. Total sales revenues are a proxy for the effect of size on the decision to use derivatives as risk management instruments. The regression model has revealed a positive relation between the decision to use derivatives and the size of company, implying that it is more likely for larger Slovenian companies to use derivatives. Several previous empirical studies (e.g., Nance, Smith and Smithson, 1993; Dolde, 1995; Mian, 1996; Géczy, Minton and Schrand, 1997; Allayannis and Weston, 2001) have found that firms with more assets are more likely to hedge. These studies have contended that the positive correlation between size and hedging can be attributed to significant economies of scale in information and transaction costs of hedging. We have also predicted a positive relation between the company's size and the decision to hedge. The regression results support our hypothesis for the Slovenian companies. It should be noted that the alternative variable that has been used as proxy for company's size (the value of total assets), has not been shown as relevant for making the decision to use derivatives. Therefore, our result is not robust to the other control variable.

Another variable that is significant for the decision of the Slovenian companies to use derivatives is a company's credit rating as a proxy for the agency cost of debt. The relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge by using derivative instruments more intensively. This evidence is inconsistent with our prediction and with the findings of DeMarzo and Duffie (1991) and Haushalter (2000), who have proven that firms with a credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry, benefit greatly from risk management activity. Therefore, we should reject our hypothesis related to the agency cost of debt and asymmetric information problems for the Slovenian companies. It should be emphasised that we have proven the identical result when we analysed the decision of Croatian companies to hedge or not to hedge, where we found a positive relation with the credit rating variable.

Finally, the investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant negative relation with the decision to use derivatives. The results of our logistic model do not support our prediction that the firm's decision to hedge by using derivatives is positively correlated with measures for investment (growth) opportunities. Additionally, this finding is inconsistent with our findings regarding the Croatian companies, as well as with findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001), who have also proven a positive relation between the decision to hedge and the company's investment (growth) opportunities.

The negative relation found in the case of the Slovenian companies suggests that companies which have less investment (growth) opportunities have more incentives to hedge with derivative instruments. Again, we have conducted a robustness test regarding this finding and found no statistically significant variables in the employed separate logistic regressions. These findings suggest that the capital market imperfection hypothesis, which implies that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set, should be rejected in the case of Slovenian companies. This is an interesting result if we compare it with the findings of the Croatian sample, where we have proven a positive relation between both the decision to hedge and to use derivatives and a company's investment (growth) opportunities.

Overall, it could be concluded that the explored hedging rationales have little predictive power in explaining financial risk management decisions both in the Croatian and the Slovenian companies. The evidence based on univariate and multivariate empirical relation between the decision to hedge or to use derivatives made by Croatian non-financial companies and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility and hedge substitutes, fails to provide any support for any of the tested hypotheses but one - capital market imperfections and costly external financing measured by investment expenditures-to-assets ratio.

The univariate analysis and multivariate regression conducted for the Slovenian companies has revealed that there is no statistically significant explanatory variable for the decision to hedge; therefore we can conclude it is not dependent on any of the predicted theories of hedging. The decision to use derivatives, however, has been shown as dependent on the size of the company. The multivariate test has proven a positive relation between the use of derivatives and the size of Slovenian companies, which supports the informational and transactional scale economies argument that larger firms will be more likely to hedge.

Moreover, our analysis has revealed statistically significant relations between the decision to hedge or to use derivatives and different hedging theories, but these relations are contrary to the predicted sign. Univariate tests conducted for the hedging substitutes' hypothesis have shown that the Croatian hedgers have statistically greater dividend pay-out ratio. Additionally, the Croatian hedgers as well as derivative users have a statistically greater quick ratio, which is confirmed by the multivariate analysis. Therefore, not only have we rejected the assumption that less liquid companies have more incentives to hedge, but we have proven that companies that are more liquid are more likely to hedge.

The positive relation between the decision of Slovenian companies to hedge or to use derivatives and the coefficient of the publicly held company dummy variable leads to the conclusion that companies which list their shares on the stock-exchange have more incentives to hedge and use derivatives as risk management instruments. We have predicted that, if closely held firms tend to be risk-averse, the coefficient of the publicly held company dummy variable is predicted to be negative. Therefore, we have proven our hypothesis regarding the different behaviour of publicly traded and privately held stock companies with regard to risk management, but it is rejected because the relation is reversed – publicly traded companies are more risk-averse in comparison with those that are privately held.

Other hypotheses where the opposite sign has been proven are managerial utility maximisation in the case of the Croatian companies and costly external financing in the case of the Slovenian companies, together with the agency cost of debt hypothesis in both countries. The multivariate regression model conducted for the Croatian companies has revealed that the corporate decision to hedge is positively related to company credit rating and negatively related to the share of the company owned by management, while the regression model employed for the Slovenian companies has shown that the decision to use derivatives is positively related to credit rating and negatively related to the investment expenditures-to-assets ratio. Therefore, we can conclude that both the Croatian and Slovenian companies that have credit rating, and therefore less asymmetric information, have more incentives to hedge. Additionally, the Croatian companies where managers have more wealth invested are less likely to hedge, which could also be said for the Slovenian companies that have more investment opportunities.

7. DISCUSSION AND CONCLUSION

Financial or corporate risks - the risks to a corporation stemming from price fluctuations - are pervasive and directly or indirectly influence the value of a company. A combination of greater deregulation, international competition, interest rates and foreign exchange rates volatility, together with commodity price discontinuities starting in the late 1960s, have heightened corporate concerns, which have resulted in the increased importance of financial risk management in the decades that followed. However, from the point of view of financial theory, for a long time it was believed that corporate risk management is irrelevant to the value of a firm. The arguments in favour of irrelevance were based on the CAPM (Sharpe, 1964; Lintner, 1965; Mossin, 1966) and the Modigliani-Miller theorem (Modigliani and Miller, 1958).

One of the most important implications of the CAPM is that diversified shareholders should care only about the systematic component of total risk, which leads to the conclusion that managers of firms who are acting in the best interests of shareholders should be indifferent about hedging of risks that are unsystematic. Business risk management is unnecessary from the perspective of the CAPM, and if the design and execution of such hedging strategies are costly, it would seem that these activities would not be in the interests of diversified shareholders (Shapiro and Titman, 1998).

Miller and Modigliani's "M&M" proposition supports CAPM findings with the argument that, in the "frictionless" M&M framework, management cannot increase a firm's value by changing either capital structure or hedging policy. These are purely financial transactions that do not affect the value of a company’s operating assets. The conditions underlying the M&M propositions also imply that decisions to hedge corporate exposures to interest rates, exchange rates and commodity prices are completely irrelevant because stockholders already protect themselves against such risks by holding well-diversified portfolios.

However, it is apparent that managers are constantly engaged in hedging activities that are directed to the reduction of unsystematic risk. In the real world, financial managers and treasurers give a great deal of thought to matters of capital structure and securities design. Additionally, the corporate use of derivatives in hedging interest rate, currency, and commodity price risks is widespread and growing. As an explanation for this clash between theory and practice, imperfections in the capital market are used to argue for the relevance of corporate risk management function. It is well known that the M&M propositions were intended to hold only under a restrictive set of conditions, the most important of which are that there are no costs associated with bankruptcy or financial distress, no taxes or transactions costs, that corporate investment decisions are not influenced by financing choices, including decisions to hedge various price risks, that reliable information about the firm's future earnings prospects is costlessly available to all investors and managers alike, and that individuals and firms have equal access to all security markets, including the ability to issue identical securities on the same terms (Culp, 1994).

It has been only in the last two decades that both scholars and practitioners have realised that managing corporate risk lies at the heart of a competitive corporate strategy, and that the management of corporate risk is central to organisational evolution. Based on seminal work by Mayers and Smith (1982) in the area of the corporate demand for insurance, researchers such as Stulz (1984), Smith and Stulz (1985), and Shapiro and Titman (1998) have examined why large, diversified firms actively engage in hedging activities. These authors argued that the earlier theories are applicable to individuals and small, closely held firms but could not be used as a solid theoretical rationale for hedging by large corporations. Several theories of hedging have been demonstrated which overcome the irrelevancy arguments of modern portfolio and corporate finance theory. Most of these theories rely on the introduction of some frictions into the M&M model and argue that market imperfections enable firms to add value through hedges that cannot be exactly duplicated by individual investors.

The results of the literature review presented in this thesis suggest that the use of derivatives and risk management practices are broadly consistent with the predictions of the theoretical literature, which is based upon value-maximising behaviour (among others see: Campbell and Kracaw, 1987; MacMinn, 1987; Fazzari, Hubbard and Petersen, 1988; MacMinn and Han, 1990; Breeden and Viswanathan, 1990; Bessembinder's, 1991; Hoshi, Kashyap and Scharfstein, 1991; DeMarzo and Duffie, 1992; Dobson and Soenen, 1993; Froot, Scharfstein and Stein, 1993; Nance, Smith and Smithson, 1993; Dolde, 1995; May, 1995; Mian, 1996; Stulz, 1996; Tufano, 1996; Haushalter, 1997; Getzy, Minton and Schrand, 1997; Lamont, 1997; Kaplan and Zingales, 1997; Gay and Nam, 1998; Minton and Schrand, 1999; Graham and Smith, 1999; Haushalter 2000; Mello and Parsons, 2000; Allayannis and Ofek, 2001; Haushalter, Randall and Lie, 2002). By hedging financial risks such as currency, interest rate and commodity risk, firms can decrease cash flow volatility, which leads to a lower variance of the firm’s value. This means that not only the firm value moves less, but that the probability of occurring low values is smaller than without hedging.

However, it needs to be emphasised that, in spite of the extensive body of literature on corporate risk management and the efforts that have been devoted in developing theoretical rationales for hedging, it seems fair to say that there is not yet a single accepted framework which can be used to guide hedging strategies, or a widely accepted explanation for risk management as a corporate policy. There is no consensus as to what theory is the most important in explaining corporate risk management. Rather than presenting additional evidence on the existence of financial market imperfections, this dissertation has aimed to produce new empirical evidence on hedging rationales by exploring the risk management activity in Croatian and Slovenian companies, which should support the implications of the theory it develops.

Corporate risk management is a propulsive field that has made a significant progress, but it still has much room for further contributions. In this thesis the rationales of corporate risk management, the implementation of different risk management strategies and the use of risk management instruments in the Croatian and Slovenian companies have been investigated. We have tested hypotheses explaining corporate hedging rationales and offered empirical evidence on the relative importance of these corporate motives. Based on the arguments that arise from the literature review presented in chapter 2, we have proposed several hypotheses. First, we have argued that hedging can increase the value of the firm by reducing the costs associated with the financial distress, agency costs of debt, expected taxes or capital market imperfections. These premises are known as the shareholder maximisation hypothesis and were explored in the following research assumptions.

The first assumption argues that, by reducing the volatility of cash flows, firms can decrease the costs of financial distress (Mayers and Smith, 1982; Myers, 1984; Stulz, 1985; Smith and Stulz, 1985; Shapiro and Titman, 1998). In the MM world, financial distress is assumed to be costless. Hence, altering the probability of financial distress does not affect a firm's value. If financial distress is costly, firms have incentives to reduce its probability, and hedging is one method by which a firm can reduce the volatility of its earnings. By reducing the variance of a firm's cash flows or accounting profits, hedging decreases the probability, and thus the expected costs, of financial distress. Additionally, Smith and Stulz (1985) have argued that, while the reduction of financial distress costs increases firm value, it augments shareholder value even further by simultaneously raising the firm's potential to carry debt. Corporate risk management lowers the cost of financial distress, which leads to a higher optimal debt ratio and the tax shields of the additional debt capital further increase the value of the firm. This theory has been empirically proven by, among others, Campbell and Kracaw (1987), Bessembinder (1991), Dolde (1995), Mian (1996) and Haushalter (2000). The argument of reducing the costs of financial distress implies that the benefits of hedging should be greater the larger the fraction of fixed claims in the firm's capital structure. Therefore, we have predicted a positive relation between the value of a company's debt capital and the decision to hedge.

The second assumption suggests that, by reducing the volatility of cash flows, firms can decrease the agency costs (see: Jensen and Meckling, 1976). According to Dobson and Soenen (1993) there are three sound reasons based on agency costs why management should hedge corporate risk. First, hedging reduces uncertainty by smoothing the cash flow stream thereby lowering the firm's cost of debt. Since the agency cost is borne by management, assuming informational asymmetry between management and bondholders, hedging will increase the value of the firm. Therefore, management will rationally choose to hedge. Second, given the existence of debt financing, cash flow smoothing through risk hedging will tend to reduce the risk-shifting as well as the underinvestment problems (see: Jensen and Smith, 1985). Finally, hedging reduces the probability of financial distress and thereby increases the duration of contractual relations between shareholders. By fostering the acquisition of corporate reputation, hedging contributes directly to the amelioration of the moral-hazard agency problem. The results of MacMinn (1987), MacMinn and Han (1990), Bessembinder (1991), Minton and Schrand (1999) and Haushalter, Randall and Lie (2002) support this hedging rationale. Hence, we have predicted that the benefits of hedging should be greater the higher the firm's leverage and asymmetric information problem.

The third assumption argues that reducing cash flow volatility with hedging can improve the probability of having sufficient internal funds for planned investments eliminating the need either to cut profitable projects or bear the transaction costs of obtaining external funding. The main hypothesis is that, if access to external financing (debt and/or equity) is costly, firms with investment projects requiring funding will hedge their cash flows to avoid a shortfall in their funds, which could precipitate a costly visit to the capital markets. An interesting empirical insight based on this rationale is that firms which have substantial growth opportunities and face high costs when raising funds under financial distress will have an incentive to hedge more of their exposure than the average firm. This rationale has been explored by numerous scholars, among others by Smith and Stulz (1985), Stulz (1990), Lessard (1990), Shapiro and Titman (1998), Hoshi, Kashyap and Scharfstein (1991), Froot, Scharfstein and Stein (1993), Getzy, Minton and Schrand (1997), Gay and Nam (1998), Graham and Rogers (1999), Minton and Schrand (1999), Haushalter (2000), Mello and Parsons (2000), Allayannis and Ofek (2001) and Haushalter, Randall and Lie (2002). In our research, we have predicted that the higher values for factors related to the capital market imperfections and costly external financing are associated with a greater likelihood that the firm will engage in hedging activities.

The last assumption, which focuses on risk management as a means to maximise shareholder value, suggests that, by reducing the volatility of cash flows, firms can decrease expected taxes. This rationale is put forward by Smith and Stulz (1985), who have argued that the structure of the tax code can make it beneficial for firms to take positions in futures, forward, or option markets. If a firm faces a convex tax function, then the after-tax value of the firm is a concave function of its pre-tax value. If hedging reduces the variability of pre-tax firm values, then the expected tax liability is reduced and the expected post-tax value of the firm is increased, as long as the cost of the hedge is not too large. By reducing the effective long-run average tax rate, activities which reduce the volatility in reported earnings will enhance shareholder value. The more convex the effective tax schedule is, the greater the reduction in expected taxes. This rationale has been supported by Zimmerman (1988), Froot, Scharfstein and Stein (1993), Nance, Smith and Smithson (1993), Mian (1996) and Graham and Smith (1996). Therefore, in our thesis we have suggested that the benefits of hedging should be greater the higher the probability that the firm's pre-tax income is in the progressive region of the tax schedule, and the greater the value of the firm's tax loss carry-forwards, investment tax credits and other provisions of the tax code.

The next group of research assumptions, which presents the other line of reasoning differing from the shareholders value maximisation hypothesis, refers to the managerial utility maximisation hypothesis. We have argued that, because a firm's managers have limited ability to diversify their own personal wealth position associated with stock holdings and the capitalisation of their career earnings, they have strong incentives to hedge. Usually that kind of hedging is not conducted to improve the value of company's stockholders but to improve managers' own wealth. To avoid this problem, managerial compensation contracts need to be designed so that when managers increase the value of the firm, they also increase their expected utility. This can usually be achieved by adding option-like provisions to managerial contracts. This rationale was firstly proposed by Stulz (1984) and has been further explored by Smith and Stulz (1985). The results of some empirical studies have confirmed this hypothesis (e.g., see Tufano, 1996; Gay and Nam, 1998), while, in contrast, Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings. We have made a proposition that managers with greater stock ownership would prefer more risk management, while those with greater option holdings would prefer less risk management.

A different managerial theory of hedging, based on asymmetric information, has been presented by Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992), who have focused on managers' reputations. In both of these models, it is argued that managers may prefer to engage in risk management activities in order to better communicate their skills to the labour market. Breeden and Viswanathan (1990) and DeMarzo and Duffie (1992) have argued that younger executives and those with shorter tenures have less developed reputation than older and longer-tenure managers. Therefore, they are more willing to embrace new concepts like risk management with the intention of signalling their management quality. In order to test this hypothesis, in our thesis we have argued that firms with younger managers and those whose managers have shorter tenures would be more inclined to manage risk.

We have also tested the hypothesis regarding the alternative financial policies, usually referred to as “hedge substitutes”, which can also reduce a firm’s risk without requiring the firm to directly engage in risk management activities. Firms could adopt conservative financial policies (e.g. low leverage, low dividend pay-out ratio, large cash balances) to protect them against potential hardship (see: Froot, Scharfstein and Stein, 1993; Nance, Smith and Smithson, 1993; Tufano, 1996; Pulvino, 1998; Harford, 1999). Structured debt as well as preferred stock can be seen as another example of “hedge substitutes” (see: Smith and Stulz, 1985; Smithson and Chew, 1992; Nance, Smith and Smithson, 1993; Culp, 1994). In our thesis it has been argued that the likelihood of the firm employing risk management instruments is lower the more convertible debt the firm issues, the more preferred stock the firm issues, the more liquid the firm’s assets are, and the lower the firm’s dividend payout is.

The last group of assumptions regards risk management practices in Croatia in comparison with risk management practices in Slovenia. In order to test the hypothesis that financial risk management is more developed or has different rationales among Slovenian than among Croatian companies, we have argued that Slovenian companies have more advanced risk management practices measured by the total number of companies that use derivative instruments to manage their risk exposures.

Additionally, we have discussed that Slovenian companies have more advanced risk management practices than Croatian companies, measured by the implementation of more sophisticated risk management strategies. To distinguish the less and more sophisticated risk management strategies, we took the use of different derivatives instruments as an example of more advanced risk management strategies with an emphasis on structured derivatives use, while instruments like natural hedge or international and business diversification we have classified as a less sophisticated risk management strategies.

Research was conducted on the biggest non-financial companies and the criteria for selecting companies in the sample were similar for both countries. The Croatian companies needed to meet two out of three conditions required by the Croatian Accounting Law[18] that relate to large companies, while the Slovenian companies were included in the sample if they met two out of three conditions required by the Slovenian Company Law[19] related also to large companies. We have used a list of the biggest 400 Croatian companies in the year 2005 published by The Croatian Business Herald and included 157 companies in the sample that have met the required criteria. In the case of the Slovenian companies, we used GVIN and AJPES[20] electronic databases and, on the basis of selected criteria, we chose 189 companies for further analysis. The primary advantage of these samples is that the evidence can be generalised to a broad class of firms in different industries. Research was conducted on the large non-financial companies because these companies have access to derivatives markets and should have a developed risk management function. Financial firms were excluded from the sample because most of them are also market makers, hence their motivation in using derivatives may be different from the motivations of non-financial firms.

Data were collected from two sources: from annual reports and notes to the financial statements for the fiscal year 2005, and through our survey. A survey questionnaire was addressed to the firm’s chief financial officer or, if there was no such position, to the financial controller or the treasurer. The questionnaire covered three broad areas; foreign exchange rate

[18] In Croatian: Zakon o računovodstvu, Narodne novine 146/05
[19] In Slovene: Zakon o gospodarskih družbah, Uradni list 15/05

risk management, interest rate risk management and commodity price risk management. Additionally, a part of the questionnaire referred to those companies that classified themselves as non-hedgers in order to search for reasons not to manage financial risks. The questionnaire was mailed at the beginning of September 2006 to the Croatian and Slovenian managers involved in the financial risk management decision. In order to encourage willingness to participate, the respondents were promised a copy of the summarised results. A follow-up letter was also sent to non-responding Croatian companies at the end of September 2006, which encouraged a response rate from 12 per cent to 31 per cent, while 41 Slovenian companies answered the questionnaire without any additional contact with the potential respondents, creating a response rate of 22 per cent.

We have started the analysis of our results with a detailed description of risk management practices in analysed countries. We have explored how many companies manage financial risks, what kind of risk management instruments they use and which corporate risk management strategies are employed in the analysed Croatian and Slovenian companies. Additionally, we have explored different types of derivatives instrument employed by the analysed companies, as well as the intensity of their use, to show what the most important financial contracts in interest-rate, foreign-exchange and commodity price risk management are. Managers were also questioned about the scope of the risk management policy, the firm's hedging horizon, corporate risk management goals and the use of VaR or Monte Carlo analysis or some other type of simulation techniques as measures of the firm's risk exposure. Additionally, we explored which financial institutions and intermediaries are the most important in providing risk management instruments and what are the reasons why Croatian and Slovenian companies do not manage corporate risks or use derivative instruments.

[20] See the section 3.5. for detailed explanation of GVIN and AJPES databases.

The survey results have revealed that the majority of analysed companies in both countries manage financial risks - 78 per cent of Slovenian respondents and 73.5 per cent of Croatian respondents claim that they use some form of financial engineering to manage interest-rate, foreign exchange, or commodity price risk. Regarding the use of derivatives as a risk management instrument, 65.9 per cent of the analysed Slovenian companies use derivatives as risk management instruments, while in Croatia only 43 per cent of respondents declare themselves as derivative users. It could be concluded that the Slovenian companies use derivatives more frequently than their counterparts in Croatia. Therefore, our research hypothesis, which argues that the Slovenian companies have more advanced risk management practices than Croatian companies, measured by the total number of companies that use derivative instruments to manage their risk exposures, is accepted.

Regarding the influence of financial risks on the performance of the analysed companies, the results have shown that the price risk has the highest influence among the Slovenian as well as among the Croatian companies. We believe that these findings could be explained by the fact that Slovenia and Croatia are small and open economies, which results in a high dependence on international trade. On the highly competitive international market, prices of goods are volatile, therefore companies that compete on that market need to be prepared for these conditions and manage their risky positions.

The survey has revealed that the Croatian companies are more affected by the currency risk than Slovenian companies. This could be explained by the fact that the exposure of Slovenian companies to foreign-exchange risk was not so high in 2006 when our survey was carried out, and it is expected to be further decreased in 2007, due to the introduction of the Euro as an official currency. Slovenia's major trade partners are Germany, Italy, France and Austria, so the majority of transactions are now denominated in one currency since Slovenia entered the Euro Zone. This contributes to the lowering of risk in business transactions as companies no longer have to worry about their currency risk exposures, which should additionally enhance trade between Slovenia and its partners. Univariate analysis has confirmed the results of descriptive statistics and has revealed a statistically significant difference between the analysed companies regarding the intensity of influence of currency as well as price risk on the company's performance – the Croatian companies are more affected by the currency risk, while the Slovenian companies are more affected by the price risk.

Finally, the interest rate risk has been ranged as less important in comparison with commodity price and currency risks. The explanation for this result could be found in the fact that Slovenian and Croatian companies do not use debt capital heavily. The average long-term debt-to-assets ratio in both countries is below 30 per cent – the level of company indebtedness taken as the threshold to distinguish highly levered companies (Graham and Campbell, 2001). However, the results of t-test have revealed that debt-to-assets ratio, long-term debt-to-assets ratio and long-term debt-to-equity ratio as proxies for financial leverage and financial distress costs are significantly higher in the case of Croatia, which leads us to the conclusion that Croatian companies use more debt capital in comparison with Slovenian companies. Explanation for this result can be found in empirical research conducted by Miloš (2004) on the long-term financing methods in the large Croatian companies. The survey has revealed that even 80 per cent of the analysed Croatian companies collect long-term capital by using bank loans, while 47 per cent of them are highly dependent on bank loans as the most important instrument of corporate financing.

The survey results have clearly indicated that the Croatian and Slovenian non-financial companies manage financial risks primarily with simple risk management instruments such as natural hedging. In the case of derivatives use, forwards and swaps are by far the most important instruments in both countries, but futures as representatives of standardised derivatives and structured derivatives are more important in the Slovenian than in the Croatian companies. Exchange-traded and OTC options together with hybrid securities are not important means of financial risk management in either country.

The results of t-test conducted to explore for statistically significant differences between risk management practices in the Slovenian and Croatian companies have shown statistically significant evidence that the Slovenian companies use all types of derivatives, especially structured derivatives like swaptions, caps, floors, collars or corridors, as instruments for managing currency and interest-rate risk more intensively than the Croatian companies. Additionally, the Croatian companies use simple risk management instruments like managing assets and liabilities to a greater extent in comparison with the Slovenian companies when managing price risk. These findings are consistent with our research prediction that Slovenian companies have more advanced risk management practices than Croatian companies, measured by the implementation of more sophisticated risk management strategies. Therefore, in respect of the use of structured derivative instruments, our research hypothesis is accepted.

Regarding the scope of the corporate risk management policy, the majority of the analysed Slovenian and Croatian companies claim that they use selective hedging. The hedging horizon for financial risk management in Slovenian and Croatian companies is typically less than one year. Commercial banks are by far the primary source for derivatives transactions and very few analysed firms in both countries use investment banks, insurance companies or exchange/brokerage houses as counterparties. The primary goal of hedging is managing the volatility of cash flows, but both the Slovenian and Croatian firms focus also on accounting earnings volatility and managing balance sheet and financial ratios. This result could be explained by the strong link between the Slovenian as well as the Croatian financial accounting and tax accounting. As a result of those institutional features, we believe that there is a strong focus in both countries on accounting earnings in all business decisions and consequently also in hedging decisions. However, the results of t-test has revealed that the

Croatian companies differ from their Slovenian counterparts in evaluation of balance sheet and financial ratios management as an important risk management goal, so it could be concluded that in the case of Croatia the focus on accounting earnings is even stronger.

Amongst the most important reasons why companies do not use derivatives, the Slovenian financial managers have addressed two problems, which they share with their Croatian counterparts as the most important reasons why their companies do not hedge – difficulties in pricing and valuing derivatives together with the high costs of establishing and maintaining risk management programs that exceed the benefits of it. The explanation of this problem is that there are substantial economies of scale or economically significant costs related to hedging. (e.g. costs related to executing the transactions, hiring personnel with the required skills, acquiring relevant information and monitoring the hedge positions, etc.). Indeed, for many firms (particularly smaller firms), the marginal benefits of a hedging program may be exceeded by these marginal costs (see: Froot, Scharfstein and Stein, 1993; Haushalter, 2000; Hoyt and Khang, 2000).

Apart from these problems, the Slovenian managers have numbered two additional reasons that have stopped them from hedging. The first is the high cost of financial risk management instruments (e.g. see: Mian (1996), Getzy, Minton and Schrand (1997) and Hushalter (2000)). Transaction costs of hedging include the costs of trading, as well as the substantial costs of information systems needed to provide the data necessary to decide on the appropriate hedging positions. For forwards, futures, options, and swaps, this cost consists of out-of-pocket costs such as brokerage fees in futures markets and the implicit cost of the bid-ask spread. Then, there are agency costs that such activities bring, which include the costs of the internal control systems to run the hedging program. These include the problems associated with the opportunities for speculation that participation in derivative and other markets allows. Transaction costs have fallen with the growth of the derivatives markets, but Slovenian derivatives market is still small and shallow, so the high cost of risk management instruments remains the problem for the substantial number of analysed Slovenian companies.

The second problem that has prevented Slovenian companies from using derivatives is insufficient exposure to financial risks. This problem is closely connected to the problems of the high costs of establishing and maintaining risk management programs and the high cost of risk management instruments discussed above. It has been argued that only firms with sufficiently large risk exposures are likely to benefit from a formal hedging program, because organising the Treasury for risk management involves significant fixed costs (Dolde, 1995). In addition to economies of scale in obtaining information on hedging techniques and instruments, there are also economies of scale in transaction costs associated with trading financial derivatives. These facts suggest there are sizable set-up costs related to operating a corporate risk-management program. It can be concluded that numerous analysed companies do not hedge at all, even though they are exposed to financial risks, simply because it is not an economically worthwhile activity.

The Croatian managers have argued that the insufficient supply of risk management instruments traded on domestic financial market or offered by financial institutions is a very important reason why they do not hedge. On the basis of the respondents' answers and informal interviews conducted at the 3rd Annual Conference of the Croatian Association of Corporate Treasurers held in September 2006, we have concluded that, in spite of the fact that there is an increasing number of Croatian non-financial companies which are aware of the importance of corporate risk management, a lack of suitable instruments offered to them by the domestic financial industry becomes a leading factor why many companies do not use derivatives when managing risks. Other reasons such as concerns about perceptions of derivatives use by investors, regulators and the public or insufficient knowledge about financial risk management instruments are not very important reasons why the Slovenian and Croatian companies do not hedge.

After presenting descriptive statistics, we have conducted univariate analysis for the two different groups. *Firstly*, we have explored differences between hedgers and nonhedgers, and *secondly* we have investigated differences between companies that are derivative users and those companies that do not use derivatives. In both cases, we have employed the Pearson test of correlation as well as t-test to determine if the means of two unrelated samples differ regarding the size of the company, financial leverage, growth opportunities, managerial shareholdings, taxes, alternative financial policy as substitutes for hedging or institutional investors' ownership.

According to a mean comparison test for Croatian hedgers and nonhedgers, the hedgers are statistically different from nonhedgers with respect to variable that proxy for alternative financial policy as substitutes for hedging. Hedgers have a statistically greater quick ratio as a measure of short-term liquidity. We argued in chapter 2 that, although hedge substitutes are not considered as a special kind of risk management strategy, alternative financial policies can also reduce a firm's risk without requiring the firm to directly engage in risk management activities. Firms could adopt conservative financial policies such as maintaining low leverage and a low dividend pay-out ratio or carrying large cash balances to protect them against potential financial difficulties (a form of negative leverage). Greater use of these substitute risk management activities should be associated with less financial risk management activities. Therefore, the coefficient on quick ratio is predicted to be negative (see: Nance, Smith and Smithson, 1993; Tufano, 1996; Getzy, Minton and Schrand, 1997; Pulvino, 1998 and Harford, 1999). Contrary to our prediction as well as to the findings of the cited studies, our results show a positive relation between the decision to hedge and this explanatory variable, suggesting that companies that are more liquid are more likely to hedge. Therefore, our assumption regarding hedging substitutes should be rejected in the case of the Croatian companies.

Additionally, t-test has shown that the Croatian hedgers have a statistically higher share owed by foreign investors in comparison with nonhedgers, which is confirmed by the Pearson correlation coefficient. Although other scholars have not examined this hypothesis, the specific economic situation in Croatia and the high value of foreign direct investment in the last five years have prompted us to examine whether foreign ownership of a company plays an important role in the decision to hedge risks. The result, which shows that the Croatian hedgers have a statistically higher share owed by foreign investors in comparison with nonhedgers, leads to the conclusion that investing companies which have headquarters in developed countries (major investors in the Croatian business sector are companies from Austria, Germany and Italy) have enforced employment of corporate risk management in the acquired Croatian companies.

Other results of univariate tests suggest that hedgers are not statistically different from nonhedgers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items or managerial utility. Therefore, we should reject all research hypotheses regarding shareholder maximisation as well as managerial utility maximisation in the case of Croatian companies. Additionally, we should reject our hypothesis regarding alternative financial policies that substitute for risk management strategies. Our findings predict the opposite sign to what we assumed, suggesting that the Croatian companies that are more liquid have more incentives to hedge. However, it needs to be mentioned that Froot, Scharfstein and Stein (1993) have predicted a positive association between liquidity and hedging, which results from the interpretation of liquidity not as a substitute for hedging, but as a measure of the availability of internal funds. Therefore, we argue that the positive relation between the decision to hedge and quick ratio can be explained by the capital market imperfection and costly external financing hypothesis and not by hedging substitute's rationale.

Regarding the univariate analysis of the Croatian derivative users vs derivative nonusers, t-test has discovered that derivative users are statistically different from nonusers with respect to variables that are proxies for alternative financial policy as substitutes for hedging as well as for capital market imperfection and costly external financing**.** Derivative users have a statistically greater quick ratio and a greater ratio of investment expenditures to the book value of assets. This finding suggests that these two groups differ with respect to proxies for short-term liquidity and investment (growth) opportunities. Similarly to the analysis of hedgers and nonhedgers, our results suggest that the Croatian companies that are more liquid use derivatives more intensively, which is also confirmed by the Pearson correlation coefficient. This result is contrary to our predictions and to the findings of Nance, Smith and Smithson (1993), Tufano (1996), Getzy, Minton and Schrand (1997), Pulvino (1998) and Harford (1999). Here we also argue that the positive relation between the decision to hedge and quick ratio can be explained by the capital market imperfection and costly external financing hypothesis and not by hedging substitute's rationale. Froot, Scharfstein and Stein (1993) have predicted a positive association between liquidity and hedging, which results from the interpretation of liquidity not as a substitute for hedging, but as a measure of the availability of internal funds.

In respect to the other statistically significant variable, our t-test has shown that derivative users have statistically higher value of investment expenditures to the book value of assets, which is confirmed by the correlation analysis. This result suggests that there is a positive relation between the value of a company's investment and the decision to use derivatives, which is consistent with our prediction and the findings of Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and

Schrand (1997) and Allayannis and Ofek (2001). They have proven that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set, because the reduction of cash flow volatility with hedging can improve the probability of having sufficient internal funds for planned investments eliminating the need either to cut profitable projects or bear the transaction costs of obtaining external funding. Other variables that have been used to test the capital market imperfection hypothesis have not shown statistically significant differences between analysed derivative users and nonusers.

On the basis of t-tests and correlation analysis, it could be concluded that the Croatian derivative users are not statistically different from nonusers with respect to other research assumptions regarding the cost of financial distress, agency cost of debt, tax preference items, or managerial utility. Similarly to the findings for the Croatian hedgers and nonhedgers, we should reject all research assumptions regarding the managerial utility maximisation hypothesis and shareholder maximisation hypothesis, apart from the capital market imperfection and costly external financing assumption.

Comparison of the Croatian univariate analysis results with the findings of the identical analysis conducted for the Slovenian sample has revealed that the tested hedging theories have little predictive power regarding the risk management practices in both countries. Univariate tests have discovered that the Slovenian hedgers as well as derivative users are statistically different from nonhedgers and derivative nonusers with respect only to the coefficient of the publicly held company dummy variable that proxy for alternative financial policy as substitutes for hedging. A positive relation between the decision to hedge or to use derivatives and the coefficient of the publicly held company dummy variable leads to the conclusion that companies that list their shares on the stock-exchange have more incentives to hedge and use derivatives as risk management instruments., while privately held companies do not act in a risk-averse manner and do not hedge.

This is contrary to what we predicted in our assumption connected to the different behaviour of publicly traded and privately held stock companies with regard to risk management (e.g. see: Stulz, 1984; Smith and Stulz, 1985; Froot, Scharfstein and Stein, 1993; Cummins, Phillips and Smith, 2001). Stulz (1984), Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993) constructed models of corporate hedging, which have predicted that firms attempt to reduce the risks they face if they have poorly diversified and risk-averse owners. Cummins, Phillips and Smith (2001) have expected that the owners of closely held firms may exhibit a degree of risk aversion, to the extent that the wealth of the shareholders is sub-optimally diversified because of their holdings in the company. They have predicted that, if closely held firms tend to be risk-averse, the coefficient of the publicly held company dummy variable is predicted to be negative.

As our univariate test has revealed the coefficient of the publicly traded company dummy variable to be positive, our research assumption should be rejected. We believe the explanation for this result can be found in the fact that, regardless to the opinion that the ownership of publicly traded companies is well diversified, research results have shown that even 64.7 per cent of the analysed Slovenian companies are owned by the major shareholder, meaning that there is one owner who has more than 50 per cent of a company's shares and has a power to control the business. Therefore, it can be argued that the major shareholder has poorly diversified wealth and therefore acts in risk-averse manner. Another explanation for the positive coefficient of the publicly held company dummy variable could be found in the fact that publicly traded companies, which act in a risk-averse manner tend to signal good news to investors on the financial market as well as to all company's stakeholders, because a company that manages its risk exposures is seen as a less risky investment or a better rated business partner. However, to the best of our knowledge, we cannot support this argument by theoretical or empirical evidence, meaning that this second explanation is based only on our opinion.

Other univariate results have shown that the Slovenian hedgers and derivative users are not statistically different from nonhedgers and derivative nonusers with respect to the cost of financial distress, agency cost of debt, capital market imperfection, tax preference items or managerial utility. Therefore, we should reject all research assumptions regarding the shareholder maximisation hypothesis and managerial utility maximisation hypothesis for the Slovenian companies.

We have concluded our analysis by employing the multivariate regression model. Binominal logistic regression was estimated to distinguish among the possible explanations for the decision to hedge and to use derivative. We have chosen binomial (or binary) logistic regression because it is a form of regression which is used when the dependent variable is a dichotomy (limited, discrete and not continuous) and the independents are of any type. In the first group of companies, named “hedgers”, we included not only companies that use derivatives instruments as an instrument of corporate risk management, but also companies that use other types of hedging strategies such as debt with embedded options, operational hedging, natural hedging, international diversification of business, etc.

The majority of the earlier empirical studies on risk management such as Nance, Smith and Smithson (1993), Mian (1996), Geczy, Minton and Schrand (1997), Allayannis and Weston (2001) and Cummins, Phillips and Smith (2001) have used a dichotomous variable that equalled one if a firm used derivatives and zero if it did not. Because of the decision to include all financial risk management activities, our dichotomous variable should not be subject to the inaccurate categorisation of functionally equivalent financial position. This allowed us to disentangle derivatives activity from risk management activity, which is a major advantage of our approach.

We have expanded our analysis only to companies that use derivatives as risk management instruments. As we have already explained, among companies that manage financial risks, there is a substantial number of hedgers who do not use derivatives, but manage risk exposure with some other instruments like natural hedge, operational hedging etc. By separating derivative users from companies that do not use derivatives, our intention was to explore whether some specific company characteristics affect the decision to hedge by using derivative instruments.

The variables tested in multivariate analysis were based on the determinants we have presented in the literature review as the key rationales of corporate hedging decision. In our logistic model we have tested whether the decision to hedge or not, and the decision to hedge with derivatives, is a function of the six factors – the financial distress costs, agency costs, capital market imperfections, taxes, managerial utility and hedge substitutes. Because multiple proxies were available to measure some firm characteristics, we have estimated separate logistic regressions, using all possible combinations of variables representing each predicted construct.

The multivariate regression model for the Croatian companies has revealed that the corporate decision to hedge is related to the company's credit rating, investment expenditures-to-assets ratio and share of the company owned by management. Company credit rating is a proxy for the agency cost of debt. In our research assumptions we argue that firms that have a credit rating hedge less extensively. The severity of agency cost of debt is related to the extent of informational asymmetries present in the firm and it is expected that firms with greater asymmetric information problems are more likely to have a greater incentive to engage in risk-shifting and under-investment activities. Our evidence is inconsistent with the predictions derived from the agency cost of debt model, because the relationship between the dependent variable and credit rating in our model is positive, leading to the conclusion that companies that have a credit rating hedge more extensively.

This is contrary to the findings of DeMarzo and Duffie (1991) and Haushalter (2000), who have proven that firms with a credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry benefit greatly from risk management activity. An alternative variable that has been used as proxy for the agency cost (the share of the company owned by institutional investors) has not been shown as relevant for making the decision to hedge. We argue that positive relation between the decision to hedge and company's credit rating can be explained by the fact that the activity of corporate risk management has a positive influence on the company's rating grade, because a company that manages its risk exposures is seen as a less risky investment or a better rated business partner. However, we cannot support this argument by theoretical or empirical evidence, meaning that this explanation is based only on our opinion and that further research should be conducted to test this assumption.

The investment expenditures-to-assets ratio, which controls for company's investment (growth) opportunities, is very important in the model because it tests our prediction that hedgers are more likely to have larger investment opportunities (e.g. see: Froot, Scharfstein and Stein (1993) for theoretical arguments, or Bessembinder (1991), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001) for empirical evidence). They have argued that reducing cash flow volatility with hedging can improve the probability of having sufficient internal funds for planned investments eliminating the need either to cut profitable projects or bear the transaction costs of obtaining external funding. The main hypothesis is that, if access to external financing (debt and/or equity) is costly, firms with investment projects requiring funding will hedge their cash flows to avoid a shortfall in their funds, which could precipitate a costly visit to the capital markets. An interesting empirical insight based on this rationale is that firms which have substantial growth opportunities and face high costs when raising funds under financial distress will have an incentive to hedge more of their exposure than the average firm.

The results of our logistic model support this prediction and show a statistically significant positive relation between the decision to hedge and investment expenditures-to-assets ratio. However, robustness tests employed by replacing investment expenditures-to-assets ratio with other variables that were used as proxies for capital market imperfections and costly external financing hypothesis have not shown statistically significant results. These findings suggest that the association between hedging and capital market imperfections is not robust. Overall, the data, at best, provide a weak support for the prediction of the tested hypothesis.

The third variable that is statistically significant in our model is the fraction of the firm's outstanding shares held by the company's management. We argue that, because a firm's managers have limited ability to diversify their own personal wealth position associated with the stock holdings and their earnings' capitalisation, they have strong incentives to hedge. Usually that kind of hedging is not conducted to improve the value of company's stockholders but to improve managers' own wealth. To avoid this problem, managerial compensation contracts need to be designed so that when managers increase the value of the firm, they also increase their expected utility. This can usually be achieved by adding option-like provisions to managerial contracts. This rationale was firstly proposed by Stulz (1984) and has been further explored by Smith and Stulz (1985). The results of some empirical studies have confirmed this hypothesis (e.g., see Tufano, 1996; Gay and Nam, 1998), while, in contrast, Geczy, Minton and Schrand (1997) and Haushalter (2000) have not found evidence that corporate hedging is affected by managerial shareholdings.

Our results show a negative relation between the decision to hedge and share of the company owned by management, which leads to the conclusion that firms that have a greater fraction of outstanding shares held by the company's management have less incentives to hedge. This is contrary to our prediction, and to the evidence of Tufano (1996), who has found that firms whose managers have more wealth invested in the firm's stocks manage more corporate risks. Other variables that were employed as proxies for the managerial utility hypothesis (value of company share owned by management, managers' ownership of stock options, managers' age and tenure) were not statistically significant in the model. Therefore we should reject the hypothesis regarding managerial utility maximisation.

However, we need to emphasise that the inability to use variables employed in other studies (see e.g.: Smith and Stulz, 1985; Tufano, 1996; Geczy, Minton and Schrand, 1997; Gay and Nam, 1998; Haushalter, 2000) as proxies for the extent to which options are used in managers' compensation plans[21], has prevented us from testing whether managerial option holdings in Croatian companies has an impact on the fact that managers who own company's shares do not act in a risk averse manner and have less incentive to hedge corporate risks. Managerial option holdings are not available as public information in the case of Croatian companies and managers were not willing to reveal this information in the survey questionnaire.

Therefore, we believe a negative relation between the decision to hedge and share of the company owned by management can be explained by the fact that, apart from stock holdings, Croatian managers also have option-like provisions. It has been proven (see: Tufano, 1996; Gay and Nam, 1998) that managers with greater option holdings would prefer less risk management. The theoretical explanation for this is offered by Smith and Stulz (1985) who claimed that managers' compensation plans can influence their hedging choices. They

[21] Like the total option holdings held by officers and directors or the market value of shares that could be owned by managers and directors by exercising their options.

argued that the expected utility of managerial wealth has the shape of a convex function of the firm's expected profits when managers own unexercised options. Therefore, the more option-like features there are in the compensation plans, the less managers will hedge. In this case, managers can choose to increase the risk of the firm in order to increase the value of their options. Yet, further research among the analysed Croatian companies should be conducted to confirm this argument as it is based only on our opinion, not on empirical evidence.

Overall, it could be concluded that the evidence based on an empirical relation between the decision to hedge made by Croatian non-financial companies and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility and hedge substitutes, fails to provide any support for any of the tested hypotheses but one - capital market imperfections and costly external financing measured by investment expenditures-to-assets ratio. Regarding this result, we need to emphasise that the association between hedging and capital market imperfections is not robust to other variables employed as proxies for testing this hypothesis. Moreover, the multivariate regression model conducted for the Slovenian hedgers has revealed that there is no statistically significant explanatory variable, therefore it could be concluded that the decision to hedge in Slovenian companies is not dependent on any of the predicted theories of hedging.

When we used a company's decision to use derivative instruments as a dependent variable, the multivariate analysis conducted for Croatian companies showed that the use of derivative instruments is related only to two variables - investment expenditures-to-assets ratio and quick ratio. The investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant positive relation with the decision to use derivatives. This result is consistent with the results of multivariate analysis regarding the decision to hedge corporate risks in Croatian companies, where it has been shown that companies with a higher investment-to-assets ratio have more incentives to hedge. Additionally, the result is consistent with the results of univariate analysis for the sample of Croatian derivative users/nonusers, where t-test and correlation analysis have shown that derivative users have a statistically higher value of this ratio, as well as to the findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001).

This finding supports our prediction that a firm's decision to hedge is positively related to measures for investment (growth) opportunities. Again, as in the case of sample hedgers/nonhedgers, we conducted a robustness test regarding this result by employing other variables that were used as proxies for capital market imperfections and costly external financing hypothesis. The results for alternative regression variables were not statistically significant. These findings suggest that the association between derivative use and capital market imperfections is not robust.

In respect of the statistically significant quick ratio as a measure of a company's liquidity and substitute for hedging, consistently with the findings of univariate analysis conducted for the samples of Croatian hedgers/nonhedgers and for derivative users/nonusers, the multivariate analysis results show a positive relation between the decision to use derivatives and the value of quick ratio, suggesting that companies that are more liquid have more incentives to use derivatives. As we predicted a negative relation for this variable, and our prediction was based on the findings of Nance, Smith and Smithson (1993), Tufano (1996), Getzy, Minton and Schrand (1997), Pulvino (1998) and Harford (1999), we should reject the hypothesis regarding hedging substitutes. Other variables that were employed to test the hedging substitutes' hypothesis were not significant in the model. However, it needs to be mentioned that Froot, Scharfstein and Stein (1993) have predicted a positive association between liquidity and hedging, which results from the interpretation of liquidity not as a substitute for hedging, but as a measure of the availability of internal funds. Therefore, we argue that the positive relation between the decision to hedge and quick ratio can be explained by the capital market imperfection and costly external financing hypothesis and not by hedging substitute's rationale.

Regarding the corporate decision to use derivative instruments in the Slovenian companies, the regression model has shown that this decision is related to three variables – total sales revenues, investment expenditures-to-assets ratio and credit rating. Total sales revenues are a proxy for the effect of size on the decision to use derivatives as risk management instruments. The regression model has revealed a positive relation between the decision to use derivatives and the size of the company, implying that it is more likely for larger Slovenian companies to use derivatives. Several previous empirical studies (e.g. Nance, Smith and Smithson, 1993; Dolde, 1995; Mian, 1996; Géczy, Minton and Schrand, 1997; Allayannis and Weston, 2001) have found that firms with more assets are more likely to hedge. These studies have contended that the positive correlation between the size and hedging can be attributed to significant economies of scale in information and transaction costs of hedging. We have also predicted a positive relation between the company's size and decision to hedge. The regression results support our hypothesis for the Slovenian companies. It should be noted that the alternative variable that has been used as proxy for the company's size (the value of total assets), has not been shown as relevant for making the decision to use derivatives. Therefore, our result regarding the company's size and the decision to use derivatives is not robust.

A positive relation between the company's size and decision to use derivatives can be related to the most important reasons why Slovenian companies do not use derivatives, which were discussed earlier in this chapter. Slovenian financial managers have addressed the high costs of establishing and maintaining risk management programs that exceed the benefits of it together with the high cost of financial risk management instruments as very important reasons that have prevented them from using derivatives. In addition to economies of scale in obtaining information on hedging techniques and instruments, there are also economies of scale in transaction costs associated with trading financial derivatives. These facts suggest there are sizable set-up costs related to operating a corporate risk-management program. A substantial number of the analysed Slovenian companies do not use derivatives, even though they are exposed to financial risks, simply because it is not an economically worthwhile activity. It can be concluded that these companies are not large enough as it is proven that the company's size is relevant factor in the decision to use derivative instruments.

Another variable that is significant for the decision of the Slovenian companies to use derivatives is a company's credit rating as a proxy for the agency cost of debt. The relationship between the dependent variable and company's credit rating in our model is positive, leading to the conclusion that companies that have credit rating use derivative instruments more extensively. This evidence is inconsistent with our prediction and with the findings of DeMarzo and Duffie (1991) and Haushalter (2000), who have proven that firms with credit rating hedge less extensively, while firms without credit rating and therefore greater informational asymmetry benefit greatly from risk management activity. Therefore, we should reject our hypothesis related to the agency cost of debt and asymmetric information problems for the Slovenian companies.

It should be emphasised that we have proven the identical result when we analysed the decision of Croatian companies to hedge or not to hedge, where we also found a positive relation with the credit rating variable. We argue that a positive relation between the decision to hedge and company's credit rating can be explained by the fact that the activity of corporate risk management has a positive influence on the company's rating grade, because a company that manages its risk exposures is seen as a less risky investment or a better rated business partner. However, we cannot support this argument by theoretical or empirical evidence, meaning that this explanation is based only on our opinion. Further research should be conducted to explore this thesis.

Finally, investment expenditures-to-assets ratio, as a proxy for capital market imperfections and costly external financing, has a statistically significant negative relation with the decision to use derivatives. The results of the logistic model do not support our prediction that a firm's decision to hedge by using derivatives is positively related to measures for investment (growth) opportunities. Additionally, this finding is inconsistent with our findings regarding the Croatian companies, as well as with the findings of Bessembinder (1991), Froot, Scharfstein and Stein (1993), Dobson and Soenen (1993), Nance, Smith and Smithson (1993), Getzy, Minton and Schrand (1997) and Allayannis and Ofek (2001), who have also proven a positive relation between the decision to hedge and a company's investment (growth) opportunities.

The negative relation found in the case of the Slovenian companies suggest that companies which have less investment (growth) opportunities have more incentives to hedge with derivative instruments. Again, we conducted a robustness test in order to further investigate this result and found no statistically significant variables in the employed separate logistic regressions. These findings suggest that the capital market imperfection hypothesis, which imply that the benefits of hedging should be greater the more growth options are in the firm's investment opportunity set, should be rejected in the case of the Slovenian companies. This is an interesting result if we compare it with the findings of the Croatian sample, where we have proven a positive relation between both the decision to hedge and use derivatives and the company's investment (growth) opportunities. Further research should be carried out to explore why Slovenian companies that invest less in the growth opportunities have more incentives to use derivative instruments, when there is both theoretical and empirical evidence that firms with investment projects requiring funding hedge their cash flows to avoid a shortfall in their funds.

Overall, on the basis of the research results it could be concluded that the explored hedging rationales have little predictive power in explaining financial risk management decisions both in Croatian and Slovenian companies. The evidence based on univariate and multivariate empirical relations between the decision to hedge or use derivatives in Croatian non-financial companies and financial distress costs, agency costs, capital market imperfections and costly external financing, taxes, managerial utility and hedge substitutes, fails to provide any support for any of the tested hypotheses but one - capital market imperfections and costly external financing measured by investment expenditures-to-assets ratio.

The univariate analysis and multivariate regression conducted for the Slovenian companies have revealed that there is no statistically significant explanatory variable for the decision to hedge; therefore we can conclude it is not dependent on any of the predicted theories of hedging. The decision to use derivatives, however, has been shown as dependent on the size of the company. The multivariate test has proven a positive relation between the use of derivatives and the size of Slovenian companies, which supports the informational and transactional scale economies argument that larger firms will be more likely to use derivatives.

The analysis conducted to explore differences between risk management practices in Slovenian and Croatian companies has shown statistically significant evidence that Slovenian companies use all types of derivatives, especially structured derivatives, more intensively than Croatian companies. Additionally, Croatian companies use simple risk management instruments like natural hedging to a greater extent in comparison with Slovenian companies. These findings are consistent with our research prediction that Slovenian companies have more advanced risk management practices than Croatian companies.

Moreover, our analysis has revealed statistically significant relations between the decision to hedge or use derivatives and different hedging theories, but these relations are contrary to the predicted sign. Univariate tests conducted for the hedging substitutes' hypothesis have shown that the Croatian hedgers and derivative users have a statistically greater quick ratio, which is confirmed by the multivariate analysis. Therefore, not only have we rejected the assumption that less liquid companies have more incentives to hedge, but we have proven that companies that are more liquid are more likely to hedge.

The positive relation between the decision of Slovenian companies to hedge or use derivatives and the coefficient of the publicly held company dummy variable leads to conclusion that companies which list their shares on the stock-exchange have more incentives to hedge and use derivatives as risk management instruments. We have predicted that, if closely held firms tend to be risk-averse, the coefficient of the publicly held company dummy variable is negative. Therefore, the hypothesis regarding the different behaviour of publicly traded and privately held stock companies with regard to risk management is proven to be relevant, but it is rejected because the relation is reversed – publicly traded companies are more risk-averse in comparison with those that are privately held.

Other hypotheses where the opposite sign has been proven are managerial utility maximisation in the case of the Croatian companies and costly external financing in the case of the Slovenian companies, together with the agency cost of debt hypothesis in both countries. The multivariate regression model conducted for the Croatian companies has revealed that the corporate decision to hedge is positively related to the company's credit rating and negatively related to the share of the company owned by management, while the regression model employed for the Slovenian companies has shown that the decision to use derivatives is positively related to a credit rating and negatively related to investment expenditures-to-assets ratio. Therefore, we can conclude that both the Croatian and Slovenian companies that have a credit rating, and therefore less asymmetric information, have more incentives to hedge. Additionally, the Croatian companies where managers have more wealth invested in company stocks are less likely to hedge, which can also be said for the Slovenian companies that have more investment opportunities.

Our thesis contributes to the existing theory as it indicates the weak predictive power of well-known and accepted hedging theories on corporate risk management behaviour in the Croatian and Slovenian companies. Our research has confirmed that, in spite of the extensive body of literature on corporate risk management and the efforts that have been devoted to developing theoretical rationales for hedging, there is no single accepted framework which can be used to guide hedging strategies, and no widely accepted explanations for risk management as a corporate policy. The majority of existing studies, from which this conclusion has been drawn, were conducted on American or Western European companies. The contribution of our thesis is in bringing new empirical evidence on hedging rationales and practices of corporate risk management in South-eastern European countries, which confirms such a conclusion.

Directions for further research stem from the research findings as well as from missed opportunities that indicate avenues for future research. It would be worthwhile to conduct a more comprehensive and detailed analysis of reasons why our research has revealed several statistically significant relations between the decision to hedge or use derivatives and different hedging theories, but these relations were contrary to the predicted sign. Further research should find answers to the following questions:

- Why the Slovenian companies which list their shares on the stock-exchange have more incentives to hedge and use derivatives as risk management instruments
- Why the Slovenian companies which have less investment opportunities have more incentives to use derivatives as risk management instruments

- Why the Croatian companies whose managers have more wealth invested in the company stocks hedge less
- Why the Croatian companies which are more liquid have more incentives to hedge and use derivatives as risk management instruments
- Why the Croatian and Slovenian companies which have credit rating and therefore less asymmetric information, have more incentives to hedge.

The advantage of our work is that it provides an impetus for further research to address these issues and move beyond the existing hedging theories, which have proven inadequate in explaining risk management decisions in the Croatian and Slovenian companies. We believe that this cannot be accomplished by using the same research methods as we have used in our thesis. Qualitative methods such as the in-depth explanatory case study type of research need to be employed because they enable scholars to expand existing theories or test new ones, and to produce results that can be generalised. As discussed by Spicer (1992), the objective of case study research is not to draw inferences to a larger population based on sample evidence, but rather to generalise back to the theory.

Further research should explore why the analysed Croatian and Slovenian companies act in the opposite way to what was predicted by existing hedging theories. By using explanatory case study research, new theories which provide a convincing explanation of hedging behaviour should be retained and used in other case studies, while theories that do not offer an explanation should be modified or rejected. This kind of approach provides scholars with a deeper understanding of the research problem and offers possible solutions. We believe that the in-depth explanatory case study type of research would enable a more comprehensive analysis of corporate risk management rationales in the Croatian and Slovenian companies and consequently find answers to the questions this thesis has left open.

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APPENDICES

1. LETTER TO FINANCIAL MANAGERS

Dear Sir/Madam

I would like to ask for your participation in a research project conducted by a doctoral student MSc Danijela Miloš on corporate risk management in Slovenian and Croatian companies. MSc Danijela Miloš is a research assistant at the Faculty of Economics University of Zagreb in Croatia. Moreover, she is a doctoral student at the University of Greenwich Business School, London, UK, under tutorship of professor Željko Šević and this research project is a part of her dissertation. MSc Danijela Miloš has a status of a visiting research assistant at the Faculty of Economics Ljubljana, where I am appointed her supervisor as I am a fellow professor at the University of Greenwich Business School, London.

Her research aims to explore existing practice of Slovenian and Croatian companies connected with different activities and instruments that companies use when managing corporate risks. In this way, the development of corporate risk management practices has been monitored and compared to the world trends. Only the biggest and most successful Slovenian and Croatian companies are included in this research. On the basis of the research results, Ms Miloš is planning to develop a model that will show which corporate characteristics influence company's decision to manage corporate risks.

As you know, in modern and dynamic economic surrounding, corporate risk management has become a very important activity and plays an important role in improving company's success and competitiveness. With these new trends, a need to quantify and pursue this corporate function has emerged. We believe that you are aware of this fact as well as we are, so we should both share the same interest. Hence, we need your cooperation in collecting relevant data to realise this idea. Therefore, we will be very grateful if you could spend a few minutes of your time and fill out a questionnaire that is enclosed with this letter.

As a sign of our gratitude, after we analyse collected data, we will send you the Report on corporate risk management practices. We believe that the Report will be very useful to you as you will be able to compare risk management practice of your own company to the practice of other companies in the sample, as well as to evaluate feasibility of this corporate function and its contribution to the company's success.

It is very important to emphasise that collected data will be analysed and reported only in an aggregate form, which means that your company specific data will be attainable only to Ms Miloš, and that it will not be published nor publicly available.

If you are interested for this cooperation, we would like to ask you to fill out the questionnaire by the 20th of September 2006, and to send it back to the Faculty of Economics Ljubljana using addressed envelope that is enclosed in the letter.

We hope that you will find this cooperation interesting and we are looking forward to hearing from you.

Sincerely

Metka Tekavčič PhD
Vice-Dean for Finance and Administration

If you do not want to use the addressed envelope, please send a questionnaire to the following address:
Danijela Miloš, Ekonomski fakultet Zagreb
Trg J. F. Kennedya 6, 10 000 Zagreb
Croatia

2. SURVEY QUESTIONNAIRE

1. **What is the intensity of influence (on the scale from 1 to 5) of the following types of financial risks on the performance of your company?**

	Low intensity/effect				High intensity/effect
	1	**2**	**3**	**4**	**5**
a) Currency risk	☐	☐	☐	☐	☐
b) Interest rate risk	☐	☐	☐	☐	☐
c) Price risk	☐	☐	☐	☐	☐

2. **Does your company manage financial risks? (NOTE: it is possible to mark several answers)**

   a) Yes, we manage all kinds of financial risk (currency, interest-rate and price risk)

   b) Yes, but we manage only interest-rate risk.

   c) Yes, but we manage only currency risk.

   d) Yes, but we manage only price risk.

   e) No, we do not manage financial risks at al.

NOTE: If your company manages financial risks, please answer to all questions, except the question number 13. If your company does not manage financial risks, please go directly to the question number 13.

3. **Which of the following instruments are used in your company as a currency risk management tool?**
NOTE: it is possible to mark more than one instrument. If some of instruments numbered bellow is used in your company, please mark it with X and give a grade to it regarding its importance in risk management strategy. For instruments you are not using, do not mark it at al.

Instrument	**In use**	**Importance 1-3 (1 less important, 2 important, 3 very important)**
20. Natural hedge or netting		
21. Matching currency structure of assets and liabilities (e.g. debt in foreign currency)		
22. Currency forward		
23. Currency futures		
24. Currency swap		
25. Stock-Exchange Currency option		
26. OTC (over-the-counter) currency option		
27. Structured derivatives (e.g. currency swaption)		
28. Hybrid securities (e.g. convertible bonds or preferred stocks)		
29. Operational hedging (International diversification – moving part of the business abroad)		
30. Something else? Please name what!		

4. **Which of the following instruments are used in your company as an interest-rate risk management tool?**
NOTE: it is possible to mark more than one instrument. If some of instruments numbered bellow is used in your company, please mark it with X and give a grade to it regarding its importance in risk management strategy. For instruments you are not using, do not mark it at al.

Instrument	**In use**	**Importance 1-3 (1 less important, 2 important, 3 very important)**
1. Matching maturity of assets and liabilities		
2. Interest rate forward		
3. Interest rate futures		
4. Interest rate swap		
5. Stock-Exchange interest rate option		
6. OTC (over-the-counter) interest rate option		
7. Structured derivatives (e.g. cap, floor, collar, corridor or swaption)		
8. Hybrid securities (e.g. convertible bonds or preferred stocks)		
9. Something else? Please name what!		

5. Which of the following instruments are used in your company as a price risk management tool?
NOTE: it is possible to mark more than one instrument. If some of instruments numbered bellow is used in your company, please mark it with X and give a grade to it regarding its importance in risk management strategy. For instruments you are not using, do not mark it at al.

Instrument	**In use**	**Importance 1-3 (1 less important, 2 important, 3 very important)**
1. Natural hedge or netting		
2. Managing assets and liabilities		
3. Commodity forward		
4. Commodity futures		
5. Commodity swap		
6. Commodity option		
7. OTC (over-the-counter) commodity option)		
8. Structured derivatives (combination of swaps, future contacts and options)		
9. Business diversification through mergers, acquisitions, and other business combinations)		
10. Something else? Please name what!		

6. How would you describe risk management policy in your company regarding its scope?

a) We manage a particular risk exposure completely (complete hedge)

b) We cover/manage only potential losses caused by the possible negative changes of financial prices (interest-rate, exchange rate or price changes), but we leave a possibility of potential gains open if changes of the financial prices have a positive impact on the performance of our company (partial or selective hedge)

7. For each of the following exposures, which one describes the best your company's typical hedging horizon?

a) Risk is managed for transaction with maturity up to a year time

b) Risk is managed for transaction with maturity up to a two year time

c) Risk is managed for transaction with maturity up to a five year time

d) Risk is managed for transaction with maturity longer than a five year time

8. On the scale from one to five, please give grades to the following risk management aims regarding their importance in risk management policy of your company.

	Not important 1	2	3	4	Very important 5
a) Managing accounting earnings volatility	☐	☐	☐	☐	☐
b) Managing cash flow volatility	☐	☐	☐	☐	☐
c) Managing balance sheet and financial ratios	☐	☐	☐	☐	☐
d) Managing market value of the company	☐	☐	☐	☐	☐

9. Does you company have a documented policy regarding the use of financial risk management instruments?

a) Yes

b) No

10. Does your company use "Value-at-Risk" (VaR) as a measure of risk exposure?

a) Yes

b) No

11. Does your company use Monte Carlo analysis or some other type of simulation techniques as a measure of risk exposure?

a) Yes

b) No

12. Please give grades (on the scale from 1 to 5) to the following financial institutions regarding their importance in providing derivative instruments to your company.

	Not important 1	2	3	4	Very important 5
a) Commercial banks	☐	☐	☐	☐	☐
b) Investment banks	☐	☐	☐	☐	☐
c) Insurance companies	☐	☐	☐	☐	☐
d) Exchange/brokerage houses	☐	☐	☐	☐	☐
e) Some other institutions? Please name which ones!	☐	☐	☐	☐	☐

13. If your company does not manage financial risks, please give grades to the following factors (regarding their importance on the scale from 1 to 5) if they have influenced a decision not to manage risk in your company.

	Not important 1	2	3	4	Very important 5
a) Insufficient exposure to financial risks	☐	☐	☐	☐	☐
b) Insufficient knowledge about financial risk management instruments and their use	☐	☐	☐	☐	☐
c) Financial risk management instruments are not efficient	☐	☐	☐	☐	☐
d) Financial risk management instruments are too expensive	☐	☐	☐	☐	☐
e) Difficulties in pricing and valuing derivatives	☐	☐	☐	☐	☐
f) Concerns about perceptions of derivatives use by investors, regulators and the public	☐	☐	☐	☐	☐
g) Costs of establishing and maintaining a risk management program exceed the expected benefits	☐	☐	☐	☐	☐
h) Supply of risk management instruments traded on domestic financial market is insufficient	☐	☐	☐	☐	☐
i) Supply of risk management instruments offered by financial institutions is insufficient	☐	☐	☐	☐	☐
j) Something else? Please name what!	☐	☐	☐	☐	☐

NOTE: We would like to ask all survey participants, those whose companies manage as well as not manage financial risks, to complete the following section of a questionnaire (questions from the number 14 to 41)

14. What is the share of your company owned by management? (e.g. 23%) -----------------------%

15. Does management own call options on your company's common stocks?

a) Yes
b) No

16. What is the share of your company owned by institutional investors (banks, insurance company, mutual funds or brokerage house)

------------------------%

17. Please estimate (at least approximately) what is the share of your company owned by:

a) State -----------------------%
b) Major shareholders -----------------------%
c) Minority shareholders -----------------------%

18. What is the share of your company owned by foreign investors? --------------------------%

19. What business market (regarding geographical orientation) your company is primarily oriented to?

a) National
b) Regional
c) European
d) International

20. What was your company's book value of <u>the long-term debt</u> in 2005?

Long-term debt in 2005.

21. What was your company's book value of <u>the total debt</u> (long and short-term) in 2005?

Total debt in 2005.

22. What was your company's book value of <u>the total common equity (preferred capital excluded)</u> in 2005?

Total common equity in 2005.

23. What was your company's book value of <u>the preferred equity</u> in 2005?

Preferred equity in 2005.

24. What was your company's book value of <u>the convertible debt</u> in 2005?

Convertible debt in 2005.

25. What was your company's book value of <u>the total assets</u> (long and short-term) in 2005?

Total assets in 2005.

26. What was your company's book value of <u>the total short-term assets</u> in 2005?

Total short-term assets in 2005.

27. What was your company's book value of <u>the money and short-term securities</u> in 2005?

Money and short-term securities in 2005.

28. What was your company's value of <u>the interest cost</u> in 2005?

Interest costs in 2005.

29. What was the value of <u>the earnings before interest and taxes</u> (EBIT) in 2005?

Earnings before interest and taxes in 2005.

30. What was the value of <u>the research and development (R&D) expenditures</u> in 2005?

Research and development expenditures in 2005.

31. What was the value of <u>the total sales revenues</u> of your company in 2005?

Total sales revenues in 2005.

32. What was the <u>value invested in long term assets and operating capital</u> of your company in 2005?

Investment in long-term assets in 2005.

33. What was the value of <u>the earnings after interest and taxes</u> (net income available to owners) in 2005?

Net income in 2005.

34. What was the value of <u>the investment tax credits</u> of your company in 2005?

Investment tax credits in 2005.

35. What was the value of <u>the net operating loss carry-forwards</u> of your company in 2005?

Net operating loss carry-forwards in 2005.

36. What percentage of <u>the net income</u> was distributed through dividends (the dividend pay-out ratio) to the owners in 2005?

Dividend pay out ratio in 2005.
%

37. Are the shares of your company listed on the stock-exchange?

a) Yes
b) No

38. Does your company have credit rating rated by rating agencies?

a) Yes
b) No

39. What is the notional value of derivative securities that your company currently holds in its portfolio? (e.g. 1,2 million Euro)

--?

40. PLEASE MARK THE FIELD WHICH DESCRIBES THE BEST CHARACTERISTICS OF YOUR COMPANY.

Industry:

(in the case your company belongs to more than one industrial segment, mark as many fields as you consider necessary for describing your company)

1. Agriculture and forestry ☐
2. Fishing ☐
3. Mining ☐
4. Manufacture ☐
5. Power/Energy (gas, electric, water) ☐
6. Construction ☐
7. Trade (wholesale and retail) ☐
8. Catering industry (hotels and restaurants) ☐
9. Transport and storage ☐
10. Communication ☐
11. Financial intermediation and other financial services ☐
12. Real estate ☐
13. Other. Please name what! ____________________

Your company was establish:

1. 5 years or less ☐
2. 6 – 10 years ☐
3. 11 – 15 years ☐
4. 16 – 20 years ☐
5. More than 20 years ☐

☐

Number of employees:

1. 250 – 350 ☐
2. 351 – 450 ☐
3. 451 – 550 ☐
4. 551 – 650 ☐
5. 651 – 750 ☐
6. > 751 ☐

☐

41. QUESTION ABOUT THE RESPONDENT

Gender

a) Mail
b) Female

Age

a) 20-25
b) 26-35
c) 36-45
d) 46-55
e) 56-65
f) More than 65

Formal education

a) High school

b) College
c) Bachelor degree
d) Master degree
e) PhD

How many years you work for your company?

____

Did you attend educational programmes regarding risk management?

a) Yes

b) No

What is your position and a department that you work in?

Position ____________________________________

Department ____________________________________

NAME OF THE COMPANY (this question is optional, company does not need to reveal its identity):

____