Macroeconomic Conditions and Capital Structure: Evidence from Publicly Listed Companies in the U.K.

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DECLARATION

I certify that the work contained in this thesis, or any part of it, has not been accepted in substance for any previous degree awarded to me, and is not concurrently being submitted for any degree other than that of "Doctor of Philosophy (PhD)" 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 the contents are not the outcome of any form of research misconduct

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• ABSTRACT

This research investigates whether and to what extent macroeconomic variables, namely, business cycle, financial market risk, credit supply and stock market performance, affect capital structure of publicly listed U.K. firms. Specifically, by using fixed effects, random effects, tobit, and GLS regression models and GMM methods (SGMM and DGMM), this research tests if the macroeconomic variables affect capital structure in a manner that is consistent with the pecking order, trade-off and market timing theories. Without considering the effect of 2008 financial crisis, I find that, first, the results from static models and dynamic models of capital structures indicate that leverage is negatively associated with the business cycle. This is consistent with the prediction of pecking order theory. Second, the results from static models report that leverage is positively associated with credit supply which is consistent with either prediction of pecking order or trade-off theories. However, the dynamic models' results show that leverage is negatively associated with credit supply which is consistent with prediction of market timing theory. Third, the results from static models report that leverage is negatively associated with financial market risk which is consistent with the predictions of trade-off theory. However, leverage is associated significantly and positively with financial market risk based on the dynamic model results which is consistent with the predictions of pecking order theory. Fourth, the results from static models report that leverage is positively associated with stock market performance which is consistent with predictions of pecking order theory. However, the dynamic models' results show that stock market performance does not have an explanatory power on capital structure. Moreover, considering the effect of 2008 financial crisis, I find that, the results are the same and consistent with both the static and dynamic results with the exception of financial market risk's result which is only consistent with the static model's results. The above results are robust to the stated estimation strategies and indicate that macroeconomic condition has explanatory power on capital structure. In addition, this research, despite the strong empirical evidence supporting effect of macroeconomic conditions on capital structure does not have overwhelming evidence in support of any of the three stated theories. Furthermore, the empirical findings indicate that the effect of macroeconomic condition was more balanced after the crisis, suggesting that during crises due to the uncertain level of financial market risk, the effect is undetermined, and a trade-off rises for economic policy. Therefore, this research contributes to the literature, by using the four chosen macroeconomic variables, static and dynamic estimation strategies and U.K. data and by

establishing the hypotheses to predict how the four stated macroeconomic variables affect capital structure under the pecking order, trade-off and market timing theories.

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- ## List of Abbreviations and Acronyms

GMM: Generalized Method of Moments

SGMM: System Generalized Method of Moments

DGMM: Difference Generalized Method of Moments

GLS: Generalized Least Squares

OLS: Ordinary Least Squares

ONS: Office for National Statistics

FRED : Federal Reserve Economic Data

M&M theorem: Modigliani and Miller theorem

REM: Random Effects Model

FEM: Fixed Effects Model

• CHAPTER ONE: INTRODUCTION

An important research question in finance relates to the factors that determine the capital structure of firms such as firm characteristics, industry classifications and country effects. In addition, there are a series of recent studies that give this important subject a new perspective. The new perspective examines the impact of macroeconomic conditions on capital structure. The capital structure of a firm is important because it has effects on firms' ability to take up investment opportunities. For example issuing debt might allow firms to increase their after-tax earnings by taking advantage of tax shields.

Modigliani and Miller (1958) explain that the value of a firm is irrelevant to the financial structure of firms in the absence of market imperfections. There are a lot of theoretical and empirical researches on capital structure but there is no generally accepted theory yet, and thus it remains an open line of research. Some of the researchers who did not accept the conclusion of Modigliani and Miller propose some alternative theories to make the debt-equity choice, namely: the trade-off, the pecking order, the agency, the market timing, the market microstructure, and the industry structure theories. Despite the vast existing literature on capital structure, there is still a lack of consensus in the empirical research on this subject. Moreover, previous studies focus more on the impact of firm-specific variables, corporate governance variables, country-specific effects and industry classification effects (e.g., Rajan and Zingales, 1995).

Given that the existing empirical literature on the capital structure using the stated variables is still undecided, this research uses the macroeconomic variables to examine the capital structure. Further, this research intends to answer whether the effect of the business cycle on capital structure is pro-cyclical or counter-cyclical and also intends to investigate whether credit supply, financial market risk and stock market performance affect capital structure. Moreover, it is important to study the impact of macroeconomic conditions on adjustment behaviour of capital structure, since few studies have investigated the impact of macroeconomic conditions on capital structures.

1.1 Motivation

This section explains the existing capital structure literature and discusses the four motivations for doing this research.

There is an extensive body of capital structure literature, both theoretical and empirical produced over the past few decades (Myers, 1977; Rajan and Zingales, 1995; Jensen and Meckling, 1976; Taggart, 1977; Marsh, 1982). Modigliani and Miller (1958) originate the analysis of capital structure and find that a cost emerging from transactions, taxes, bankruptcy, and adverse selection and agency conflicts, are the main reasons for firms forming their capital structure through debt. In fact, they suggest that firm value is independent of its financial structure in the absence of market imperfections and that there is no relationship between debt-to-equity ratio and the total value of a firm. Their capital structure irrelevance propositions (M&M theorem) is the starting point for capital structure theories although Ross et al. (1993) criticise their work as it is a theoretical model without any empirical support. Capital structure evolves four main theories to explain the rationale behind the selection of debt and equity finance: the trade-off theory, the pecking order theory, the agency theory and the market timing theory.

Due to a lack of research in capital structure and a generally accepted theory that determines the capital structure, this research aims to uncover macroeconomic determinants and to test three of the capital structure theories to see which of them predicts the determinants of capital structure. So the lack of a generally accepted theory that determines the capital structure of a firm is the first motivation for this research.

In the field, there is a notion that macroeconomic conditions affect adjustments of capital structure. Along these lines, Hackbarth et al. (2006) assert that firms adjust their capital structure more often in periods of economic prosperity than in periods of recessions due to a lower restructuring threshold. They analyse the impact of macroeconomic conditions and credit risk on the dynamic capital structure choice. They characterise the impact of macroeconomic conditions on the pace and size of capital structure changes and debt capacity by constructing a partial equilibrium model of firms' financing decision which predicts that market leverage is countercyclical. Their result is consistent with the work of Korajczyk and Levy (2003) in which they conclude that factors affecting the capital structure are industry classification, firm-specific variables, country-specific effects and macroeconomic conditions.

Based on the studies mentioned above, there is emerging evidence on the impact of macroeconomic conditions on capital structures, and there are still a lot of unknowns. Therefore, there is a growing consensus on the need to examine the impact of macroeconomic conditions on capital structure, which is the second motivation for this research. Additionally,

it seems necessary for managers to understand the impact of macroeconomic conditions on the capital structure as this could lead to better investment decisions for shareholders and also optimal financing projects. Therefore, it is of interest to understand how macroeconomic conditions affect capital structure.

Moreover, leverage by definition is truncated between zero and one, and the tobit model is the appropriate econometric model to estimate the truncated dependent variable. However, not many researchers used tobit model. Previous studies use the Ordinary Least Square (OLS) regression model, but the results from OLS estimation method for truncated data are inconsistent and biased.

In addition, based on existing studies, firms' observed leverage cannot be their optimal leverage given that there are costs, and consequently lags in adjusting to the optimal leverage. Firms cannot balance the effects of random events, which take them away from the optimal leverage. Large adjustment costs could be an important factor to explain the observed variation in actual leverage ratio across firms. Since large costs involved in adjusting to the optimal ratio, it is difficult to achieve an accurate test of the effects of variables on the leverage of a cross-section of firms in a particular year (Myers, 1984; Ozkan, 2001 and Benito, 2003). Therefore, the dynamic nature of capital structure motivates this research to use the Generalized Method of Moments (GMM), which is the appropriate method to analyse the dynamic capital structure. Even though there are some studies that have used the tobit model or the GMM method, there are no studies that have used both methods at the same time. The third motivation for this research is to use both of the econometrics methods to consider the above-mentioned econometric issues at the same time.

A few studies find different cross-country results and discuss that the variation in the results suggests the institutional differences are affecting capital structure. Most of the existing studies on the determinants of capital structure, specifically those incorporating the effects of macroeconomic conditions, are concentrated on the U.S. market. Therefore studying another country such as the U.K. with different financial institutional characteristics is an interesting ground to test the impact of macroeconomic conditions on capital structure. Studying the U.K. firms' capital structures involves paying particular attention to the differences in capital structure in both countries.

The U.K. is a market-based system and has a well-developed and mature financial system (Benito, 2003; Huang, 2003). According to Levine (1999), U.K. firms rely more on markets to invest, which shows that markets play a more dynamic role. The U.K. and the U.S. are market-oriented, but they have a few differences, which may affect firms' financing decision facing the macroeconomic conditions. For instance, differences in the tax code, bankruptcy laws, development of bond markets, and patterns of ownership of both countries may affect the capital structure. The most important difference between the U.K. and the U.S. is the bankruptcy laws (Rajan and Zingales, 1995; Beattie et al., 2006). Bankrupt firms in the U.S. can either be reorganised, refer to Chapter 11, or be liquidated based on Chapter 7, but U.K. firms have only one option, which leads the failing firms to be liquidated through the receivership system. The U.S. system has chapter 11, but the U.K. has no equivalent. Moreover, they both have a different allocation of control rights. The U.K. firms' receivership gives control rights to a particular secured creditor and is strict in terms of enforcing the creditor's rights, but according to Chapter 11, the debtor can retain control of the U.S. firm and have the exclusive right to propose a plan of reorganisation. Therefore, U.K. firms tend to have less debt compared with U.S. firms because they are not willing to give their control rights to a particular secured creditor.

Besides, according to the Merrill Lynch series of indices (2010), U.S. and U.K. bond markets have differences in terms of the weight of their indices and their average duration. The U.K. sterling portion is relatively small in comparison to the U.S. dollar, which is the biggest bond market in the world. However, the U.K. is still the fourth largest bond market in the world. Regarding duration (average time to maturity of the market), the U.K. has a long duration of 8.5 years as shown in Table 1.1, which shows that U.K. firms tend to have long-term debt compared with U.S. firms.

Furthermore, the tax system in the U.S. subsidises firms' use of debt, having tax-deductible interest payments while retained earnings and dividends are not tax-deductible. This is another reason for U.S. firms to issue more debt compared to U.K. firms.

All the above mentioned differences are the fourth motivation for this research to use U.K. data for analysing the impact of macroeconomic conditions on capital structures.

Table 1.1 Comparison of U.K. & U.S. Institutional Characteristics

Institutional characteristics\ Country		U.K.	U.S.
Power of the banking sector		Market-oriented	Market-oriented
Bankruptcy laws		receivership	Chapter 11(Reorganisation) and chapter7 (liquidation)
Bond markets based on Merrill Lynch series of indices (2010)	Average Duration (years)	8.1	4.5
	Index Weight	0.049	0.437

1.2 Research Aims and Objectives

Firstly, this research intends to investigate whether and to what extent macroeconomic variables, namely, business cycle, credit supply, financial market risk and stock market performance, affect capital structure. This research might help establish new determinants of capital structure. Secondly, this research tests three of the capital structure theories namely, the pecking order, the trade-off and the market timing theories to see which of these theories predicts capital structure of U.K. firms. Lastly, this research investigates whether these relationships are robust to different econometric methods.

1.3 Research Questions

As stated earlier, this research focuses on the impact of macroeconomic conditions on capital structure. Therefore, this research aims to answer the following questions.

- Is the effect of business cycle on capital structure pro-cyclical or counter-cyclical?
- Do credit supply, financial market risk and stock market performance have a significant effect on capital structure?
- Do macroeconomic variables affect capital structure in a manner that is consistent with the pecking order, trade-off, and market timing theories?

1.4 Novelties and Innovations

This research intends to contribute to the existing literature on capital structures and will be vital in filling in the knowledge gaps. This is by investigating the impact of macroeconomic conditions on capital structure and it tries to innovate in three ways.

Firstly, this research contributes to literature by performing tests on capital structure using the macroeconomic variables. As discussed in section 1.1, most of the theoretical and empirical

capital structure studies use firm-specific variables to test capital structure. This research uses the macroeconomic variables to test capital structure and investigates if the macroeconomic variables affect capital structure in a manner that is consistent with the pecking order, trade-off and market timing theories. To the best of this author's knowledge, there is no previous study that considers this particular chosen combination of macroeconomic variables to study the capital structure. Therefore this research, by setting a unique pattern for the impact of each of the stated macroeconomic variables under each of the capital structure theories, contributes to the existing capital structure knowledge. Table 1.2 shows the unique pattern of the relationship between stated macroeconomic variables and leverage under each of capital structure theories:

1.5 Structure of the Dissertation

This research consists of sIX chapters, including this introductory chapter that provides a general background to the study, the motivations, and the research questions. Chapter Two reviews the existing theoretical and empirical literature and explains the determinants of capital structure. Chapter Three discusses capital structure theories and the main statistical hypotheses. Chapter Four explains the methodology and data of this research. The methodology section describe the methodology and a detailed description of the panel data regression models namely, fixed effects, random effects, tobit, and GLS regression models and GMM methods (SGMM and DGMM). The data section describes the data, variable characteristics (dependent, independent and control variables), and the sorting methods. Chapter Five discusses the empirical results. Last chapter concludes and reports the limitation and areas for furthers research and implication of this research.

• CHAPTER TWO: LITERATURE REVIEW

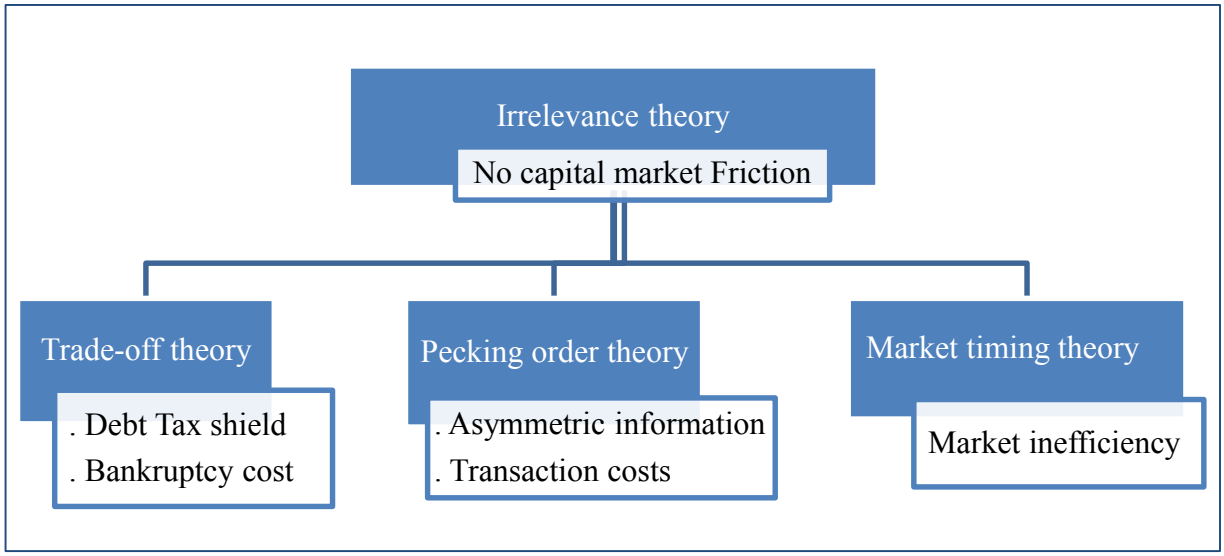
This chapter discusses the existing theoretical and empirical literature of capital structure. Section 2.1 briefly explains the capital structure and its importance. Section 2.2 describes the traditional theories of capital structure and then explains the irrelevance theorem and six new theories of capital structure namely trade-off, pecking order, market timing, agency, product market interactions and market microstructure theories. Then for clarity, it summarises all of the mentioned theories in table 2.1. Section 2.3 explains the existing empirical studies based on trade-off, pecking order, market timing theories, plus those based on macroeconomic conditions, those based on U.K. data and lastly those based on other countries' data.

2.1 Introduction

Capital structure is an important subject in finance studies. It refers to a selected combination of internal and external financing sources. In other words, firms' external financing is sourced through debt or issuing equity, whereas internal financing is funded by using their internal funds or savings. Modigliani and Miller (1958) claim the value of a firm is irrelevant to its financial structure in the absence of market imperfections. They state that there is no relationship between debt-to-equity ratio and the total value of the firm. There is a lot of theoretical and empirical research on capital structure but there is no generally accepted theory yet, and thus it remains an open line of research. Some of the researchers who did not accept the conclusion of Modigliani and Miller propose some alternative theories to make the debt-equity choice, including, trade-off, the pecking order, the agency, the market timing, the market microstructure, and the industry structure theories. These theories emerge to explain the rationale behind the selection of debt and equity in firms' financing choices. It should be mentioned that all these theories are based on the Modigliani and Miller proposition, but each of these theories considers the effect of one or a few of the introduced capital market frictions which were not previously considered by Modigliani and Miller. Most of these studies test U.S. data and conclude there are significant results, although there is a conflict in some cases with one another. This chapter aims to study the existing classical literature, investigating and

discussing their significance in order to propose a solution to this problem. Figure 2.1 demonstrates a comparison between the irrelevance theory and the pecking order, trade-off and market timing theories in terms of considering market imperfection.

Figure 2.1 Classical Theories and Market Imperfections



2.2 Theories of Capital Structure

This section includes seven subsections. Section 2.2.1 explains the irrelevance theorem and its relationship to the capital structure decisions of firms and some existing market imperfections in the real world. The next six subsections are organised as follows; the first three subsections describe the classical theories of capital structure, namely pecking order, the static and dynamic trade-off, and agency theories and the last three subsections describe the new theories of capital structure, namely market timing, capital structure based on product market interactions, and market microstructure theories. Finally, for clarity this section summarises all of the theories in table 2.1.

2.2.1 Irrelevance Theorem

Modigliani and Miller (1958) suggest the irrelevance theorem of capital structure and assume that under a perfect capital market there are no market imperfections such as taxes, agency costs, asymmetric information, and bankruptcy costs. They propose that, based on the

perfect capital market conditions, the capital structure is irrelevant in determining a firm's revenue or value, and the cost of equity capital increases with the increase in leverage as there is need of a higher return on equity. Though these propositions are valid under conditions, such as when there are no transaction costs, no personal or corporate taxes, investors' expectations follow a normal probability distribution, corporations and individuals borrow at the same rates, and firms are all in an equal risk classification.

Existing capital structure theories start with the seminal paper of Modigliani and Miller (1958), which assumes that capital structure is irrelevant to firm value in the perfect capital market. The irrelevance theory's assumptions were helpful in the formation of capital structure theories and the study of imperfect capital markets. In other words, market imperfections such as taxes, bankruptcy costs, asymmetric information, agency costs, market inefficiency and transaction costs can affect capital structure choices in the real world. There are a few studies, which have findings contradictory with the irrelevance theory. For instance, Graham and Harvey (2001) state that firms tend to minimise their cost of capital in order to maximise firm value and revenue. Their survey of 392 CFOs of U.S. firms shows that most of the managers consider capital structure decision important for firm value and 81% of the questioned CFOs answered that they do have some target debt ratio. Myers (2002) assumes perfect market condition for a supermarket and states, *"the value of a pizza does not depend on how it is sliced."* The author further states that capital markets are not perfect, so the value of a pizza does depend on how it is sliced. For example, consumers are willing to pay more for the several slices rather than the equivalent whole. Therefore, the value of the firm depends on how its assets are sliced up and offered to investors. Firms combine the impact of market imperfection in order to overcome to the shortcoming of the irrelevance theorem as will be discussed throughout subsections 2.2.1 to 2.2.6. The reminder of this subsection explains market imperfections.

Modigliani and Miller (1963) correct their paper of 1958 to account for market imperfections and how such rigidities affect capital structure and consider tax as one of the imperfections that affect firm value, and state that firms use debts to minimise their taxes in order to increase their value. They explain that corporate taxes include corporate tax rate, personal tax rate on equity income and on debt income; personal taxes are taxes that investors need to pay on their capital gains and dividends. Differences between personal tax on equity

income and on debt income affect capital structure. Miller (1977) argues that even in a world in which interest payments are deductible, if corporate income taxes are added the value of the firm is still independent of its capital structure. Braudel (1982) states that tax is not the only determinant of capital structure as capital structure exists even before taxes. Therefore, in the real world, capital structure stems from other market imperfections as well.

Another market imperfection that Modigliani and Miller (1958) do not consider in their paper is financial distress. Financial distress happens if a firm has too much debt and faces bankruptcy. During bankruptcy, two different types of costs are deducted from the value of assets, namely direct and indirect costs. Direct costs include legal and administrative payments such as the cost of consultants, experts, accountants, administration, court costs, and legal expenses. According to Warner (1977) direct costs are small and according to Berk et al. (2010) indirect costs have more impact on capital structure in comparison with direct costs although these are hard to measure and some indirect costs arise from the concerns of management, employees, customers and suppliers over the uncertainty of the firm. Megginson (1997) states that loss of sales, loss of employees, and distractions of management's time during and after bankruptcy are some indirect costs that cause financial distress. Previous studies use different variables and methods to predict the bankruptcy cost and to estimate the probability of default in a static model (Altman, 1968; Ohlsen, 1980; and Zmijewksi, 1984). More recently, Duffie et al. (2007) use a mean-reverting time series method for macroeconomic and firm-specific variables to predict the probability of default and find that as the debt level increases, the probability of financial distress and benefit of debt tax increases. Therefore, firms need to balance between financial distress and the benefits of tax in order to gain optimal capital structure.

Fama and Miller (1972) study agency conflict which is another market imperfection and the possibility of different utility functions between agents and shareholders. Jensen and Meckling (1976) explain that agency conflicts happen because agents do not meet the contract's conditions between equity holders and managers or between equity holders and debt holders, and state, "*A contract under which one or more persons (the principal) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent."* They conclude that firms need to prevent financing

through high debt because of monitoring and bonding expenditures created by owners, managers and debt holders as well as existing bankruptcy costs.

In the real world, with the existence of market imperfections, information asymmetry between outsider and insiders of the firms increase. For instance, when managers have more information about the firm's performance than investors, information asymmetry occurs. There are two types of information asymmetry, namely: the signalling arguments (Ross, 1977) and the under-investment arguments (Myers & Majluf, 1984). Ross (1977) suggests that firms use leverage to send a signal to the market about their future prospects and claims that the higher the debt to equity ratio, the higher the quality of the firm would be. Myers and Majluf (1984) state that less-informed outsiders do under-price the firm especially for firms which finance externally. They suggest that the firm should issue common stocks to increase cash to be taken as a valuable investment opportunity and claim that firms prefer debt financing to equity financing because debt has payoffs that are less dependent on future states of the world than equity.

Myers (1984) explains that firms financing internally do not have to pay any transaction costs. In contrast, firms that finance externally have to pay transaction costs, depending on the type of financing instruments and the author states that, generally, transaction costs of issuing equity are higher than the costs of issuing debt. Therefore firms tend to minimise these costs by taking the cheaper source rather than the expensive one. Consequently, firms follow some pecking order that starts with internal funding, leading on to debt and finally, equity.

The following three subsections discuss the classical theories of capital structure, namely trade-off, pecking order and agency theories.

2.2.2 Trade-off Theory

This section explains the trade-off theory in more detail and how this theory considers the impact of tax and bankruptcy costs on a firm's capital structure decision. Moreover, this section discusses the static trade-off theory and the dynamic trade-off theory of capital structure.

In financial language, a firm can use either internal or external financing or both. Internal financing is using a firm's cash resources, and external financing includes issuing equity (e.g. ordinary shares) or issuing debt (e.g. a bank loan or corporate bonds). A few authors use the word trade-off theory to explain a group of related theories which are all estimates of the costs and benefits of firms' leverage ratio. The trade-off theory includes corporate tax with the irrelevance propositions to use the benefits of debt. Therefore firms prefer using debt to increase their tax benefits by raising leverage.

A few authors consider the tax advantages of debt in their financing decisions. For instance, Kraus and Litzenberger (1973) state that the firm's objective function is linear, and there is no compensating cost of debt so they predict 100% debt financing. However, they suggest the trade-off between the tax advantage of borrowing and the bankruptcy cost determines the firm's optimal debt ratio. These authors establish a model where *"the value of the levered firm is equal to the value of the unlevered firm plus the present value of the tax advantage after deducting the costs of bankruptcy."* Moreover, Scott (1977) argues that firms choose debt over equity to the point where the probability of financial distress starts to be significant.

A firm that follows trade-off theory defines a target by balancing the debt tax shields against cost of bankruptcy (Myers, 1984). Myers' definition is important in different aspects. Firstly, the target is not directly observable but it can be deduced from evidence, depending on structure. Secondly, depending on which tax code is included, targets can be changed (Graham, 2003). Thirdly, the nature of bankruptcy costs is important (e.g. fixed, on-time, permanent, direct and indirect costs …). Haugen and Senbet (1978) explain that bankruptcy costs can be direct and indirect. Fourthly, according to Frank and Goyal (2007), it is essential for transaction costs to have a definite form for the study to work. The marginal cost of adjusting must rise in accordance with the size of adjustment. Therefore these authors break Myer's definition into two parts and call the first part static trade-off theory and the second part, target adjustment behaviour.

Hovakimian et al. (2001) use firm level data taken from Standard and Poor's Compustat annual files and they find that firms tend to move towards a target debt ratio that is consistent with theories based on trade-off between the costs and benefits of debt when they adjust their

capital structure. Based on their postulation, firms may face impediments in movements toward their target ratio and the target ratio may change over time as the firm's profitability and stock prices change. Their results show that past profits might be an important predictor of observed debt ratios.

Static Trade-off: Kraus and Litzenberger (1973) write that the static trade-off theory is the trade-off between the tax benefit of debt and the cost of bankruptcy. Bradley et al. (1984) present the standard static trade-off theory and assume that tax structure is not strictly realistic. Increasing the non-debt tax shield decreases the firm's leverage ratio, and a firm's leverage ratio is inversely related to financial distress cost and earning volatility.

Later on Myers (1984) argues, in a static trade-off theory, *"The firm is supposed to substitute debt for equity, or equity for debt until the value of the firm is maximised."* On the other hand, Lewis (1990) indicates that in a perfect market world, apart from taxation, a firm could have a set of debt ratios which are consistent with the value maximisation objectives. The author states that firms with different debt structures that create a consistent series of promised interest payments have the same market value.

Furthermore, Ashton (1989) and Adedeji (1998) argue that the impact of the debt tax shield depends on the nature of the system applied by each country. For example the U.S. tax system allows firms to sustain a loss for a year to carry-back or carry-forward, which allows them to receive a cash refund on prior taxes paid or a tax reduction in the future. Therefore, U.S. companies are expected to depend more on debt financing. On the other hand, the tax system in the U.K. does not encourage firms to use debt as much as the classical tax system in the U.S.. Berens and Cuny (1995) study the tax advantage of debt and suggest a different view of capital structure and state that over time, there are many optimal capital structure levels. However, there is still no consensus about the tax-based predictions.

Jensen (1986) claims that when managers have free cash under their control, there is a conflict of interest between managers and shareholders and this causes agency costs to rise. Consequently, managers with more cash flow than is needed to fund all of the firm's available profitable projects invest the excess cash in unprofitable projects. Stulz (1990) calls this cost

an over-investment cost of managerial discretion and describes it as "*the expected cost to the shareholders that arise because management invest cash flow is in excess of that available to fund positive NPV projects in negative NPV projects*." The author argues that these firms are expected to have more debt to decrease the amount of free cash flow under management control. Similarly, Jensen (1986) predicts that since debt obligates the firms to pay out cash, it decreases the amount of unrestricted funds available to managers to invest in less profitable projects that are not in the interests of equity holders. Using debt without retaining the earnings of the issue obligates the managers to meet their promise to pay future cash flows to the debt-holders and, if the firms do not sustain their promise to make the interest and principal payments, bondholders can take the firm to the bankruptcy court.

Harris and Raviv (1990) define debt as a disciplining tool since default allows creditors the option of forcing the firm into liquidation. For firms with poor investment opportunities, the benefit of debt financing in modifying the agency cost of free cash flow is more effective than in firms with large and good investment opportunities and no available free cash flow. In addition to the roll of debt in mitigating the agency cost of cash flow, debt helps managers to maintain control of debt issue rather than equity because debt holders have no voting right as equity holders. Baskins (1989) and Alen (1993) conclude that firms have a preference for debt rather than equity for balancing control considerations. In addition, debt financing motivates managers to make better investment decisions (Lasfer, 1995).

Shleifer and Vishny (1992) say that there is a strong relationship between leverage and industry classification under the static trade-off theory. Therefore it can be concluded that the cost and benefit of debt are different in every firm under trade-off theory. Highly profitable, low-risk firms with a high tax burden, less investment opportunities and which derive most of their value from tangible assets-in-place must consider higher debt financing. On the other hand, high-risk firms with inconsistent profitability and more investment opportunities, which derive much of their value from growth prospects, must consider lower levels of debt financing.

Dynamic Trade-off: Another related capital structure theory is the dynamic trade-off theory which explains that firms have optimal capital structure and they aim to achieve this through target leverage. Firms may deviate from their target leverage but they adjust their leverage towards their target. A firm follows a dynamic trade-off theory if the determinants of

capital structure such as marginal benefit and costs of debt change over time as the firm's characteristics change (Elsas and Florysiak, 2008).

Myers (1984) claims that firms adjust their leverage to their capital structure target. Kane et al. (1984) is amongst the earliest studies on dynamic trade-off models that considered bankruptcy costs, uncertainty and taxes. Furthermore, Hovakimian et al. (2001) state that high profitability is correlated with low leverage and less probability of issuing equity rather than debt financing. Myers (1984) studies the firms' adjustment speed towards a target following shocks to leverage.

To sum up, a number of studies argue that, in the real world, firms cannot follow the trade-off theory as it is hard for firms to achieve optimal target capital structure. According to Rajan and Zingales (1995), empirical studies do not find a positive relationship between profitability and leverage, and so this is against trade-off theory predictions. Hence it is hard to say that only the trade-off theory determines capital structure decisions.

2.2.3 Pecking Order Theory

This section explains the pecking order theory, considering the impact of asymmetric information and transaction costs in the actualisation of the theory.

The pecking order theory explains the capital structure decisions by taking into account the information asymmetry that exists between different managers and shareholders. However, choice of capital structure moderates the effects of information asymmetry on the capital structure decisions. According to the pecking order theory, firms prefer internal financing to external financing. Firms tend to choose internal funds for financing their operations as the first option, then issuing debt as their second option and lastly issuing equity. For instance, firms with higher levels of cash flow than capital investment outflows prefer using surplus to pay their debts rather than to repurchase or retire equity. If the need for external financing increases, firms prefer safe debts to risky ones and use equity as the last resort (Myers, 1984; Myers and Majluf, 1984).

Based on the adverse selection model, managers have more information about the firm's value and predictions than investors, which creates information asymmetry between managers and investors. Myers (2001) explains that firms prefer internal funds (e.g. retained earnings) rather than external financing and information asymmetries are relevant mostly for external financing. In addition, firms with higher levels of cash flow than capital investment prefer to use surplus to pay down debt rather than repurchasing and retiring equity. If the need for external financing increases, firms prefer first debt and then equity as a last resort. A firm's debt ratio refers to its requirement for external financing.

In contrast with the trade-off theory, the pecking order theory suggests that firms with high growth rate and more investment opportunity use more external financing and have higher debt ratio. In this theory there is no belief in optimal leverage ratio.

2.2.4 Agency Theory

This section reviews agency theory in more detail and how it uses the impact of agency costs on capital structure decisions. The agency theory explains that managers' self-interests strongly affect capital structure, unlike other theories of capital structure, which consider the interest of shareholders.

Jensen and Meckling (1976) discuss that, in contrast with the work of Modigliani and Miller (1958), capital structure and ownership structure have an impact on the probability distribution of future cash flows. Therefore, the agency cost of debt and equity affects firms' optimal capital structure. Jensen (1986) states that managers prefer their firms to grow further than the optimal size, to increase their power and resources under their control. However, these sorts of managers' inefficiencies cause problems for firms with a high free cash flow. There are some disciplinary tools for a firm's management such as assessment by the firm's board of directors as internal control systems, and the market corporate control. Paying dividends and debt creation reduces agency costs of free cash flow and consequently reduces the cash available for the discretion of managers and contributes to increasing firm value. Debt financing is an important control option for firms with low investment opportunities and large cash flows, and firms can have benefits from debt financing by controlling the agency problem between firm managers and shareholders.

According to Barclay and Smith (1999), increasing debt financing leads to value-destroying distortions in investment policy such as the underinvestment, debt overhang and asset substitution that cause agency costs of conflict between debt-holders and equity-holders. Hence, debt holders react with higher interest rates and stronger covenants and consequently these agency costs reduce firm value. They find two types of agency cost namely: "*conflict between equity-holders and debt-holders and conflict between managers and equity-holders."*

To conclude, this theory and its benefits and costs of debt financing is somehow consistent with the trade-off theory, as the optimal capital structure and firm value- maximising include marginal benefits of increasing debt such as tax benefit and agency control function of debt with its marginal cost such as financial distress (the agency cost between debt-holders and equity-holders).

The following subsections review theories that appear since the 1980s, which provoke academics to link applied economics with pure financing theory, behavioural economics, and capital structure. For instance, the theory of product market interaction assesses the impact of capital structure on the competitive and strategic behaviour of competing firms in product markets. Around the mid-1980s another theory assesses the relationships between "corporate control" and capital structure, as the market in the United States had a strong rise in merger and acquisition (M&A) activities. Moreover, the two dynamic based theories of market timing and windows-of-opportunity are the most recent ones. These theories focus on the dynamics of capital structure and follow a deductive method except the market timing theory, which follows an inductive approach.

2.2.5 Market Timing Theory

This section reviews market timing theory in more detail, considering the impact of market inefficiency in firms' capital structure decisions. Recent literature states that the market timing theory challenges previous capital structure theories by taking into account the market inefficiency frictions (Loughran and Ritter, 1995; Hertzel et al., 2002). According to the market timing theory, firms prefer to issue equity when the cost of equity is low and share price is high; likewise to repurchase it at low price. The market timing theory states that in inefficient capital markets, market inefficiencies are significant while firms seek to minimise their cost of

capital. Market timing theory proposes the assumption that financing decisions depend on existing market conditions.

For instance, Marsh (1982) explains that firms tend to issue equity when stock prices are high. Korajczyk et al. (1989), state that firms prefer to issue more equity when there is an abnormal increase in their own price of equity. Baker and Wurgler (2002) use the market-to-book ratio to measure the market timing opportunities perceived by managers and state that low levered firms tend to raise funds when their valuations are high, conversely highly levered firms tend to raise funds when their valuations are low. They find that fluctuations in market valuations have large effects on capital structure that persist for at least a decade and assert that capital structure is largely the cumulative outcome of past attempts to time the equity market. In addition, current capital structure is related to historical market values. Their results suggest that capital structure is the cumulative outcome of past attempts to time the equity market and managers issue equity when the market values are high and repurchase the equity when the market values are low.

Most of the studies on the market timing theory emphasise the equity market. However, the market timing theory can work on the debt market as well. For example, when the interest rate decreases, firms tend to take loans rather than issue equity. Korajczyk and Levy (2003) explain that interactions between the capital market and macroeconomic conditions affect capital structure decisions. Cook and Tang (2010) state that during financial crises firms have lower chances of adjusting their capital structure because they are less able to increase capital in either the debt or the equity markets. They evaluate the impact of macroeconomic conditions on the speed of capital structure adjustment toward target leverage using two dynamic partial adjustment capital structure models and discover evidence that firms adjust their leverage towards a target faster in 'good' macroeconomic states in compare to 'bad' macroeconomic states.

According to Frank and Goyal (2009), firms that strictly follow market timing behaviour can be in a situation when raising debt or equity is unrelated to the actual current need for capital; if the equity and debt market are in good states, firms may increase their external financing even if there is no need for new capital. The market timing theory is in contrast with the pecking order theory as it accesses external funds depending on the debt or equity market

situation, whereas the pecking order theory chooses external funds when there is a lack of internal funds. Several studies support this theory including Taggart (1977), Marsh (1982), Asquith and Mullins (1986), Korajczyk et al. (1991), Jung et al. (1996), Shyam-Sunder and Myers (1999), Hovakimian et al. (2001), Frank and Goyal (2003), and Welch (2004).

2.2.6 Capital Structure based on Product Market Interactions

Until the mid-1980's, financial economists had not considered the effects of product market on capital structure, though a few recent studies investigate the capital structure and product market interactions. These studies consider the effect of capital structure of firms on the firm's conduct in its product market as well as its effect on other market participants.

There are a few studies on the relationship between firms' behaviour and different industries in the market. For instance, Bowen et al. (1982) indicate that firms inside an industry generally tend to keep similar leverage rankings in comparison with those firms in different industries. Similarly, Bradley, et al. (1984), and Kester (1986) display that cement, airlines, paper, steel, and textile mill products have high leverage ranking, though food, electronics, drugs and instruments have low leverage ranking. Brander and Lewis (1986) and Poitevin (1989) incorporate features of the theory of industrial organisation into the institutional finance literature models. Specifically, the theory of industrial organisation states that capital structure has effects on its behaviour in the product market and the behaviour of other market participants and it causes competitive results. Brander and Lewis (1986) analyse the interaction of financial and product markets in a Cournot Oligopoly setting (based on the evidence that companies compete on their production amount). Chevalier and Scharfstein (1996) study the effect of product market competition and capital structure and find that firms that seek external financing have the countercyclical industry mark-up. Moreover, during low macroeconomic states, financially constrained firms decrease their investment in market share depending on the financial status of their industry rivals.

Moreover, Campello (2001) investigates the capital structure and product market interactions using firm and industry level evidence and finds that leverage has a negative impact on firm (relative-to-industry) sales growth in industries where competitors are relatively unlevered during recessions, but not during booms. At the industry level, the author finds that

rises are more countercyclical when industry debt is high. Korajzyk et al. (2003) estimate the target leverage for a subsample of unconstrained firms in competitive industries by including industry-fixed effects in their regression and using the fact that capital structure can interact with product market competition only when firms have market power. MacKay and Phillips (2005) express that a firm's leverage ratio depends on its status as entrant, incumbent, or exiting firm, its natural hedge and the actions of other firms in the industry. Furthermore, Elsas and Florsiak (2008) use industry median debt ratio (IMDR) in their model and discuss that IMDR can play an explanatory role in the model as a proxy for industry-specific fundamentals such as product market interactions, the nature of competition, business risk and operating leverage. Leary and Roberts (2010) argue that firms make capital structure decisions in response to their peers.

2.2.7 Market Microstructure Theory

The National Bureau of Economic Research (NBER) defines market microstructure theory as a process of measurement and control for liquidity, transaction cost and implication for efficiency (Madhavan, 2000). Market Microstructure theory is an implementation for corporate and international finance and asset pricing. Bagehot (1971) states that market microstructure theory aims to investigate firms' information asymmetry from observing market data such as trade and transaction prices to ensure the existence of an exact process of price formation. This theory establishes a novel of information asymmetry index built on measures of adverse selection. In other words, this theory is the study of market friction and examines the impact of the market on trading costs, prices, volume, and trading behaviour. In addition to the asset pricing theory, this theory has a broader interest in corporate finance. Differences between the price and value of assets affect financing and capital structure decisions.

Garman (1976) uses the expression "market microstructure" as the title of a paper about market making and inventory costs. There are a few studies about the market microstructure. For instance, Morse and Ushman (1983) analyse the impact of information announcement on the bid/ask spreads and find no significant changes in these, but they find significant rises in the size of such spreads on the day of large price changes. Allen and Gorton (1992) state that buyers avoid trading with informed investors and choose the time at which they trade and tend to cluster. They find that profitable manipulation by uninformed investors may happen.

It should be mentioned that this research tests its hypothesis under three of the explained capital structure theories; namely, the pecking order, the trade-off and the market timing theories. Therefore, the remainder of this chapter concentrates more on these theories.

Table 2.1. Capital Structure Theories

Theory	Authors/year	Predictions
Irrelevance theorem	Modigliani-Miller (1958)	Firm market value is irrelevant regardless of the ratio of assets and liabilities it holds.
Trade-off theory	Myers (1974), Kraus & Kitzenberger (1973)	Firms prefer using debt to equity because debt increases tax benefits by raising leverage to a level where remunerations of tax shields outweigh costs of liquidation.
Pecking order theory	Myers & Majluf (1984)	Firms prefer internal financing to external financing and will choose internal financing first, debt second and equity as a last resort.
Agency theory	Jensen (1986), Jensen & Meckling (1976), Harris & Raviv (1991)	Explains the financing behaviour of companies when the interests of managers are perfectly aligned with those of shareholders. Growth firms incur higher agency costs when issuing debt. Therefore, they avoid borrowing.
Market timing theory	Baker & Wurgler (2002), Ritter (2003)	Firms issue shares when stock prices are high and turn to internal finance or debt when prices are low. Continued pursuit of timing strategies would make debt ratios depend on paths of past stock prices as well as on requirements for external funds (windows of opportunity theory).
Industry structure theory	Bowen, et al. (1982), Bradley et al. (1984) and Kester (1986)	Over time, firms inside an industry tend to keep similar leverage rankings compared with those in different industries.
Market microstructure theory	Bagehot (1971)	Assesses firms' information asymmetry from market data such as transaction price bid-ask spreads and quotes to ensure the existence of an exact process of price formation.

2.3 Empirical Studies

This section reviews the existing empirical researches into three chosen theories of capital structure. The first three subsections concentrate on the existing empirical literature on capital structure, namely: the pecking order, the static and dynamic trade-off, and the market timing theories. Subsection 2.3.4 discusses empirical studies of the impact of macroeconomic conditions on capital structure. Subsection 2.3.5 discusses empirical studies that use U.K. data. The last subsection reviews empirical studies that use other countries' data.

2.3.1 Empirical Studies based on the Trade-off Theory

This subsection reviews the empirical studies based on trade-off theory. The trade-off theory is one of the three popular theories of capital structure, and there is a lot of debate about it. Therefore, this section discusses the studies, which have consistent or inconsistent results with the prediction of trade-off theory.

There are some empirical studies on capital structure based on the trade-off theory. For instance, Jensen and Meckling (1976) find that during expansions, there is a pro-cyclical relationship between leverage and GDP growth rate which is in line with the prediction of static trade-off theory. While the equity market is performing well, bankruptcy costs are lower, firms are more likely to have taxable income to shield, and have more free cash, and therefore, unconstrained firms prefer more debt. Miller (1977) presents the tax shield formula and claims that firms must weigh the benefits of debt tax shields against the costs of higher bankruptcy risk. Wilson (1977) analyses the relationship between business cycle stages and capital structure and he states that there is a higher probability of bankruptcy during the low point of the business cycle. During the recession, because of higher risk and the higher probability of bankruptcy, firms tend to incur less debt. Similarly, Myers (1984) suggests that there is a positive relationship between leverage and GDP under the trade-off theory. Gertler and Hubbard (1991) state that according to trade-off theory the relationship between leverage and GDP growth rate is pro-cyclical as during expansion the GDP is high, the marginal cost of debt declines and firms tend to increase their leverage. In contrast, during recessions when GDP is

low, the cost of financial distress increases, and therefore the marginal cost of debt increases, which leads to firms decreasing their leverage.

Furthermore, there are some studies related to capital structure and the trade-off theory, although their results are not supportive of the relationship between capital structure and the trade-off theory. For example, Baker and Wurgler (2002) state that "*The trade-off theory suggests that momentary fluctuations in the market-to-book ratio must have temporary effects.''* Hackbarth et al. (2007) express that most trade-off models only examine the amount of debt that a firm must hold and do not provide any guidance on the capital structure of the firm. They analyse the optimal mix of market and non-market debt and suggest that small companies use non-market debt, while older companies develop a mix of bank and market debt.

There are a few studies' results that challenge the idea of the trade-off theory in contrast with the above studies. For instance, Titman and Wessels (1988) find that as firms' size and age increases the percentage of market debt increases too. They state that there is a negative correlation between the profitability and the debt ratio of a firm, which is against the prediction of the trade-off theory, and firms with more growth opportunities and high intangible assets incur less debt financing. Therefore, their results challenge the idea of the trade-off theory. Similarly, Myers (1993) reports an inverse correlation between profitability and financial leverage which is against the static trade-off theory. Graham (2000) argues that, *"in contradiction, large, liquid, profitable firms with low expected distress costs use debt conservatively."*

To sum up, based on the aforementioned studies, the existing debates on this subject encourage further research considering other capital structure theories.

2.3.2 Empirical Studies based on the Pecking Order Theory

The pecking order theory is another theory of capital structure on which there is a lot of debate. This subsection reviews the studies that have results, which are either consistent or inconsistent with what this theory predicts.

There are some empirical studies on capital structure, which are consistent with the predictions of the pecking order theory. For instance, Myers and Majluf (1984) state that firms with a lot of cash flow prefer to use internal financing first and then external financing. When

an increase in the size of the GDP means that firms have more cash flow available, according to them, firms prefer to use their cash flow as the primary source of funding instead of raising loans. The pecking order suggests firms' weight of debt decreases, and they use internal funds to retire their debt especially short-term debt. McDaniel et al. (1994) find that firms prefer to finance using 80% of their internal capital and resort to 20% of their financing through external capital and they show that firms tend to raise debt rather than issue equity. Kayhan and Titman (2007) find that firms with a higher financial deficit increase their leverage. Bharat et al. (2009) provide empirical results that the asymmetric information issue is a significant factor of capital structure, which is in line with the assumptions of the pecking order theory.

There are other studies, whose results contradict the above studies and the pecking order theory's assumptions. For instance, Rajan and Zingales (1995) analyse the cross-sectional relation between firm-specific factors and debt, and find that firms with few tangible assets issue more equity, contradicting the core assumptions of the pecking order theory. Furthermore, Frank and Goyal (2003) find a robust relationship between financial deficits and leverage for older and larger firms with less severe asymmetric information problems. Their results show a little support for the pecking order theory. However, Fama and French (2005) show their results contradict this theory. They assess the capital structure of firms from 1983 to 2002 and state that small firms with more asymmetric information problems prefer equity rather than debt. However, according to this theory, firms with high growth opportunities and more asymmetric information problems should increase their debt level. Barclay et al. (2006) claim that firms with high growth opportunities issue less debt in contrast to the idea of the pecking order theory. Seifert and Gonenc (2008) examine the validity of the pecking order theory among firms in the U.S, the U.K., Germany, and Japan and their result contradicts with this theory, and shows that all four countries prefer equity financing to raising debt.

To sum up, based on the aforementioned studies, there are results, which are consistent and inconsistent with the predictions of pecking order theory. The existing debates, therefore, on this subject encourage further research considering other capital structure theories.

2.3.3 Empirical Studies based on the Market Timing Theory

This subsection reviews existing empirical studies on capital structure based on the market timing theory.

There are empirical studies on capital structure consistent with the predictions of the market timing theory. For instance, Baker and Wurgler (2002) find that market timing has an impact on capital structure based on their evidence from US firms. Von Nitzsch and Rouette (2006) find that the market environments should have an effect on the capital structure decision and firms issue equity when it is cheap compared with debt. Alti (2006) shows that companies issue more equity in *"hot markets''* than in *"cold markets"* and, accordingly, in the short-run, market timing is a significant determinant of financing decisions by firms rather than in the long term. This is because the long-term market timing of equity is consistent with the trade-off theory and follows a target capital structure. Moreover, the author states, *"Immediately following their IPOs, hot-market firms start issuing significantly more debt and less equity than cold-market firms do. Because of this active reversal policy, the leverage ratios of hot-market firms increase significantly in the 2 years following the IPO. In contrast, cold-market firms appear to be content with the leverage ratios they attain at the IPO. By the end of the second year, the hot-market effect on leverage completely vanishes."* Hovakimian (2006) finds that there is no evidence of a continuing effect of market-to-book ratio on leverage of US firms and firms with more growth opportunities issue more equity. This is why there is a negative relationship between market-to-book ratio and leverage. Six years after the work of Baker and Wurgler in 2002, some other authors such as Talberg et al. (2008), support their idea and approve the significance of market timing in the capital structure decision and state, *"Every company would like a capital structure which is best fitted to their current situation that minimises the cost of capital."* Mahajan and Tartaroglu (2008) analyse the market timing effect in all G7 countries and observe that all G7 countries, except Japan market timing effect on equity issue, decreases. Huang and Ritter (2009) claim that market timing has a long lasting effect on capital structure; for example, when the cost of equity is high, firms follow pecking order theory. Huang and Ritter (2005, 2009) prove with their evidence that firms issue equity when market valuation is high.

However, other studies have results that contradict with the above studies and the market timing theory's predictions. For instance, Flannery and Rangan (2006) find that market timing has a non-persistent effect on the capital structure, and state that firms quickly adjust their debt ratio to their target leverage because of the impact of shocks on the leverage ratio. Similarly, Drobetz et al. (2006) in their survey interview of European firms claim that market timing is not an important factor on firms' financing decisions.

2.3.4 Capital Structure Studies and Macroeconomic Conditions

This subsection discusses the empirical studies on the capital structure and macroeconomic conditions.

There are some studies in the context of capital structure that suggest capital structure may vary with macroeconomic conditions, even after controlling for the effects of relevant firm-specific variables (Meckling, 1976; Wilson, 1977; Marsh, 1982; Gertler and Hubbard, 1991). For instance, Lasfer (1995) analyses the effect of share prices on the U.K. firms' leverage for the pre-1988 period and the post-1988 period and finds that there is a relationship between macroeconomic factors and leverage. Kiotaki and Moore (1997) assess how credit constraints interact with aggregate economic activity over the business cycle and suggest that relative aggregate managerial wealth defines the debt ratio.

Furthermore, recent studies such as Korajczyk et al. (2002) examine the role of macroeconomic conditions to determine the capital structure decisions. Similarly, Korajczyk et al. (2003) analyse the impact of stock return and find that there is a negative relationship between profitability and leverage; as a consequence firms prefer to use their retained earnings which is consistent with the pecking order theory. Korajczyk and Levy (2003) analyse the impact of macroeconomic conditions on the capital structure of firms and conclude that the presence of the negative relationship between the macroeconomic variables and leverage seems consistent with the pecking order theory, particularly for unconstrained firms. Hackbarth et al. (2006), by constructing a partial equilibrium model of firms' financing decisions, analyse the impact of macroeconomic conditions on dynamic capital structure choice and characterise the impact of macroeconomic conditions on the pace and size of capital structure changes and debt capacity. They find that the corporate performance relates to macroeconomic conditions, and the average solvency of a company is 40% stronger in economic booms than that in economic recessions. In good economic conditions, as stock prices and GDP increase and leverage ratio tends to decrease, firms need to adjust their capital structure in order to achieve their target leverage. Similarly, Cook and Tang (2010) investigate the impact of macroeconomic conditions on the capital structure by using two dynamic partial adjustment capital structure models and find strong evidence consistent with the predictions of Hackbarth et al. (2006) that firms tend to decrease their leverage in good macroeconomic states.

All the studies mentioned above show that macroeconomic conditions have an effect on the capital structure, which encourages adding macroeconomic factors to firm-specific variables in order to investigate and control for the possible effects of macroeconomic conditions on capital structure.

2.3.5 Capital Structure Studies based on the U.K. Data

As mentioned earlier, there is a large amount of existing research on capital structure, but only a few studies have used U.K. data. For instance, Marsh (1982) studies the capital structure using 748 issues of equity and debt made by U.K. firms during the 1959 to 1970 period and finds results consistent with the trade-off theory. Bennett and Donnelly (1993) analyse the determinant of capital structure using a regression analysis and U.K. data of the 1977-1988 period and find that long-term debt is more representative of a firm's policy with regard to its capital structure. They conclude that a positive relationship exists between leverage and volatility. Their results support the view that size, profitability, asset structure and non-debt tax shields of firms have an effect on capital structure. Walsh and Ryan (1997) examine the impact of tax and agency considerations on capital structure using U.K. firms from 1984 to 1991. They use a binomial choice model and find that tax considerations have a significant effect on the capital structure of U.K. firms. Ozkan (2001) uses a panel data set including 390 non-financial U.K. companies from 1984 to 1996 and partial adjustment modelling to investigate the determinants of capital structure and adjustment process. The author finds that size has a positive relationship with leverage whilst profitability, growth opportunities, non-debt tax-shields and liquidity have a negative effect on leverage. Benito (2003) tests capital structure using 1,784 U.K. companies over the 1973-2000 period and finds evidence consistent with the pecking order theory. Panno (2003) examines firms' equity and debt choices using 87 cash issues of equity and debt made by U.K. firms from 1992 to 1996 and finds evidence consistent with the trade-off theory. Bevan and Danbolt (2004) use the OLS and the fixed effects methods to investigate the determinant of 1,054 U.K. companies. Their result from the OLS method is consistent with prior literature, but their fixed effects method results show that larger companies have a higher level of debt, growth opportunities have a small effect on leverage, and profitability has a negative relationship with leverage ratio.

Furthermore, Fattouh et al. (2008) analyse the capital structure choices using a pooled cross-section of 6,614 U.K. firm observations for the period 1988-1998. They examine the

effect of variables that affect leverage of firms using the quantile regression method and find that an increase in firms' internal funds leads to a decrease in their leverage. They suggest that the effect of size on leverage is positive at lower quantiles while it is negative for firms in the upper quantiles.

Table 2.2 Comparison of Length of the Period and Sample Size

Previous study	Time	No. of firms	Country	Method
Marsh (1982)	1959-1970	748	U.K.	Logit and Probit
Bennett and Donnelley (1993)	1977-1988	433	U.K.	Variance, ANOVA
Rajan and Zingales (1995)	1987-1991	608	U.K.	Maximum likelihood & a censored Tobit model
Ozkan (2000)	1983-1996	429	U.K.	GMM
Ozkan (2001)	1984-1996	390	U.K.	GMM
Benito (2003)	1973-2000	1784	U.K.	GMM-system
Panno (2003)	1992-1996	87	U.K.	Logit and Probit
Bevan and Danbolt (2004)	1991-1997	1054	U.K.	Fixed effects panel estimation

2.3.6 Evidence from other Countries

This subsection discusses the existing empirical studies on the capital structure that analyse other countries' data.

Most researchers use U.S. data as their sample data. For instance, Ferri and Jones (1979) use U.S. data to analyse the relationship between capital structure and size, income, operating leverage and industry class. They find that operating leverage and size have a negative impact on leverage, and industry class has a significant effect on capital structure. Titman and Vessels (1988) use U.S. data set from 1974 to 1982 and factor analytic methods to evaluate the determinants of capital structure, and find that uniqueness and firm size has a negative effect on the short-term debt ratio. Shyam-Sunder and Myers (1999) examine capital structure models using a sample of 157 US firms from 1971 to 1989, to test trade-off theory against pecking order theory. They find that external financing depends on the internal financial deficit and their model is more consistent with the pecking order theory rather than a static trade-off theory. Fama and French (2002) use a more comprehensive sample of 3,000 US firms from 1965 to 1999 to assess the predictions of the trade-off theory and the pecking order theory. They find that highly profitable firms use less external financing and firms with more investment

opportunities have a lower leverage ratio. Frank and Goyal (2003) use a cross-section model of publicly traded US firms from 1971 to 1998 and find that while firms follow some aspects of pecking order theory, the financing deficit does not show any challenge to leverage factors in explaining capital structure. Indeed, they find that as time has elapsed, the relevance of the pecking order theory has decreased. Following their initial findings, in 2009 they examine 39 factors to explain the capital structure of a sample of publicly traded US firms and discover that the most significant and reliable factors are industry leverage, firm size, tangibility of assets, collateral (with a positive effect on the leverage), bankruptcy risk, dividend and market-to-book ratio (with negative effects on the leverage).

There are studies that use other countries as their sample data. For instance, Rajan and Zingales (1995) use the data sample of public firms of G7 industrialised countries from 1987-1991 to analyse the determinant of capital structure. They find that tangibility has a positive impact on leverage and profitability, and firm size has a positive correlation with leverage with the exception of Germany. Deesomsak et al. (2004) use the OLS model and analyse the capital structure of Asian Pacific countries, namely, Thailand, Malaysia, Singapore and Australia from 1993 to 2001. They find that a positive relationship exists between firm size and leverage ratio, whilst there is a negative relationship between liquidity and leverage. In addition, they state that specific corporate governance, institutional environment and legal structures of countries have an impact on leverage. Dejong et al. (2008) analyse the effects of country-specific factors on the capital structure using OLS regression and the sample choice of firms from 42 countries. Their empirical results show that tangibility, profitability, firm size, risk and growth opportunities are consistent with the capital structure theories. Tong and Green (2005) assess the trade-off and pecking order theories using a sample of the 44 largest firms listed on the Shanghai and Shenzen stock exchanges and find a negative relationship between leverage and profitability consistent with the pecking order theory. Elsas and Florysiak (2008) examine the impact of size, growth opportunities, the tangibility of assets and profitability on the capital structure decisions of publicly listed German firms from 1987 to 2006.

The next chapter evaluates macroeconomic factors that determine capital structure in order to develop the research hypotheses. This research tests the stated hypotheses under three of the explained capital structure theories; namely, the pecking order, the trade-off and the market

timing theories. The aim of this section is to explore an array of prominent empirical research on these theories, which has made them prevalent in the discourse on the firm capital structure.

2.4 Conclusion

To sum up, Modigliani and Miller (1958) explain that the firm value is irrelevant to capital structure of firms in the absence of market imperfections. There are a lot of theoretical and empirical researches on capital structure but there is no generally accepted theory yet, and thus it remains an open line of research. Some of the researchers who did not accept the conclusion of Modigliani and Miller propose some alternative theories to make the debt-equity choice, namely: trade-off, pecking order, agency, market timing, market microstructure, and industry structure theories. Despite the vast existing literature on capital structure, there is still a lack of consensus in empirical research on capital structure. In addition, previous studies focus more on the impact of firm-specific variables, corporate governance variables, country-specific effects and industry classification effects (e.g., Rajan and Zingales, 1995). Given that the existing empirical literature on the capital structure using the stated variables is still undecided; this research focuses on the relationship between macroeconomic conditions and capital structure. It should be noted that considering what was learnt from the literature on macroeconomic conditions and capital structure, it was decided that this work should mainly focus on the impact of business cycle, credit supply, financial market risk and stock market performance on capital structure.

The next chapter develops the research hypotheses using the existing literature on the impact of macroeconomic conditions on capital structure. It firstly briefly reviews the previous studies to demonstrate the importance of the topic and then develops the first three hypotheses for analysing the impact of the business cycle, credit supply and financial market risk on leverage under the pecking order and trade-off theories. Finally, it develops the fourth hypothesis to analyse the impact of stock market performance on leverage under the three stated theories.

CHAPTER THREE: HYPOTHESES

An important research question in finance relates to the factors that determine the capital structure. Some of the previous studies conducted in the context of capital structure suggest that it may vary with macroeconomic conditions, even after controlling for the effects of relevant firm-specific variables (Mackling, 1976; Wilson, 1977; Marsh, 1982; Gertler and Hubbard, 1991). Most of the previous capital structure studies concentrate more on the effects of firm-specific variables; there are still not enough studies on the impact of macroeconomic conditions on capital structure.

Therefore, the purpose of this research is to develop the research hypotheses using the existing literature on the impact of macroeconomic conditions on capital structure. The chapter starts with a brief review of previous studies to demonstrate the importance of the topic. Then this chapter develops the first three hypotheses in sections 3.1, 3.2, and 3.3 for analysing the impact of the business cycle, credit supply and financial market risk on leverage under the pecking order and trade-off theories. Finally, section 3.4 develops the fourth hypothesis for analysing the impact of stock market performance on leverage under the pecking order, trade-off and market timing theories.

Lasfer (1995) studies the behaviour of share prices on U.K. firms' leverage for the pre-1988 period and the post-1988 period and finds that there is a relationship between macroeconomic factors and firms' leverage. In addition, Kiotaki and Moore (1997) evaluate how credit constraints interact with aggregate economic activity over the business cycle and suggest that relative aggregate managerial wealth defines the debt ratio (parallel to Levy and Hennessy (2007)). For instance, Kiyotaki and Moore (1997) and Suarez and Sussman (1999) use general equilibrium models and find that constrained firms (farmers in the Kiyotaki and Moore model) are always up against their borrowing constraints. Consequently the pro-cyclical value of collateral against which they borrow results in pro-cyclical leverage.

Recent studies, such as, Korajczyk et al. (2002), examine the role of macroeconomic conditions and financial constraints in determining capital structure decisions like these can bring in time-series and cross-sectional heterogeneity to a firm behaviour, which is also a motivation for this author to include macroeconomic factors in the model. Likewise, Hackbarth et al. (2006), by constructing a partial equilibrium model of firms' financing decisions, analyse

the impact of macroeconomic conditions on dynamic capital structure choice. They characterise the impact of macroeconomic conditions on the pace and size of capital structure changes and debt capacity. They predict market leverage should be countercyclical.

All the studies mentioned above indicate that macroeconomic conditions have an effect on the capital structure of firms. This motivates this author to add macroeconomic factors to firm-specific variables in order to investigate and control for the possible effects of macroeconomic conditions on capital structure decisions. Based on the stated related theoretical studies and the results of previous empirical studies, this research suggests the direction of the supposed relationship between macroeconomic factors and capital structure as the following hypotheses.

This research develops its research hypotheses based on the macroeconomic variables, namely business cycle, credit supply, financial market risk and stock market performance under the three stated capital structure theories. For instance, Hypothesis 1 (H1) proposes the direction of impact of business cycle on capital structure under the pecking order theory; and the alternative Hypothesis 1 (H1A) suggests the direction of the impact of business cycle on capital structure under the trade-off theory, and so on for H2-H4. This research sets the impacts of macroeconomic factors in four key hypotheses, shown in Table 3.1.

3.1 Business Cycle and Capital Structure

This section discusses the existing literature on business cycle and leverage to emphasise the importance of the impact of the business cycle on capital structure which justifies why this study chooses business cycle as one of the macroeconomic variables. This research uses industrial production and corporate tax as a measure to proxy for business cycle. Firstly, this section explains pecking order theory and discusses the existing studies on the impact of industrial production and corporate tax rate on leverage under pecking order theory in order to develop H1. Next, this section explains both the static trade-off and dynamic trade-off theories and discusses the existing studies on the impact of industrial production and corporate tax on leverage under the static trade-off and dynamic trade-off theories in order to provide a basis for developing H1A.

The pecking order theory explains the capital structure decisions by taking into account the information asymmetry that exists between managers and shareholders. However, the

choice of capital structure moderates the effects of information asymmetry on the capital structure decisions. According to the pecking order theory, firms prefer internal financing to external financing. Firms tend to choose internal funds for financing their operations as the first option, then issuing debt as their second option and lastly issuing equity. For instance, those with a higher level of cash flow than capital investment outflows prefer using surplus to pay their debts rather than to repurchase or retire equity. If the need for external financing increases, firms prefer safe debts to risky ones and use equity as a last resort (Myers, 1984; Myers and Majluf, 1984).

Myers and Majluf (1984)'s theory describes that firms with a lot of cash flow prefer to use internal financing and then external financing. When there is an increase in the size of GDP, firms have more cash flow available. According to them, firms prefer to use their cash flow as the primary source of funding instead of getting a loan. Consequently, firms' weight of debt decreases and they use internal funds to retire their debt especially the short-term debt. This is suggesting that business cycle has a negative impact on leverage under pecking order theory.

According to pecking order theory, in the period of economic expansion the leverage decreases due to a higher level of industrial production and corporate tax, firms have more cash flow available for internal financing. Firms, therefore, prefer internal financing. However, during recessions, there is a lower level of industrial production and corporate tax, firms have less cash flow available, so firms tend to seek external financing and have a higher leverage ratio as the pecking order theory would suggest.

A few authors use the pecking order theory to explain the effect of business cycle on leverage. For example, Choe et al. (1993) study the debt and equity issuance of all NYSE, AMEX and NASDAQ listed firms during the 1971-1991 period, and find that during expansions debt issues decrease. Korajczyk and Levy (2003) study the impact of macroeconomic conditions on the capital structure of firms. They split their firm's sample based on a measure of financial constraints and find that target leverage is counter-cyclical for the relatively unconstrained sample. They state, *"In the pecking order theory, external financing is more expensive for riskier securities (possibly due to informational asymmetries between managers and security holders). Thus, firms prefer to finance first with internal funds, then with debt, and lastly with equity."* They conclude that the presence of the negative relationship between the macroeconomic variables and leverage seems consistent with the pecking order theory, particularly for unconstrained firms. Consistent with results of Korajczyk and Levy

(2003), Cook and Tang (2010) investigate the impact of macroeconomic conditions on the capital structure by using two dynamic partial-adjustment capital structure models and find strong evidence consistent with the predictions' of Hackbarth et al. (2006) that firms tend to decrease their leverage in good macroeconomic states.

To conclude, different points of the business cycle and macroeconomic conditions affect capital structure choices. According to the pecking order theory, firms finance their operations in different ways while in different stages of the business cycle. For instance, during expansion the higher size of industrial production suggests that firms have a lot of cash flow, which they use mainly as the primary source of funding instead of raising loans as the pecking order theory suggests. Consequently, firms' weight of debt decreases and they use the internal fund to pay off their debt, especially with the short-term debt. During a recession with a low industrial production and corporate tax, firms tend to seek external financing and have a higher leverage ratio as the pecking order theory indicates.

According to pecking order theory, during expansion the government increases tax rates in order to reduce inflation and firms due to a higher level of cash flow, need to pay more tax. Therefore they tend to seek internal financing in order to reduce their level of cash flow and have a lower leverage ratio. This shows there is a countercyclical relationship between corporate tax and leverage. Similarly, during the recession due to a low level of economic growth, firms do not have enough cash flow, which leads them to seek external financing and have a higher leverage ratio as the pecking order theory indicates. Therefore, there is a countercyclical relationship between corporate tax and leverage.

Therefore similar to expansion, during recessions, there is also a negative relationship between leverage and business cycle under pecking order theory.

Based on all aforementioned studies, I propose the first hypothesis as below:

H1*: There is a countercyclical relationship between leverage and business cycle under pecking order theory.*

Another theory of capital structure is the trade-off theory, which explains the capital structure decisions by taking into account taxes and bankruptcy costs. This theory states that the firms achieve the optimal leverage by trading-off between the cost and benefits of debt (Fama and French, 2002). Increasing leverage has some benefits and costs for firms, in other

words, in the static trade-off theory the benefits of increased leverage (for example, tax benefits or reductions in agency costs) are weighed against the costs of increased leverage (for example, deadweight bankruptcy costs and agency conflicts) in order to determine the optimal amount of leverage (Korajczyk and Levy, 2003). Additionally, Myers, (2001) explains that firms replace debt with equity or equity with debt until they reach the maximum value of the firm. Therefore, firms with debt can benefit from an interest tax shield, and increasing debt increases the risk of firms becoming financially distressed.

According to the static trade-off theory, firms finance their operations in different ways while they are in different stages of the business cycle. For instance, during expansion, the equity market is performing well, expected bankruptcy costs are lower and therefore firms tend to issue more debt. As a result, firms are more likely to have taxable income to shield and have more free cash, and there is a pro-cyclical relationship between leverage and business cycle in the expansion. During the recession, as the cost of financial distress is higher and the marginal cost of debt increases, firms tend to issue less debt, and there is a pro-cyclical relationship between leverage and the business cycle during the recession. Therefore, a trade-off model would imply pro-cyclical leverage.

A few authors use the static trade-off theory to explain the effect of the business cycle on leverage. For instance, Wilson (1977) analyses the relationship between business cycle and capital structure and explains that there is a higher probability of bankruptcy during a low point of the business cycle. During recessions, because of higher risk and the higher probability of bankruptcy, firms tend to incur less debt. The author finds that different points of the business cycle and the macroeconomic conditions affect capital structure choices, and GDP has a positive effect on leverage. In addition, Jensen and Meckling (1976) state that in expansions, the relationship between leverage and GDP growth rate is pro-cyclical under the static trade-off theory. While the equity market is performing well, bankruptcy costs are lower, firms are more likely to have taxable income to shield, and have more free cash, and therefore, unconstrained firms prefer more debt. Myers (1984) suggests that there is a positive relationship between leverage and GDP under the trade-off theory. Similarly, Gertler and Hubbard (1991) state that under the trade-off theory the relationship between leverage and GDP growth rate is pro-cyclical. During expansion, GDP is high, marginal cost of debt declines and firms tend to increase their leverage. In contrast, during recessions when GDP is low, the

cost of financial distress increases, and therefore the marginal cost of debt increases as well, which leads to firms decreasing their leverage.

Another related capital structure theory is the dynamic trade-off theory, which explains that firms have optimal capital structure and they aim to achieve this through target leverage. Firms may deviate from their target leverage but they adjust their leverage towards their target leverage. Therefore, according to the dynamic trade-off theory, during expansion as stock prices, industrial production, corporate tax and GDP increases, firms tend to issue more equity; consequently, leverage ratio tends to decrease and firms need to raise their leverage in order to adjust toward target leverage. In recession, stock prices, industrial production, corporate tax and GDP decreases and firms tend to increase their leverage, but perhaps firms should decrease their leverage to meet the target. Therefore, during both expansion and recession, industrial production, corporate tax and GDP have a pro-cyclical impact on leverage.

A number of studies use the dynamic trade-off theory to explain the effect of the business cycle on leverage. For instance, Graham and Harvey (2001) explain that the adjustment speed might be quite different among companies due to different adjustment costs. Based on their result, 80% of the investigated firms declared having target leverage. Additionally, a few studies state that macroeconomic factors can explain a firm's capital structure adjustment toward their target leverage ratio (Booth et al., 2001; Levy and Hennessy, 2007). Hackbarth et al. (2006) use the dynamic trade-off theory to explain the effect of the business cycle on leverage and state that the firms' adjustment threshold is lower during expansion than during recession. Therefore, the cost of adjustment is lower during expansion. They find that the corporate performance is closely related to macroeconomic conditions, and the average solvency of a company is 40% stronger in economic booms than than in economic recessions. In good economic conditions, as stock prices, industrial production, corporate tax and GDP increase and leverage ratio tend to decrease, firms need to adjust their capital structure in order to achieve their target leverage. This suggests that industrial production and corporate tax has a pro-cyclical impact on leverage ratio.

Based on all aforementioned studies, this author formulates the alternative to the first hypothesis as:

H1A*: There is a pro-cyclical relationship between leverage and industrial production and corporate tax under both the static and dynamic trade-off theories*

3.2 Credit Supply and Capital Structure

This section first discusses the importance of the impact of credit supply on leverage. Secondly, it reviews the previous studies about financial constraint. Thirdly, it explains a few existing studies of the impact of credit supply on capital structure. Finally, it develops the second hypothesis of this research.

The fact that firms face financial constraints verifies the importance of the impact of credit supply on the capital structure of firms. However, despite the substantial development of capital structure literature, there is little attention to the effects of credit supply on capital structure, and the majority of the previous studies concentrate on the demand side of credit. This research excludes financial firms from the data sample but controls for the effect of these firms by including credit supply in the model and uses money supply as a proxy to measure the credit supply and by including firm size as a control variable for analysing the impact of credit supply on leverage.

Different monetary policy and credit supply shocks affect capital structure choices. Therefore, changes in monetary policies are one of the main causes of credit supply fluctuations. For instance, when the central bank (e.g. Federal Reserve or the Bank of England) desires to tighten their monetary policy interest rates increase and the amount of money supply in the economy decreases. Because of a fall in the credit supply, the firm's debt ratio decreases. Therefore, the supply of credit deviates at different points of the business cycle. For instance, during the contraction in the early 1990s and credit crunch of 2008-09, the Bank of England used the policy of quantitative easing and put more money into the economy. Consequently, while credit supply increases, firms tend to issue debt instead of equity; this shows a positive relationship between credit supply and leverage.

Firms finance their operations in different ways while facing credit supply uncertainty. For instance, during expansion the money supply increases, which means there is more credit supply and consequently, as there are more loans available, firms prefer to issue debt instead of equity. Although there is no direct relationship between credit supply and information asymmetry and is ambiguous, firms still prefer debt rather than equity as the pecking order theory indicates. Likewise, during recession when firms face financial constraints and a low

level of credit supply, they find it difficult to issue debt and therefore they prefer internal financing rather than external financing, which is in line with the predictions of pecking order theory. Similarly, based on the prediction of trade-off theory, if credit supply increases, credit value becomes cheaper. Consequently, more loans will be available, and the cost of loans reduces, and therefore firms prefer to incur more debt, which shows a positive relationship between leverage and credit supply.

A few studies discuss the impact of credit supply on capital structure. For instance, using the U.K. data sample, Huang's (2003) suggests tight money supply decreases debt ratio. The author uses a dummy variable to control for monetary policy tightening and finds that reduction in money supply leads to a general reduction of leverage. Massa, Yasuda & Zhang (2009) also express the view that credit supply uncertainty has a negative impact on leverage and affects firms' maturity choices. Balsari and Kirkulak (2010) report a negative impact of the 1994 crisis on Turkish firms' leverage ratios. This suggests a positive relationship between money supply and leverage. Choi et al. (2010) examine the effect of credit supply on the capital structure and find a strong relationship between convertible bond issuance and a variety of measures of supply of credit. Similarly, Erel, Julio, Kim & Weisbach (2012) use time series evidence on the relationship between macroeconomic conditions including credit supply and firms' capital raising. They report that the supply of credit has a significant impact on leverage.

Morellec (2010) develops a model of corporate investment and financing decisions taking into account that firms face uncertainty regarding their future access to credit markets. The author finds that credit supply is crucial to the determination of capital structure and explains why firms may appear to time the market when issuing common stock. The model also explains why negative shocks to the supply of credit may hamper investment even if firms have enough financial slack to fund all profitable investment opportunities internally.

Consistent with the previous studies, Voutsinas and Werner (2011) analyse the effect of financial constraints and credit supply fluctuations on the 1,537 Japanese publicly listed firms' capital structure from 1980 to 2007. They assess the impact of the asset bubble in the 1980s and the credit crunch of the late 1990s on corporate capital structure decisions. Similar to Leary (2009), they consider two major economic events: the burst of the land value bubble in 1989, and the Japanese financial crisis in 1998. Their finding shows that the asset bubble in the 1980s and the credit crunch of the late 1990s have a significant impact on corporate capital structure decisions and during economic downturns, small firms face financial constraints. They

conclude that credit supply uncertainty in Japan has a significant negative effect on Japanese firms' financial leverage levels particularly for bank-dependent firms. Moreover, Morellec et al. (2012) investigate the effect of various firms and industry characteristics, including credit supply, using a large sample of US firms for the period 1986-2007 and present new evidence on firms' debt choices and investment decisions.

Based on all aforementioned studies, the second hypothesis is:

H2: *There is a positive relationship between leverage and credit supply under the pecking order theory and the trade-off theory.*

3.3 Financial Market Risk and Capital Structure

This section, firstly, discusses the importance of the impact of financial market risk on leverage. Secondly, it reviews the previous studies on the impact of financial market risk on capital structure. Finally, it develops the third hypothesis of this research.

The level of financial market risk is important for firms, mainly to mitigate risk and optimise capital structure. Financial market risk changes over time and stems from exposure to fluctuations in macroeconomic growth rates. In other words, different points of the business cycle evolve different levels of financial market risk (Bansal and Yaron, 2004). Dangl and Zechner (2004) explain that firms adjust their financial structures in response to stochastic changes in their economic environment. Therefore, measuring and managing financial market risk is important for financial institutions, because in most countries, banks' equity requirements are already tied to their exposure to financial market risk.

Based on the pecking order theory both debt and equity issuance have an adverse selection risk premium but issuing equity is strictly riskier than issuing debt. Financial market risk will not always remain constant and at different points of the business cycle, firms face different levels of financial market risk. Consequently, firms need to finance their operations in different ways while in different stages of the business cycle. Accordingly, during recessions while financial market risk increases, information asymmetry increases. Consequently, if there are no internal funds available, firms tend to issue debt rather than equity. Therefore, from a pecking order theory perspective, there is a positive relationship between leverage and financial market risk. Likewise, according to trade-off, theory, during recession financial market risk is high and the costs of debt increases, so debt becomes expensive and firms tend

to incur less debt and issue more equity. This suggests a negative relationship between leverage and financial market risk under trade-off theory.

A few studies have results consistent with the capital structure theories studying the impact of financial market risk on capital structure under the trade-off theory. For instance, Hackbarth et al. (2006) state that during recessions credit risks are higher than during a boom for any level of leverage and they find that firms tend to incur less debt during a recession; this is in line with predictions of the trade-off theory. Moreover, Bhamra et al. (2009) study the impact of time-varying macroeconomic conditions on optimal capital structure, considering the standard trade-off model of dynamic capital structure. Credit risk leads to substantially lower leverage at refinancing, and the unconditional leverage ratio is 6% higher than the optimal leverage ratio at refinancing in the bad state. They examine the relationship between leverage and the term structure of default probabilities and find that leverage includes adequate macroeconomic information, both past and present, and their model does not lose much power by not controlling for macroeconomic conditions once leverage is accounted for. They conclude that macroeconomic risk leads to significantly lower leverage at refinancing which is in line with the predictions of trade-off theory.

In addition, Chen (2010) investigates how financial market risk affects capital structure and default policies using a trade-off model. The author, using macroeconomic conditions into firms' financing decisions, provides a risk-based explanation for two puzzles about corporate debt. The author states, "*The first puzzle is the 'credit spread puzzle': yield spreads between investment grade corporate bonds and treasuries are high and volatile relative to the observed default probabilities and recovery rates. The second is the 'under-leverage puzzle': firms choose low leverage ratios despite facing seemingly large tax benefits of debt and small costs of financial distress."* Using a dynamic capital structure model, which generates interesting dynamics for financing and defaults, including "credit contagion" and market timing of debt issuance, they observe that default risk premium varies significantly over time and has a large influence due to large economic shocks. There is countercyclical fluctuation in risk prices, default probabilities, and default losses that arise endogenously through firms' responses to the macroeconomic conditions. These co-movements generate large credit risk premium for investment grade firms, which helps in addressing the "credit spread puzzle" and "under-leverage puzzle" in a unified framework. They show that in the long-run risk framework, a dynamic trade-off model can endogenously generate the "right amount" of co-movement in

risk premium, default probabilities, and default losses, which explains the high credit spreads and low leverage ratios of investment grade firms. This again suggests a negative relationship between credit market risk premium and leverage under the trade-off theory.

Based on all aforementioned studies, it should be mentioned that most of the previous studies of impact of financial market risk on leverage concentrate more on the trade-off theory. Consequently, as there are not enough studies on the impact of financial market risk on leverage under pecking order theory, this is a motivation to fill the gap. Hence, this author proposes the third hypothesis as below:

H3: *There is a positive relationship between leverage and financial market risk under pecking order theory.*

H3A: *There is a negative relationship between leverage and financial market risk under the trade-off theory.*

3.4 Stock Market Performance and Capital Structure

The remainder of this chapter is as follows. Firstly, it discusses the importance of the impact of stock market performance on leverage. Secondly, it reviews the previous studies on the impact of stock market performance on leverage under the trade-off theory and develops H4. Thirdly, this section explains another theory of capital structure, namely market timing theory. Fourthly, it reviews the previous studies on the impact of stock market performance on leverage under the market timing and pecking order theories and develops H4A. Finally, it summarises the hypotheses of this research in table 3.1.

A number of corporate finance studies explain that firms' stock price histories have an impact on its capital structure. They propose that firms tend to issue equity after an increase in stock prices and therefore they decrease their leverage; highly profitable firms use their earnings to reduce their leverage (Titman and Wessels, 1988; Masulis and Korwar, 1986). Similarly, Baker and Wurgler (2002) investigate the effect of past stock market returns on the active issuing decisions of firms. This suggests that stock market performance has an effect on leverage.

According to Welch (2004), stock prices have a significant effect on the debt-equity ratio and can last for several years. The author states that US firms do not issue and repurchase debt and equity to stabilise the mechanistic effects of stock returns on their debt-equity ratios, and stock returns can explain about 40 percent of debt ratio dynamics in a five-year period. In addition, stock returns play a much higher role in explaining capital structure in comparison with other proxies used in the literature. Stock returns and stock return-adjusted are the best variables forecasting market-based capital structure. By examining the relationship between lagged stock returns and capital structure, he concludes that stock returns are the most important determinant of debt ratios and correlate with omitted dynamics caused by stock price changes. Previously used proxies, therefore, seem to have helped clarify capital structure dynamics. Therefore, following the above authors, this present research uses stock return to measure the stock market performance.

According to the trade-off theory, firms finance by trading off between tax benefits of debt and financial distress costs. An increasing leverage may provide additional tax benefits in exchange for risking a short-term liquidity crunch or bankruptcy. Firms' leverage increases with a rise in stock market performance as tax benefits are desirable for firms that are more profitable and those firms pay more taxes in order to lever up. In addition, by increasing the stock market performance, the market value of equity becomes larger; consequently, firms are required to increase their leverage in order to obtain their target leverage. Leverage and stock market performance have a positive relationship under the trade-off theory.

A few studies have results consistent with the impact of stock market performance on capital structure of a firm under the trade-off theory. For instance, Barclay et al. (2006) state that for profitable firms increasing leverage may provide additional tax benefits in exchange for risking a short-term liquidity crunch or bankruptcy costs. This is in line with predictions of trade-off theory. Welch (2004) reports that firms with high profitability need to pay more taxes. Therefore, they tend to lever up.

Based on the aforementioned studies, this author proposes H4 hypothesis as:

H4*: There is a positive relationship between leverage and stock market performance under the trade-off theory.*

The third theory that this research assesses is the market timing theory of capital structure. Recent literature states that this theory challenges previous capital structure theories by taking into the account the market inefficiency frictions (Loughran and Ritter, 1995; Hertzel et al., 2002). According to this theory, firms prefer to issue equity when the cost of equity is low and share price is high, similarly repurchasing it at a low price.

For instance, Marsh (1982) explains that firms tend to issue equity when stock prices are high. Ritter (1984) finds that timing of stock market does matter for specific industries. Korajczyk et al. (1989), state that firms prefer to issue more equity when there is an abnormal increase in their own price of equity. Fama and French (1992) explain that when there is a hot market, stock market performance is good, and firms tend to issue more equity as the market timing theory indicates. They find that stock market performance has a negative impact on leverage under market timing theory.

On the other hand, Bayless and Chaplinsky (1996) explain the theory of *"windows of opportunity"* as capital can be raised at favourable terms, which results in periods of extreme equity issue volume, namely hot equity markets, as firms seek to benefit from these opportunities. There are two interpretations for the window of opportunity: *"(i) a behavioural argument where the market is particularly exuberant over equity issues and (ii) the relative pricing of Asset classes (i.e., debt and equity), due to the severity of adverse selection for example, is such that a large number of firms prefer to issue equity."* However, during the second expansion of the 1970s, the equity market performed poorly, and the average price drop upon equity issue announcement was relatively large, yet equity issues as a fraction of total external funding was relatively high. In their research, the period from 1976 to 1979 is called the *"cold market",* during which the average price reaction to an equity issue announcement was 3.6%, compared with 2.0% during their classified *''normal''* markets.

In addition, Graham and Harvey's (2001) survey states that firms' manager finance based on market timing. Two thirds of firm managers decide to issue equity in accordance with stock prices. Baker and Wurgler (2002) study explains that firms prefer to issue equity when their share price is high, relative to book and past market values, and to repurchase equity when their share price is low. They find that this has a significant effect on capital structure. As a result, there is a relationship between historical market values and capital structure.

Therefore, based on the market timing theory, a firm's history has an important role in determining its capital structure. For instance, when there is a hot market and stock market performance is good, firms tend to issue more equity. Whereas, when stock market performance declines then managers may have inside information that their firms have become too undervalued and tended to increase debt. Hence, stock market performance has a negative impact on leverage under market timing theory.

According to the pecking order theory (Myers, 1984; Myers and Majluf, 1984), firms do not tend to raise equity when their stock prices depreciate because there would be negative inference by investors. Nevertheless, when stock prices increase because the information asymmetry reduces, firms tend to issue more equity. Therefore, firms finance with their retained earnings rather than debt, but prefer debt to equity financing and so, profitable firms issue less debt and accumulate their retained earnings. When they are unprofitable, they issue more debt. In addition, firms are reluctant to raise more equity when their stock prices decrease because of negative inferences by investors, so they tend to raise more debt. There is a negative relationship between stock market performance and leverage under the pecking order theory.

There are some studies on the impact of stock market performance on leverage, whose results are consistent with the prediction of the pecking order theory. For instance, Myers (1984) explains that firms are reluctant to get more debt when their stock prices increase. Thus, it shows a negative relationship between leverage and stock market performance under pecking order theory. Similarly, Korajczyk et al. (2003) analyse the impact of stock return and find that there is a negative relationship between profitability and leverage. Consequently, firms prefer to use their retained earnings, which is consistent with the pecking order theory.

The preceding paragraphs show that according to pecking order theory, firms do not tend to raise equity when their stock prices depreciate because of negative inference by investors. However, firms tend to issue more equity when the stock prices increase. Therefore, firms finance with their retained earnings rather than debt, but prefer debt to equity financing. Therefore profitable firms issue less debt and accumulate their retained earnings, and when they are unprofitable, they issue more debt. In addition, firms are reluctant to raise more equity when their stock prices decrease because of negative inferences by investors so they tend to

get more debt. Therefore, there is a negative relationship between stock market performance and leverage under the pecking order theory.

From the literature above, this author concludes that stock market performance has a negative effect on leverage under both the pecking order and market timing theories. Hence, this study proposes the H4A hypothesis as:

H4A: *There is a negative relationship between leverage and stock market performance under the pecking order and market timing theories.*

Table 3.1 shows the impact of business cycle, credit supply, financial market risk and stock market performance on leverage under each of the three capital structure theories. A (+) indicates that there is a positive impact while a (-) stands for a negative impact, N/A shows no impact is expected. For instance, H1 shows hypothesis 1 which states there is a countercyclical relationship between business cycle and leverage under the pecking order theory.

Table 3.1 Static Model Hypotheses

Variable\ Theory	**Trade-off**	**Pecking order**	**Market timing**
Business cycle	H1A (+)	H1 (-)	NA
Credit supply	H2	(+)	NA
Financial market risk	H3A (-)	H3 (+)	NA
Stock market performance	H4 (+)	H4A	(-)

**A (+) indicates a positive impact while a (-) stands for a negative impact, where no impact is expected NA marks it.

To conclude, this research hypothesises that macroeconomic conditions have a large impact on firms' financing decisions. Since the tax benefit of debt depends on the level of cash flows, and expected bankruptcy costs depend on the probability of default and the loss given defaults, both depend on the different stages of business cycles. Because optimal leverage is influenced by balancing the tax benefit of debt against bankruptcy costs, macroeconomic conditions should induce variations in firms' financing decisions.

• CHAPTER FOUR: METHODOLOGY AND DATA

4.1 Introduction

This chapter explains the methodology and data used in this research to answer the three following research questions:

- Is the effect of business cycle on capital structure pro-cyclical or counter-cyclical?
- Do credit supply, financial market risk, and stock market performance have a significant effect on firms' capital structure?
- Do macroeconomic variables affect capital structure in a manner that is consistent with the pecking order, trade-off, and market timing theories?

In order to answer the above questions this research constructs a regression model including dependent variable, different combinations of independent variables and control variables. This research uses book leverage as a measure for the dependent variable. Business cycle, credit supply, financial market risk and stock market performance are independent variables (considering two proxies for each of the variables to check robustness). This research chooses firm-specific factors that are significant in previous studies as control variables. Then this research applies different static estimation strategies such as fixed effect, random effect, tobit and GLS regression models to analyse the impact of macroeconomic conditions on the capital structure of U.K. firms. It uses the Hausman test for the choice of model between fixed effect and random effects models. It also tests the data for the serial correlation and heteroscedasticity, as well as using dynamic estimation strategy of Generalized Method of Moments (GMM) to check the impact of macroeconomic conditions on dynamics capital structures of firms.

The rest of this chapter consists of five main sections. Section 4.2 explains the conceptual framework; section 4.3 describes the static panel data regression model, including fixed effects, random effects, tobit and GLS regression models. Section 4.4 demonstrates the estimation strategy of the dynamic panel data regression model, and describes the GMM. Section 4.5 explains the data description and sample selection. Section 4.6 discusses and justifies the elements of the model including dependent, independent and control variables.

4.2 Conceptual framework

According to Gujarati (2009), depending on the objects of the study, regression analysis can apply time-series, cross-sectional and panel data. Each kind of regression analysis is more useful in certain areas than others. A time-series regression analysis observes the value of one or more variables over a period, cross-sectional regression analysis observes data values of one or more variables for several sample units at the same point in time; and the panel data regression analysis studies the same cross-sectional data over time. This implies that panel data combines the two dimensions (time series and cross sectional-data). In other words, panel data includes three types of data, namely: a time-invariant unique identifier for each unit (here firms), a time-varying outcome (here macroeconomic variables) and an indicator of time (year). As stated in the previous section, this research combines the macroeconomic variables and firm-specific variables in order to answer the above research questions. This leads us to consider both times series and cross-sectional aspects of data.

This research applies panel data regression analysis for the following reasons. Firstly, because the panel data method merges time series and cross-sectional observations, it provides us with, *"more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency"* (Baltagi, 1995). Secondly, because the panel data sample includes firms over time, there is heterogeneity in this data sample. The method of panel data estimation can take such heterogeneity explicitly into account by including macroeconomic variables (This research constructs a data sample of 922 firms to reduce the bias that might result if this study aggregates individuals or firms into broad aggregates.) Thirdly, since this research looks at dynamic aspects of capital structure, panel data method, by reviewing the repeated cross section of observations is suitable for analysis of the dynamics of change (Gujarati, 2009).

The reasons mentioned above show that using the panel data model is essential for investigating the impact of macroeconomic conditions on capital structure. Previous researchers have used this method for analysis of determinants of capital structure. For instance, Frank and Goyal (2006) use linear regression modelling to describe leverage measured by least squares-based methods in panel data analysis. Bevan and Danbolt (2004) use pooled ordinary least square (OLS), fixed effects, and random effects panel estimation

models. So following Korajczyk (1991), this research uses panel data regression analysis to answer the research questions stated above.

Gujarati (2009) explains that panel data has other names such as pooled data, combination of time series and cross-sectional data, micro panel data, longitudinal data, event history analysis, and cohort analysis. There are two types of balanced and unbalanced panel. If each unit has the same number of observations, the panel is balanced. This research is an unbalanced panel data because it has a different number of observations for each firm.

There are several attractive features and advantages for panel data compared with time series or cross-sectional data sets:

- Panel data makes it possible to analyse changes on an individual level.
- It is not only suitable to explain why individual units perform differently but also to explain why a given unit behaves differently at different points in time.
- It reduces identification problems (identification in the presence of endogenous aggressors or measurement error, robustness to omitted variables and the identification of individual dynamics (Verbeek, 2008)).
- It describes the behaviour of individuals over several years, by identifying the dynamic effects between individuals, not detected by cross-sectional data (Baltagi, 1995).
- Furthermore, it provides more degrees of freedom, offers the possibility of controlling for omitted variables bias, and decreases the problem of multicollinearity, consequently improving the accuracy of parameter estimates and prediction (Baltagi, 1995).

This research, therefore, uses panel data regression analysis.

Various regression models exist for analysing panel data, and the use of them depends on the assumptions made about the intercept, the slope coefficients, and the error term. These can be summarised as:

- The slope coefficients are constant but the intercept varies over individuals and time;
- Intercept and slope coefficients are constant across time and units and the error term varies over time and individuals;
- The slope coefficients are constant but the intercept varies over individuals;
- All coefficients vary over individuals;

- The intercept as well as slope coefficients vary over units and time.

Due to the limitations of the OLS estimation model to estimate capital structure (i.e. failure to control for time invariant firm-specific heterogeneity), this research uses fixed and random effects panel estimation models to assist in the examination of capital structure. This is done by considering macroeconomic conditions and their interaction with firm-specific factors so as to determine whether and to what extent capital structure choice varies over time across firms. Fixed effects and random effects panel data regression analyses are applied to deal with firms' heterogeneity, which may be caused by characteristics that differ among firms but are invariant over time.

Section 4.3 explains the static panel data regression model and describes four of the static panel data strategies to estimate the effect of macroeconomic variables on capital structure. Section 4.3.1 describes the fixed effects model; section 4.3.2 describes the random effects model; section 4.3.3 explains different statistical tests and the choice of model between the fixed effect and random effects models. Section 4.3.4 explains the tobit model. Lastly, section 4.3.5 explains the GLS regression model.

4.3 Static Panel Data Regression Strategies

This section explains the four different static strategies that this research uses and formulates equation 4.1 as the static model based on capital structure theories. The initial regression of capital structure in this research is a function of macroeconomic variables, namely business cycle, credit supply, financial market risk, and stock market performance as independent variables, firm-specific variables, and industrial classification as control variables. It constructs equation 4.1 to analyse the impact of business cycle, credit supply, financial market risk, and stock market performance on capital structure.

$$LEV_{it} = \alpha_i + \beta_1 Buinesscycle_t + \beta_2 M3_t + \beta_3 RISK_t + \beta_4 FTSE_t + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\theta_z x_{zit}} + e_{it} \quad (4.1)$$

where i represents firms (cross-sectional dimension, i=1,…, 992), t represents (t = 1995,..., 2014), LEV is the book leverage ratio of firms, $Businesscycle_t$ represents the growth rate of business cycle's proxies, $M3_t$ represents the credit supply, $RISK_t$ represents the financial market risk's proxies, $FTSE_t$ represents the stock market performance, $Crisis_D$ represents 2008 financial crisis dummy, I_D represents industry dummies, θ_z represents the coefficient for

firm-specific variables, $\boldsymbol{x}_{zit}$ is a vector of firms' characteristics and there is z observation of each $(x_1, \ldots, x_z)$; and e_{it} is the error term.

For simplicity this research rewrites equation 4.1 as:

$$LEV_{it} = \alpha_i + \boldsymbol{\beta_k Macro_{kt}} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m Macro_{kt}} * \boldsymbol{Crisis_D} + \boldsymbol{\theta_z x_{zit}} + e_{it} \quad (4.2)$$

Note, $(\boldsymbol{\beta_k Macro_{kit}})$ is a vector of K macroeconomic variables $Macro_1, \ldots, Macro_K$, and $\boldsymbol{\beta_m Macro_{kt}} * \boldsymbol{Crisis_D}$ is a vector of M macroeconomic variables interactions with the crisis dummy.

This assumes that there is unobserved heterogeneity across firms captured by α_i such as unobserved characteristics of firms that affect regressors. Due to the limitations of the OLS estimation model to control for time invariant firm-specific heterogeneity, this research uses fixed and random effects panel estimation models to assist in the examination of capital structure.

Moreover, leverage by definition is truncated between zero and one. However, the results from OLS estimation of truncated regression model are biased, inconsistent and the estimated parameter will not be similar to their true values, whether including the whole sample or a subset of the sample (Gujarati, 2011). Following Iliev and Welch (2010), this research uses the tobit model.

4.3.1 The Fixed Effects Model (FEM)

As stated in section 4.3 the first estimation method to run the static model is the fixed effects method. The FEM method eliminates the unobserved heterogeneity. The FEM allows heterogeneity across subjects by allowing each unit to have its own intercept value. FEM is simply a linear regression model which allows the intercept to vary for all units (here firms) but still assume that the slope coefficients are constant across units and over time. The variation in the intercept term allows for special features of each cross-sectional feature of units (here such as profitability or size, etc.). The term "fixed effects" is due to the fact that, even though the intercept differs across firms, each firm's intercept does not vary over time. As FEM considers a different intercept term and the same slope parameters for each firm, this research rewrites equation 4.2 to obtain the firm-specific effects as,

$$\widehat{\alpha_i} = \overline{\mathrm{LEV}}_{\mathrm{it}} - (\,\widehat{\boldsymbol{\beta}}_{\mathrm{k}}\overline{\mathbf{Macro}}_{\mathrm{kt}} + \boldsymbol{\beta}_{\mathbf{m}}\mathbf{Macro}_{\mathbf{kt}} * \boldsymbol{Crisis_D} + \widehat{\boldsymbol{\theta}}_{\mathrm{z}}\bar{\mathbf{x}}_{\mathrm{zit}}\,) \quad (4.3)$$

Where ($\widehat{\alpha_i}$) explains the leftover variation in the leverage that cannot be explained by the independent and control variables. Note that ($\widehat{\alpha_i}$) has the subscript i on the intercept term to suggest that the intercepts of each firm may be different. The difference may be due to special features of each firm, such as managerial style and philosophy, type of product, and type of market each firm is serving. It may be noted that the FEM assumes that the slope coefficients of the regressors do not vary across firms and over time (Gujarati, 2009).

This research uses STATA software to run the FEM with the "xtreg" command and adding the option ",fe" at the end of regression. This command fits the FEM by using the regression estimator.

4.3.2 Random Effects Model (REM)

The second estimation method to run the static model and an alternative to the FEM model that described in the previous section is the Random Effects Model (REM). REM is often also known as the error components model. Similar to the FEM, the REM suggests different intercept terms for each unit and these intercepts are constant during time. The difference is that the REM assumes the intercept for each unit arises from a common intercept α . In addition, a random variable ε varies between cross sections but is constant over time.

REM overcomes the loss of the degree of significance in FEM. It is commonly assumed in regression analysis that all factors that affect the dependent variable, but that have not been included as regressors, can be appropriately summarised by a random error term. The model does not allow constant coefficients among the units to vary. However, instead of treating α_i as fixed, the model assumes that it is a random variable with a mean value of α (no subscript i). In other words, this model assumes that differences between firms have some influence on the firms' leverage. REM allows for more degrees of freedom than FEM. By adding an intercept α in the error term (e_i), this research obtains the intercept of any cross-section unit as following:

$$\varepsilon_i = (\alpha + e_i) \quad (4.4)$$

And rewrites equation 4.2 as

$$LEV_{it} = \boldsymbol{\beta_k Macro_{kt}} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m Macro_{kt}} * \boldsymbol{Crisis_D} + \boldsymbol{\theta_z x_{zit}} + (e_i + \alpha) \quad (4.5)$$

Where ε_i is a random error term with a mean value of zero and $var(\varepsilon_i) = (\delta_\alpha^2 + \delta_e^2)$. Therefore the individual differences in the intercept values of each unit are reflected in the error term ε_i. REM for a given observation and assuming unobserved effect (u_{it}) having a zero mean by adding an intercept could be written as:

$$LEV_{it} = \beta_k \boldsymbol{Macro_{kt}} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m Macro_{kt}} * \boldsymbol{Crisis_D} + \boldsymbol{\theta_z x_{zit}} + \varepsilon_i + u_{it} \quad (4.6)$$

Where;

$$\omega_{it} = \varepsilon_i + u_{it} \quad (4.7)$$

(ε_i) represents the within entity error (cross-section error component) and (u_{it}) is the between entity error (the combined time series and cross-section error component). Substituting Eq. (4.7) into Eq. (4.6) as:

$$LEV_{it} = \boldsymbol{\beta_k Macro_{kt}} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m Macro_{kt}} * \boldsymbol{Crisis_D} + \theta_z \mathbf{x}_{zit} + \omega_{it} \quad (4.8)$$

where ω_{it} represents the error term.

To conclude, FEM eliminates the unobserved heterogeneity, but REM formulates the unobserved heterogeneity as a random error term. One of the advantages of REM is that it adds a time invariant variable (i.e. industry) in to the model, whereas, in FEM the intercept absorbs the time invariant variables.

This research uses STATA software to implement the REM with the user-written command “xtreg” and adding the option “,re” at the end of regression. This command fits the REM by using the GLS estimator (producing a matrix-weighted average of the between and within results). Then, if the results suggest that differences across entity have some effect on the leverage, this research chooses REM (Cox, 2011).

4.3.3 Choice of Model

Which model is better, FEM or REM? The answer to this question relates to the assumption about the correlation between the individual, or cross-sectional specific, error component ε_i and the X regressors. If it is assumed that ε_i and the X's are uncorrelated, REM is the appropriate way, whereas if ε_i and the X's are correlated, FEM may be appropriate.

The Hausman specification test is the most common way to determine the statistically best model between FEM and REM. This assumes there is a correlation between each unit's non-observable individual effects and the independents variables. If the coefficients are relevant, the FEM should be used and, if there is no correlation, REM is the most appropriate way of carrying out evaluation (Hausman and Taylor, 1981). The Hausman specification test examines the null hypothesis of non-existence of correlation between non-observable individual effects and the explanatory variables. If this research does not reject the null hypothesis, which means there is not a correlation between coefficients then it uses REM for carrying out evaluation of the relationship between leverage and macroeconomic variables. Conversely, rejecting the null hypothesis means that correlation is relevant, and it suggests using FEM.

The null and alternative hypotheses are: $H_0 : E(\varepsilon_t' \alpha_i) = 0, \quad H_a : E(\varepsilon_t \alpha_i) \neq 0$

where (ε_t) represents the individual invariant variables.

Under null hypotheses, both estimators are consistent, but REM is appropriate. Under alternative hypotheses, REM is inconsistent and FEM is still consistent. Therefore, a statistical test on the difference between these two estimators may show that the endogeneity affects the consistency of the random effects estimator. The Hausman test statistic is then:

$$H = \left(\widehat{\boldsymbol{\beta}}_{RE} - \widehat{\boldsymbol{\beta}}_{FE}\right)' \left(Var\left(\widehat{\boldsymbol{\beta}}_{RE}\right) - Var\left(\widehat{\boldsymbol{\beta}}_{FE}\right)\right)^{-1} \left(\widehat{\boldsymbol{\beta}}_{RE} - \widehat{\boldsymbol{\beta}}_{FE}\right) \quad (4.9)$$

This distribution is asymptotically as H (k), where k is the dimension ε_{it}. Rejecting the null hypothesis means that endogeneity is a problem for the random effects estimator and there is a need to use the fixed effects estimator.

Testing for Serial Correlation

Serial correlation means correlation between the observations of residuals, which can occur when there are omitted variables, misspecified functional form, and spatial or time

pattern to the data. Serial correlation causes linear panel-data models to make the standard errors biased and consequently makes the results to be less efficient. Therefore, this research needs to identify serial correlation in the idiosyncratic error term in a panel-data model. There are a number of tests for serial correlation in panel-data models such as, the Baltagi–Wu test derived from Baltagi and Wu (1999), which is the best within a class of tests. In contrast, Wooldridge (2002) suggests a test for serial correlation in panel-data models which requires relatively few assumptions and is easy to implement. In addition, it has good power despite its fewer assumptions. This method uses the residuals from a regression in first-differences.

Wooldridge (2002) explains for REM that, under the null of homoscedasticity and no serial correlation in the idiosyncratic errors, the residuals from the quasi-demeaned regression must be spherical. Because the quasi-demeaned regression excludes the individual effects, any leftover serial correlation may be the idiosyncratic component. A standard serial correlation test to the quasi-demeaned model is a way to test serial correlation.

However, in FEM the original model's errors are uncorrelated and consequently fixed effects residuals are negatively serially correlated, with $corr(\hat{e}_{it}, \hat{e}_{is}) = \frac{-1}{(T-1)}$ for each t, s (Wooldridge, 2002). While Wooldridge proposes a test with this null hypothesis on FE residuals on themselves, lagged one period:

$$\hat{e}_{it} = \alpha + \delta \hat{e}_{it-1} + n_{it} \quad (4.11)$$

Note, rejecting the restriction of $\alpha = \frac{-1}{(T-1)}$ disagrees with the original null hypothesis of no serial correlation.

To conclude, if the serial correlation exists, the variances of FEM and REM estimators are not accurate and the Hausman test statistic is inappropriate. Therefore, this research uses three ways to test for serial correlation. Firstly, following Wooldridge (2002) it regresses the panel model on its first difference, predicting the residuals, and then regresses the residuals on its first lag and tests the coefficient on those lagged residuals using STATA software with the user-written command "xtserial". Secondly, it runs user-written command "xttest0", after "xtreg, re", to calculate the Breusch-Pagan Lagrange multiplier test for a REM (Cox, 2011). Thirdly, it implements the Baltagi-Li (1991) joint test for serial correlation in STATA software with the user-written command "xttest1" (which is an extension of xttest0) after running the regression.

Testing for Heteroscedasticity

One of the classical linear regression model's (CLRM) assumptions is that the disturbances U_i appearing in the population regression function are homoscedastic, which means they all have the same variance. Symbolically, $E(U_i^2) = \delta^2 \ for \ i = 1,2,\dots,n$. In contrast, if the disturbance U_i is not constant there is heteroscedasticity. There are several reasons why the variance U_i is different, namely the presence of an outlier, omitted important variables in the model, existing skewness in the distribution of one or more regressors included in the model, incorrect data transformation, or incorrect functional form (Mazodier and Trognon, 1978).

If the heteroscedasticity exists, the variances of the fixed effects and random effects estimators are not accurate and the Hausman test statistic is inappropriate. Therefore, this research applies Modified Wald statistic for group wise heteroscedasticity in FEM to correct for possible heteroscedasticity, which is a common problem in panel data.

This research uses three ways to test for heteroscedasticity. Firstly, this research implements the Wald test in STATA software with the user-written command "xttest3" after running the regression (where the null hypothesis is equal to homoscedasticity). Secondly, it considers heteroscedasticity by adding the option robust in regression. Thirdly, it applies the user-written commands such as "ivhettest" and "ivreset" which perform Pagan-Hall and related heteroscedasticity tests in STATA software. The tests differ according to the choice of indicator variables and the choice of test statistics. Under the null of no heteroscedasticity, the test statistic is distributed as chi-squared with degrees of freedom equal to the number of indicator variables (Cox, 2011).

4.3.4 Panel Data Tobit Model

In actuality, the leverage ratio can be negative or greater than one; however, in economic terms, the leverage ratio is truncated between zero and one. Therefore, this research requires dropping leverage observation with the negative or greater than one value from the sample data, otherwise the result will be inconsistent. Then it applies an econometric method that accounts for this truncation.

According to Gujarati (2011), the results from OLS estimation of truncated regression model are biased, inconsistent and the estimated parameter will not be similar to their true

values, whether including the whole sample or a subset of the sample. This is because in truncated regression models, the conditional mean of the error term, u_t is nonzero and there is a correlation between error and the regressors. Therefore, the OLS estimators are biased as well as inconsistent.

This research uses the tobit model for several reasons. Firstly, the leverage by definition is truncated between zero and one. Secondly, the results from the OLS estimation method for truncated data are inconsistent and biased. Thirdly, the tobit estimates are consistent and asymptotically normal (Amemiya, 1973). The tobit model is a suitable approach for the truncated dependent variable to investigate the impact of macroeconomic variables on leverage of U.K. firms, otherwise the results will be inconsistent. The following paragraphs explain the tobit model and the way of interpreting the coefficients.

Originally, Tobin (1958) suggests the tobit model to study the household expenditures on durable goods taking into account their non-negativity, while only in 1964 Arthur Goldberger referred to this model as a tobit model. This is an econometric model suitable for a truncated dependent variable with normal error terms. The tobit model is appropriate for applications where the dependent variable is continuous but its range may be constrained, such as truncated data (here leverage). Tobin (1958) defines the standard tobit model as follow,

$$y_i = \beta X_i + \varepsilon_i \quad (4.12)$$

where $(i) = 1, \ldots, N$, (y_i) is an unobserved ("latent") variable, (X_i) is a vector of observed explanatory variables, (β) is a vector of unknown parameters, and (ε_i) is a disturbance term and is independent of X_i $(\varepsilon_i \sim \text{IIDn}(0, \sigma^2))$.

$$y_i = \begin{cases} y_i, & if \ y_t > \gamma \\ 0, & if \ y_t \leq \gamma \end{cases} \quad (4.13)$$

Tobin (1958) uses the method of Maximum Likelihood Estimation (MLE) to find $\beta's$ of the truncated regression model in cases where some observations of the dependent variables are not included in the regression model. It should be mentioned that β's coefficient in the tobit model determines both changes in the value of the dependent variable, if it is already under/above the limit, and changes in the probability of being under/above the limit.

Hence, the standard tobit model is not suitable in the firms' leverage context, because leverage ratios do not follow the standard panel process and it is truncated between an interval.

Because of the unbalanced nature of the panel data and the truncation between zero and one, the model can best be estimated by using the truncated tobit model.

As a result of having a continuous dependent variable and truncated between 0 and 1, this research uses the tobit regression model and is interested in $0 < LEV < 1$, as in previous studies of capital structure (Kayhan and Titman, 2007; Harford, et al., 2009). This research defines the observable truncated dependent variable as:

$$\mathrm{LEV_{it}} = \boldsymbol{\beta_k}\mathbf{Macro_{kt}} + \beta_5\, Crisis_D + \beta_6\, \mathrm{I_D} + \boldsymbol{\beta_m}\mathbf{Macro_{kt}} * \boldsymbol{Crisis_D} + \boldsymbol{\theta_z}\mathbf{x_{zit}} + \mathrm{u_{it}} \quad (4.14)$$

where, ($\mathrm{LEV_{it}}$) is truncated between 0 and 1 (truncation interval), ($\mathrm{u_{it}}$) is an error term assumed to be truncated normal with zero mean and constant variance σ^2. This model explains an underlying, stochastic index equal to $\beta_k \mathrm{Macro_{kit}} + \beta_6\, \mathrm{I_D} + \theta_z \mathrm{x_{zit}} + \mathrm{u_{it}}$, which includes positive values, less than or equal to 1.

As explained earlier the β coefficient in the tobit model determines both changes in the value of the dependent and changes in the probability of being under/above the limit. Cong (2001) explains different types of marginal effects for the tobit model, as the β coefficients themselves measure how the truncated $\mathrm{LEV_{it}}$ changes with respect to changes in the regressors, and the marginal effects of the truncated expected value $\mathrm{E(LEV_{it} \mid 0 < LEV_{it} < 1)}$. Ignoring the truncation can lead to biased estimates of regression coefficients as truncation is essentially a characteristic of the distribution of the sample data.

This section explains the truncated density normal distribution as it provides reliable information on leverage with suitable estimation of β coefficients. If $\mathrm{LEV_{it}}$ has a normal distribution with mean μ and standard deviation σ, the density of the truncated normal distribution is as follows:

$$\mathrm{f\,(\,LEV_{it} \mid 0 < LEV_{it} < 1)} = \frac{\mathrm{f(\,LEV_{it}\,)}}{\varphi\left(\frac{1-\mu}{\sigma}\right) - \varphi\left(\frac{0-\mu}{\sigma}\right)} = \frac{\frac{1}{\sigma}\emptyset\left(\frac{\mathrm{LEV_{it}}-\mu}{\sigma}\right)}{\varphi\left(\frac{1-\mu}{\sigma}\right) - \varphi\left(\frac{0-\mu}{\sigma}\right)} \quad (4.15)$$

where $\emptyset$ represents the density and, φ is distribution functions of the standard normal distribution. Note, truncation decreases the variance compared with the variance in the un-truncated distribution. Tobin expresses the expected value of $\mathrm{LEV_{it}}$ as,

$$E(LEV_{it}) = (\boldsymbol{\beta_k Macro_{kt}} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m Macro_{kt}} * \boldsymbol{Crisis_D} + \boldsymbol{\theta_z x_{zit}})F(z) + \sigma f(z) \quad (4.16)$$

where f(z) represents the unit normal density; F(z) the cumulative normal distribution function (probability of being truncated between 0 and 1); and $ELEV_{it}$ represents the expected value of $0 < LEV_{it} < 1$. Consequently, using the product rule, the partial coefficients, which are the changes in LEV_{it} divide in two parts:

$$\frac{\partial ELEV_{it}}{\partial \mathbf{Macro}_{kit}} = F(z)\left(\frac{\partial ELEV_{it}}{\partial \mathbf{Macro}_{kit}}\right) + ELEV_{it}\left(\frac{\partial F(z)}{\partial \mathbf{Macro}_{kit}}\right) \quad (4.17)$$

Note the nature of changes in LEV_{it} is different from OLS coefficients. The total changes in LEV_{it} can be disaggregated into two parts, which emphasises the fact mentioned earlier. The changes in LEV_{it} of $0 < LEV_{it} < 1$, multiply by the probability of $0 < LEV_{it} < 1$; and the change in probability of being $0 < LEV_{it} < 1$, multiply by the expected value of $0 < LEV_{it} < 1$. This research can find the information on correct regression effects for observation $0 < LEV_{it} < 1$ by calculating Eq (4.17).

To conclude, the tobit model appears a sensible approach, because it was developed specifically for situations where the dependent variable is truncated between zero and some other constrained value (here one). The OLS parameter estimates are downward biased and inconsistent, while tobit estimates are consistent and asymptotically normal (Amemiya, 1973). This research estimates this model by STATA software and implementing user-written command of "xttobit".

4.3.5 GLS Regression Model

The fourth estimation method to run the static model is the Generalized Least Squares (GLS) regression Model. This research uses GLS regression to control if there is a certain degree of correlation between the residuals in a regression model and to allow for possible unequal variances of the observations (Gujarati, 2003).

This research applies GLS regression model to throw additional light on the effect of macroeconomic conditions on the capital structure of firms and test whether the effect of macroeconomic variables on the capital structure is still vigorous and robust to applying

different estimation strategies. The GLS regression model analyses whether and to what extent the correlation between residuals has an effect on the relationship between macroeconomic conditions and capital structure. This research estimates this model by STATA software and implementing user-written command of "xtgls".

4.4 Dynamic Panel Data Model

For the reasons stated in section 4.2, this research applies a dynamic approach to look at dynamic adjustment of capital structure, by reviewing the repeated cross section of observations (Gujarati, 2009). Many economic relationships are dynamic in nature and one of the advantages of panel data is that it allows the researcher to understand the dynamic of adjustment. This research implements the dynamic panel data model by including lagged dependent variables among independent variables.

Myers (1984) explains that firms' observed leverage cannot be their optimal leverage given that there are costs, and consequently lags in adjusting to the optimum. Firms cannot balance the effects of random events, which take them away from the optimal leverage. Large adjustment costs could be an important factor to explain the observed variation in actual leverage ratio across firms. Since large costs involved in adjusting to the optimal ratio, it is difficult to achieve an accurate test of the effects of variables on the leverage of a cross-section of firms in a particular year. Therefore, following Myers (1984), this research adds a lagged leverage among the selected macroeconomic variables.

This research considers the dynamic relationship by including a lagged dependent variable in the model among the regressors as below:

$$LEV_{it} = \alpha_i + \boldsymbol{\beta_k}\mathbf{Macro}_{kt} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m}\mathbf{Macro_{kt}} * \boldsymbol{Crisis_D} + \boldsymbol{\theta_z}\mathbf{x}_{zit} + \delta\, LEV_{i,t-1} + \psi_{it} \quad (4.18)$$

Note δ is a scalar; ψ_{it} follows a two-way error component model; i is from 1,…, N; and t is from 1, …, T.

$$\psi_{it} = \mu_i + \gamma_{it} \quad (4.19)$$

where μ_i and γ_{it} are independent of each other and among themselves.

The dynamic panel data regression defined in Eq.4.18 is considered by two sources of persistence over time, autocorrelation due to the presence of a lagged dependent variable among regressors and individual effects characterising the heterogeneity among the individuals. Since LEV_{it} and $LEV_{i,t-1}$ are function of μ_i , and $LEV_{i,t-1}$ is correlated with the error term, this causes the OLS estimator to be biased and inconsistent. Only if $T \to \infty$ are the estimators of δ and β consistent for the dynamic error component model. Considering fixed effects and random effects estimators the difficulty is that both correlates with the disturbance, even if it assumes that u_{it} is not itself autocorrelated.

This research first investigates the role of adjustment costs by adapting a partial adjustment model by assuming the leverage of a firm is taken to be a function of several variables outlined in the previous section. The desired leverage of firm can be written as

$$LEV_{it}^{*} = \alpha_i + \beta_k \mathbf{Macro}_{kt} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m}\mathbf{Macro_{kt}} * \boldsymbol{Crisis_D} + \boldsymbol{\theta_z}\mathbf{x}_{zit} + \psi_{it} \quad (4.20)$$

Where β's which are common to each firm are the unknown parameters of interest, firms adjust their leverage in order to get closer to their target leverage ratio. This leads to a partial adjustment, which is written below,

$$LEV_{it} - LEV_{i,t-1} = \lambda\,(LEV_{it}^{*} - LEV_{i,t-1}) \quad (4.21)$$

where $0 < \lambda < 1$; LEV_{it} is the actual debt ratio; LEV_{it}^{*} is the target debt ratio of (an asterisk sign will be used to express target leverage); and the term $(LEV_{it}^{*} - LEV_{it-1})$ is the desired change, though only a fraction λ of the desired change is attained, which is equal to $(LEV_{it} - LEV_{i,t-1})$.

Combining (4.20) and (4.21),

$$(LEV_{it} - LEV_{i,t-1}) = \lambda\,(\alpha_i + \beta_k \mathbf{Macro}_{kt} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m}\mathbf{Macro_{kt}} * \boldsymbol{Crisis_D} + \theta_z \mathbf{x}_{zit} + \psi_{it} - LEV_{i,t-1}) \quad (4.22)$$

Rewriting equation (4.22),

$$LEV_{it} = (1-\lambda)LEV_{i,t-1} + \lambda(\alpha_i + \beta_k \mathbf{Macro}_{kt} + \beta_5\, Crisis_D + \beta_6\, I_D + \boldsymbol{\beta_m}\mathbf{Macro_{kt}} * \boldsymbol{Crisis_D} + \theta_z \mathbf{x}_{zit} + \psi_{it}) \quad (4.23)$$

Rewriting equation (4.23),

$$LEV_{it} = \gamma_0 LEV_{i,t-1} + \gamma_k \mathbf{Macro}_{\mathrm{kt}} + \gamma_{\mathrm{C}}\, Crisis_D + \gamma_p\ \mathrm{I_D} + \gamma_{\mathrm{m}}\, \mathbf{Macro_{kt}} * \boldsymbol{Crisis_D} + \gamma_z\, \mathbf{x}_{\mathrm{zit}} + \eta_i + \psi_{it} \quad (4.24)$$

where $\gamma_0 = 1 - \lambda$, $\gamma_k = \lambda\, \beta_k$, $\eta_i = \lambda \alpha_i$, $\gamma_{\mathrm{C}} = \lambda\, \beta_5$, $\gamma_{\mathrm{p}} = \lambda\, \beta_6$, $\gamma_{\mathrm{m}} = \lambda\, \beta_{\mathrm{m}}$, $\gamma_{\mathrm{z}} = \lambda\, \theta_{\mathrm{z}}$ and, $\lambda\, \psi_{it} = u_{it}$ (note u_{it} has the same properties of ψ_{it}).

Hsiao (1985) states that in a dynamic model, OLS estimations lead to inconsistent estimations of γ_0 , γ_k, γ_C , γ_{p}, γ_{m}, γ_{z} because of the correlation between $LEV_{i,t-1}$ and η_i and then eliminates unobservable independent effects α_{i} by taking first differences (instrumental variable) as,

$$(LEV_{it} - LEV_{i,t-1}) = \gamma_0\, (LEV_{i,t-1} - LEV_{i,t-2}) + \gamma_k (\mathbf{Macro}_{kt} - \mathbf{Macro}_{kt-1}) + \gamma_z (\mathbf{x}_{zit} - \mathbf{x}_{zi,t-1}) + (u_{it} - u_{i,t-1}) \quad (4.25)$$

Yet again, because $(LEV_{i,t-1} - LEV_{i,t-2})$ *and* $(u_{it} - u_{i,t-1})$ are correlated with $LEV_{i,t-1}$ and $u_{i,t-1}$, OLS regression cannot consistently estimate γ_0 , γ_k *and* γ_{z} .

Similarly, Anderson and Hsiao (1981) propose using the instrumental variable (IV) estimation method to obtain a consistent estimation technique. The IV estimation method takes the first difference of model to eliminate the fixed effects and uses the twice-lagged dependent variable as an instrument for the level of dependent variable. Both $LEV_{i,t-2}$ and $\Delta LEV_{i,t-2}$ are correlated with $(LEV_{i,t-1} - LEV_{i,t-2})$ but not correlated with $(u_{it} - u_{i,t-1})$. The IV estimation provides consistent estimation of γ_0 , γ_k *and* γ_{z}. However, the IV estimation may not provide efficient estimates of parameters in the model, as it does not use all the available moment conditions. Finally, this research implements Eq. (4.25) in STATA software.

Additionally following Arellano and Bond (1991), this research uses another method, the Generalised Method of Moments (GMM), using additional instruments. The GMM develops the orthogonality conditions between the lagged values of the dependent variable and disturbances. This research discusses GMM in the next section.

4.4.1 Generalized Method of Moments:

For the reasons stated in section 4.4, this research estimates the model using the GMM estimator. This section first explains the GMM and six reasons for using it. Then it describes

two estimation strategies of GMM, namely difference GMM and system GMM in depth. Finally, it presents the model.

Hansen (1982) derives the GMM, which is based on formulation of meaningful moment conditions, which, when satisfied, allows the parameters of the model to be estimated consistently. The GMM estimator is a general IV estimator, which moves from population moment conditions to their corresponding sample and uses the latter ones to estimate the parameters of the model. The GMM estimator is a suitable IV for dynamic models with fixed effects, endogenous regressors, and idiosyncratic errors (uncorrelated across individuals). Moreover, the GMM estimator exploits lags of the endogenous variables, which is one of the characteristics of the GMM estimator for dynamic panel data.

This research use GMM for six reasons. Firstly, it is a suitable approach for analysing the dynamic panel data with few periods and many panels (Roodman, 2006). Secondly, it can deal with generated regressors to consider the dynamic of capital structure. Thirdly, it uses lagged values of the levels of explanatory variables to deal with autocorrelation problems. Fourthly, it can use all variables that have no correlation with the error term (including lagged and differenced variables) as valid instruments. Fifthly, it uses the first-difference of variables to eliminate the firm's unobservable fixed effects. Finally, the GMM estimator corrects for bias caused by endogenous explanatory variables.

IV plays an important role in using GMM estimators for estimating equations. In order to find a unique solution, the number of instruments needs to be the same as the number of independent variables, or in other words, it should not be less than moments (endogenous). GMM includes two estimation strategies, namely Difference GMM (DGMM) and System GMM (SGMM). Each method uses a different type of IV. The original estimator is entitled DGMM estimator and the extended estimator is SGMM estimator, which adds some restrictions to the process generating the dependent variable. This research explains and uses both strategies and their advantages and disadvantages below.

4.4.2 Difference GMM:

Arellano and Bond (1991) formalise the work by Anderson and Hsiao (1982) and Holtz-Eakin, Newey, and Rosen (1988) as DGMM estimation strategy. They use all the lags of the dependent variables available at time (t) as IV for first differences, namely Arellano-Bond

DGMM estimator. This research estimates the DGMM method by STATA software and implementing user-written command of "xtabond".

However, a few authors discover that the first difference transformation wipes out the individual effects (Anderson and Hsiao, 1981, 1982; Baltagi, 2008). Additionally, Arellano and Bover (1995) suggest that the lagged levels are poor instruments for first differenced variables, particularly if the variables are close to a random walk; it is a possible weakness in the Arellano–Bond dynamic panel data estimator. However, they adjust the model by including lagged levels as well as lagged differences.

Arellano (1989) uses both types of instrument for dynamic error components models, and discovers that using the instruments in differences causes very large variances over a significant range of parameter values. However, using the instruments in levels does not run into such problems and is appropriate. Nevertheless, there are a few criticisms of the IV estimation, such as not considering the differenced structure of the residual disturbances (Baltagi, 2008) and not using all the available moment conditions (Ahn and Schmidt, 1995).

4.4.3 System GMM:

SGMM is the second strategy or the augmented version of GMM outlined in Arellano and Bover (1995) and fully developed in Blundell and Bond (1998). They formulate extra orthogonality conditions to increase the efficiency and the reliability of the instruments. The SGMM estimator uses the standard set of equations in first-differences with suitably lagged levels as instruments, with an additional set of equations in levels with suitably lagged first-differences as instruments.

According to Blundell et al. (2000), SGMM's estimators can avoid the inconsistency problem presented by the lagged dependent variable as an independent variable in regression. By using SGMM, this research can consider more explanatory variables in a regression without worrying about the endogeneity problem, by getting the level values of variables back to the regression and omitting the bias caused by the decrease of data variation in the first differences. Therefore, SGMM is a suitable approach for unbalanced panel data.

This research estimates the SGMM method by STATA software and implements the user-written command of "xtabond2". "xtabond2" handles both the DGMM and the SGMM estimators and provides several additional features such as the orthogonal deviations

transformation (not available in official STATA's commands). The "xtabond2" command has the ability to specify, for GMM-style instruments, the limits on how many lags are to be included. Note that if T is large (more than 7–8), and there is an unrestricted set of lags, consequently it introduces a huge number of instruments, and leads to loss of efficiency. Additionally, this research can add some options such as "twostep", "robust", "noconstant", "abar" and "nolevel" for using two-step estimators, computing robust standard errors, suppressing the constant term in the level equation, autocorrelation and excluding the level equation from the estimation (Roodman, 2006).

Next, this research uses the dynamic Eq. 4.23 and 4.24 with a lagged leverage among the regressors as,

$$\mathrm{LEV_{it}} = \gamma_0 \mathrm{LEV_{i,t-1}} + \gamma_k \mathrm{Macro_{kt}} + \gamma_C \, Crisis_D + \gamma_p \, \mathrm{I_D} + \gamma_m \, \mathbf{Macro_{kt}} * \boldsymbol{Crisis_D} + \gamma_z \mathrm{x_{zit}} + \eta_i + \mathrm{u_{it}} \quad (4.26)$$

Since $\mathrm{LEV_{it}}$ is a function of $\mathrm{u_{it}}$, so $\mathrm{LEV_{i,t-1}}$ is also a function of $\mathrm{u_{it}}$. Therefore, $\mathrm{LEV_{i,t-1}}$ is correlated with the error term and the estimator is biased and inconsistent. Consequently following Anderson and Hsiao (1981, 1982), this research eliminates the firm effects by using the first difference and then it uses either the differences instrument ($\Delta \mathrm{LEV_{i,t-2}} = \mathrm{LEV_{i,t-2}} - \mathrm{LEV_{i,t-3}}$) or $\mathrm{LEV_{i,t-2}}$ as an instrument in levels instead of $\Delta \mathrm{LEV_{i,t-1}} = \mathrm{LEV_{i,t-1}} - \mathrm{LEV_{i,t-2}}$. Note that each of these variables is correlated with $\Delta \mathrm{LEV_{i,t-1}} = \mathrm{LEV_{i,t-1}} - \mathrm{LEV_{i,t-2}}$ but not with $\Delta \mathrm{u_{it}} = \mathrm{u_{it}} - \mathrm{u_{i,t-1}}$ as long as the $\mathrm{u_{it}}$ themselves are not serially correlated. Therefore, using $\mathrm{LEV_{i,t-2}}$ is better since it maximises the sample size, as using $\Delta \mathrm{LEV_{i,t-2}}$ is not possible until $\mathrm{t} = 4$ but $\mathrm{LEV_{i,t-2}}$ is available at $\mathrm{t} = 3$.

Additionally, in order to construct the GMM instrument, this research needs to specify the specification of variables such as being endogenous, predetermined, or exogenous. Then it decides on the specification of each variable, based on the previous studies of capital structure and by results from the Difference-in-Hansen test of exogeneity of instrument subset. Therefore, leverage and firm-specific variables are endogenous and macroeconomic variables are exogenous. The lagged and lagged differences of leverage based on econometrics theory are weakly exogenous variables. In addition to the lagged forms of leverage among the regressors as lagged levels, it constructs and uses the instruments for the independent variables to mitigate endogeneity (Roodman, 2006).

Table 4.1 Reason for using different estimation strategies

FEM	1)Eliminates the unobserved heterogeneity; 2)We cannot add time invariant variables (e.g., industry dummy) in the model, as intercept absorbs the time invariant variable; 3) Intercept varies for all units (here firms) but each unit's intercept does not vary over time.
REM	1) Formulates the unobserved heterogeneity as a random error term; 2) Allows more degree of freedom; 3) We can include time invariant dummy in the REM model; 4) Similar to the FEM, the REM suggests different intercept terms for each unit and these intercepts are constant during time; 5) REM assumes the intercept for each unit arises from a common intercept α; 6) A random variable ε varies between cross sections but is constant over time.
Tobit	1) The tobit model is a suitable approach for the truncated dependent variable (here leverage); 2) In contrast to the results from the OLS estimation method for truncated data that are inconsistent and biased, the tobit estimates are consistent and asymptotically normal (Amemiya, 1973).
GLS	1) It controls if there is a certain degree of correlation between the residuals in a regression model; 2) It allows for possible unequal variances of the observations.
GMM	1) It is a suitable approach for analysing the dynamic panel data with few periods and many panels (Roodman, 2006; 2) It can deal with generated regressors to consider the dynamic of capital structure; 3) It uses lagged values of the levels of explanatory variables to deal with autocorrelation problems; 4) It can use all variables that have no correlation with the error term (including lagged and differenced variables) as valid instruments; 5) It uses the first-difference of variables to eliminate the firm's unobservable fixed effects; 6) The GMM estimator corrects for bias caused by endogenous explanatory variables and it reduces endogeneity problems.

DATA AND DESCRIPTIVE STATISTICS

The aim of the data section is to gain further understanding of the determinants of capital structure. Therefore, the following two Sections explain the process of collecting and cleaning the data sample, and constructing the dependent variable, macroeconomic variables, and firm-specific control variables used in the empirical analysis. Additionally, the sections discuss the approach which is used to generate each variable for the empirical analysis. Section 4.5 explains the data description and sample selection. Section 4.6 discusses and justifies the elements of the model including dependent, independent and control variables.

4.5 Data Description and Sample Selection

The sample data of this study includes two sets of macroeconomic and microeconomic data, to study the impact of macroeconomic conditions on the capital structure of publicly listed firms in the U.K. The macroeconomic data investigates the impact of macroeconomic variables and the U.K.'s economic situation on the capital structure, and the firm-level micro data analyses how firm-specific variables affect capital structure. It consists of an unbalanced panel data of all the U.K. non-financial publicly listed companies' (PLCs) consisting of 922 companies.

The period that this research investigates is from January 1995 to September 2014, thus totalling 20 annual observations for each variable and each company. The study chooses the period based on the availability of total assets, total debts, and macroeconomic variables. This research excludes financial firms (property investment & services, property investment trusts, equity investment instruments, non-equity investment instruments, financial services, life assurance, nonlife insurance and banks) with the ICBIC code of 8000, to measure the product-market completion and it uses the 2 and 3 digit industry classification code of SIC. This research obtains the data from DataStream, containing available accounting data at the time of downloading for 922 U.K. firms quoted on the London Stock Exchange.

The data sample is different in four ways from others studies on capital structure that have used U.K. data. Firstly, this data sample considers a longer and more recent period from 1995 to 2014. Secondly, this study uses different combinations of econometrics methods, namely FEM, REM, tobit, and GLS regression models, SGMM and DGMM methods to analyse the data. Thirdly, none of the previous studies included the data for the four stated macroeconomic

variables in their sample. Fourthly, the number of observations is different from previous studies. Table 4.2 shows the comparison of the length of the period, methods of analysing the data sample, and the number of observations for a few earlier studies:

Table 4.2 Comparison of Length of the Period and Sample Size of U.K. Studies

Previous study	Time	No. of firms	Method
Marsh (1982)	1959-1970	748	Logit and Probit
Bennett and Donnelley (1993)	1977-1988	433	Variance, ANOVA
Rajan and Zingales (1995)	1987-1991	608	Maximum likelihood & a censored tobit model
Ozkan (2000)	1983-1996	429	GMM
Ozkan (2001)	1984-1996	390	GMM
Benito (2003)	1973-2000	1784	GMM-system
Panno (2003)	1992-1996	87	Logit and Probit
Bevan and Danbolt (2004)	1991-1997	1054	Fixed effects panel estimation

4.5.1 Rationale for Selecting U.K. sample

Most of the existing studies on the determinants of capital structure, specifically those incorporating the effects of macroeconomic conditions, are concentrated on the U.S. market. Therefore, studying another country such as the U.K. with different financial institutional characteristics is an interesting ground for testing the impact of macroeconomic conditions on capital structure. Studying the U.K. firms' capital structures involves paying particular attention to the differences in capital structure in both countries.

The U.K. is a market-based system and has a well-developed and mature financial system (Benito, 2003; Huang, 2003). According to Levine (1999), U.K. firms rely more on markets to invest, which shows that markets play a more dynamic role. The U.K. is institutionally similar to the U.S. and they both are market-oriented, but they have a few differences, which may

affect firms' financing decisions facing the macroeconomic conditions. For instance, differences in the tax code, bankruptcy laws, development of bond markets, and patterns of ownership in both countries may affect the capital structure.

The most important difference between the U.K. and the U.S. is the bankruptcy laws (Rajan and Zingales, 1995; Beattie et al., 2006). Bankrupt firms in the U.S. can either be reorganised by referring to Chapter 11, or be liquidated based on Chapter 7. On the other hand, U.K. failing firms have only one option to be liquidated through the receivership system. The U.S. system has Chapter 11 but the U.K. has no equivalent. Moreover, they both have a different allocation of control rights. The U.K. firms' receivership gives control rights to a particular secured creditor and is strict in terms of enforcing the creditor's rights, but according to Chapter 11, the debtor can retain control of the firm and have the exclusive right to propose a plan of reorganisation. Therefore, U.K. firms tend to have less debt compared with US firms.

According to the Merrill Lynch series of indices (2010), U.S. and U.K. bond markets have differences in terms of the weight of their indices and their average duration. The U.K. sterling portion is relatively small in comparison to the U.S. dollar, which is the biggest bond market in the world. Nevertheless, the U.K. is still the fourth largest bond market in the world. In terms of duration (average time of market maturity), the U.K. has a long duration of 8.5 years as shown in table 4.3.

The tax system in the U.S. subsidises firms' use of debt, having tax-deductible interest payments, while retained earnings and dividends are not tax-deductible. This is another reason why U.S. firms issue more debt in comparison with U.K. firms. As below:

Table 4.3 Comparison of U.K. & U.S. Institutional Characteristics

Institutional characteristics\ Country		**U.K.**	**US**
Power of the banking sector		Market-oriented	Market-oriented
Bankruptcy laws		receivership	Chapter 11(Reorganisation) and chapter7 (liquidation)
Bond markets based to Merrill Lynch series of indices (2010)	Average Duration (years)	8.5	4.5
	Index Weight	0.049	0.437

All the mentioned differences indicate that studying U.K. data would be an interesting ground for analysing the impact of macroeconomic conditions on capital structures.

4.5.2 Reason for Selecting DataStream and ONS and FRED

DataStream: This research obtains the data from the DataStream, which is the world's largest historical financial numerical database. DataStream contains more than two million instruments, securities and indicators for more than 175 countries in 60 markets, up to 50 years of history, over one hundred million time series (e.g., futures, options, equity indices, unit trusts, bonds, interest rates and exchange rates), and quantitative data for most companies quoted on any stock exchange. A number of organisations provide their data, such as WorldScope, International Monetary Fund (IMF), Organisation for Economic Cooperation and Development (OECD) and national government sources. DataStream offers powerful analytical tools, such as a range of charting and reporting tools to manipulate and display the data. Moreover, DataStream-AFO (Advance for Office) offers analytical tools to code and download a big dataset in a short time in order to dig deeper, uncover insights faster and run complex searches directly in Excel. DataStream has some features such as output and results that are easily downloadable to Excel, Word, and PowerPoint, simplified search for data series and data types through navigator.

ONS: This research obtains the industrial production and corporate tax from the Office for National Statistics (ONS), which is the largest independent producer of official statistics and is the recognised national statistical institute for the U.K. ONS collects and publishes statistics related to the economy, population, and society at national, regional, and local levels. ONS data is accessible easily using a keyboard in Internet Explorer in a short time and downloadable to Excel.

FRED: This research obtains US Dollar LIBOR (London Inter-Bank Offered Rates) rates to calculate the commercial paper spread as proxy for financial market risk from Federal Reserve Economic Data (FRED). FRED is one of the research divisions of the Federal Reserve Bank of St. Louis that is responsible for advising the bank president on matters of economic policy. FRED publishes statistics and in the areas of money and banking, macroeconomics, and international and regional economics.

4.5.3 Cleaning Data and Outliers Treatment

This research constructs the sample data in the following manner. Firstly, it selects firms listed in the FTSE, which have been active between the years 1995 and 2014. Secondly, it excludes 345 firms which operate in the financial sector (banks, investment trusts, and insurance companies). Thirdly, it excludes 185 firms with any missing observations for the total asset and 148 firms with any missing observations for total debt during the sample period. Fourthly, it excludes 22 firms that are included more than one time in the sample, the 10 firms that had no industry classification available, and 12 firms, which appeared with their previous names as a separate firm. Fifthly, it chooses only firms which have at least three continuous time series observations during the period 1995-2014, in order to apply the GMM method. Lastly, it discards the leverage values below 0 and above +1 (winsorized at 0 and 1 respectively). The data sample after cleaning consists of 922 firms and 9,951 observations. Table 4.4 shows the process of constructing the data sample, as below:

Table 4.4. Constructing Data Sample Process

Treatment	No. of firms
Initial Sample	1644
Financial Firms (deleted)	345
Firms with no total assets information available (deleted)	185
Firms included more than one time (deleted)	22
Firms with no total debt information available (deleted)	148
Firms with previous names appearing as separate firm (deleted)	12
Firms with no industry classification available (deleted)	10
Final sample (Total)	**922**

Rationale for selecting non-financial firm

Following Rajan and Zingales (1995) and Ozkan (2002), this research excludes financial companies, banks, insurance agencies and property companies (DataStream ICBIC 8000) because of several reasons. Firstly, regulatory requirements affect the capital structure of the financial sector. According to the Department of Trade and Industry (DTI), manufacturing is the most important sector in the U.K. (measured by industrial production) and it controls the

majority of exports from the U.K. market. Explicit investor insurance schemes (e.g., deposit insurance and minimum capital requirements) affect the capital structure of insurance companies (Rajan and Zingales, 1995).

4.6 Variables

This research considers different aspects in the selection of variables. For instance, it chooses those macroeconomic variables that empirical studies on firm capital structure in the U.K. have not used, but the same variables might have been used in studies on other countries. Firm-specific variables selection is based on those that have been tested by the majority of researchers and were statistically tested. Table 4.5 shows the selection of macroeconomic and firm-specific data that has been gathered for each company. This study obtains the data sample from DataStream for macroeconomic variables including financial market risk, stock market performance and credit supply; and for firm-specific data, such as firm size, growth opportunity, asset tangibility, profitability, current ratio and industry classifications. Furthermore, this study obtains Industrial production and corporate tax data from the ONS, and obtains LIBOR rates to calculate the commercial paper spread FRED.

The sample size is large enough to overcome the shortfalls of small sample biases and the array of companies considered includes several industries. All these companies are selected from publicly listed companies on the London Stock Exchange (LSE). Chen (2003) states that all publicly listed firms on LSE represent industrial classifications and therefore it presents the aggregate leverage in the country.

Table 4.5 Variables Definition

Variable	Definition	Frequency
Leverage	Total debt scaled by total asset	Annual
Industrial Production	Growth rate of the industrial production	Annual
Corporate Tax	Corporate tax growth rate	Annual
Risk Premium on Lending	Prime rate minus Treasury bill interest rate	Annual
Commercial Paper Spread	Three-month Libor minus the three-month Treasury bill.	Annual
Credit Supply	M3 growth rate	Annual
Stock Market Performance	FTSE100 return	Annual
Asset Tangibility	Other tangible assets scaled by total assets	Annual
Profitability	Earnings before interest and taxes scaled by the total assets	Annual
Firm Size	Log of total assets	Annual
Growth Opportunity	Growth rate of net sales	Annual
Current Ratio	Current assets divided by current liabilities	Annual

The following subsections explain the definition, the construction process, the choice of variables motivation and theories concerning each of the selected variables individually. The variables used in this research are:

4.6.1 Leverage

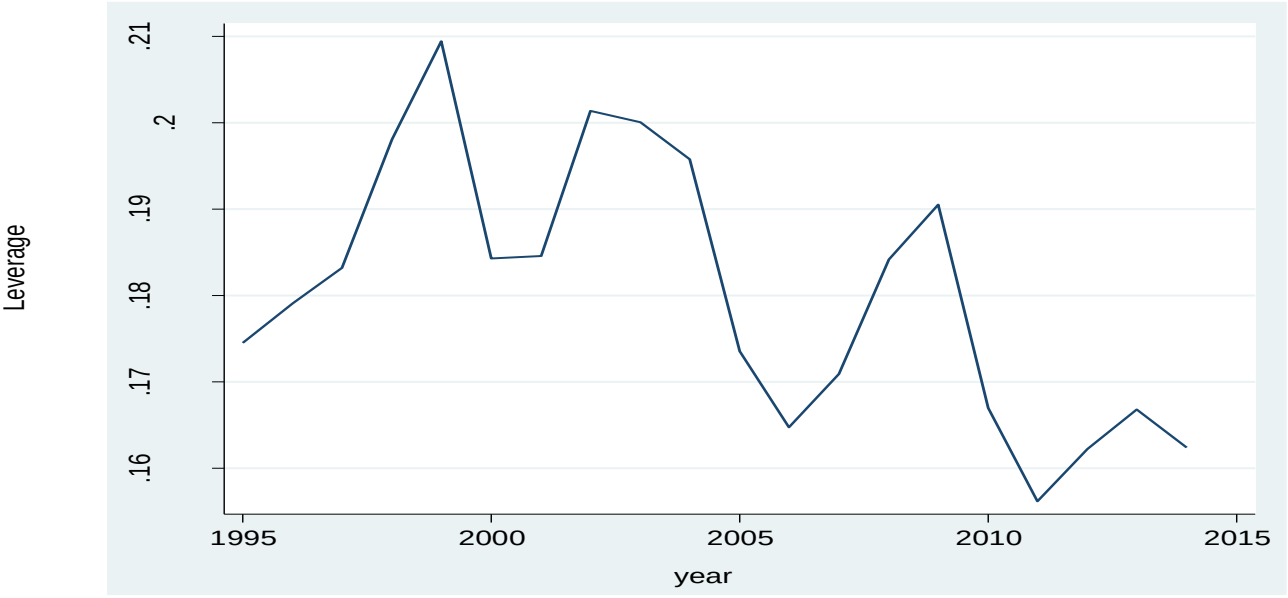
Following Rajan and Zingales (1995), this study uses book values of asset which is the total debts scaled by total assets of the firms. Myers (1977) states book values of debt are more realistic measures of capital structure because they are not the capitalised future value of assets. Other researchers use the book value of leverage and they argue that the market debt ratio may not be very important in debt decisions (Taggart, 1977; Marsh, 1982; Stonehill et al., 1975; Graham and Harvey, 2001; and Bessler et al., 2011). On the other hand, there are some studies that use market values of debt (Sweeney et al., 1997; Bowman, 1980).

Regardless of all the above studies, Bevan and Danbolt (2002) find that the book and market values of debt lead to similar signs of coefficients but using the book values of debt improves the fit of the model. Therefore, in order to be consistent with the prior studies and because market values of debt are not available, this study uses the book values of debt to construct the dependent variable. Where leverage is equal to the total debts scaled by total assets, it is symbolically expressed as:

$$Leverage = \frac{total\ debts}{total\ assets} \qquad (4.27)$$

After constructing the leverage values, some negative values and some greater than 1 were found in the data sample but, because leverage by definition is truncated between 0 and 1, this study ignored those leverage values below 0 and above +1, at 0 and 1 respectively.

Figure 4.1. Time vs. Leverage



Source: author's calculation based on DataStream data.

The figure 4.1 shows the average leverage of U.K. firms over the sample period and shows that average leverage is quite consistent during 1995 to 2014 with minor changes from year to year. The minimum of average leverage was 15.6% in 2011, which is still quite high and the maximum is 20.9% in 1999 which shows that the current U.K. leverage is manageable with minor changes from year to year compared to the early 1950s.

4.6.2 Business Cycle

The industrial production, and corporate tax are the most inclusive and important measure of the economic activity of a country. Using industrial production, and corporate tax helps policymakers to observe short-run (cyclical) fluctuations in economic activity and long-run growth trends. Industrial production index is the physical volume of output of the nation's manufacturing sector, including factories, mines, and utilities. Corporate tax is a function of profit. As during recession profits tend to decrease, hence companies pay less tax and corporate tax decreases as well.

Burns and Mitchel (1946) stated that *"Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organise their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic*

activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own".

This research downloaded industrial production, and corporate tax from the ONS database. In order to check how the economy is growing over time, this study uses the growth rate of these variables in the analyses (Bannock et al, 2003):

$$\text{Industrial Production}_t = Log\text{Industrial Production}_t - Log\text{Industrial Production}_{t-1} \quad (4.28)$$

$$\text{Corporate Tax}_t = Log\text{Corporate Tax}_t - Log\text{Corporate Tax}_{t-1} \quad (4.29)$$

It is hypothesised that the industrial production, and corporate tax are expected to have a positive relationship with the leverage under the trade-off theory (H1A) and a negative relationship under the pecking order theory (H1).

Figure 4.2 Leverage vs. Industrial Production Growth Rate

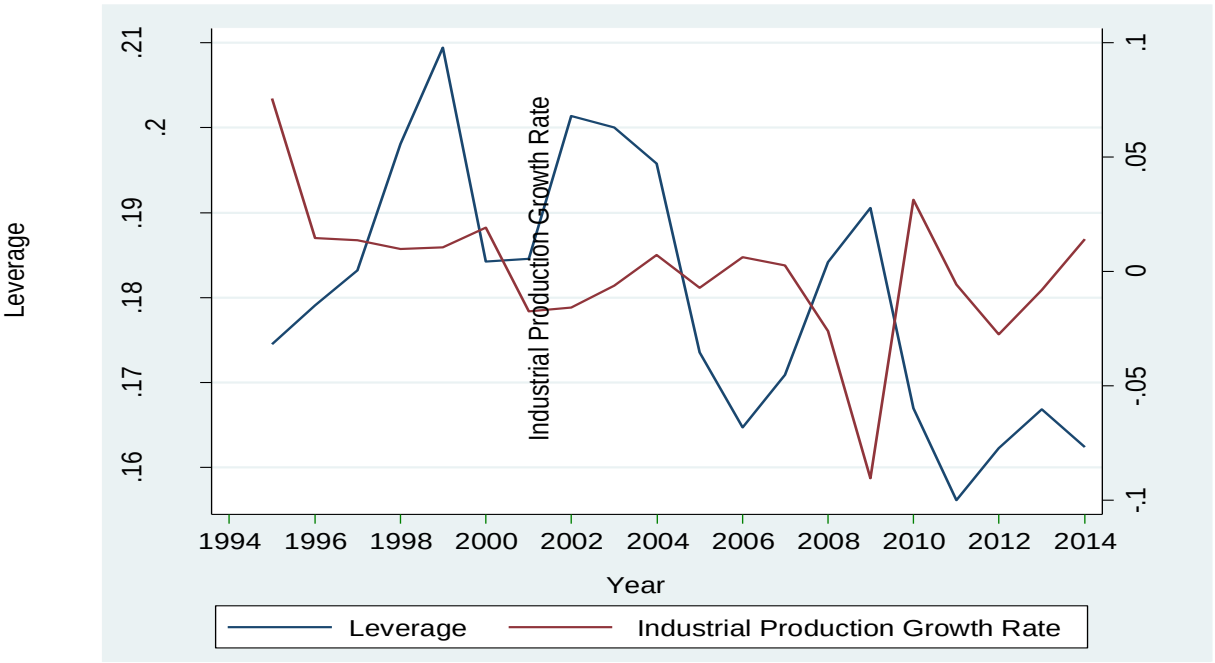
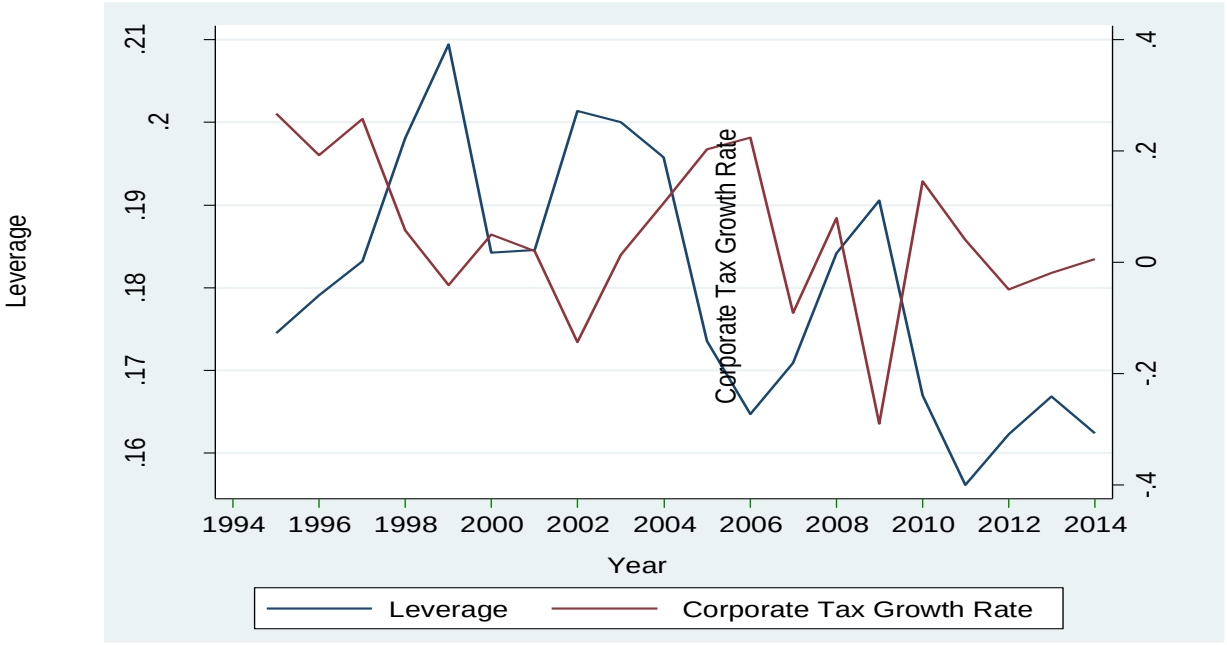


Figure 4.3 Leverage vs. Corporate Tax Growth Rate



As can be seen in figures 4.2 and 4.3, the leverage and industrial production growth rate and leverage and corporate tax growth rate in this sample of the U.K. data follow a counter-cyclical trend from 1995 to 2014.

4.6.3 Credit Market Risk

Measuring financial market risk is of central importance for firms, mainly to mitigate risk and optimise both capital budgeting decisions and the possibility of getting expected investment returns. Note the point that the financial market risk will not always remain constant, but could change over time. The key analytical model for financial market risk is the transition matrix. For example, the credit rating developed by Standard and Poor's stated that AAA would correspond to the safest credit rating and CCC to the least safe. This study uses commercial paper spread and risk premium as a proxy to measure the financial market risk. Risk premium on lending is the interest rate charged by banks on loans to private sector customers minus the Treasury bill interest rate at which short-term government securities are issued or traded in the market. This study calculates the risk premium on lending and commercial paper spread as follow:

$$\text{Risk Premium}_t = \text{Prime rate}_t - \text{Treasury bill interest rate}_t \quad (4.30)$$

$$\text{Commercial Paper Spread}_t = \text{three month Libor}_t - \text{three month Treasury bill}_t \quad (4.31)$$

Figure 4.4 Leverage vs. Commercial Paper Spread

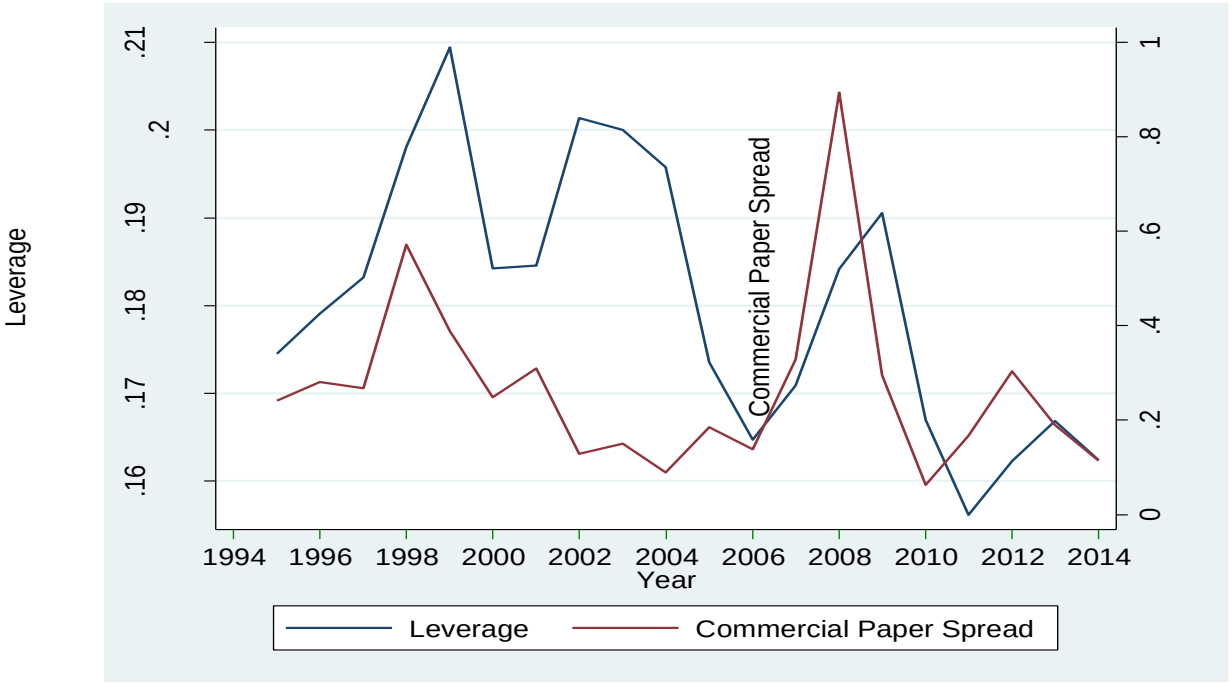
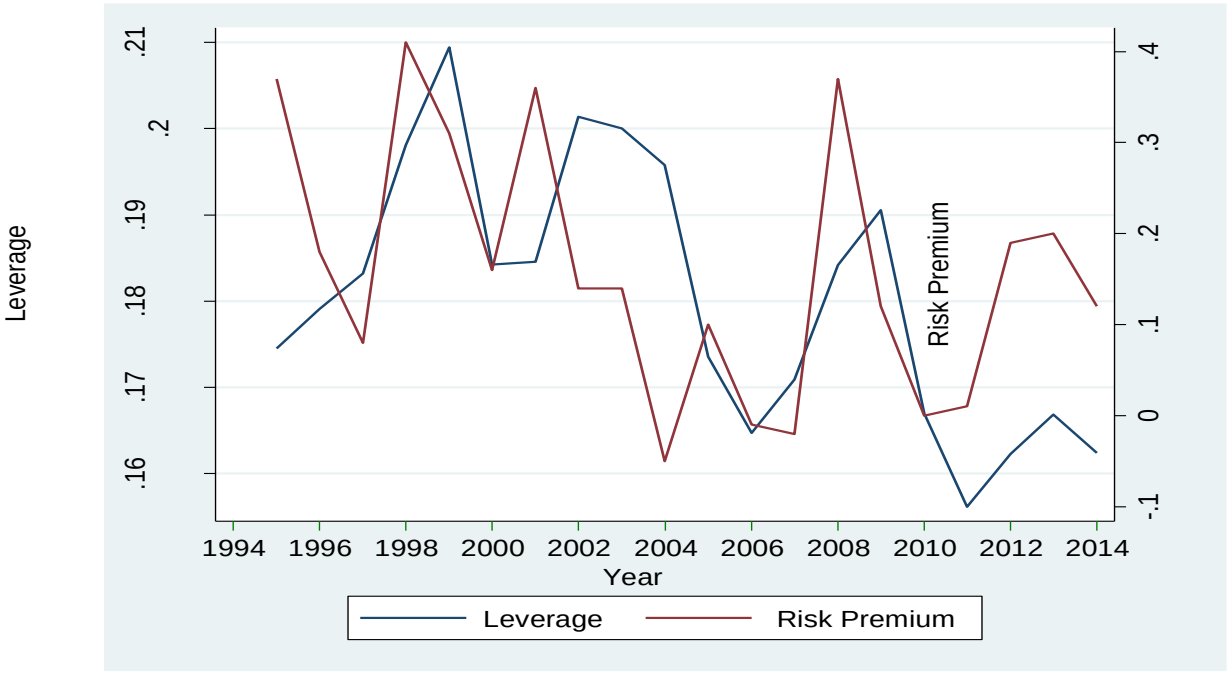


Figure 4.5 Leverage vs. Risk Premium



Figures 4.4 and 4.5 show commercial paper spread and risk premium and leverage follow a pro-cyclical trend from 1997 to 2000 and from 2006 to 2014. This positive relationship is consistent with the prediction of pecking order theory (H3). However, the figures show a

counter-cyclical trend from 1995 to 1997 and from 2000 to 2006. The negative is consistent with the prediction of trade-off theory (H3A).

4.6.4 Credit Supply

There are two types of money supply, narrow money and broad money. This study will use the broad money supply (M3). The M3 aggregate (estimate of the Economic and Monetary Union (EMU) aggregate for the U.K.) comprises monetary liabilities of Monetary and Financial Institutions (MFIs) in the U.K. and non-MFI U.K. entities, excluding central government. The estimate for M3 is compiled using components of M4, which in turn is derived from the consolidated balance sheets of MFIs in the U.K. Note that this research excludes financial firms from the data sample but, by including credit supply in the model, it addresses some of the features of financial firms that make them special.

$$M3_t = LogM3_t - LogM3_{t-1} \quad (4.32)$$

where $M3_t$ is the rate of the broad money supply; $m3_t$ is broad money supply and $m3_{t-1}$ is the broad money supply for the previous year of t.

Figure 4.6 Leverage vs. Credit Supply

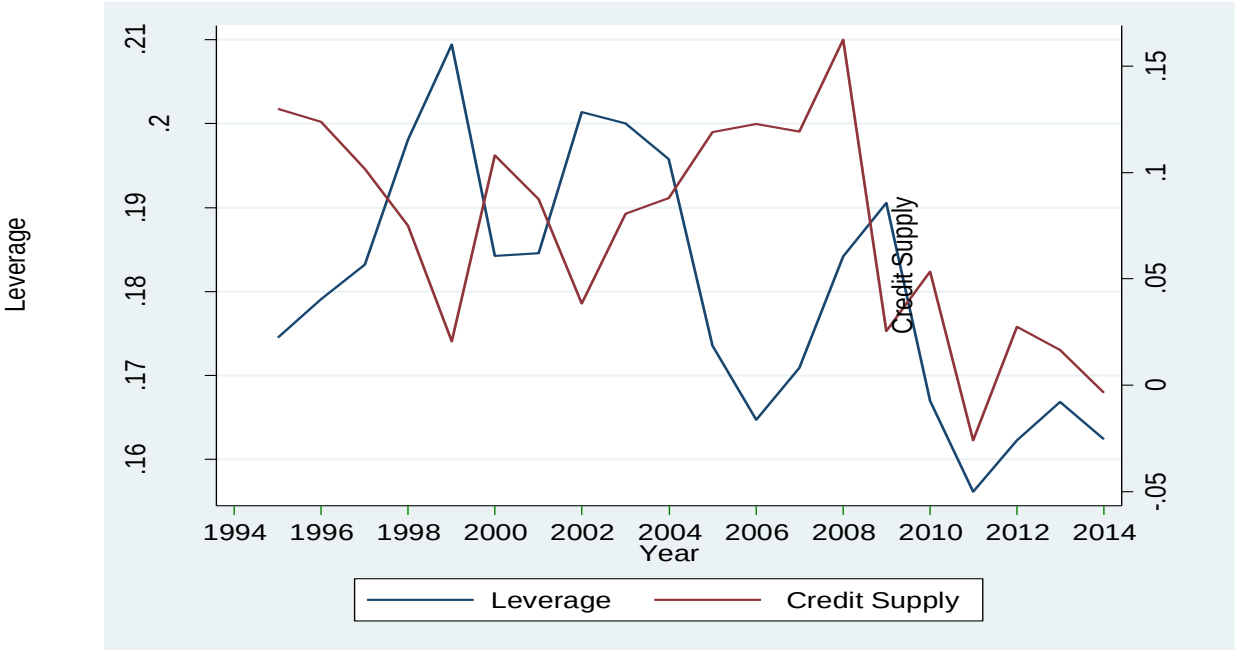


Figure 4.6, Shows the trend of credit supply and leverage of this U.K. data. From 2007 onwards, both of them have a positive and similar trend with the exception of the period 1995-2007. It is hypothesised that the credit supply is expected to have a positive relationship with leverage under both the trade-off and pecking order theories (H2).

4.6.5 Stock Market Performance

Stock market prices show significant changes since the 1960s, such as the 1990s bull market in the U.S.A. The U.K. stock market is the third largest stock market in the world and is one of the oldest exchanges. It can have a significant impact on the financial ratio of firms. Therefore, this research analyses the impact of stock market performance on capital structure.

One of the commonest approaches to measuring the stock market performance is to use stock market returns. Returns are given by the appreciation in price of a share plus any dividend payment that this may yield. Normally, a good performance and optimistic atmosphere in the market translates into high returns for several sectors of the market. However, other approaches include the consideration of price-to-earnings ratios.

$$Stock\ Return = Rt = lnp_t - lnp_{t-1} \qquad (4.33)$$

where, lnp_t is the logarithm of share price plus dividends; lnp_{t-1} is the logarithm of share price for the previous year of t.

Figure 4.7 Leverage vs. Stock Market Performance

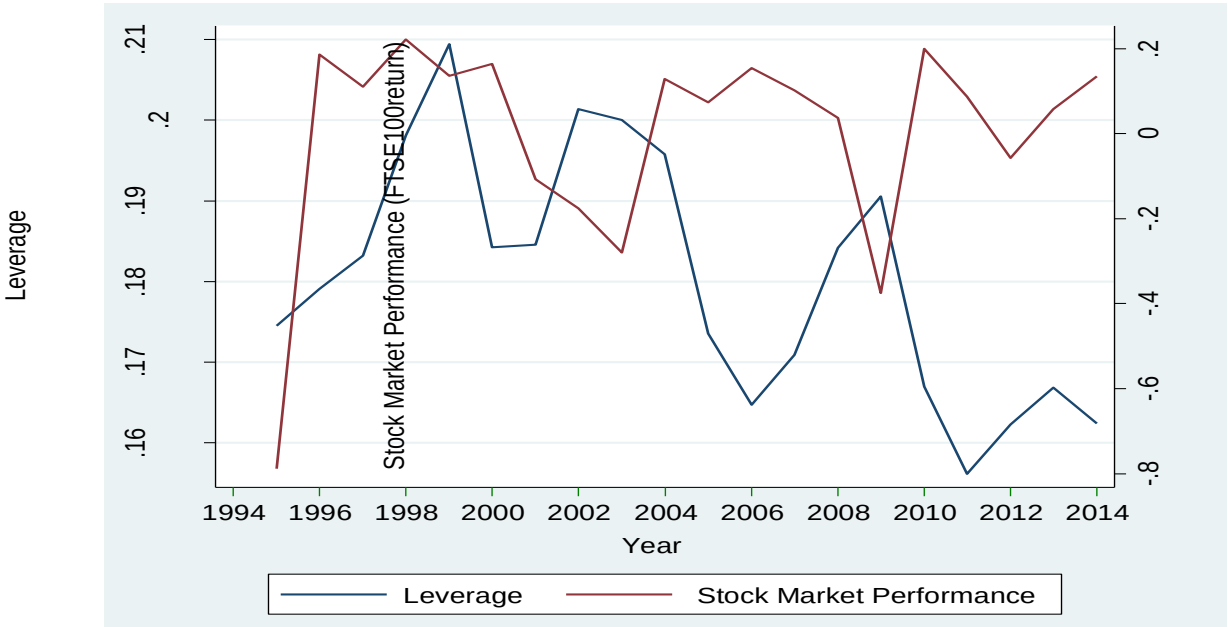


Figure 4.7, shows the trend of stock market performance and leverage in this U.K. data. From 1995 to 2001, both of them have a pro-cyclical trend. The positive trend is consistent with the prediction of trade-off theory (H4). From 2001 onwards, both of them have a counter-cyclical trend. The negative relationship is consistent with the prediction of both the market timing and pecking order theories (H4A).

4.6.6 Control Variables

This section describes definition and the way this research measures the control variables: asset tangibility, current ratio, growth opportunity, profitability, firm size and industry classifications.

Asset tangibility: Asset tangibility is another important determinant of capital structure that this research includes in the model as a control variable. Existing capital structure theories propose the type of a company's assets has an impact on its capital structure. Some researchers find that firms owning more assets to secure their debt have more opportunities to increase their leverage, therefore asset tangibility is expected to have a positive impact on leverage (Marsh, 1982; Titman and Wessel, 1988; Rajan and Zingales, 1995; Walsh and Ryan, 1997; and Deesomsak et al., 2004). On the other hand, other researchers state that a measure of debt has an impact on the relationship between leverage and asset tangibility (Chittenden et al., 1996; and Bevan and Danbolt, 2002). Although there are a lot of inconsistencies in the previous studies, it is predictable that leverage and asset tangibility have a positive relationship based on the majority of existing evidence. This study uses the ratio of other tangible assets scaled by total assets as a proxy for measuring asset tangibility.

Current ratio: This research uses current ratio to determine the firms' liquidity. Current ratio is determined by current assets divided by current liabilities. The current assets includes cash, or receivables assets from customers and inventories of finished goods and raw materials. Current liabilities is the immediate payment obligations including debt to suppliers, short-term financial expense and maturing instalments of long-term debt. Shleifer and Vishny, (1992) state that liquidity increases leverage ratio because higher liquidity may increase firm value in liquidation. Firms with higher liquidity ratios may have higher debt ratio due to greater ability to pay their short-term. This shows a positive relationship between leverage and current ratio. However, firms with higher current ratio may use their current assets to finance their

investments. Therefore, the firm's liquidity ratio may have a negative impact on its leverage ratio.

Growth opportunity: Growth opportunity is another important determinant of capital structure that this research includes in the model as a control variable. Myers (1977) predicts the leverage is negatively related to growth opportunity. Marsh (1982) suggests that relying on debt to finance growth may be too costly for high-growth firms and the agency problem shows a negative relationship between leverage and a firm's growth. Other researchers explain that there is a negative relationship between leverage and a firm's growth (Bevan and Danbolt, 2002; Nguyen, 2006). Therefore growth opportunity is expected to have a negative relationship with leverage. Following previous literature, this study uses the growth rate of net sales as a proxy for measuring investment opportunity.

Profitability: Profitability is one of the most important determinant of capital structure that this research includes in the model as a control variable. Profitability is a proxy for the availability of internal funds. As Myers (1977) explains that firms prefer financing, first from their internal funds, then from debt, and lastly from issuing equity. He states that this behavior is due to the cost of issuing new equity or due to asymmetric information, or they can be transaction costs (Myers and Majluf, 1984). In both case, the firms' profitability and their available internal funds, should be an important determinant of its capital structure. They, report that firms use internal funds due to the fact that external funds are characterized by higher agency costs. According to pecking order theory, since profitable firms are associated with larger internal funds, firms use their internal fund and they use less debt. Hence, profitability is associated with less leverage under the pecking-order theory. Rajan and Zingales (1995) report that profitability is negatively correlated with leverage. Moreover, they conclude that changes in profitability will be negatively correlated with changes in leverage if in the short run, dividends and investments are fixed, and if debt financing is the dominant mode of external financing. Therefore, profitability is expected to have a negative relationship with leverage. This study uses earnings before interest and taxes scaled by the total assets as a proxy for measuring profitability.

Firm size: Size is another important determinant of capital structure that this research includes as a control variable in the model. Firm size has a positive relationship with leverage as large firms tend to choose long-term debt, whereas small firms tend to use short term debt (Marsh, 1982). Biger (2008) indicates that large firms enjoy creditworthiness in issuing long-term debt and use higher leverage. Small companies, because of their few available resources to get out of financial distress, are more sensitive to economic recession and more susceptible

to liquidation when in financial distress; they tend to obtain less long-term debt but more short-term debt than larger companies do. Large companies are more likely to issue equity to increase funds, which shows a negative relationship between leverage and firm size (Ozkan, 2000). Therefore, firm size is expected to have a negative relationship with leverage. This research uses the log of total asset as a proxy for measuring firm size.

Industry dummy variable: Industry classification is another important determinant of capital structure that this research includes in its model as a control variable. Different industries are influenced by different regulations; therefore firms in a similar industry face similar regulations and level of uncertainty with respect to financing decisions. Industry dummies describe variations in the leverage ratio (Bradley et al., 1984) and firms across different industries have different levels of leverage ratio (Martin, 1975). However, existing studies on U.K. firms' data did not control for the effects of industry-level heterogeneity on the capital structures, which motivates this research to include this variable in its regression model to reduce the possible misspecification bias.

This study includes industry dummy variables as a proxy for the industry classifications of firms and categorises nine main dummy variables using the U.K. SIC industry classification, namely Oil and Gas (0001), Basic Materials (1000), Industrials (2000), Consumer Goods (3000), Healthcare (4000), Consumer Services (5000), Telecommunications (6000), Utilities (7000) and Technology (9000). This research represents the industry dummy variable as I_D.

As Table 4.6 shows the largest and smallest numbers of firms in the sample belong to Industrial and Telecommunication industries respectively.

Table 4.6 Industrial Classification of Firms

	No. of firms	Frequency
Basic material	130	14.09%
Consumer Goods	67	7.26%
Consumer Services	178	19.3%
Health Care	73	7.91%
Industrials	227	24.62%
Oil & Gas	100	10.84%
Technology	110	11.93%
Telecommunications	16	1.73%
Utilities	21	2.27%
Total	922	100%

Financial Crisis dummy: Some studies find that the financial crisis affects capital structure (Campello, Graham, and Harvey, 2010; Bhamra, Kuehn, and Strebulaev, 2011). Because this research sample period includes the 2008 crisis, it provides an interpreting opportunity to examine whether the 2008 crisis has any impact on the capital structure of firms. So this research employs a crisis dummy variable in model specification 3 that takes a value of one if the year is smaller than 2009.

Bharath et al. (2009) state that during the crisis pecking order theory would be more capable to explain the capital structure choice as the problem of asymmetric information increases. They explain that small firms prefer to use their internal funds during financial crisis but as their internal funds are less, so they are forced to use external financing. Because the equity market is very volatile during the financial crisis, hence the remaining option for a smaller firm to raise capital is debt. Information asymmetry increases during financial crises. According to predictions of pecking order theory, big firms and small firms use their internal fund in circumstances where information asymmetry is relatively high. However, small firms may experience internal financial constraints and therefore use external financing. But big firms may have greater potential to use their internal funds. So, the coefficient of firm size is negative reflecting the tendency of big firms toward low leverage and small firms toward high leverage.

Finally, this study will attempt to contribute to the literature by considering a wide range of assessments of macroeconomic conditions and to include variables not previously considered in other studies with respect to U.K. listed companies.

• CHAPTER FIVE: RESULTS AND DISCUSSION

This chapter presents the results from different estimation techniques to benchmark these results with previous studies and support the conclusion. Section 5.1 presents the summary statistics for macroeconomic variables in the U.K., firm-specific variables and leverage ratio for publicly listed U.K. firms. Section 5.2 explains the empirical results from the static model including fixed effects and random effects regression models. Section 5.3 presents the empirical results from the tobit regression models. Section 5.4 demonstrates the empirical results from the GLS regression models, and lastly, Section 5.5 describes the empirical results from the dynamic regression models of capital structure including SGMM and DGMM estimation strategies.

5.1 Descriptive Statistics of Dependent, Independent and Control variables

Table 5.1 presents the descriptive statistics of dependent, independent and control variables, with their mean, median, standard deviation, maximum, minimum, 95% confidence interval and a number of observations of 992 U.K. non-financial firms from 1995 to 2014. This study obtains annual firm level data from DataStream with some exceptions for the commercial paper spread, which is achieved from Federal Reserve Economic Data (FRED) and industrial production and corporate tax, which is obtained from the Office for National Statistics (ONS). This study excludes financial firms as they are heavily regulated and have a particular capital structure (Rajan and Zingales, 1995; Hovakimian et al., 2001). The data is relatively clean, but there are some outliers which are eliminated by winsorising all the dependent, independent and control variables at 2% level.

Table 5.1 shows that the number of observations varies for each variable because of the unbalanced panel structure. As Table 5.1 shows, the mean value of total debt accounted for 17.78 % of the book value of total assets. It seems that publicly listed firms in the U.K. prefer to issue equity rather than getting debt. The standard deviation of leverage indicates that there are firms whose capital structure consists of only debt, and there are firms that do not have debt at all in their capitals structure. However, the confidence interval figures show that leverage ratio of 95 % of U.K. firms is between 17.44% and 18.13%. The table A.5.1 in the appendix shows that the gap between average leverage confidence interval for each year is bigger but still has the same spread. This result is similar and slightly lower than the previous studies by

Rajan and Zingales (1995) and Bevan and Danbolt (2002), who stated mean debt ratios such as 0.21 and 0.18 respectively for U.K. firms. But the value is a little higher than the mean debt ratio 0.16 reported by Ozkan (2001) for the U.K. firms. The mean value of leverage shows this research's result is consistent with the results of previous researches that have used U.K. data, which indicates that U.K. firms tend to issue equity rather than issuing debt.

Table 5.1 presents the summary statistics of leverage, macroeconomic variables, and control variables. This research follows Rajan and Zingales (1995) in the choice of control variables including tangibility, current ratio, growth opportunity, profitability, and size (Table 4.5 for the definitions). Since the composition of firms varies over time, the data is unbalanced. To show the variation in the mean value over the time this research also reports the average of the variables each year (Appendix Table A.5.3).

The corporate tax growth rate with the average of 0.051 shows the corporate tax growth rate changes with the average rate of five percentage points during 1995 to 2014. Besides, it would be interesting to know that the actual U.K. corporate tax rates level has decreased during the same period from 0.33 to 0.22 (Appendix Table A.5.2). Particularly the corporate tax rate decreased from 0.33 to 0.29 for the period 1995-2008 and from 0.29 to 0.22 for 2008-2014, which shows during the last six years of the mentioned period it decreased by 0.07. Figure 5.1 plots the macroeconomic variables during the mentioned period. Interestingly Figure 5.1 panel A bottom, middle and upper parts show the decreasing trend, and the upper panel also shows the decreasing trend is sharper after the 2008 crisis. The decreasing trend of the amount of corporate tax paid by firms is similar to the decreasing trend of U.K. corporate tax rate. Section 5.6 discusses the extent to which U.K. firms react to this declining trend.

Table 5.1 shows that the industrial production growth rate varies from -0.090 to 0.075, with the mean of -0.00000409. The year 2009 has the minimum industrial production growth rate of -0.090, and the maximum relates to 1995. The growth rate of industrial production varies by three percentage points during 1995 to 2014. The figure 5.1 shows overall a decreasing trend for the period 1995 to 2014. However considering the structural break and dividing the sample to pre-crisis and post-crisis periods, Figure 5.1 panel F middle and upper panels show a decreasing trend in the mean value of industrial production growth rate for period pre-crisis and an increasing trend for post-crisis respectively. Interestingly Figure 5.1 panels E and F show that both proxies of the business cycle have similar trends during the same period.

The table 5.1 shows the M3 growth rate ranges from a minimum of -0.025 in 2011 to the maximum growth rate in 2008, which equals 0.162, with the mean of 0.073. Besides, the descriptive statistics shows that each M3 growth rate yearly value is an average of 5.02% away from the mean value. Figure 5.1 panel C shows a decreasing trend in the mean value of M3 growth rate for the period 1995 to 2014. However considering the financial crisis effect, figure 5.1 panel C the middle and upper graph report a sharper downward trend in the mean value of M3 growth rate for post-crisis compared with the pre-crisis.

Risk premium varies from -0.05 to 0.41, with the mean of 0.159. In addition, the descriptive statistics show that each risk premium yearly value is an average of 14.2% away from the mean value. Figure 5.1 panel D reports a decreasing trend for the year 1995 to 2014, pre-crisis and post-crisis period. The lowest yearly average value for risk premium is equal to -0.05 in 2004 and the highest value is equal to 0.41 in the year 1998 (Appendix Table A.5.2).

Table 5.1 reports commercial paper spread ranges from 0.062 in the year 2010 to 0.893 in 2008, with the mean of 0.267. Moreover, the yearly commercial paper spread value is an average of 18.8% away from its mean value. Figure 5.1 panel E presents a decreasing trend for the year 1995 to 2014, pre-crisis and post-crisis period. The Figure 5.1 Upper graph of panels A, B and C show that commercial paper spread, risk premium and M3 growth rate are high in 2008 compared with other times.

Table 5.1 shows that FTSE100 return changes from -0. 7878 to 0.221, with the mean of 0.0007. Additionally, it shows that the rate of FTSE100 return varies by 0.24 around its mean value. The highest yearly average value for FTSE100 return is equal to 0.22 in 1998, and the lowest value is equal to -0.37 in the year 2009 (Appendix Table A.5.2). Figure 5.1 panel B shows an increasing trend for the year 1995 to 2014, pre-crisis and post-crisis periods.

Table 5.1 firm-specific variables, Tangibility ranges from -0.003 to 1, with the mean of 0.009. Moreover, confidence interval figures show that 95 % of tangibility of U.K. firms is between 0.008 and 0.0103. The tangibility's mean value shows that U.K. firms have the low level of tangible assets, which they can use as collateral to get loans and secure their debt. Therefore, they have fewer opportunities to increase their leverage ratio. The current ratio ranges from 0 to 2273.13, with the mean of 3.499. However, confidence interval figures show that 95% of U.K. firms' current ratio is between 3.08 and 3.91. The confidence interval figures show that U.K. firms have more assets compared with their liabilities indicating that they have

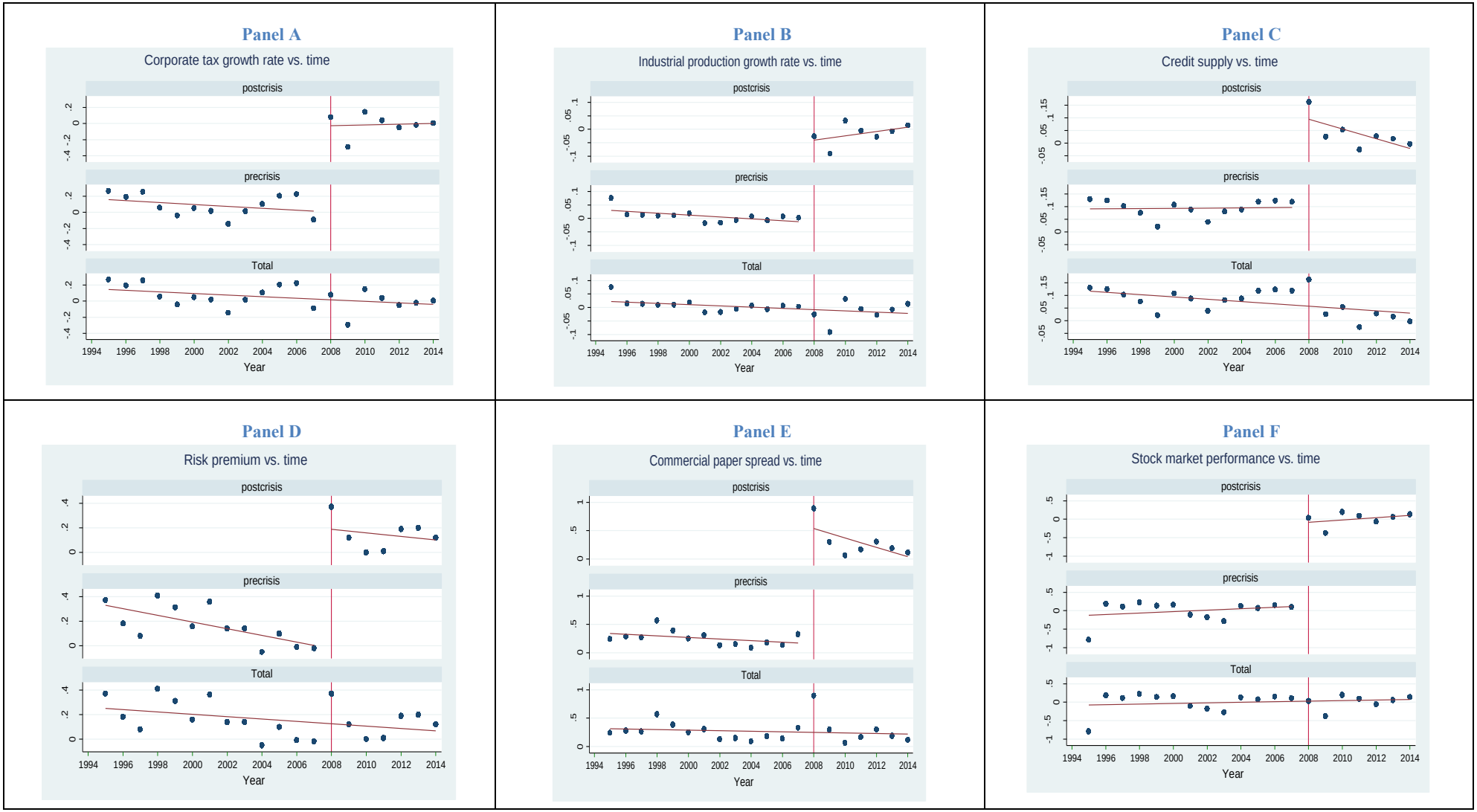
good short-term financial strength. The growth opportunity ranges from -11.019 to 11.627, with the mean of 0.123, shows that the growth opportunities differ among firms. Moreover, the yearly growth opportunity value is an average of 0.83 away from its mean value and growth opportunity of 95% of U.K. firms is between 0.10 and 0.13. The profitability has the mean of -0.141 and it ranges from -396.4 to 5.335. The confidence interval figures show that profitability of 95% of U.K. firms is between -0.21 and -0.07, which is not encouraging U.K. firms to lever up because firms with a low level of profitability need to pay fewer taxes, and do not tend to issue debt. The variable size ranges from 0.693 to 24.551, with the mean of 11.210. However, the size of 95% of U.K. firms is between 11.16 and 11.25. After this brief summary of the descriptive statistics results, Section 5.2 discusses the empirical results from the static model.

Table 5.1 Descriptive Statistics

Variable	Mean	Median	Std. Dev.	Min	Max	[95% Conf. Interval]		N
Leverage	0.1778	0.1151	0.2072	0	0.9505	0.1744	0.1813	13765
Corporate Tax Growth Rate	0.0514	0.0447	0.1375	-0.2904	0.2674	0.0494	0.0533	20
Industrial Production Growth Rate	0	0.0027	0.0303	-0.0906	0.0756	-0.0004	0.0004	20
M3 Growth Rate	0.0735	0.0842	0.0503	-0.0259	0.1624	0.0728	0.0743	20
Risk Premium	0.159	0.14	0.1421	-0.05	0.41	0.1570	0.1610	20
Commercial Paper Spread	0.2677	0.2449	0.1888	0.0629	0.8933	0.2650	0.2703	20
FTSE100 Return	0.0007	0.0945	0.2464	-0. 7878	0.2213	-0.0028	0.0041	20
Tangibility	0.0093	0	0.0545	-0.0034	1	0.0084	0.0103	13195
Current ratio	3.5	1.472	23.4324	0	2273.13	3.0807	3.9193	12000
Growth opportunity	0.1235	0.0741	0.8365	-11.0191	11.6272	0.1085	0.1386	11900
Profitability	-0.1413	0.052	4.1144	-396.4	5.3351	-0.2108	-0.0718	13463
Size	11.2109	11.0116	2.7172	0.6931	24.5519	11.1655	11.2563	13778

This table presents the descriptive statistics for the sample. The sample includes a total of 11520-year end observations for a sample of 922 companies for the period 1995 to 2014. **Leverage** for each company calculated as the ratio of total debt scaled by the total asset. **Corporate Tax Growth rate** defined as the first difference of the log of the U.K. corporate tax growth rate. **Industrial Production Growth Rate** calculated as the first difference of the log of the U.K. industrial production 2012 index. **M3 Growth Rate** calculated as the first difference of the log of the broad money supply (M3). **Risk Premium** described as the Prime rate minus Treasury bill interest rate. **Commercial Paper Spread** calculated as the difference between three-month Libor and the three-month Treasury bill. **FTSE100 return** defined as the first difference of the log of the stock market return. **Tangibility** for each company defined as the Ratio of tangible assets scaled by the total assets. The **Current ratio** for each company calculated as the ratio of current assets divided by current liabilities. **Growth opportunity** for each company defined as the Growth rate of net sales. **Profitability** for each company defined as the Ratio of earnings before interest and taxes scaled by the total assets. **Size** for each company calculated as Log of total assets.

Figure 5.1 Macroeconomics Variables vs. Time (Structural Break Considered)



5.2 Empirical Results from Static Model

This section reports the results from the fixed effects and random effects regressions. This research chooses 6 model specifications with various proxies to measure the impact of macroeconomic variables on leverage. The first two model does not consider the effect of the financial crisis and models 3-6 do consider the effect of the 2008 crisis. The first regression model specification column labelled "1" includes leverage, macroeconomic variables, and the five stated control variables. The second regression model specification column labelled "2" includes all variables in regression 1 and adds the year dummies. The third regression model specification column labelled "3" contains all variables in regression 1 and adds the crisis dummy. Regression columns labelled "4", "5", and "6" include the interaction between macroeconomic variables and financial crisis in the models. Regression 4 includes all variables in regression 3 and adds interaction between money supply and crisis dummy. Regression 5 includes all variables in regression 4 and adds interaction between corporate tax growth rate and industrial production growth rate with the crisis dummy. Regression 6 includes all variables in regression 5 and adds interaction between financial market risk and crisis and stock market performance and crisis dummy. Section 5.2.1 reports the results from fixed effect regression models and Section 5.2.2 reports the results from random effect regression models.

5.2.1 Fixed Effects Model

This section presents the results from fixed effects regression models including leverage, macroeconomic variables, and firm-specific variables. To see if the result is sensitive to a change in business cycle, Table 5.2 and 5.4 consider corporate tax growth rate and Table 5.3 and 5.5 consider industrial production growth rate as proxies to measure business cycle. Moreover to check if the results are robust to using different proxies of financial market risk, Table 5.2 and 5.3 consider commercial paper spread and Table 5.4 and 5.5 consider risk premium.

Business cycle: The Tables 5.2, 5.3, 5.4 and 5.5 report that the effect of both corporate tax growth rate and industrial production growth rate on the capital structure of U.K. firms are negative and statistically significant at the 1% level. This result supports the first hypothesis, which outlines that there is a countercyclical relationship between leverage and business cycle under the pecking order theory. An explanation is that during expansion, due to high economic growth, firms have high profitability and consequently a higher degree of cash flow; so firms

have more cash available and when they are in need of financing a project they may use internal financing in the presence of information asymmetry, according to pecking order theory. Similarly during the recession, due to low economic growth, firms have low profitability and consequently a lower degree of cash flow. Therefore, firms do not have enough cash flow which leads to them seeking external financing and having a higher leverage ratio as the pecking order theory indicates.

This empirical result also coincides with previous studies. As an illustration, Choe et al. (1993) assess the capital structure of all NYSE, AMEX and NASDAQ listed firms during the 1971-1991 period. They find that firms tend to issue less debt during expansion. Likewise, Korajczyk and Levy (2003) study the impact of macroeconomic conditions on the capital structure by splitting their firm's sample based on a measure of financial constraints and find that target leverage is counter-cyclical for the relatively unconstrained sample. They state that the negative relationship between the macroeconomic variables and leverage seems consistent with the pecking order theory, particularly for unconstrained firms. Consistent with results of Korajczyk and Levy (2003), Cook and Tang (2010) investigate the impact of macroeconomic conditions on the capital structure by using two dynamic partial adjustment capital structure models. Their sample consists of nonfinancial firms from the Compustat database during 1976 to 2005. They find strong evidence consistent with the predictions of Hackbarth et al. (2006) that firms tend to decrease their leverage in good macroeconomic states.

Furthermore, model 2 in Tables 5.2, 5.3, 5.4 and 5.5 shows that controlling for the year dummies decreases the magnitude of the coefficient estimates for the tax growth rate and the industrial production growth rate. However, model 3, 4, 5 and 6 show that by adding crisis dummy and the interaction between macroeconomic variables and crisis dummy the magnitude of the stated coefficient estimates increases in all four stated tables. The magnitude of coefficient estimates of business cycle increases from -0.0695 percentage points (model 6 Table 5.4) to -0.599 percentage points (model 5 Table 5.3) for the period before the 2008 financial crisis. For the period after the 2008 crisis magnitude of coefficient estimates increases from -0.070 percentage points (model 5 Table 5.4) to -0.581 percentage points (model 6 Table 5.3). Therefore, the results indicate that business cycle has a negative and statically significant effect on leverage with the exception of a positive coefficient on model 6 in Table 5.5. The model reports a positive coefficient equal to +1.783 ((-0.592) + (2.375)) which shows a positive

relationship between the business cycle and leverage. However, the positive sign might be due to model 6 being over-specified and due to effect of financial crisis.

This result shows if industrial production growth rate increases by one percentage point, then the expected change in leverage decreases from -0.599 percentage points to -0.0695 percentage points for the period before the crisis, and expected change in leverage decreases from -0.581 percentage points to -0.070 percentage points for the period after the crisis.

Besides, the results of random effect regression, tobit regression, GLS regression, SGMM and DGMM regressions (sections 5.2.2, 5.3, 5.4, and 5.5) show that the effect of both corporate tax growth rate and industrial production growth rate on leverage is negative and statistically significant. This is similar to fixed effects regression results and indicates the results are strongly robust to stated estimation strategies. The negative effect is consistent with H1 and the prediction of the pecking order theory.

Credit supply: Models 1 and 2 in Tables 5.2, 5.3, 5.4 and 5.5 report that the effect of M3 growth rate on leverage is positive and statistically significant. Model 3-6 in Table 5.2 and 5.4 show report positive and statistically significant before and after the crisis and in Tables 5.3 and 5.5 including industrial production growth rate in regressions report insignificant coefficients. The magnitude of coefficient estimated in model 1 and 2 not considering the effect of crisis increases from 0.079 percentage points (model 2 Table 5.5) to 0.186 (model 2 Table 5.2) percentage points. For the period before and after the crisis, the magnitude of coefficient estimates increases from 0.0770 percentage points (model 3 Table 5.4) to 0.0925 percentage points (model 3 Table 5.2) and statistically significant at 10%. This result shows if M3 growth rate increases by one percentage point, then the expected change in leverage ranges between 0.0770 to 0.186 percentage points.

The fixed effects regression's coefficient estimates in Tables 5.2, 5.3, 5.4 and 5.5, are positively significant only on model specification 1, 2 and 3, and by adding the interaction between macroeconomic variables and crisis dummy they become insignificant in model specification 4, 5, and 6. Nevertheless, this research keeps the results of interaction variables in the Tables 5.1-5.5 as they become positively significant in the subsequent robustness tests using random effect regression, tobit regression and GLS regressions.

Furthermore, the positive effect of credit supply on capital structure is consistent with the findings of previous capital structure studies. Specifically, Huang's (2003) study of U.K. data, by using a dummy variable to control for monetary policy tightening which finds that reduction in money supply leads to a general reduction of leverage. Similarly, Balsari and Kirkulak (2010) state that the 1994 crisis has a negative impact on Turkish firms' leverage ratios and there is a positive relationship between money supply and leverage.

Overall, the effect of M3 growth rate on leverage is positively significant which is in line with the hypothesis H2 and is consistent with either prediction of the trade-off and pecking order theories. Moreover, the existence of the positive effect based on the fixed effects result is similar and strongly robust to the results of random effect regression, tobit regression, and GLS regression as reported in sections 5.2.2, 5.3 and 5.4.

Financial market risk: Table 5.2, 5.3, 5.4 and 5.5 report negative coefficients for the commercial paper spread and risk premium, but the coefficients are not statistically significant. However, Table 5.2 Model 6 reports a negatively significant coefficient estimate at 10 % for the commercial paper spread which is equal to -0.0814. As stated the coefficient estimates only became significant in model 6 and not in models 3, 4 and 5, hence this research cannot conclude that the variable has a negative impact for the period after the crisis. This can be due to incorporating crisis dummy interactions with the commercial spread in the estimation, which reveal the effect. Therefore, the results imply that financial market risk has no relation to leverage of U.K. firms before and after the crisis, with the exception of model 6. The negative effect of financial market risk in Table 5.2 model 6 is in line with the prediction of trade-off theory for the period after the crisis and in line with this study H3A. The negative effect of financial market risk is similar to many previous studies that support the existence of a relationship between financial market risk and leverage (e.g. Hackbarth, Miao, and Morellec 2006; Chen, 2008). For instance, Hackbarth et al. (2006) state that during recessions credit risks are higher than during a boom for any level of leverage and they find that firms tend to incur less debt during a recession, and they reported a negative relationship between leverage and credit risk. Their result is in line with predictions of the trade-off theory.

Interestingly, random effect and tobit regressions results (Tables 5.7 - 5.10 and 5.12 - 5.15) show similar results to fixed effect regression results. Particularly model 6 in all the stated above tables report a negatively significant effect for the financial market risk for the period after the crisis.

Stock market performance: Models 1 and 2 in Tables 5.2-5.4 and Models 3-6 in Tables 5.2-5.5 show that the effect of FTSE100 return on leverage is positively significant. Though, the magnitude and level of significances vary depending on the type of proxy which has been used to measure business cycle and financial market risk. The magnitude of coefficient estimates without considering the effect of financial crisis increases from 0.0156 percentage points (model 2 Table 5.3) to 0.0199 percentage points (model 1 Table 5.2). For the period before the crisis, the magnitude of coefficient estimates increases from 0.0151 percentage points (model 4 Table 5.5) to 0.0210 percentage point (model 5 Table 5.2) and statistically significant at 10%. Regarding the period after the crisis, the magnitude of coefficient estimates increases from 0.0151 percentage points (model 4 Table 5.5) to 0.1426 percentage point (model 6 Table 5.4). However, the model 6 in Table 5.5 reports a negatively significant coefficient equal to -0.406, which can be due to model 6 being over-specified and the correlation between industrial production growth rate and stock market performance. An explanation is as industrial production growth rate increases firms' production increase and as profitability is a function of growth hence the profitability of firms increases. Therefore, firms achieve a higher stock return.

The model 6 in Table 5.4 implies that incorporating the crisis dummy and the interaction between crisis dummy, and macroeconomic variables increase the magnitude of the effect FTSE100 return from 0.0176 to 0.1426 percentage points. Therefore, these results support the H4, which states that there is a positive relationship between leverage and stock market performance under the trade-off theory.

This positive effect of FTSE100 return on leverage is consistent with existing capital structure studies. For example, Baker and Wurgler (2002) test the effect of past stock market returns on the financing decisions of firms. They state that stock market performance has an impact on leverage. Moreover, Welch (2004) states that stock prices have a significant effect on the debt-equity ratio and can last for several years. The author explains that stock returns can explain about 40 percent of debt ratio dynamics of US firms in a five-year period. In addition, the stock returns play a much higher role in explaining capital structure in comparison with other proxies used in the literature. Barclay et al. (2006) explain that for profitable firms increasing leverage may provide additional tax benefits in exchange for risking a short-term liquidity crunch or bankruptcy costs, which is in line with predictions of trade-off theory.

The preceding paragraphs show that if the profitability of a firm increases then the stock market performs better and consequently stock market performance increases, therefore, firms might issue debt to avoid tax; as tax benefits are desirable for firms that are more profitable. An increase in issuance of debt may provide additional tax benefits in exchange for risking a short-term liquidity crunch or bankruptcy. So leverage ratio of firms increases with a rise in stock market performance which shows a positive relationship between stock market performance and leverage under the trade-off theory. Besides, by increasing the stock market performance, the market value of equity becomes larger; consequently, firms are required to increase their leverage to obtain their target leverage.

In Tables 5.2, 5.3, 5.4 and 5.5, model 6 has a highest adjusted R-Square, this shows that adding the crisis dummy and its interaction with macroeconomic variables into the models helps to describe more variance in the leverage. However, the coefficient estimates in Model 6 in stated tables seem biased. As Tables 5.2, 5.3, 5.4 and 5.5 show, the effect of crisis dummy on leverage is negatively significant. This negative impact of crisis dummy on leverage is similar and strongly robust to the results of random effect regression, tobit regression, GLS regression, SGMM and DGMM regressions. This result is also in line with previous studies that find financial crisis has an impact on the capital structure of firms. For instance, Choe et al. (1993) state that managers of firms need to reduce the adverse selection costs of equity financing. Their result shows that during an expansion, the adverse selection costs of equity decrease which leads to the amount of equity issuance to increase relative to debt issuance. Similarly, Dittmar and Dittmar (2008) find that during an expansion, equity financing increases because of the cost of equity decreases, and this has an impact on the capital structure of the firms.

Regarding the control variables, as Tables 5.2-5.5 present, the effect of size, current ratio and profitability is negatively significant at the 1% level. The negative sign of firm size indicates that larger firms tend to issue more debt while the negative sign of the profitability demonstrates highly profitable firms tend to issue less debt. Furthermore, the effect of growth opportunity and tangibility are negative but not significant and therefore do not have explanatory power in any of the model specification. Except for the growth opportunity and tangibility, all other results coincide with previous studies (Rajan & Zingales, 1995; Ozkan, 2000).

Table 5.2 Fixed Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.0078	-0.00849	-0.00599	-0.00635	-0.00596	-0.00177
	(-0.95)	(-1.03)	(-0.72)	(-0.72)	(-0.67)	(-0.19)
Corporate Tax growth rate	-0.162***	-0.157***	-0.167***	-0.163***	-0.203***	-0.193***
	(-5.61)	(-5.20)	(-5.76)	(-5.52)	(-6.33)	(-5.03)
M3 growth rate	0.165***	0.186***	0.0925*	0.0973	0.0798	0.0611
	(4.49)	(4.76)	(1.78)	(1.48)	(1.15)	(0.87)
FTSE100 return	0.0199***	0.0176**	0.0184**	0.0184**	0.0210**	0.0193**
	(2.65)	(2.29)	(2.43)	(2.43)	(2.54)	(2.29)
Tangibility	-0.0508	-0.0507	-0.0493	-0.0493	-0.0502	-0.0486
	(-0.88)	(-0.88)	(-0.86)	(-0.86)	(-0.87)	(-0.84)
Current ratio	-0.00808***	-0.00806***	-0.00813***	-0.00813***	-0.00813***	-0.00813***
	(-18.14)	(-18.07)	(-18.23)	(-18.23)	(-18.22)	(-18.22)
Growth opportunity	-0.00114	-0.000919	-0.00142	-0.00142	-0.00142	-0.00141
	(-0.68)	(-0.54)	(-0.84)	(-0.84)	(-0.84)	(-0.84)
Profitability	-0.00139***	-0.00138***	-0.00140***	-0.00140***	-0.00140***	-0.00140***
	(-4.12)	(-4.08)	(-4.14)	(-4.14)	(-4.15)	(-4.15)
Size	-0.0155***	-0.0170***	-0.0140***	-0.0140***	-0.0138***	-0.0137***
	(-8.11)	(-7.97)	(-6.81)	(-6.75)	(-6.62)	(-6.55)
Year		*yes*				
Crisis			-0.0100**	-0.00947	-0.0111	0.00177
			(-1.96)	(-1.38)	(-1.54)	(0.15)
M3 growth rate *crisis				-0.0126	0.00829	0.0306
				(-0.12)	(0.08)	(0.25)
Corporate Tax growth rate*crisis					-0.0193	-0.0679
					(-0.77)	(-0.84)
FTSE100 return*crisis						0.00445
						(0.07)
Commercial paper spread*crisis						-0.0814*
						(-1.75)
Adjusted R2 , within	5.05%	5.08%	5.09%	5.09%	5.10%	5.14%
Adjusted R2 , between	0.15%	0.27%	0.05%	0.05%	0.04%	0.03%
Adjusted R2 , overall	0.09%	0.02%	0.22%	0.22%	0.24%	0.26%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.3 Fixed Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.0085	-0.00838	-0.00812	-0.00535	-0.00936	-0.006
	(-1.02)	(-1.00)	(-0.97)	(-0.62)	(-1.07)	(-0.68)
Industrial Production growth rate	-0.332***	-0.321***	-0.351***	-0.345***	-0.599***	-0.581***
	(-5.89)	(-5.50)	(-6.20)	(-6.08)	(-5.89)	(-5.69)
M3 growth rate	0.0940**	0.104**	-0.0171	-0.0573	-0.0424	-0.0531
	(2.96)	(3.02)	(-0.37)	(-1.05)	(-0.77)	(-0.96)
FTSE100 return	0.0171*	0.0156*	0.0170*	0.0174*	0.00466	0.00568
	(2.31)	(2.03)	(2.3)	(2.36)	(0.55)	(0.67)
Tangibility	-0.0538	-0.0537	-0.0507	-0.0502	-0.0448	-0.0427
	(-0.93)	(-0.93)	(-0.88)	(-0.87)	(-0.78)	(-0.74)
Current ratio	-0.00805***	-0.00803***	-0.00813***	-0.00813***	-0.00815***	-0.00815***
	(-18.06)	(-18.02)	(-18.22)	(-18.23)	(-18.28)	(-18.28)
Growth opportunity	-0.00102	-0.000923	-0.0014	-0.00137	-0.00118	-0.00114
	(-0.60)	(-0.55)	(-0.83)	(-0.81)	(-0.70)	(-0.68)
Profitability	-0.00141***	-0.00140***	-0.00142***	-0.00142***	-0.00140***	-0.00140***
	(-4.16)	(-4.14)	(-4.20)	(-4.19)	(-4.15)	(-4.14)
Size	-0.0161***	-0.0168***	-0.0136***	-0.0133***	-0.0143***	-0.0142***
	(-8.37)	(-7.86)	(-6.66)	(-6.47)	(-6.87)	(-6.80)
Year		***yes***				
Crisis			-0.0172***	-0.0226***	-0.0191**	0.0149
			(-3.38)	(-3.47)	(-2.89)	(0.97)
M3 growth rate*crisis				0.133	0.108	-0.0863
				(1.33)	(1.07)	(-0.54)
Industrial Production growth rate*crisis					0.378**	1.648
					(3.00)	(1.76)
FTSE100 return*crisis						-0.29
						(-1.60)
Commercial paper spread*crisis						-0.0567
						(-1.02)
Adjusted R2 , within	5.00%	5.01%	5.12%	5.14%	5.23%	5.30%
Adjusted R2 , between	0.21%	0.27%	0.04%	0.03%	0.07%	0.05%
Adjusted R2 , overall	0.05%	0.03%	0.27%	0.31%	0.21%	0.23%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.4 Fixed Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	-0.00829	-0.00543	-0.00978	-0.00975	-0.00937	-0.00675
	(-0.78)	(-0.50)	(-0.91)	(-0.91)	(-0.88)	(-0.59)
Corporate Tax growth rate	-0.0809***	-0.0781***	-0.0784***	-0.0782***	-0.0700***	-0.0695***
	(-6.47)	(-6.17)	(-6.25)	(-6.11)	(-4.20)	(-4.17)
M3 growth rate	0.149***	0.164***	0.0770*	0.0736	0.0577	0.0566
	(4.93)	(5.11)	(1.69)	(1.37)	(1)	(0.98)
FTSE100 return	0.0177**	0.0159**	0.0160**	0.0160**	0.0187**	0.0176**
	(2.31)	(2.05)	(2.08)	(2.08)	(2.21)	(2.04)
Tangibility	-0.0512	-0.0511	-0.0495	-0.0495	-0.0504	-0.0485
	(-0.89)	(-0.89)	(-0.86)	(-0.86)	(-0.87)	(-0.84)
Current ratio	-0.00807***	-0.00805***	-0.00812***	-0.00812***	-0.00812***	-0.00813***
	(-18.12)	(-18.05)	(-18.21)	(-18.21)	(-18.21)	(-18.22)
Growth opportunity	-0.00112	-0.000922	-0.00141	-0.00141	-0.00141	-0.0014
	(-0.67)	(-0.55)	(-0.84)	(-0.84)	(-0.84)	(-0.83)
Profitability	-0.00139***	-0.00138***	-0.00140***	-0.00140***	-0.00140***	-0.00140***
	(-4.11)	(-4.07)	(-4.14)	(-4.14)	(-4.15)	(-4.15)
Size	-0.0157***	-0.0170***	-0.0141***	-0.0140***	-0.0139***	-0.0138***
	(-8.24)	(-8.00)	(-6.86)	(-6.76)	(-6.62)	(-6.57)
Year		***yes***				
Crisis			-0.0107**	-0.0112*	-0.0127*	-0.0142*
			(-2.11)	(-1.72)	(-1.86)	(-1.85)
M3 growth rate *crisis				0.0117	0.031	0.155
				(0.12)	(0.3)	(1.3)
Corporate Tax growth rate*crisis					-0.0193	-0.207**
					(-0.77)	(-2.12)
FTSE100 return*crisis						0.125*
						(1.91)
Risk Premium*crisis						-0.062
						(-1.63)
Adjusted R2 , within	5.05%	5.07%	5.09%	5.09%	5.10%	5.14%
Adjusted R2 , between	0.17%	0.28%	0.05%	0.05%	0.04%	0.03%
Adjusted R2 , overall	0.08%	0.02%	0.21%	0.22%	0.24%	0.26%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.5 Fixed Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	-0.0079	-0.0065	-0.011	-0.0109	-0.0176	-0.0189
	(-0.74)	(-0.60)	(-1.03)	(-1.02)	(-1.61)	(-1.60)
Industrial Production growth rate	-0.310***	-0.300***	-0.332***	-0.335***	-0.592***	-0.592***
	(-6.10)	(-5.64)	(-6.48)	(-6.53)	(-6.12)	(-6.09)
M3 growth rate	0.0798**	0.0878**	-0.0324	-0.0704	-0.0654	-0.0652
	(2.96)	(2.95)	(-0.77)	(-1.44)	(-1.34)	(-1.33)
FTSE100 return	0.0148	0.0137	0.0143	0.0151*	0.00012	0.000896
	(1.96)	(1.78)	(1.89)	(2)	(0.01)	(0.1)
Tangibility	-0.0541	-0.054	-0.0509	-0.0503	-0.0447	-0.0436
	(-0.94)	(-0.94)	(-0.88)	(-0.87)	(-0.78)	(-0.76)
Current ratio	-0.00804***	-0.00803***	-0.00812***	-0.00812***	-0.00814***	-0.00815***
	(-18.03)	(-18.00)	(-18.20)	(-18.22)	(-18.26)	(-18.29)
Growth opportunity	-0.00101	-0.00093	-0.0014	-0.00136	-0.00115	-0.00105
	(-0.60)	(-0.55)	(-0.83)	(-0.80)	(-0.68)	(-0.62)
Profitability	-0.00140***	-0.00140***	-0.00142***	-0.00142***	-0.00140***	-0.00140***
	(-4.15)	(-4.13)	(-4.19)	(-4.19)	(-4.15)	(-4.13)
Size	-0.0162***	-0.0168***	-0.0138***	-0.0134***	-0.0145***	-0.0147***
	(-8.46)	(-7.90)	(-6.74)	(-6.50)	(-6.94)	(-6.98)
Year		***yes***				
Crisis			-0.0177***	-0.0237***	-0.0208**	0.0123
			(-3.47)	(-3.67)	(-3.19)	(0.8)
M3 growth rate*crisis				0.148	0.132	-0.16
				(1.52)	(1.36)	(-1.06)
Industrial Production growth rate*crisis					0.397**	2.375**
					(3.13)	(2.98)
FTSE100 return*crisis						-0.406*
						(-2.49)
Risk Premium*crisis						0.0322
						(0.98)
Adjusted R2 , within	5.00%	5.00%	5.12%	5.15%	5.25%	5.31%
Adjusted R2 , between	0.22%	0.27%	0.05%	0.03%	0.08%	0.07%
Adjusted R2 , overall	0.04%	0.02%	0.25%	0.30%	0.19%	0.19%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.6 Summary of Results Signs from Fixed Effect Estimations

Macroeconomic Variables\Table	Business Cycle	Credit Supply	Financial Market Risk	Stock Market Performance
Without considering financial crisis effect (model 1 and 2)				
6.2	(-)	(+)	N.S	(+)
6.3	(-)	(+)	N.S	(+)
6.4	(-)	(+)	N.S	(+)
6.5	(-)	(+)	N.S	N.S*
Pre-crisis (model 3-6)				
6.2	(-)	(+)	N.S	(+)
6.3	(-)	N.S**	N.S	(+)
6.4	(-)	(+)	N.S	(+)
6.5	(-)	N.S	N.S	(+)
Post-crisis (model 3-6)				
6.2	(-)	(+)	(-)***	(+)
6.3	(-)	N.S	N.S	(+)
6.4	(-)	(+)	N.S	(+)
6.5	(-) / (+)****	N.S	N.S	(-)*****

(*) FTSE100 return coefficient become insignificant only in Table 5.5 after incorporating the industrial production in the model with risk premium, which can be due to omitted variable bias. (**) M3 growth rate coefficient become insignificant when including industrial production growth rate in the models 3-6 in Table 5.3 and 5.5. (***) Only for model 6 by including commercial papers spread and corporate tax growth rate. (****) Only model 6 shows a (+) effect on industrial production growth rate which can be due to the problem of over specification. (*****) Only model 6 shows a (-) effect for stock market performance which can be due to the problem of over specification.

Table 5.6 summarises the results' sign of all four above tables presented, which shows the sign of results are the same across all four tables and are robust to using the different proxy to measure financial market risk and the business cycle. The empirical results from fixed effect estimation disclose many interesting implications;

- Both industrial production and corporate tax growth rates are statistically significant and negative. Therefore, the business cycle has a negatively significant effect on the non-financial firm in the U.K. which supports hypothesis H1 and is consistent with the prediction of pecking order theory.

- The M3 growth rate effect on leverage ratio is positive and highly significant for all four tables. These empirical results also indicate that credit supply has a positive effect on the non-financial firm in the U.K. which supports hypothesis H2 and is consistent with the prediction of the pecking order and trade-off theories.

- The results report negative coefficients for the commercial paper spread and risk premium which is based on the prediction of trade-off theory. But the coefficients are not statistically significant for models 1 and 2 without considering the financial crisis effect and for the period before the financial crisis (models 3-6). However, the result implies that financial market risk has a negative effect on the leverage of U.K. firms for the period after the crisis.

- The empirical results show that FTSE100 return effect on leverage is positive and highly significant. The effect indicates that high stock market performance leads the firm to issue more debt which is in line with the hypothesis H4 and is consistent with the prediction of trade-off theory.

To sum up, according to the fixed effect regression results, the business cycle, credit supply and stock market performance seem to be the most relevant determinants of capital structure for the period before and after the crisis. The results are highly robust to using different proxies. Furthermore, the results indicate that to examine the effect of macroeconomic conditions on leverage ratio both pecking order and trade-off theories have explanatory power.

The next section presents and discusses whether the documented relation also holds using random effect regression model in the sample.

5.2.2 Random Effects Model

This research applies the random effects model (REM) to account for the unobserved heterogeneity. In other words, REM regression formulates the unobserved heterogeneity as a random error term, to investigate if the differences between firms have some influence on the firms' leverage. Tables 5.7, 5.8, 5.9, 5.10 re-examine the effect of macroeconomic variables on the capital structure of firms applying the random effect regression model.

In respect of business cycle, the effect of corporate tax growth rate and industrial production growth rate on the capital structure of firms are negative and statistically significant at 1% level in all reported random effect regressions. Without considering the effect of the financial crisis, the magnitude of the coefficient estimates increases from -0.0717 percentage points (model 1 Table 5.9) to -0.317 percentage points (model 2 Table 5.8). For the period before the crisis, the magnitude of coefficient estimates increases from -0.0499 percentage points (model 6 Table 5.7) to -0.492 percentage points (model 5 Table 5.8). Regarding the period after the crisis, the magnitude of coefficient estimates increases from -0.049 percentage points (model 6 Table 5.7) to -0.322 percentage points (model 3 Table 5.8) and statistically significant at the 5%. Hence, these results are similar to fixed effect results regarding the magnitude and statistical significance of coefficient estimates. The finding favours the hypothesis H1 and the pecking order theory.

However, with incorporating the macroeconomic variables interaction with dummy crisis , model 6 in Table 5.8 and 5.10 report positively significant coefficient estimates, which are equal to 1.123 ((-0.472) + (1.595)) and 1.872 ((-0.475) +(2.347)) for the period after the crisis respectively. Though, the unexpected sign seems to be due to either Model 6 being over-specified especially as it is not adding much to the adjusted R-square or due to the correlation between the interaction variables between the financial crisis and industrial production and financial crisis and stock market performance.

Regarding the effect of credit supply on firms' capital structure, it is positively significant at the 1% level. The magnitude of the coefficient estimates increases from 0.088 percentage points (model 2 Table 5.10) to 0.206 percentage points (model 1 Table 5.7). However, after considering the effect of the financial crisis in models 3-6, the coefficient estimates become statistically insignificant in tables 5.7 and 5.9, and they become negatively significant in tables 5.8 and 5.10 for the period before the crisis. The magnitude of the coefficient estimates

increases from -0.089 percentage points (model 5 Table 5.8) to -0.114 percentage points (model 4 Table 5.10). The negative effect of credit supply can be due to the inclusion of the financial crisis dummy. As can be seen from Figure 1, credit supply has a decreasing trend during period 1995 to 2014 (Panel C bottom graph) and the period after the crisis shows a strongly decreasing trend (Panel C top graph), but trends increase for the period before the crisis (Panel C middle graph). An explanation is that during the crisis, economic activity was less than expected, hence credit market reacted in the short term as the increasing trend of credit supply. During the crisis when the economy slows down in economic activity and hence the amount of M3 decreases, central bank conduct quantitative easing and restore the M3 and M3 increases during the crisis. However, after the crisis as the economy is still reluctant to M3 the trend of M3 after crisis decreases. This upside trend of credit supply could cause the purchase of equities in the hope of a turnaround and decrease the leverage ratio.

In respect of the period after the crisis, Tables 5.8-5.10 show that the coefficient estimates are positively significant except in model 6 (Table 5.8 and 5.10), which can be due to the model being over-specified (incorporating the crisis dummy interaction with commercial paper spread and stock market performance changes the sign of the effect) . The magnitude of coefficient estimates increases from 0.082 percentage points (model 5 Table 5.10) to 0.256 percentage points (model 6 Table 5.9). The positive effect of M3 growth rate on leverage is in line with the hypothesis H2 and is consistent with either prediction of the trade-off and pecking order theories.

Regarding the effect of financial market risk on the capital structure of firms, Tables 5.7-5.10 show that coefficient estimates in models 1 and 2, without considering the effect of the financial crisis, are negative and statistically insignificant. Likewise, coefficient estimates in models 3-6 for the period before the crisis are negative and statistically insignificant. Nevertheless, by incorporating financial crisis dummy interactions with macroeconomic variables model 6 in Tables 5.7 and 5.9 reports a negative and statistical significance at the 5% level coefficient estimate for commercial paper spread equal to -0.0961 and -0.0768 for the period after the crisis respectively. The results of random effect are similar to fixed effect results regarding the magnitude and statistical significant of financial market risk coefficient estimates. The finding of the period after the crisis favours the H3A and the trade-off theory.

Regarding the effect of stock market performance on firms' capital structure, Tables 5.7-5.9 report that coefficient estimates are positively significant at 10% level. For the period 1995-

2014 (without considering the effect of the financial crisis) the magnitude of coefficient estimates increases from 0.0142 percentage points (model 2 Table 5.9) to 0.0164 percentage points (model 2 Table 5.7). Table 5.7 and 5.9 report positively significant coefficient estimates for the period before the crisis. The magnitude of coefficient estimates increases from 0.0146 percentage points (model 5 Table 5.9) to 0.0164 percentage points (model 5 Table 5.7). About the period after the crisis, Table 5.7 and 5.9 report positively significant coefficient estimates. The positive coefficient estimates increase from 0.0146 to 0.129 percentage points (model 5 and 6 Table 5.9 respectively). However, incorporating the crisis dummy interaction with financial market risk and stock market performance and industrial production changes the sign of the effect. Model 6 in Tables 5.8 and 5.10 report negatively significant coefficient estimates. Table 5.8 reports the coefficient estimate as -0.307 and Table 5.10 as -0.428 for the period after the crisis. As the negative effect appears only in model 6, it can be caused by the correlation between industrial production and stock market performance or due to model 6 being over-specified.

Overall, these results show that applying the random effects model decreases the magnitude and statistical significances of the coefficient estimates of stock market performance. The positive effect of stock market performance on leverage is in line with the hypothesis H4 and is consistent with the prediction of trade-off theory.

Table 5.7 Random Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.0115	-0.0108	-0.00728	-0.00532	-0.00461	0.0000753
	(-1.39)	(-1.31)	(-0.88)	(-0.60)	(-0.52)	-0.01
Corporate Tax growth rate	-0.0791***	-0.0811***	-0.0726***	-0.0696***	-0.0540***	-0.0499***
	(-5.79)	(-5.90)	(-5.29)	(-4.82)	(-2.99)	(-2.75)
M3 growth rate	0.206***	0.189***	0.0533	0.0279	-0.00347	-0.0241
	(5.65)	(4.83)	(1.03)	(0.43)	(-0.05)	(-0.35)
FTSE100 return	0.0144*	0.0164**	0.0119	0.0115	0.0164**	0.0147*
	(1.91)	(2.13)	(1.58)	(1.52)	(1.98)	(1.74)
Tangibility	-0.02	-0.0198	-0.0166	-0.0162	-0.0178	-0.0161
	(-0.35)	(-0.35)	(-0.29)	(-0.28)	(-0.31)	(-0.28)
Current ratio	-0.00843***	-0.00844***	-0.00849***	-0.00850***	-0.00849***	-0.00848***
	(-19.42)	(-19.44)	(-19.56)	(-19.56)	(-19.55)	(-19.53)
Growth opportunity	-0.00177	-0.0019	-0.00222	-0.00222	-0.0022	-0.00219
	(-1.05)	(-1.13)	(-1.32)	(-1.31)	(-1.30)	(-1.30)
Profitability	-0.00182***	-0.00183***	-0.00182***	-0.00182***	-0.00182***	-0.00182***
	(-5.42)	(-5.43)	(-5.40)	(-5.41)	(-5.42)	(-5.42)
Size	-0.00368**	-0.00299*	-0.00197	-0.00175	-0.00158	-0.0015
	(-2.49)	(-1.92)	(-1.28)	(-1.14)	(-1.02)	(-0.97)
Year		***yes***				
Crisis			-0.0204***	-0.0233***	-0.0261***	-0.01
			(-4.15)	(-3.53)	(-3.79)	(-0.83)
M3 growth rate *crisis				0.0673	0.105	0.118
				(0.64)	(0.97)	(0.98)
Corporate Tax growth rate*crisis					-0.0362	-0.075
					(-1.44)	(-0.92)
FTSE100 return*crisis						-0.00846
						(-0.13)
Commercial paper spread*crisis						-0.0961**
						(-2.06)
Adjusted R2 , within	4.65%	4.62%	4.73%	4.72%	4.73%	4.78%
Adjusted R2 , between	2.81%	3.25%	3.94%	4.06%	4.17%	4.33%
Adjusted R2 , overall	3.68%	4.05%	4.63%	4.74%	4.84%	4.91%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.8 Random Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.0107	-0.0109	-0.00977	-0.00588	-0.0087	-0.00489
	(-1.28)	(-1.30)	(-1.17)	(-0.68)	(-0.99)	(-0.55)
Industrial Production growth rate	-0.285***	-0.317***	-0.322***	-0.315***	-0.492***	-0.472***
	(-5.06)	(-5.42)	(-5.69)	(-5.54)	(-4.87)	(-4.66)
M3 growth rate	0.137***	0.109***	-0.0426	-0.0983*	-0.0896	-0.101*
	(4.36)	(3.17)	(-0.93)	(-1.80)	(-1.64)	(-1.85)
FTSE100 return	0.0103	0.0147*	0.0113	0.012	0.00276	0.00388
	(1.4)	(1.9)	(1.53)	(1.62)	(0.32)	(0.45)
Tangibility	-0.0227	-0.0222	-0.0176	-0.0166	-0.0128	-0.0106
	(-0.40)	(-0.39)	(-0.31)	(-0.29)	(-0.23)	(-0.19)
Current ratio	-0.00841***	-0.00842***	-0.00849***	-0.00849***	-0.00851***	-0.00851***
	(-19.35)	(-19.38)	(-19.55)	(-19.55)	(-19.60)	(-19.60)
Growth opportunity	-0.00171	-0.00189	-0.00218	-0.00211	-0.00201	-0.00197
	(-1.02)	(-1.12)	(-1.29)	(-1.25)	(-1.19)	(-1.17)
Profitability	-0.00184***	-0.00185***	-0.00183***	-0.00183***	-0.00183***	-0.00183***
	(-5.47)	(-5.50)	(-5.45)	(-5.44)	(-5.43)	(-5.43)
Size	-0.00393***	-0.00281*	-0.00181	-0.00147	-0.00179	-0.00172
	(-2.65)	(-1.81)	(-1.18)	(-0.96)	(-1.17)	(-1.12)
Year		***yes***				
Crisis			-0.0268***	-0.0343***	-0.0323***	0.00503
			(-5.44)	(-5.41)	(-5.04)	-0.33
M3 growth rate*crisis				0.186*	0.171*	-0.0344
				(1.86)	(1.7)	(-0.21)
Industrial Production growth rate*crisis					0.266**	1.595*
					(2.12)	(1.7)
FTSE100 return*crisis						-0.307*
						(-1.69)
Commercial paper spread*crisis						-0.0674
						(-1.21)
Adjusted R2 , within	4.58%	4.56%	4.77%	4.79%	4.85%	4.93%
Adjusted R2 , between	2.59%	3.28%	3.94%	4.10%	3.94%	4.19%
Adjusted R2 , overall	3.52%	4.13%	4.74%	4.91%	4.77%	4.85%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.9 Random Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	-0.00454	-0.00756	-0.00807	-0.00786	-0.00721	-0.0029
	(-0.42)	(-0.69)	(-0.75)	(-0.73)	(-0.67)	(-0.25)
Corporate Tax growth rate	-0.0717***	-0.0749***	-0.0682***	-0.0661***	-0.0510***	-0.0503***
	(-5.74)	(-5.90)	(-5.45)	(-5.20)	(-3.09)	(-3.05)
M3 growth rate	0.179***	0.162***	0.0329	0.00781	-0.0207	-0.0226
	(5.95)	(5.02)	(0.73)	(0.15)	(-0.37)	(-0.40)
FTSE100 return	0.0122	0.0142*	0.00956	0.00944	0.0146*	0.0141
	(1.59)	(1.82)	(1.25)	(1.23)	(1.72)	(1.63)
Tangibility	-0.0206	-0.0203	-0.0169	-0.0163	-0.0179	-0.0159
	(-0.36)	(-0.36)	(-0.30)	(-0.29)	(-0.32)	(-0.28)
Current ratio	-0.00842***	-0.00843***	-0.00849***	-0.00849***	-0.00848***	-0.00849***
	(-19.39)	(-19.42)	(-19.55)	(-19.55)	(-19.54)	(-19.54)
Growth opportunity	-0.00175	-0.00191	-0.00222	-0.00221	-0.00219	-0.00219
	(-1.04)	(-1.13)	(-1.32)	(-1.31)	(-1.30)	(-1.30)
Profitability	-0.00182***	-0.00183***	-0.00182***	-0.00182***	-0.00182***	-0.00182***
	(-5.40)	(-5.43)	(-5.40)	(-5.41)	(-5.42)	(-5.42)
Size	-0.00383***	-0.00302*	-0.00201	-0.00175	-0.00158	-0.0015
	(-2.60)	(-1.94)	(-1.32)	(-1.14)	(-1.03)	(-0.98)
Year		***yes***				
Crisis			-0.0212***	-0.0248***	-0.0274***	-0.0277***
			(-4.34)	(-3.95)	(-4.20)	(-3.72)
M3 growth rate *crisis				0.0878	0.122	0.256**
				(0.89)	(1.2)	(2.16)
Corporate Tax growth rate*crisis					-0.0363	-0.235**
					(-1.44)	(-2.40)
FTSE100 return*crisis						0.129**
						(1.98)
Risk Premium*crisis						-0.0768**
						(-2.01)
Adjusted R2 , within	4.64%	4.61%	4.73%	4.72%	4.73%	4.78%
Adjusted R2 , between	2.72%	3.23%	3.90%	4.05%	4.16%	4.36%
Adjusted R2 , overall	3.60%	4.03%	4.61%	4.74%	4.84%	4.90%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.10 Random Effect Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	-0.00376	-0.0086	-0.00924	-0.00914	-0.0137	-0.0128
	(-0.35)	(-0.79)	(-0.86)	(-0.85)	(-1.26)	(-1.08)
Industrial Production growth rate	-0.254***	-0.290***	-0.297***	-0.301***	-0.479***	-0.475***
	(-5.02)	(-5.43)	(-5.81)	(-5.88)	(-5.00)	(-4.93)
M3 growth rate	0.117***	0.0884***	-0.0621	-0.114**	-0.112**	-0.113**
	(4.37)	(2.96)	(-1.48)	(-2.33)	(-2.30)	(-2.32)
FTSE100 return	0.00839	0.0122	0.0086	0.00983	-0.000826	0.000604
	(1.11)	(1.58)	(1.14)	(1.3)	(-0.09)	(0.07)
Tangibility	-0.023	-0.0226	-0.0178	-0.0166	-0.0127	-0.0114
	(-0.41)	(-0.40)	(-0.31)	(-0.29)	(-0.22)	(-0.20)
Current ratio	-0.00840***	-0.00841***	-0.00848***	-0.00848***	-0.00850***	-0.00852***
	(-19.33)	(-19.36)	(-19.54)	(-19.54)	(-19.59)	(-19.62)
Growth opportunity	-0.00172	-0.00191	-0.00218	-0.00211	-0.002	-0.00192
	(-1.02)	(-1.13)	(-1.30)	(-1.25)	(-1.19)	(-1.14)
Profitability	-0.00183***	-0.00185***	-0.00183***	-0.00183***	-0.00183***	-0.00182***
	(-5.45)	(-5.49)	(-5.44)	(-5.44)	(-5.43)	(-5.42)
Size	-0.00403***	-0.00285*	-0.00188	-0.00149	-0.00184	-0.00185
	(-2.72)	(-1.84)	(-1.23)	(-0.98)	(-1.20)	(-1.20)
Year						
Crisis			-0.0273***	-0.0354***	-0.0338***	0.00246
			(-5.53)	(-5.65)	(-5.37)	(0.16)
M3 growth rate*crisis				0.202**	0.194**	-0.109
				(2.08)	(2)	(-0.72)
Industrial Production growth rate*crisis					0.277**	2.347***
					(2.2)	(2.94)
FTSE100 return*crisis						-0.428***
						(-2.63)
Risk Premium*crisis						0.0177
						(0.54)
Adjusted R2 , within	4.57%	4.55%	4.76%	4.79%	4.86%	4.92%
Adjusted R2 , between	2.54%	3.25%	3.90%	4.07%	3.89%	4.16%
Adjusted R2 , overall	3.47%	4.10%	4.70%	4.90%	4.75%	4.79%
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.11 Summary of Results Signs from Random Effect Estimations

Macroeconomic Variables\Table	Business Cycle	Credit Supply	Financial Market Risk	Stock Market Performance
Without considering financial crisis effect (model 1&2)				
5.7	(-)	(+)	N.Sig	(+)
5.8	(-)	(+)	N.Sig	(+)
5.9	(-)	(+)	N.Sig	(+)
5.10	(-)	(+)	N.Sig	N.Sig*
Pre-crisis (model 3-6)				
5.7	(-)	N.Sig**	N.Sig	(+)
5.8	(-)	(-)***	N.Sig	N.Sig
5.9	(-)	N.Sig	N.Sig	(+)
5.10	(-)	(-)	N.Sig	N.Sig
Post-crisis (model 3-6)				
5.7	(-)	N.Sig	(-)****	(+)
5.8	(-)/(+)*****	(+)	N.Sig	(-)******
5.9	(-)	(+)	(-)	(+)
5.10	(-)/(+)	(+)	N.Sig	(-)

(*) FTSE100 return coefficient become insignificant only in Table 5.10 after incorporating the industrial production in the model with risk premium, which can be due to omitted variable bias. This is similar to fixed effect results (Table 5.5 model 1 and 2). (**)M3 growth rate coefficient become insignificant when including corporate tax growth rate in the models 3-6 in Table 5.7 (before and after the crisis) and Table 5.9 (before the crisis). (***) M3 growth rate's coefficient estimates become negatively significant when considering the financial crisis and including industrial production growth rate in the models 3-6 in tables 5.8 and 5.10. (****) Only for model 6 by including dummy crisis interaction with risk premium, commercial paper spread and corporate tax growth rate. (*****) Only model 6 shows a positive effect for industrial production growth rate which can be due to the problem of over specification. (******) Only model 6 shows a negative effect for stock market performance which can be due to the problem of over specification.

Random effect results conclude as follows. (1) The business cycle has a negative impact on the capital structure, indicating that the pecking order theory has more explanatory power (hypothesis H1). (2) The positive effect of credit supply is consistent with the prediction of either pecking order or trade-off theories (hypothesis H2). (3) The negative effect of financial market risk is consistent with prediction of trade-off theory (hypothesis H3A). (4) The positive effect of stock market performance is consistent with prediction of trade-off theory (hypothesis H4). (5) The results are not sensitive to applying random effect regression models and hence the results are robust.

According to the random effect regression results, the business cycle, credit supply and stock market performance seem to be the most relevant determinants of capital structure for the period 1995-2014 (without considering the effect of the financial crisis) and also for the period before and after the crisis. The results are highly robust to using different proxies for macroeconomic variables. Besides, the results show that to examine the effect of macroeconomic conditions on leverage ratio both pecking order and trade-off theories have explanatory power.

Section 5.3 presents and discusses whether the documented relation also holds using tobit regression model in the sample.

5.3 Tobit Regression Model

The leverage ratio can be negative or greater than one. However, in economic terms, the leverage ratio is truncated between zero and one. Hence, this research requires dropping leverage observation with the negative or greater than one value from the sample. According to Gujarati (2011), the results from OLS estimation of truncated regression model are biased, inconsistent, and the estimated parameter will not be similar to their true values, including either the whole sample or a subset of the sample. This is because in truncated regression models, the conditional mean of the error term, u_t is nonzero and there is a correlation between error and the independent variables. As a result, the OLS estimators are biased as well as inconsistent. With this in mind, this research uses the tobit regression model for several reasons. Firstly, the leverage by definition is truncated between zero and one. Secondly, the results from the OLS estimation method for truncated data are inconsistent and biased. Thirdly, the tobit estimates are consistent and asymptotically normal (Amemiya, 1973). The tobit regression model is appropriate for applications where the dependent variable is continuous, but its range may be constrained, such as truncated data (here leverage).

This research applies tobit regression model to shed additional light on the effect of macroeconomic conditions on the capital structure of firms. It examines whether the effect of macroeconomic variables on the capital structure is still vigorous and robust to applying different estimation strategies. Tables 5.12, 5.13, 5.14, 5.15 re-estimate the effect of macroeconomic variables on the capital structure of firms by applying the tobit regression model.

In respect to business cycle, the effect of corporate tax growth rate and industrial production growth rate on the leverage of firms are negatively significant at the 1% level. The magnitude of coefficient estimates increases from -0.0383 (model 1 Table 5.14) to -0.185 (model 2 Table 5.13) percentage points during 1995 to 2014. Regarding the period before the crisis, the magnitude of coefficient estimates increases from -0.0180 percentage points (model 6 Table 5.14) to -0.204 (model 5 Table 5.13) percentage points. During the period after the crisis, the magnitude of coefficient estimates increases from -0.0332 (model 4 Table 5.14) percentage points to -0.204 (model 5 Table 5.13) percentage points. However, by incorporating the financial crisis dummy interaction with macroeconomic variables, model 6 in Table 5.15 reports a positively and significant at 1% level coefficient estimates. The positive coefficient

estimate might be due to model 6 being over-specified. Hence, the results are smaller than fixed effect results regarding the magnitude and statistical significance of business cycle coefficient estimates; though, the results are similar to fixed effect and random effect results in terms of the sign of the coefficient estimates and consistent with the H1 and the prediction of pecking order theory.

On the effect of credit supply on capital structure, it is significant at 1% and increases from 0.0482 percentage points (model 2 Table 5.15) to 0.142 percentage points (model 1 Table 5.12) during the period 1995 to 2014. However, controlling for the effect of the 2008 crisis the coefficient estimates become negatively significant for the period before the crisis. The magnitude of coefficient estimates increases from -0.0550 percentage points (model 3 Table 5.13) to -0.0974 percentage points (model 4 Table 5.15) for the period before the crisis. With regard to the period after the crisis, the coefficient estimates are positively significant at 5%. Tables 5.13 to 5.15 report that the magnitude of coefficient estimates for M3 growth rate increases from 0.032 percentage points (model 5 Table 5.13) to 0.128 percentage points (model 6 Table 5.14).

The tobit results regarding the sign of the effect of credit supply is similar to the random effect result for the period before and after the crisis (Tables 5.8 and 5.10). Hence, as explained in section 5.2.2 and as Figure 5.1 shows, the credit supply has a decreasing trend during the period 1995 to 2014 (Panel C bottom graph). However, after controlling for 2008 crisis the trend is increasing for the period before the crisis (Panel C middle graph). Because during the crisis when the economy slows down in economic activity central bank conduct quantitative easing and M3 increases. Therefore, the credit market reacted in the short term as the increasing trend of credit supply. This upside trend of credit supply could cause the purchase of equities on the hope of a turnaround and decrease the leverage ratio.

Tables 5.12 to 5.15 report that the effect of financial market risk on leverage is negative but statistically insignificant in models 1 and 2 (without considering the effect of the financial crisis). Likewise, the coefficient estimates for financial market risk are statistically insignificant for the period before the crisis. Nevertheless, it is negatively significant at the 10% level for the period after the crisis. The magnitude of coefficient estimates increases from -0.0489 percentage points (model 6 Table 5.14) to -0.0571 (model 6 Table 5.12) for the period after the crisis. Hence, the results are similar to fixed effect and random effect results concerning the magnitude and statistical significance of financial market risk coefficient estimates.

Using the tobit regression model decreases the magnitude and statistical significance of the coefficient estimates of stock market performance. Model 1 in Tables 5.12-5.15 reports insignificant coefficient estimates for the period 1995-2014, although, after including the year dummy the coefficient become positively significant at 5% level. The magnitude of coefficient estimates increases from 0.0088 percentage points (model 2 Table 5.15) to 0.0113 percentage points (model 2 Table 5.12) during the period 1995 to 2014. For the period before the crisis, Tables 5.12 and 5.14 show that the coefficient estimates are positively significant and their magnitude increases from 0.00873 percentage points (model 6 Table 5.14) to 0.00914 percentage points (model 5 Table 5.12).

Regarding the period after the crisis, Tables 5.12 and 5.14 show that the stock market performance is positively significant at 5% level. The magnitude of coefficient estimates is the same as the period before the crisis. However, incorporating the crisis dummy interaction with financial market risk and stock market performance changes the sign of the effect. The model specification 6 in Table 5.13, and 5.15 shows a negative and statistically significant coefficient at the 10% level for the period after the crisis, which is due to model 6 being over-specified. Therefore, the tobit regression model results report that stock market performance is positively significant which is in line with H4 and the predictions of trade-off theory.

It should be noted, this research winsorized the data set at 2% and consequently the leverage values below 0 and above +1 discarded. Therefore, the number of observations of tobit model (after the truncation) remains similar to the number of observations without truncation and only dropped by one from 9952 to 9951.

Table 5.12 Tobit Estimation of the Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.00749	-0.00636	-0.0036	-0.00174	-0.00112	0.00175
	(-1.48)	(-1.25)	(-0.70)	(-0.32)	(-0.21)	(0.31)
Corporate Tax growth rate	-0.0436***	-0.0481***	-0.0373***	-0.0345***	-0.0193*	-0.0169
	(-5.23)	(-5.68)	(-4.42)	(-3.89)	(-1.74)	(-1.51)
M3 growth rate	0.142***	0.108***	-0.00541	-0.0293	-0.0598	-0.0720*
	(6.27)	(4.5)	(-0.17)	(-0.74)	(-1.43)	(-1.71)
FTSE100 return	0.00734	0.0113**	0.00477	0.00445	0.00914*	0.00792
	(1.62)	(2.44)	(1.05)	(0.97)	(1.82)	(1.56)
Tangibility	-0.0221	-0.022	-0.0192	-0.019	-0.0207	-0.0196
	(-0.64)	(-0.64)	(-0.56)	(-0.55)	(-0.60)	(-0.57)
Current ratio	-0.0114***	-0.0115***	-0.0116***	-0.0116***	-0.0116***	-0.0116***
	(-22.77)	(-22.85)	(-22.96)	(-22.96)	(-22.97)	(-22.96)
Growth opportunity	-0.000599	-0.000892	-0.00108	-0.00107	-0.00105	-0.00105
	(-0.57)	(-0.84)	(-1.02)	(-1.01)	(-0.99)	(-0.99)
Profitability	-0.000981***	-0.000997***	-0.000987***	-0.000985***	-0.000989***	-0.000989***
	(-4.94)	(-4.99)	(-4.94)	(-4.93)	(-4.94)	(-4.94)
Size	-0.000011	0.00144	0.00185*	0.00196*	0.00216**	0.00218**
	(-0.01)	(1.42)	(1.86)	(1.96)	(2.15)	(2.17)
Year		***yes***				
Crisis			-0.0200***	-0.0227***	-0.0254***	-0.0165**
			(-6.51)	(-5.57)	(-5.97)	(-2.19)
M3 growth rate *crisis				0.0665	0.103	0.119
				(1.02)	(1.52)	(1.59)
Corporate Tax growth rate*crisis					-0.0357**	-0.0722
					(-2.29)	(-1.43)
FTSE100 return*crisis						0.00504
						(0.13)
Commercial paper spread*crisis						-0.0571*
						(-1.95)
Wald chi^2 (Prob > chi^2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log likelihood	2090.7853	2099.4475	2112.5627	2113.0815	2115.7095	2118.2797
yhat^2	0.0547	0.0592	0.0613	0.0616	0.0623	0.0626
N	9951	9951	9951	9951	9951	9951

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.13 Tobit Estimation of the Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.00566	-0.00616	-0.00509	-0.00263	-0.00321	-0.000979
	(-1.11)	(-1.19)	(-0.99)	(-0.50)	(-0.60)	(-0.18)
Industrial Production growth rate	-0.137***	-0.185***	-0.170***	-0.165***	-0.204***	-0.193***
	(-4.01)	(-5.16)	(-4.90)	(-4.74)	(-3.34)	(-3.14)
M3 growth rate	0.0991***	0.0602***	-0.0550**	-0.0902***	-0.0882***	-0.0949***
	(5.11)	(2.85)	(-1.97)	(-2.72)	(-2.65)	(-2.84)
FTSE100 return	0.00397	0.0100**	0.00452	0.00492	0.00288	0.00353
	(0.9)	(2.16)	(1.01)	(1.1)	(0.55)	(0.68)
Tangibility	-0.0239	-0.0238	-0.0198	-0.0192	-0.0184	-0.0169
	(-0.70)	(-0.69)	(-0.57)	(-0.56)	(-0.53)	(-0.49)
Current ratio	-0.0114***	-0.0115***	-0.0116***	-0.0116***	-0.0116***	-0.0116***
	(-22.73)	(-22.82)	(-22.95)	(-22.95)	(-22.95)	(-22.96)
Growth opportunity	-0.000581	-0.000858	-0.00102	-0.00097	-0.000942	-0.000924
	(-0.55)	(-0.81)	(-0.96)	(-0.91)	(-0.89)	(-0.87)
Profitability	-0.000989***	-0.00101***	-0.000995***	-0.000991***	-0.000990***	-0.000989***
	(-4.98)	(-5.04)	(-4.97)	(-4.95)	(-4.95)	(-4.94)
Size	-0.000116	0.00151	0.00192*	0.00208**	0.00199**	0.00203**
	(-0.12)	(1.49)	(1.93)	(2.09)	(1.98)	(2.02)
Year		***yes***				
Crisis			-0.0234***	-0.0282***	-0.0277***	-0.00421
			(-7.59)	(-7.17)	(-6.97)	(-0.44)
M3 growth rate*crisis				0.123**	0.120*	-0.0125
				(1.98)	(1.92)	(-0.12)
Industrial Production growth rate*crisis					0.0595	0.925
					(0.78)	(1.58)
FTSE100 return*crisis						-0.198*
						(-1.75)
Commercial paper spread*crisis						-0.0397
						(-1.14)
Wald chi^2 (Prob > chi^2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log likelihood	2085.0855	2096.6052	2114.8264	2116.7921	2117.0941	2121.2498
yhat^2	0.0540	0.0593	0.0618	0.0623	0.0621	0.0626
N	9951	9951	9951	9951	9951	9951

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.14 Tobit Estimation of the Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	0.00322	-0.00254	-0.000493	-0.000376	0.000249	0.00284
	(0.49)	(-0.38)	(-0.07)	(-0.06)	(0.04)	(0.4)
Corporate Tax growth rate	-0.0383***	-0.0442***	-0.0349***	-0.0332***	-0.0183*	-0.0180*
	(-5.02)	(-5.66)	(-4.54)	(-4.24)	(-1.81)	(-1.77)
M3 growth rate	0.121***	0.0921***	-0.0164	-0.0365	-0.0647*	-0.0656*
	(6.47)	(4.62)	(-0.59)	(-1.12)	(-1.86)	(-1.88)
FTSE100 return	0.0069	0.0103**	0.00421	0.00414	0.00905*	0.00873*
	(1.5)	(2.19)	(0.91)	(0.89)	(1.77)	(1.67)
Tangibility	-0.0224	-0.0223	-0.0193	-0.019	-0.0207	-0.0194
	(-0.65)	(-0.65)	(-0.56)	(-0.55)	(-0.60)	(-0.56)
Current ratio	-0.0114***	-0.0115***	-0.0116***	-0.0116***	-0.0116***	-0.0116***
	(-22.75)	(-22.84)	(-22.95)	(-22.96)	(-22.96)	(-22.97)
Growth opportunity	-0.000597	-0.000894	-0.00108	-0.00107	-0.00105	-0.00105
	(-0.57)	(-0.84)	(-1.02)	(-1.01)	(-0.99)	(-0.99)
Profitability	-0.000974***	-0.000994***	-0.000985***	-0.000984***	-0.000989***	-0.000989***
	(-4.91)	(-4.97)	(-4.92)	(-4.92)	(-4.94)	(-4.94)
Size	-0.0000785	0.0014	0.00183*	0.00196**	0.00216**	0.00219**
	(-0.08)	(1.38)	(1.84)	(1.96)	(2.15)	(2.18)
Year		***yes***				
Crisis			-0.0203***	-0.0232***	-0.0257***	-0.0260***
			(-6.62)	(-5.93)	(-6.32)	(-5.58)
M3 growth rate *crisis				0.0735	0.107*	0.193***
				(1.19)	(1.69)	(2.6)
Corporate Tax growth rate*crisis					-0.0359**	-0.164***
					(-2.30)	(-2.68)
FTSE100 return*crisis						0.0833**
						(2.04)
Risk Premium*crisis						-0.0489**
						(-2.05)
Wald chi^2 (Prob > chi^2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log likelihood	2089.8039	2098.7369	2112.3179	2113.0315	2115.6888	2118.4965
yhat^2	0.0543	0.0591	0.0612	0.0616	0.0623	0.0626
N	9951	9951	9951	9951	9951	9951

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.15 Tobit Estimation of the Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	0.00407	-0.00289	-0.001	-0.00101	-0.0019	-0.00103
	(0.63)	(-0.43)	(-0.15)	(-0.15)	(-0.28)	(-0.14)
Industrial Production growth rate	-0.119***	-0.169***	-0.156***	-0.158***	-0.194***	-0.191***
	(-3.87)	(-5.15)	(-4.96)	(-5.02)	(-3.34)	(-3.27)
M3 growth rate	0.0857***	0.0482***	-0.0656**	-0.0974***	-0.0969***	-0.0972***
	(5.18)	(2.62)	(-2.54)	(-3.27)	(-3.26)	(-3.27)
FTSE100 return	0.00397	0.00889*	0.00375	0.00449	0.00232	0.00326
	(0.88)	(1.91)	(0.82)	(0.98)	(0.43)	(0.6)
Tangibility	-0.024	-0.024	-0.0199	-0.0193	-0.0185	-0.0175
	(-0.70)	(-0.69)	(-0.58)	(-0.56)	(-0.53)	(-0.51)
Current ratio	-0.0114***	-0.0115***	-0.0116***	-0.0116***	-0.0116***	-0.0116***
	(-22.71)	(-22.81)	(-22.94)	(-22.95)	(-22.95)	(-22.97)
Growth opportunity	-0.000595	-0.000866	-0.00103	-0.000971	-0.000943	-0.000904
	(-0.57)	(-0.82)	(-0.97)	(-0.91)	(-0.89)	(-0.85)
Profitability	-0.000982***	-0.00101***	-0.000991***	-0.000989***	-0.000988***	-0.000985***
	(-4.95)	(-5.03)	(-4.96)	(-4.95)	(-4.94)	(-4.93)
Size	-0.000132	0.00147	0.00188*	0.00208**	0.00198**	0.00196*
	(-0.14)	(1.45)	(1.9)	(2.08)	(1.97)	(1.94)
Year		***yes***				
Crisis			-0.0235***	-0.0285***	-0.0282***	-0.00466
			(-7.58)	(-7.33)	(-7.18)	(-0.49)
M3 growth rate*crisis				0.131**	0.129**	-0.0646
				(2.16)	(2.13)	(-0.69)
Industrial Production growth rate*crisis					0.0571	1.382***
					(0.74)	(2.78)
FTSE100 return*crisis						-0.275***
						(-2.70)
Risk Premium*crisis						0.00905
						(0.44)
Wald chi^2 (Prob > chi^2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log likelihood	2084.668	2095.9838	2114.3503	2116.6807	2116.9547	2120.6347
yhat^2	0.0539	0.0592	0.0616	0.0623	0.0621	0.0623
N	9951	9951	9951	9951	9951	9951

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.16 Summary of Results Signs from Tobit Estimations

Macroeconomic Variables\Table	Business Cycle	Credit Supply	Financial Market Risk	Stock Market Performance
Without considering financial crisis effect (model 1 & 2)				
6.12	(-)	(+)	N.Sig	(+)
6.13	(-)	(+)	N.Sig	(+)
6.14	(-)	(+)	N.Sig	(+)
6.15	(-)	(+)	N.Sig	(+)
Pre-crisis (model 3-6)				
6.12	(-)	(-)*	N.Sig	(+)
6.13	(-)	(-)	N.Sig	N.Sig**
6.14	(-)	(-)	N.Sig	(+)
6.15	(-)	(-)	N.Sig	N.Sig
Post-crisis (model 3-6)				
6.12	(-)	(-)	(-)***	(+)
6.13	(-)	(+)	N.Sig	(-)****
6.14	(-)	(+)	(-)	(+)
6.15	(-)/(+)*****	(+)	N.Sig	(-)

(*) M3 growth rate coefficient estimates become negatively significant when considering the financial crisis in the models 3-6 in Tables 5.12- 5.15 for the period before the crisis and in Table 5.12 (model 6) for the period after the crisis. (**) FTSE100 return coefficient estimates become insignificant only in Tables 5.13 and 5.15 after incorporating the industrial production in the models, which can be due to omitted variable bias. This is similar to fixed effect and random effect results (Tables 5.5, 5.8 and 5.10). (***) Only model 6 shows negatively significant coefficient estimates for financial market risk incorporating the industrial production growth rate interactions with the crisis which can be due to the problem of over specification. (****) Only model 6 shows a (-) effect for stock market performance which can be due to the problem of over specification. (*****) Only model 6 in Table 5.15 shows a (+) effect for industrial production growth rate which can be due to the problem of over specification.

This research summarises tobit results as follows. (1) The business cycle has a negative impact on the capital structure, which is consistent with the predictions of pecking order theory (hypothesis H1). (2) The positive effect of credit supply is consistent with predictions of either trade-off or pecking order theories (hypothesis H2). (3) The negative effect of financial market risks on leverage for the period after the crisis is consistent with the predictions of trade-off theory (hypothesis H3A). (4) The positive effect of stock market performance is consistent with the prediction of the trade-off theory (hypothesis H4). (5) The results are not sensitive to applying tobit regression models and hence the results are robust.

According to the tobit regression results, business cycle, credit supply and stock market performance seem to be the most relevant determinants of capital structure for the period 1995-2014 (without considering the effect of the financial crisis) and also for the period before and after the crisis. The financial market risk only has an explanatory power for the period after the crisis. The results are highly robust to using different proxies for macroeconomic variables. Moreover, the tobit results show that both pecking order and trade-off theories have explanatory power in examining the effect of macroeconomic conditions on capital structure of firms.

The next section presents and discusses the results of GLS regression model.

5.4 GLS Regression Model

This research applies GLS regression model to throw additional light on the effect of macroeconomic conditions on the capital structure of firms and tests whether the effect of macroeconomic variables on the capital structure is still vigorous and robust to applying different estimation strategies. The GLS regression model analyses whether and to what extent the correlation between residuals has an effect on the relationship between macroeconomic conditions and capital structure. Tables 5.17, 5.18, 5.19, 5.20 re-estimate the effect of macroeconomic variables on the capital structure of firms applying the GLS regression model.

On the business cycle, the effect of this on the leverage of firms is negative and statistically significant at the 1% level. During the period 1995-2014, models 1 and 2 in Tables 5.17-5.20 show that the magnitude of coefficient estimates increases from -0.0792 percentage points (model 1 Table 5.19) to -0.252 percentage points (model 2 Table 5.18). For the period before the crisis models, 3-6 in Tables 5.17-5.20 report the magnitude of coefficient estimates increases from -0.071 percentage points (model 6 Table 5.17) to -0.450 percentage points (model 5 Table 5.18). Regarding the period after the crisis models 3-6 in Tables 5.17-5.20 report a negative effect and the magnitude of coefficient estimates increases from -0.071 percentage points (model 6 Table 5.17) to -0.450 percentage points (model 5 Table 5.18), except for the model specification 6 in Table 5.18 and 5.20 that shows a positive effect for the period after the crisis, and the coefficient estimates equal to + 1.049 [(-0.431) + (1.480)] and +1.727 [(-0.431) + (2.158)] respectively. This demonstrates the sign of the effect of business cycle changes by incorporating the interaction between crisis dummy and financial market risk, business cycle and stock market performance in the model. The positive coefficient estimate might be due to model 6 being over-specified. Hence, the results are slightly larger than fixed effect results regarding the magnitude and statistical significance of business cycle coefficient estimates. The GLS regressions report negative results similar to fixed effect, random effect and tobit regression models results in terms of the sign of the coefficient estimates and consistent with the H1 and the prediction of pecking order theory.

Regarding the effect of credit supply on capital structure, it is positive and statistically significant at the 1% level. Models 1 and 2 in Tables 5.17-5.20 without considering the effect of the financial crisis for the period 1995-2014, show that the magnitude of coefficient estimates increases from 0.138 percentage points (model 2 Table 5.20) to 0.297 percentage

points (model 1 Table 5.17). Regarding the period before the crisis, models 3-6 in Tables 5.17-5.20 report the magnitude of coefficient estimates increases from 0.0936 percentage points (model 6 Table 5.19) to 0.145 percentage points (model 3 Table 5.17). During the period after the crisis, the magnitude of coefficient estimates increases from 0.0972 percentage points (model 5 Table 5.19) to 0.270 percentage points (model 6 Table 5.19). The GLS regression coefficient estimates of credit supply are slightly greater regarding the magnitude than fixed effect results but similar to fixed effect results regarding the sign and statistical significance of credit supply coefficient estimates.

Remarkably using GLS regression model the effect of financial market risk on leverage became statistically significant and negative. For the period 1995-2014, models 1 and 2 in Tables 5.17-5.20 report coefficient estimates increases from -0.0160 percentage points (Table 5.17 model 2) to -0.0185 percentage points (Table 5.19 model 2). Regarding the period before the crisis, models 3-6 in Tables 5.17-5.20 report the magnitude of coefficient estimates increases from -0.0136 percentage points (Table 5.17 models 3 and 4) to -0.0187 percentage points (Table 5.19 models 3 and 4). For the period after the crisis, the magnitude of coefficient estimates increases from -0.0136 percentage points (Table 5.17 models 3 and 4) to -0.109 percentage points (Table 5.17 model 6). Hence, the results for the period after the crisis are similar to fixed effect results concerning the sign, magnitude and statistical significance of financial market risk coefficient estimates. Moreover, using GLS regression models strengthens the results as the coefficient estimates became negatively significant for the period 1995-2014 and the period before the crisis as well.

This result is consistent with the findings of some of the previous studies (Hackbarth et al., 2006; Chen, 2008). Hence, the results from the GLS regression models illustrate that the correlation between residuals may have a significant effect on the relationship between financial market risk and capital structure. The negative effect agrees with the proponents of the trade-off theory and in line with this study H3A.

Using the GLS regression model slightly decreases the magnitude and statistical significance of the coefficient estimates of stock market performance. Model 2 in Table 5.17 reports a positively significant coefficient estimate at 10% equal to 0.0114 for the period 1995-2014. After considering the effect of the financial crisis in models 3-6, for the period before the crisis, the magnitude of coefficient estimates increases from -0.0126 percentage points (Table 5.20 model 6) to -0.0147 percentage points (Table 5.20 model 5). Regarding the period

after the crisis, Tables 5.18 and 5.20 report the magnitude of coefficient estimates increases from -0.0126 percentage points (Table 5.20 model 6) to -0.399 percentage points (Table 5.20 model 6). However, model 6 in Table 5.19 reports a positively significant coefficient estimates equal to 0.119, which shows a positive relationship between stock market performance and leverage. Overall, the results report that the stock market has a positive effect on capital structure of firms. However, after including the crisis dummy and crisis dummy interaction with financial market risk and stock market performance, it changes the sign of the effect. The model specifications 5 and 6 in Table 5.20 show a negative and statistically significant coefficient at the 10% level, which can be due to models 5 and 6 being over-specified.

Table 5.17 GLS Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.0169**	-0.0160**	-0.0136**	-0.0136*	-0.0111	-0.00606
	(-2.46)	(-2.33)	(-1.96)	(-1.87)	(-1.52)	(-0.81)
Corporate Tax growth rate	-0.0876***	-0.0907***	-0.0814***	-0.0816***	-0.0763***	-0.0710***
	(-8.32)	(-8.46)	(-7.69)	(-7.45)	(-5.51)	(-5.07)
M3 growth rate	0.297***	0.273***	0.145***	0.144***	0.125**	0.103*
	(10.6)	(8.96)	(3.51)	(2.89)	(2.37)	(1.93)
FTSE100 return	0.00852	0.0114*	0.00691	0.00699	0.00435	0.00329
	(1.44)	(1.87)	(1.16)	(1.18)	(0.65)	(0.49)
Tangibility	0.0760*	0.0772*	0.0772*	0.0781*	0.058	0.0571
	(1.83)	(1.86)	(1.86)	(1.89)	(1.38)	(1.33)
Current ratio	-0.00900***	-0.00897***	-0.00895***	-0.00894***	-0.00931***	-0.00936***
	(-33.70)	(-33.04)	(-33.38)	(-33.01)	(-29.70)	(-29.16)
Growth opportunity	0.0000676	0.0000831	-0.0000894	-0.0000852	-0.000166	-0.000159
	(0.05)	(0.06)	(-0.06)	(-0.06)	(-0.12)	(-0.11)
Profitability	-0.00473***	-0.00478***	-0.00479***	-0.00479***	-0.00484***	-0.00486***
	(-3.94)	(-3.98)	(-3.99)	(-3.98)	(-4.03)	(-4.04)
Size	0.0174***	0.0174***	0.0176***	0.0176***	0.0175***	0.0174***
	(37.82)	(37.82)	(38.22)	(38.22)	(37.65)	(37.54)
Year		***yes***				
Crisis			-0.0202***	-0.0202***	-0.0207***	0.000139
			(-5.33)	(-4.04)	(-4.00)	(0.01)
M3 growth rate *crisis				0.00307	0.0175	-0.00112
				(0.04)	(0.2)	(-0.01)
Corporate Tax growth rate*crisis					0.00582	0.0136
					(0.28)	(0.2)
FTSE100 return*crisis						-0.049
						(-0.94)
Commercial paper spread*crisis						-0.109***
						(-2.75)
Wald chi^2	3134.29	3097.66	3182.90	3211.70	2895.63	2879.59
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.18 GLS Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Commercial paper spread	-0.00893	-0.00928	-0.00982	-0.0064	-0.01	-0.00573
	(-1.27)	(-1.32)	(-1.40)	(-0.89)	(-1.38)	(-0.78)
Industrial Production growth rate	-0.215***	-0.252***	-0.258***	-0.252***	-0.450***	-0.431***
	(-4.75)	(-5.24)	(-5.59)	(-5.45)	(-5.65)	(-5.40)
M3 growth rate	0.183***	0.153***	0.0163	-0.0302	-0.0225	-0.0319
	(7.13)	(5.36)	(0.44)	(-0.69)	(-0.51)	(-0.72)
FTSE100 return	-0.00213	0.00269	-0.000395	0.000158	-0.0105	-0.00947
	(-0.36)	(0.43)	(-0.07)	(0.03)	(-1.50)	(-1.36)
Tangibility	0.0235	0.0253	0.0304	0.0309	0.0321	0.0369
	(0.55)	(0.6)	(0.72)	(0.72)	(0.74)	(0.85)
Current ratio	-0.00994***	-0.00989***	-0.00981***	-0.00980***	-0.00986***	-0.00980***
	(-27.09)	(-26.85)	(-26.99)	(-26.92)	(-26.97)	(-26.98)
Growth opportunity	-0.000177	-0.000131	-0.000251	-0.000132	-0.0000636	0.0000683
	(-0.12)	(-0.09)	(-0.17)	(-0.09)	(-0.04)	(0.05)
Profitability	-0.00486***	-0.00492***	-0.00490***	-0.00491***	-0.00486***	-0.00488***
	(-4.05)	(-4.10)	(-4.08)	(-4.09)	(-4.05)	(-4.06)
Size	0.0170***	0.0171***	0.0173***	0.0174***	0.0173***	0.0173***
	(36.36)	(36.45)	(37.05)	(37.11)	(37.24)	(37.22)
Year		***yes***				
Crisis			-0.0254***	-0.0316***	-0.0299***	0.0075
			(-6.65)	(-6.46)	(-6.10)	(0.6)
M3 growth rate*crisis				0.164*	0.149*	-0.0423
				(1.95)	(1.76)	(-0.32)
Industrial Production growth rate*crisis					0.295***	1.480*
					(2.88)	(1.9)
FTSE100 return*crisis						-0.281*
						(-1.87)
Commercial paper spread*crisis						-0.0793*
						(-1.68)
Wald chi^2	2677.15	2695.12	2792.27	2802.58	2830.70	2848.59
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.19 GLS Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	-0.0134	-0.0185**	-0.0187**	-0.0187**	-0.0157*	-0.00883
	(-1.56)	(-2.09)	(-2.18)	(-2.18)	(-1.81)	(-0.95)
Corporate Tax growth rate	-0.0792***	-0.0844***	-0.0767***	-0.0756***	-0.0742***	-0.0721***
	(-8.17)	(-8.51)	(-7.98)	(-7.77)	(-5.89)	(-5.69)
M3 growth rate	0.265***	0.241***	0.117***	0.103**	0.0972**	0.0936**
	(11.45)	(9.47)	(3.23)	(2.47)	(2.2)	(2.11)
FTSE100 return	0.00454	0.00762	0.00278	0.00276	0.000591	0.00111
	(0.74)	(1.22)	(0.45)	(0.45)	(0.09)	(0.16)
Tangibility	0.0802*	0.0831**	0.0881**	0.0886**	0.0710*	0.0706*
	(1.96)	(2.03)	(2.17)	(2.17)	(1.72)	(1.67)
Current ratio	-0.00891***	-0.00885***	-0.00875***	-0.00875***	-0.00908***	-0.00911***
	(-34.02)	(-34.27)	(-36.32)	(-35.58)	(-31.39)	(-30.57)
Growth opportunity	0.0000515	0.0000642	-0.000104	-0.0000772	-0.000159	-0.000109
	(0.04)	(0.04)	(-0.07)	(-0.05)	(-0.11)	(-0.08)
Profitability	-0.00471***	-0.00476***	-0.00475***	-0.00475***	-0.00479***	-0.00482***
	(-3.92)	(-3.97)	(-3.95)	(-3.95)	(-3.99)	(-4.01)
Size	0.0174***	0.0175***	0.0177***	0.0177***	0.0176***	0.0175***
	(37.86)	(37.97)	(38.56)	(38.55)	(38)	(37.86)
Year		***yes***				
Crisis			-0.0218***	-0.0237***	-0.0232***	-0.0215***
			(-5.77)	(-4.92)	(-4.65)	(-3.61)
M3 growth rate *crisis				0.0502	0.0503	0.177*
				(0.61)	(0.59)	(1.78)
Corporate Tax growth rate*crisis					0.0099	-0.180**
					(0.48)	(-2.21)
FTSE100 return*crisis						0.119**
						(2.19)
Risk Premium*crisis						-0.0878***
						(-2.74)
Wald chi^2	3323.52	3451.10	5215.71	4675.33	3062.73	2997.33
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.20 GLS Estimation of Impact of Macroeconomic Variables on Leverage

	1	2	3	4	5	6
Risk Premium	-0.00429	-0.00983	-0.0115	-0.0116	-0.0169*	-0.0125
	(-0.49)	(-1.08)	(-1.30)	(-1.31)	(-1.89)	(-1.30)
Industrial Production growth rate	-0.194***	-0.233***	-0.236***	-0.241***	-0.441***	-0.431***
	(-4.77)	(-5.30)	(-5.67)	(-5.78)	(-5.81)	(-5.67)
M3 growth rate	0.168***	0.138***	0.00174	-0.0425	-0.0439	-0.0443
	(7.67)	(5.53)	(0.05)	(-1.07)	(-1.11)	(-1.12)
FTSE100 return	-0.0037	0.000391	-0.0033	-0.00231	-0.0147**	-0.0126*
	(-0.61)	(0.06)	(-0.55)	(-0.38)	(-2.02)	(-1.71)
Tangibility	0.0269	0.0293	0.0363	0.0368	0.0384	0.0412
	(0.64)	(0.7)	(0.87)	(0.87)	(0.9)	(0.96)
Current ratio	-0.00990***	-0.00985***	-0.00973***	-0.00973***	-0.00980***	-0.00972***
	(-27.13)	(-26.90)	(-27.16)	(-27.08)	(-27.13)	(-27.16)
Growth opportunity	-0.000196	-0.000162	-0.000287	-0.000146	-0.000078	0.000104
	(-0.14)	(-0.11)	(-0.20)	(-0.10)	(-0.05)	(0.07)
Profitability	-0.00486***	-0.00491***	-0.00489***	-0.00490***	-0.00484***	-0.00487***
	(-4.05)	(-4.09)	(-4.07)	(-4.08)	(-4.04)	(-4.06)
Size	0.0170***	0.0171***	0.0174***	0.0174***	0.0174***	0.0173***
	(36.32)	(36.45)	(37.11)	(37.19)	(37.34)	(37.27)
Year		***yes***				
Crisis			-0.0258***	-0.0328***	-0.0317***	0.00394
			(-6.69)	(-6.74)	(-6.51)	(0.31)
M3 growth rate*crisis				0.182**	0.177**	-0.0995
				(2.22)	(2.16)	(-0.80)
Industrial Production growth rate*crisis					0.308***	2.158***
					(3)	(3.27)
FTSE100 return*crisis						-0.387***
						(-2.87)
Risk Premium*crisis						-0.00759
						(-0.28)
Wald chi^2	2668.84	2690.40	2789.45	2805.07	2834.07	2847.17
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	9952	9952	9952	9952	9952	9952

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.21 Summary of Results Signs from GLS Estimations

Macroeconomic Variables\Table	Business Cycle	Credit Supply	Financial Market Risk	Stock Market Performance
Without considering financial crisis effect (model 1 & 2)				
5.17	(-)	(+)	(-)	(+)
5.18	(-)	(+)	N.Sig	N.Sig
5.19	(-)	(+)	(-)	N.Sig
5.20	(-)	(+)	N.Sig	N.Sig
Pre-crisis (model 3-6)				
5.17	(-)	(+)	(-)	N.Sig
5.18	(-)	N.Sig	N.Sig	N.Sig
5.19	(-)	(+)	(-)	N.Sig
5.20	(-)	N.Sig	(-)	(-)*
Post-crisis (model 3-6)				
5.17	(-)	(+)	(-)	N.Sig
5.18	(-)	(+)	(-)	(-)
5.19	(-)	(+)	(-)	(+)
5.20	(-)/(+) **	(+)	(-)	(-)

(*) FTSE100 return coefficient become negatively significant for period before and after crisis only in Tables 5.18 and 5.20 after including financial crisis dummy interaction with macroeconomic variables, which can be due to models being over-specified. This is similar to fixed effect, random effect and tobit results (Tables 5.5, 5.8, 5.10, 5.13 and 5.15). (**) Only model 6 shows a (+) effect for industrial production growth rate which can be due to the problem of over specification. This is similar to fixed effect, random effect and tobit results (Tables 5.5, 5.8, 5.10 and 5.15).

GLS regression results summarise as follows: (1) the business cycle has a negative impact on the capital structure and is consistent with the predictions of pecking order theory (hypothesis H1). (2) The positive effect of credit supply is consistent with the predictions of either trade-off or pecking order theories (hypothesis H2). (3) The negative effect of financial market risk on leverage is consistent with the predictions of trade-off theory (hypothesis H3A). (4) The positive effect of stock market performance is consistent with the prediction of the trade-off theory (hypothesis H4). (5) The results have slightly strengthened compared with fixed effect, random effect and tobit results. The financial market coefficient estimates became negatively significant for the period 1995-2014 and the period before the crisis as well. Therefore, the results are not very sensitive to applying different estimation strategies and hence the results are robust.

Section 5.5 discusses whether the documented relation also holds using SGMM and DGMM regression models in the sample.

5.5 Estimated results from the dynamic model (GMM Regression Model)

This section presents the results from applying Generalized Methods of Moments (GMM) regression model to shed additional light on the effect of macroeconomic conditions on the capital structure of firms. The GMM regression model controls for firm-specific fixed effects, which are unobservable and have an important impact on financial decisions of firms. Moreover, the GMM model deals with the endogeneity problem by allowing the choice of instruments to control for endogeneity and by using the first-difference of variables to eliminate the firm's unobservable fixed effects. This research uses Difference GMM model to include the lag of the dependent variable (leverage here) available at the time (t) as IV for first differences. However, a few authors discover that the first difference transformation wipes out the individual effects (Anderson and Hsiao, 1981, 1982; Baltagi, 2008). Therefore, this research uses System GMM model, which formulates extra orthogonality conditions to increase the efficiency and the reliability of the instruments. Moreover, SGMM's estimators can avoid the inconsistency problem presented by the lagged dependent variable as an independent variable in regression (Blundell et al., 2000). This research uses SGMM to consider more explanatory variables in a regression without worrying about the endogeneity problem, by getting the level values of variables back to the regression and omitting the bias caused by the decrease of data variation in the first differences.

This study uses both GMM estimation strategies, namely Difference GMM (DGMM) and System GMM (SGMM) to test whether the effect of macroeconomic variables on the capital structure is still robust to applying different estimation strategies. Tables 5.22 - 5.25 re-estimate the effect of macroeconomic variables on the capital structure of firms by applying SGMM in the second and third columns and DGMM in the fourth and fifth columns. Tables 5.26 - 5.29 re-estimate the effect of macroeconomic variables on the capital structure of firms by adding the lag M3 and lag FTSE100 and applying SGMM in the second and third columns and DGMM in the fourth and fifth columns.

This research in order to avoid the problem of having too many instrument chooses to run only model specification 1 and 2. Therefore, this research does not present results from models including the dummy crisis and macroeconomic variables interaction with financial crisis. This is due to avoid including instrument that are too correlated with other instrument. This is

because having too many instrument leads to chi-squared test to over-reject the over-identifying restrictions of the model and poor estimation of the parameters.

Regarding the business cycle, Tables 5.22 to 5.29 and 5.26 - 5.29 report that the effect of the industrial production growth rate and corporate tax growth rate on the leverage of firms are negatively significant at the 1% level. Using SGMM method, the magnitude of coefficient estimates increases from -0.0251 percentage points (model 1 Table 5.28) to -0.243 percentage points (model 2 Table 5.29). Applying DGMM method, the magnitude of coefficient estimates increases from -0.0256 percentage points (model 2 Table 5.26) to -0.263 percentage points (model 1 Table 5.26). Hence, SGMM and DGMM models report negative coefficient estimates, similar to fixed effect, random effect, tobit and GLS regression models results, for the period 1995-2014. The negative effect favours hypothesis H1 and is consistent with the prediction of pecking order theory.

In respect of credit supply, Tables 5.22 to 5.29 and 5.26 - 5.29 report that the effect of the M3 growth rate and lag of M3 growth rate on the leverage of firms are negatively significant at the 10% level. The results from applying SGMM models show that the magnitude of coefficient estimates increases from -0.0865 percentage points (model 1 Table 5.23) to -0.202 percentage points (model 2 Table 5.22). Applying DGMM method reports insignificant coefficient estimates and hence the credit supply does not have an explanatory power to determine the capital structure of firms. Therefore, SGMM and DGMM regression results are in contrast to fixed effect, random effect, tobit and GLS regression models results, for the period 1995-2014 regarding sign of credit supply coefficient estimates. The negative effect does not support this research hypothesis H2 and is not consistent with the prediction of pecking order or trade-off theories.

Tables 5.22 to 5.29 and 5.26 - 5.29 report that the effect of financial market risk on leverage of firms became statistically significant and positive. SGMM models report that the magnitude of coefficient estimates increases from 0.0213 percentage points (model 2 Table 5.26) to 0.0577 percentage points (model 2 Table 5.22). Applying DGMM method, the magnitude of coefficient estimates increases from 0.0180 percentage points (model 1 Table 5.28) to 0.0453 percentage points (model 2 Table 5.23). Hence, SGMM and DGMM results are in contrast with the result of previous estimation strategies applied by this research

including fixed effect, random effect, tobit and GLS regression models concerning the sign and statistical significance of financial market risk coefficient estimates, for the period 1995-2014. The positive effect favours hypothesis H3 and is consistent with the prediction of pecking order theory.

Using the SGMM and DGMM regression models report insignificant coefficient estimates for the effect of FTSE100 return, and hence the stock market performance does not have an explanatory power to determine the capital structure of firms. Therefore, SGMM and DGMM regression results do not support this research hypothesis and any of the three capital structure theories examined by this research

Table 5.22 SGMM and DGMM Estimations of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	2	1	2
$Leverage_{t-1}$	0.690***	0.688***	0.615***	0.604***
	(24.76)	(24.76)	(17.98)	(17.94)
Commercial paper spread	**0.0496*** **	**0.0577*** **	**0.0310** **	**0.0349*** **
	(3.52)	(3.67)	(2.18)	(2.59)
Corporate Tax growth rate	-0.0253	-0.0202	-0.033	-0.034
	(-1.09)	(-0.88)	(-1.23)	(-1.30)
M3 growth rate	**-0.135** **	**-0.202** **	-0.059	-0.0675
	(-1.98)	(-2.37)	(-0.79)	(-0.91)
FTSE100 return	0.0224	0.0286	0.0103	0.0119
	(1.08)	(1.34)	(0.4)	(0.49)
Tangibility	0.0354	0.0391	-0.0295	0.0117
	(0.37)	(0.41)	(-0.21)	(0.08)
Current ratio	-0.00940***	-0.00944***	-0.00748***	-0.00757***
	(-6.10)	(-6.14)	(-5.57)	(-5.58)
Growth opportunity	-0.00489	-0.00529*	-0.00101	-0.00237
	(-1.57)	(-1.68)	(-0.36)	(-0.81)
Profitability	-0.00219***	-0.00220***	-0.00961**	-0.00777**
	(-3.90)	(-3.91)	(-2.32)	(-2.14)
Size	-0.0142**	-0.0127*	-0.00716	-0.0343
	(-2.05)	(-1.88)	(-0.57)	(-1.56)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.790	0.814	0.895	0.780
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.074	0.076
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.23 SGMM and DGMM Estimations of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	2	1	2
$Leverage_{t-1}$	0.690***	0.688***	0.618***	0.607***
	(24.87)	(24.89)	(18.12)	(18.08)
Commercial paper spread	**0.0441*** **	**0.0485*** **	**0.0428*** **	**0.0453*** **
	(2.67)	(2.98)	(2.91)	(3.12)
Industrial Production growth rate	0.00144	0.151	0.103	0.128
	(0.01)	(0.54)	(0.43)	(0.55)
M3 growth rate	**-0.0865***	**-0.104***	-0.0839	-0.0861
	(-1.67)	(-1.90)	(-1.52)	(-1.53)
FTSE100 return	-0.0128	-0.0385	-0.0348	-0.0398
	(-0.23)	(-0.66)	(-0.75)	(-0.87)
Tangibility	0.0275	0.0287	-0.0409	0.000231
	(0.29)	(0.3)	(-0.29)	0
Current ratio	-0.00941***	-0.00940***	-0.00749***	-0.00757***
	(-6.11)	(-6.14)	(-5.61)	(-5.63)
Growth opportunity	-0.00528*	-0.00527*	-0.000701	-0.00207
	(-1.68)	(-1.67)	(-0.25)	(-0.70)
Profitability	-0.00229***	-0.00229***	-0.00977**	-0.00784**
	(-4.12)	(-4.13)	(-2.34)	(-2.21)
Size	-0.0112*	-0.0107*	-0.00284	-0.0304
	(-1.86)	(-1.72)	(-0.32)	(-1.42)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.799	0.781	0.914	0.797
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.102	0.098
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.24 SGMM and DGMM Estimations of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	**2**	**1**	**2**
$Leverage_{t-1}$	0.687***	0.686***	0.613***	0.603***
	(24.78)	(24.74)	-18.1	-17.87
Risk Premium	**0.0367*****	**0.0408*****	0.0268	**0.0412***
	(2.6)	(2.9)	-1.1	-1.9
Corporate Tax growth rate	**-0.0398***	-0.038	-0.0313	-0.0349
	(-1.65)	(-1.60)	(-1.10)	(-1.26)
M3 growth rate	-0.0165	-0.0334	-0.00682	-0.0493
	(-0.37)	(-0.67)	(-0.09)	(-0.62)
FTSE100 return	0.0138	0.0178	0.00387	0.0127
	(0.63)	(0.8)	-0.13	-0.41
Tangibility	0.0358	0.0373	-0.0331	0.00713
	(0.37)	(0.39)	(-0.23)	-0.05
Current ratio	-0.00949***	-0.00951***	-0.00752***	-0.00762***
	(-6.14)	(-6.15)	(-5.60)	(-5.65)
Growth opportunity	-0.00497	-0.00509	-0.000825	-0.00212
	(-1.59)	(-1.63)	(-0.29)	(-0.72)
Profitability	-0.00226***	-0.00225***	-0.00956**	-0.00792**
	(-4.00)	(-3.98)	(-2.36)	(-2.23)
Size	-0.0122*	-0.0121*	-0.00557	-0.0296
	(-1.74)	(-1.71)	(-0.38)	(-1.27)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.779	0.781	0.906	0.808
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.047	0.043
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.25 SGMM and DGMM Estimations of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	**2**	**1**	**2**
$Leverage_{t-1}$	0.690***	0.689***	0.617***	0.606***
	(24.95)	(24.93)	(18.08)	(17.93)
Risk Premium	**0.0352****	**0.0341****	0.00377	0.0231
	(2.01)	(2.07)	(0.16)	(1.11)
Industrial Production growth rate	-0.08	-0.148	-0.244	-0.138
	(-0.54)	(-0.85)	(-1.15)	(-0.69)
M3 growth rate	-0.0339	-0.0538	0.0203	-0.028
	(-0.89)	(-1.42)	(0.29)	(-0.47)
FTSE100 return	-0.0195	-0.00233	0.0173	0.00231
	(-0.65)	(-0.06)	(0.46)	(0.06)
Tangibility	0.0221	0.0248	-0.0505	-0.0108
	(0.23)	(0.26)	(-0.35)	(-0.08)
Current ratio	-0.00948***	-0.00950***	-0.00756***	-0.00768***
	(-6.15)	(-6.16)	(-5.54)	(-5.63)
Growth opportunity	-0.00474	-0.00499	-0.000818	-0.00204
	(-1.53)	(-1.62)	(-0.30)	(-0.69)
Profitability	-0.00228***	-0.00228***	-0.00990**	-0.00810**
	(-4.08)	(-4.08)	(-2.30)	(-2.28)
Size	-0.0123*	-0.0114	-0.00228	-0.0262
	(-1.89)	(-1.62)	(-0.25)	(-1.14)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.820	0.830	0.959	0.852
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.031	0.023
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.26 SGMM and DGMM Estimations of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	2	1	2
$Leverage_{t-1}$	0.688***	0.687***	0.617***	0.604***
	(24.89)	**(24.85)**	(18.02)	(17.91)
Commercial paper spread	**0.0223*****	**0.0213*****	**0.0205****	**0.0238*****
	(2.8)	(2.7)	(2.55)	(2.93)
Corporate Tax growth rate	**-0.0273****	**-0.0260****	**-0.0263****	**-0.0256****
	(-2.15)	(-2.00)	(-1.98)	(-1.96)
lag of M3 growth rate	-0.0169	-0.02	0.0136	0.0137
	(-0.60)	(-0.65)	(0.38)	(0.38)
lag of FTSE100 return	0.00865	0.00909	0.00258	0.00449
	(1.07)	(1.11)	(0.29)	(0.52)
Tangibility	0.0288	0.0278	-0.0438	0.00824
	(0.3)	(0.29)	(-0.31)	(0.06)
Current ratio	-0.00945***	-0.00949***	-0.00748***	-0.00755***
	(-6.10)	(-6.11)	(-5.56)	(-5.57)
Growth opportunity	-0.00544*	-0.00566*	-0.000704	-0.00245
	(-1.73)	(-1.79)	(-0.26)	(-0.83)
Profitability	-0.00228***	-0.00228***	-0.00998**	-0.00763**
	(-4.08)	(-4.08)	(-2.35)	(-2.13)
Size	-0.0115*	-0.0111*	-0.000766	-0.0364
	(-1.81)	(-1.71)	(-0.09)	(-1.64)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.777	0.778	0.922	0.769
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.047	0.061
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.27 SGMM and DGMM Estimations of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	2	1	2
$Leverage_{t-1}$	0.689***	0.688***	0.620***	0.605***
	(24.82)	(24.79)	(18.12)	(18.01)
Commercial paper spread	**0.0249****	0.0175	**0.0323****	**0.0320****
	(2.13)	(1.52)	(2.38)	(2.41)
Industrial Production growth rate	**-0.163*****	**-0.134****	-0.0998	-0.0903
	(-2.74)	(-2.14)	(-1.60)	(-1.48)
lag of M3 growth rate	-0.0347	-0.0336	0.0387	0.0365
	(-1.17)	(-0.98)	(0.8)	(0.79)
lag of FTSE100 return	0.00104	0.00593	-0.00968	-0.00479
	(0.11)	(0.65)	(-0.91)	(-0.47)
Tangibility	0.0229	0.0225	-0.0563	0.0033
	(0.24)	(0.24)	(-0.39)	(0.02)
Current ratio	-0.00943***	-0.00949***	-0.00747***	-0.00757***
	(-6.12)	(-6.12)	(-5.54)	(-5.56)
Growth opportunity	-0.00548*	-0.00572*	-0.000462	-0.00252
	(-1.74)	(-1.81)	(-0.17)	(-0.86)
Profitability	-0.00231***	-0.00229***	-0.0106**	-0.00781**
	(-4.14)	(-4.10)	(-2.30)	(-2.10)
Size	-0.0111*	-0.0113*	0.00501	-0.0362*
	(-1.69)	(-1.70)	(0.61)	(-1.67)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.809	0.798	0.959	0.792
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.081	0.090
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.28 SGMM and DGMM Estimations of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	**2**	**1**	**2**
$Leverage_{t-1}$	0.687***	0.687***	0.616***	0.604***
	(24.87)	(24.81)	(18.01)	(17.85)
Risk Premium	0.0236**	0.0255**	0.0180*	0.0253**
	(2.13)	(2.27)	(1.68)	(2.37)
Corporate Tax growth rate	-0.0251*	-0.0211	-0.0182	-0.0217
	(-1.74)	(-1.52)	(-1.19)	(-1.49)
lag of M3 growth rate	0.00465	0.00681	0.026	0.0154
	(0.16)	(0.21)	(0.63)	(0.39)
lag of FTSE100 return	0.0125	0.0126	0.00864	0.00894
	(1.58)	(1.58)	(1.04)	(1.1)
Tangibility	0.0315	0.0306	-0.0436	0.00437
	(0.33)	(0.32)	(-0.31)	(0.03)
Current ratio	-0.00952***	-0.00955***	-0.00755***	-0.00762***
	(-6.13)	(-6.14)	(-5.60)	(-5.63)
Growth opportunity	-0.00540*	-0.00554*	-0.000762	-0.00234
	(-1.71)	(-1.76)	(-0.28)	(-0.79)
Profitability	-0.00229***	-0.00229***	-0.00993**	-0.00778**
	(-4.10)	(-4.09)	(-2.35)	(-2.19)
Size	-0.0108*	-0.0108	-0.00114	-0.0332
	(-1.66)	(-1.63)	(-0.13)	(-1.44)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.786	0.790	0.933	0.790
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.055	0.057
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.29 SGMM and DGMM Estimation of Impact of Macroeconomic Variables on Leverage

	SGMM	SGMM	DGMM	DGMM
	1	2	1	2
$Leverage_{t-1}$	0.691***	0.689***	0.617***	0.606***
	(24.83)	(24.88)	(18.04)	(17.96)
Risk Premium	0.0173	0.0168	0.0137	0.0178
	(1.08)	(1.1)	(0.95)	(1.21)
Industrial Production growth rate	-0.229**	-0.243***	-0.116	-0.122
	(-2.32)	(-2.91)	(-1.50)	(-1.62)
lag of M3 growth rate	-0.0337	-0.0506	0.0232	0.0116
	(-0.88)	(-1.21)	(0.48)	(0.25)
lag of FTSE100 return	0.00231	0.00145	0.0014	0.00223
	(0.25)	(0.16)	(0.15)	(0.24)
Tangibility	0.0185	0.0211	-0.0497	-0.0106
	(0.19)	(0.22)	(-0.35)	(-0.08)
Current ratio	-0.00950***	-0.00951***	-0.00757***	-0.00767***
	(-6.14)	(-6.14)	(-5.58)	(-5.61)
Growth opportunity	-0.00497	-0.00528*	-0.000766	-0.00214
	(-1.58)	(-1.67)	(-0.28)	(-0.72)
Profitability	-0.00228***	-0.00231***	-0.00990**	-0.00808**
	(-4.10)	(-4.15)	(-2.32)	(-2.24)
Size	-0.0124*	-0.0108*	-0.00193	-0.0276
	(-1.93)	(-1.66)	(-0.24)	(-1.22)
Year		***yes***		***yes***
Number of instruments	27	28	20	21
Wald chi2 (Prob > chi2)	0.000	0.000	0.000	0.000
Arellano-Bond test AR(2) (Pr > z)	0.833	0.840	0.952	0.844
Sargan test (Prob > chi2)	0.000	0.000	0.000	0.000
Hansen test (Prob > chi2)	0.000	0.000	0.019	0.016
N	9495	9495	8605	8605

The dependent variable is the estimated leverage (the book value of total debts scaled by the book value of total assets). T-statistics are in parentheses. *, **, and *** denote statistically significant at 10%, 5% and 1% level respectively.

Table 5.30 Summary of Results Signs from SGMM and DGMM Estimations without Considering Financial Crisis Effect (Models 1 and 2)

Macroeconomic Variables\Table	SGMM				DGMM			
	Business Cycle	**Credit Supply**	**Financial Market Risk**	**Stock Market Performance**	**Business Cycle**	**Credit Supply**	**Financial Market Risk**	**Stock Market Performance**
5.22	N.sig	(-)	(+)	N.sig	N.Sig	N.Sig	(+)	N.Sig
5.23	N.sig	(-)	(+)	N.sig	N.Sig	N.Sig	(+)	N.Sig
5.24	(-)	N.sig	(+)	N.sig	N.Sig	N.Sig	(+)	N.Sig
5.25	N.sig	N.sig	(+)	N.sig	N.Sig	N.Sig	N.Sig	N.Sig
5.26 (with lag M3 and lag FTSE100)	(-)	N.sig	(+)	N.sig	(-)	N.Sig	(+)	N.Sig
5.27 (with lag M3 and lag FTSE100)	(-)	N.sig	(+)	N.sig	N.Sig	N.Sig	(+)	N.Sig
5.28 (with lag M3 and lag FTSE100)	(-)	N.sig	(+)	N.sig	N.Sig	N.Sig	(+)	N.Sig
5.29 (with lag M3 and lag FTSE100)	(-)	N.sig	N.sig	N.sig	N.Sig	N.Sig	N.Sig	N.Sig

This research summarises SGMM and DGMM regression results as follows. (1) The business cycle has a negative impact on the capital structure, which is consistent with the predictions of pecking order theory (hypothesis H1). (2) The credit supply does not have a significant explanatory power on capital structure. (3) The positive effect of financial market risk on leverage is consistent with predictions of the pecking order theory (hypothesis H3). (4) The stock market performance does not have a significant explanatory power on capital structure. (5) The results have changed slightly as the coefficient estimates of credit supply and stock market performance became insignificant. The financial market risk coefficient estimates became positively significant. So the results are sensitive to apply GMM regression models and hence shows the importance of taking to account the dynamic nature of capital structure and controlling for endogeneity.

5.6 Conclusion

This chapter discusses the effects of macroeconomic condition on the capital structure controlling for firm-specific variables and financial crisis. The analysis uses yearly firm-level data from U.K. non-financial publicly listed firms in 1995–2014.

The results from static models of capital structure including fixed effects, random effects, tobit, GLS regression strategies and dynamic models of capital structure including generalised methods of moment's estimators (SGMM and DGMM) precisely indicate that leverage negatively associates with the business cycle. This favours hypothesis H1 and is consistent with the prediction of pecking order theory.

Moreover, the results from static models report that leverage of firms positively associates with credit supply specifically during the period 1995-2014 without considering the effect of the 2008 financial crisis and for the period after the crisis. The dynamic models of capital structure results show that credit supply does not have an explanatory power on capital structure of firms. The positive effect favours hypothesis H2 and is consistent with either prediction of pecking order and trade-off theories.

With respect to the effect of financial market risk, the results from static models including fixed effects, random effects and tobit regression models report that leverage of firms negatively associates with financial market risk for the period after the crisis. Additionally, the static results from GLS regression models show that leverage of firms negatively associated with financial market risk for the periods 1995-2014 (without considering the effect of the 2008 financial crisis), before the crisis and after the crisis. The negative relationship between leverage and financial market risk favours the hypothesis H3A and is consistent with the predictions of trade-off theory. However, leverage relates significantly and positively with financial market risk based on the dynamic regressions model results (SGMM and DGMM results). The positive relationship between leverage and financial market risk favours the hypothesis H3 and is consistent with the predictions of pecking order theory.

The results from static models report that leverage of firms positively associates with stock market performance specifically during the overall period 1995-2014 (without considering the effect of the 2008 financial crisis), the period before the crisis and for the period after the crisis. The dynamic models' results show that stock market performance does not have an explanatory

power on capital structure of firms. The positive effect is consistent with the predictions of pecking order theory and favours hypothesis H4.

To sum up, the results from static and dynamic regressions for leverage are both theoretically and empirically plausible according to capital structure theories. Therefore, the results suggest that firm-specific variables and macroeconomic conditions ultimately determine the capital structure of non-financial firms.

• CHAPTER SIX: CONCLUSIONS

6.1 Summary of Results

This research investigates whether and to what extent macroeconomic variables, namely, business cycle, financial market risk, credit supply and stock market performance, affect publicly listed U.K. firms' capital structure. Specifically, this research intends to answer the following questions. Firstly, is the effect of business cycle on capital structure pro-cyclical or counter-cyclical? Secondly, do stock market performance, financial market risk, and credit supply have a significant effect on capital structure? Thirdly, do macroeconomic variables affect capital structure in a manner that is consistent with the pecking order, trade-off, and market timing theories?

This research does not consider model 6' results in discussing the results. This is because after including financial crisis dummy interaction with macroeconomic variables model 6 became over-specified and consequently in some cases, the effect signs changed in compare to other model specifications.

Firstly, this research shows the static models' results in Table 6.1 and summarises the findings of static models for periods before and after 2008 financial crisis as follows:

- The results from static models do not report a significant difference regarding the sign of the effect of business cycle on capital structure.

- The results from static models report that the effect of credit supply on capital structure is positively significant. However, using tobit and random effect regression models show that the effect of credit supply on capital structure during the 2008 financial crisis become negative. Therefore, according to results of tobit and random effect regressions pecking order and trade-off theories do not have explanatory power for the period before the crisis.

- Using fixed effect, random effect and tobit regression models to investigate the effect of financial market risk on capital structure show that the coefficient estimates only becomes negatively significant for the period after the crisis. According to the results of fixed effect, random effect and tobit regression, trade-off theory has explanatory power only for the period after the crisis. However, using GLS models shows that the coefficient estimates are negatively significant for the period before the crisis. Hence, trade-off theory has explanatory power for

periods before and after the crisis and this is consistent with the results from previous studies (e.g., Bhamra et al., 2009 ;Chen, 2010).

- The results from static models do not report a significant difference regarding the sign of effect of stock market performance on capital structure.

Furthermore, this research shows the dynamic and static models' results in Table 6.2 and summarises the findings for the period from 1995 to 2014 without considering the effect of the 2008 financial crisis as follows:

Secondly, the results from static models including fixed effects, random effects, tobit, GLS estimation strategies and dynamic models including generalised methods of moment's estimators (SGMM and DGMM) indicate that leverage is negatively associated with the business cycle. This is consistent with the prediction of pecking order theory (hypothesis H1) and the previous studies (e.g., Korajczyk and Levy, 2003; Hackbarth et al., 2006; Cook and Tang, 2010).

Thirdly, the results from static models report that leverage is positively associated with credit supply which is consistent with either prediction of pecking order and trade-off theories (hypothesis H2) and previous researches (e.g., Huang, 2003; Leary, 2009; Morellec et al., 2012). The dynamic models' results show that credit supply does not have an explanatory power on capital structure.

Fourthly, on the effect of financial market risk, the static results from GLS regression models show that leverage is negatively associated with financial market risk. This is consistent with the predictions of trade-off theory (hypothesis H3A) and the results from previous studies (e.g., Bhamra et al., 2009 ;Chen, 2010). However, leverage is related significantly and positively with financial market risk based on the dynamic regressions model results (SGMM and DGMM results). The positive relationship between leverage and financial market risk is consistent with the predictions of pecking order theory (hypothesis H3).

Fifthly, the results from static models report that leverage is positively associated with stock market performance which is consistent with predictions of trade-off theory (hypothesis H4) and previous studies (e.g., Welch, 2004; Barclay et al., 2006). The dynamic models' results show that stock market performance does not have an explanatory power on capital structure.

Sixthly, pecking order theory, could only predict two out of four capital structure determinants (business cycle and credit supply), compared to trade-off theory which could predict three out of four capital structure determinants (credit supply, financial market risk and stock market performance).

To sum up, the results from static and dynamic regressions for leverage are both theoretically and empirically plausible according to capital structure theories. As Bharath, Pasquariello, and Wu (2008) state, firms that face higher information asymmetry have more tendency to follow the prediction of pecking order theory. In addition, as Kraus and Litzenberger (1973) explain that static trade-off theory is the trade-off between the tax benefit of debt and the cost of bankruptcy. Therefore, firms that use the tax benefit of debt have more tendency to follow the prediction of trade-off theory. The results suggest that firm-specific variables and macroeconomic conditions ultimately determine capital structure of non-financial firms. Additionally, the results indicate that during the 2008 financial crisis, pecking order theory has more explanatory power than trade-off and market timing theories.

Moreover, this research using static regression models concludes that the 2008 financial crisis has an impact on capital structure, which is consistent with the previous studies. For instance, Campello, Graham, and Harvey (2010) conduct a survey on the effect of financial constraints during financial crises. They find that constrained firms use internal funding and put more effort in obtaining credit from the banks anticipating restricted access to credit in the future. Furthermore, Bhamra, Kuehn, and Strebulaev (2011) state that firms facing economic crises are more conservative in their financial policy. Lastly, this research, despite the strong empirical evidence supporting effect of macroeconomic conditions on capital structure, does not have overwhelming evidence in support of any of the three stated theories.

This research makes four contributions to the literature of capital structure. Firstly, most of the theoretical and empirical capital structure studies use firm-specific variables to test capital structure and some studies that have analysed the impact of macroeconomic variables on capital structure. However, to the best of this author's knowledge, no previous study considers all the four macroeconomic variables including business cycle, credit supply, financial market risk and stock market performance to study capital structure. Therefore, this research by using the four chosen macroeconomic variables contributes to the literature. Secondly, some studies analyse the impact of macroeconomic condition but do not establish the hypothesis under the capital structure theories. This research by establishing the hypotheses

to predict how the four stated macroeconomic variables affect capital structure under the pecking order, trade-off and market timing theories contribute to the literature. Thirdly, existing theoretical and empirical capital structure literature uses firm-specific variables to test capital structure, which may lead to endogeneity issues. Some of the previous studies use macroeconomic variables to reduce the endogeneity problem to test capital structure. Moreover, some of the previous studies use the tobit model to consider truncation of leverage, and lastly, some of the empirical capital structure studies use the GMM method to consider the dynamic nature of capital structure. Even though some studies use macroeconomic variables to reduce the endogeneity problem, and have used the tobit model or the GMM method, to the best of this author's knowledge, there is no existing study that has considered all the aforementioned econometric issues at the same time. Therefore, this research by using fixed effect, random effect, tobit, and GLS regression models and GMM methods contribute to capital structure literature. Fourthly, most of the theoretical and empirical capital structure studies and particularly those investigating the impact of macroeconomic conditions on capital structure use U.S. data. This research tests the robustness of the impact of macroeconomic condition on capital structure by using U.K. data that has a different bond market size, different bankruptcy laws and tax code compared with U.S. data which may have a different impact on capital structure. Therefore, this research is one of the first to examine if macroeconomic condition affects capital structure of firms by using U.K. data.

Table 6.1 Summary of Static Models' Results Signs vs. Capital Structure Theories and the Research Hypotheses

Without considering crisis	Business Cycle			Credit Supply			Financial Market Risk			Stock Market Performance		
	TOT	POT	MTT	TOT	POT	MTT	TOT	POT	MTT	TOT	POT	MTT
Hypotheses	H1A	H1	NA	H2	H2	NA	H3A	H3	NA	H4	H4A	H4A
Predicted sign	**(+)**	**(-)**	**NA**	**(+)**	**(+)**	**NA**	**(-)**	**(+)**	**NA**	**(+)**	**(-)**	**(-)**
Fixed effect		(-)		(+)	(+)					(+)		
Random effect		(-)		(+)	(+)					(+)		
Tobit		(-)		(+)	(+)					(+)		
GLS		(-)		(+)	(+)		(-)			(+)		
Pre-crisis	**Business Cycle**			**Credit Supply**			**Financial Market Risk**			**Stock Market Performance**		
	T.O.T	**P.O.T**	**M.T.T**	**T.O.T**	**P.O.T**	**M.T.T**	**T.O.T**	**P.O.T**	**M.T.T**	**T.O.T**	**P.O.T**	**M.T.T**
Fixed effect		(-)		(+)	(+)					(+)		
Random effect		(-)				(-)				(+)		
Tobit		(-)				(-)				(+)		
GLS		(-)		(+)	(+)		(-)			(+)		
Post-crisis	**Business Cycle**			**Credit Supply**			**Financial Market Risk**			**Stock Market Performance**		
	T.O.T	**P.O.T**	**M.T.T**	**T.O.T**	**P.O.T**	**M.T.T**	**T.O.T**	**P.O.T**	**M.T.T**	**T.O.T**	**P.O.T**	**M.T.T**
Fixed effect		(-)		(+)	(+)		(-)			(+)		
Random effect		(-)		(+)	(+)		(-)			(+)		
Tobit		(-)		(+)	(+)		(-)			(+)		
GLS		(-)		(+)	(+)		(-)			(+)		

TOT, POT, and MTT are short for Trade-off Theory, Pecking Order Theory, and Market Timing Theory, respectively.

Table 6.2 Summary of Dynamic and Static models' Results Signs vs. Capital Structure Theories and the Research Hypotheses

Without considering crisis	Business Cycle			Credit Supply			Financial Market Risk			Stock Market Performance		
	TOT	POT	MTT	TOT	POT	MTT	TOT	POT	MTT	TOT	POT	MTT
Hypotheses	H1A	H1	NA	H2	H2	NA	H3A	H3	NA	H4	H4A	H4A
Predicted sign	**(+)**	**(-)**	**NA**	**(+)**	**(+)**	**NA**	**(-)**	**(+)**	**NA**	**(+)**	**(-)**	**(-)**
Fixed effect		(-)		(+)	(+)					(+)		
Random effect		(-)		(+)	(+)					(+)		
Tobit		(-)		(+)	(+)					(+)		
GLS		(-)		(+)	(+)		(-)			(+)		
SGMM		(-)				(-)		(+)				
DGMM		(-)						(+)				

TOT, POT, and MTT are short for Trade-off Theory, Pecking Order Theory, and Market Timing Theory, respectively.

6.2 Empirical Implications

This research reveals three interesting empirical implications as follows:

First, the effect of business cycle on capital structure is countercyclical, suggesting that while industrial production and corporate tax are high, firms have a tendency to use less debt.

Hence, the government can employ expansionary and contractionary fiscal policies. By using expansionary policy, government can increase aggregate demand by adjusting the budget through increasing spending or decreasing taxes. Consequently, firms lose their tax benefits for debt financing. Likewise, a rise in government spending may lead to bigger sales and profits. Thus firms' retained earnings as internal funds increases and firms prefer first to use their internal funds. Consequently, the debt issuance decreases. However, government by using contractionary fiscal policy, resorts to debt when spending exceeds its revenue, and it is inadvisable to increase taxes or cut spending. Hence, as a requirement of well-functioning government, efficient financial markets provide long-term debt for firms.

Therefore, government by implementing a fiscal policy such as deploying taxation and public expenditure programmes can reduce the fluctuations of business cycle and affect capital structure and contribute toward the achievement of economic growth.

The empirical results regarding business cycle in this research are consistent with Myers and Majluf (1984) that argue firms prefer to use their cash flow as the primary source of financing. Hence, leverage decreases and firms use their internal funds to retire debt, specifically the short-term debt. They state that business cycle has a negative impact on leverage and supports the predictions of pecking order theory (Choe et al., 1993; Korajczyk and Levy, 2003; Hackbarth et al., 2006; and Cook and Tang, 2010). But the results are in contrast to those studies that document a pro-cyclical relationship between leverage and business cycle and support the predictions of trade-off theory (Wilson, 1977; Myers, 1984; Gertler and Hubbard, 1991; Graham and Harvey, 2001).

Second, the empirical findings indicate that the credit supply has a positive effect on capital structure, suggesting that while the M3 growth rate is high, firms have a tendency to use more debt. However, the results from random effect and tobit model present a negatively significant effect for credit supply which is not consistent with the prediction of either pecking order or trade-off theories. As Figure 5.1 Panel C middle graph shows during the crisis, Bank

of England conduct quantitative easing; however, it was not successful and leverage decreased which could be due to financial market risk. So, understanding the causes of shifts in credit supply and the effect and scale of the financial crisis on the credit supply shift is crucial. During the crisis as leverage decreases government should consider policies to conduct quantitative easing to the extent that could mitigate the financial market risk. It is not clear how much government policies, by applying quantitative easing, have contributed to real economic activity because many puzzling factors such as financial market risk, market uncertainty and stock market performance were associated with general economic conditions. In other words, during the crisis, it is not clear that the shift is due to the supply shifts (banks are not willing to lend), or due to demand shift (firms restrict their borrowing due to high financial market risk).

The empirical results regarding credit supply in this research are consistent with the prediction of either trade-off or pecking order theories. Korajczyk and Levy (2003) state that credit supply has a positive impact on leverage under the pecking order and trade-off theories. These results are consistent with many previous studies that document a positive relationship between credit supply and capital structure (e.g., Huang, 2003; Leary 2009; Massa et al., 2009; Balsari and Kirkulak, 2010; Choi et al, 2010; Morellec, 2010; Erel et al., 2011; Voustsinas and Werner, 2011; Morellec et al., 2012).

Third, the empirical findings indicate that financial market risk has a negative impact on capital structure which is consistent with the predictions of trade-off theory. The empirical results are consistent with those studies that document during the recessions financial market are higher than expansion and hence firms tend to issue less debt and state a negative relationship between financial market risk and leverage (Bhamra et al., 2009; Chen, 2008; Hansen et al., 2008). For instance, during financial crises as market uncertainty increases and hence financial market risk increases, firms use less debt. Even though government by conducting quantitative easing increases the M3, it may not increase the leverage and so government expansionary policy may fail.

The empirical findings indicate that stock market performance has a positive impact on capital structure. The empirical results are consistent with predictions of trade-off theory and those studies that document positive relationship (Welch, 2004; Barclay et al., 2006). However, the results are in contrast to those studies that find a negative relationship between stock market performance and capital structure of firms and support the prediction of pecking order theory

(Titman and Wessels, 1988; Fama and French, 1992; Graham and Harvey, 2001; Korajczyk et al., 2003).

The empirical findings indicate that the effect of macroeconomic condition was more balanced after the crisis, suggesting that during crises due to the uncertain level of financial market risk, the effect is undetermined, and a trade-off rises for economic policy**.**

6.3 Limitation and Future Research

There are a few limitations in doing this research and further areas for research should include the following.

Firstly, this research has collected data for business cycle, credit supply and stock market performance from 1980 to 2014, although this research could not analyse the effect of macroeconomic condition on capital structure from 1980 to 2014 due to unavailability of financial market risk for the period before 1995. Therefore, not having data for more than one business cycle and a longer period is the first limitation of this research. Hence, further research should consider collecting data on financial market risk to analyse effect of macroeconomic condition on capital structure for a longer period. The inclusion of data for more than one business cycle would strengthen the results.

Secondly, this research uses industrial production and corporate tax as a proxy to measure business cycle, M3 as a proxy to measure credit supply, risk premium and commercial paper spread as a proxy to measure financial market risk, and stock market return as proxy to measure stock market performance. However, this study did not use other proxies to measure macroeconomic variables and to check if the results are still robust. For instance, this research could measure the credit supply using other proxies apart from M3 and analyse its effect on capital structure. Kashyap, Stein and Wilcox (1993) use bank-loan supply, aggregate commercial paper issuance as a proxy to measure credit supply. Hence, further research should consider the use of other proxies to measure macroeconomic variables and to check if the results are still robust. For instance, using the growth rate of GDP to measure business cycle and bank-loan supply and aggregate commercial paper issuance to measure credit supply would strengthen the results.

Thirdly, this research uses static and dynamic estimation strategies including fixed effects, random effects, tobit, and GLS regression models and GMM methods (SGMM and DGMM)

to examine the determinant of capital structure across firms and over time. However, it did not investigate the capital structure choices over time. Moreover, there is still no well-developed dynamic capital structure model, which could comprehensively capture effect of macroeconomic conditions and the recent financial crisis on capital structure choices. Hence, using Nested Logit model provides an interesting opportunity to investigate the effect of macroeconomic condition and the crisis on capital structure choices. By defining the first-level alternatives as the choice between using internal funds versus security issuance, and determining the second-level alternatives as equity versus debt issuance to investigate effect of macroeconomic conditions on capital structure choices.

Lastly, the period of this research contains the 2008 financial crisis known as ‘’great recession’’ and the second recession of 2011 called “Euro area sovereign debt crisis’’. However, this research analyses the impact of macroeconomic conditions on capital structure and only considers the effect of the 2008 financial crisis. Further research should consider the effect of the Euro area sovereign debt crisis as well.

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Appendix:

Table A.5.1 Industry Mean Leverage

year	Oil and Gas	Basic Materials	Industrials	Consumer Goods	Healthcare	Consumer Services	Telecommunications	Utilities	Technology
1995	0.18688579	0.15728948	0.15907243	0.147837	0.1547902	0.2031838	0.1950525	0.28531999	0.18929059
1996	0.19792775	0.17192506	0.15980627	0.15587511	0.15596729	0.19347503	0.10504267	0.32908857	0.20542444
1997	0.2101314	0.17305489	0.14970384	0.15408903	0.19105884	0.21176373	0.1101165	0.28342845	0.20479219
1998	0.22884915	0.17892412	0.16371708	0.16708	0.2152705	0.22481836	0.17362175	0.2826297	0.22364746
1999	0.22080039	0.22935256	0.18085534	0.15743331	0.21289785	0.23402983	0.2672844	0.28240064	0.21096015
2000	0.21825165	0.18786265	0.17769297	0.15097589	0.15886311	0.19251008	0.1495506	0.2743617	0.16371542
2001	0.22083194	0.18819742	0.17386675	0.19218071	0.18113195	0.18988466	0.18518175	0.17541939	0.15618191
2002	0.28097557	0.20011749	0.18449931	0.20474094	0.18594106	0.19716689	0.18824875	0.19522831	0.19121827
2003	0.27611319	0.23428483	0.15344753	0.21121304	0.18811542	0.19229138	0.22227422	0.14069471	0.22084674
2004	0.22969935	0.2319249	0.16645018	0.20816746	0.19944067	0.19585757	0.13499685	0.16139779	0.19795985
2005	0.22219728	0.17300136	0.16417216	0.17085198	0.19026103	0.17631244	0.091112	0.16814245	0.15588819
2006	0.16556082	0.17450385	0.16370786	0.15436152	0.18783552	0.1833004	0.08126879	0.17275781	0.12847658
2007	0.15784527	0.1741658	0.16372996	0.15117552	0.17916166	0.202534	0.10978219	0.15749472	0.15999225
2008	0.17124371	0.21115376	0.18440039	0.17334627	0.18887804	0.2075019	0.1006635	0.12109895	0.15313397
2009	0.18805736	0.20877079	0.18285806	0.2042067	0.1687167	0.21450635	0.08751856	0.12730124	0.18145561
2010	0.18140193	0.16995862	0.15710965	0.18282374	0.14660063	0.18717473	0.0542405	0.12094976	0.16716684
2011	0.16317514	0.15609839	0.14683478	0.18348326	0.12410347	0.17446335	0.07783544	0.12688552	0.1590021
2012	0.15626486	0.16543957	0.15300338	0.19285434	0.13897246	0.17931002	0.10408287	0.14418652	0.16214074
2013	0.17127528	0.1547233	0.15688645	0.19809947	0.13881801	0.18886758	0.08623847	0.14669485	0.17650685
2014	0.16911028	0.13861441	0.14707109	0.20455595	0.13305407	0.18554284	0.08278947	0.17857785	0.18067249

Table A.5.2 Industry Average Characteristics

Industry Name	Leverage	Tangibility	Liquidity	Growth opportunity	Profitability	Size
Oil and Gas	0.1930866	0.0062987	3.241399	0.1450702	-0.2567689	11.10814
Basic Materials	0.1826806	0.011399	3.305241	0.0850065	-0.319863	11.01089
Industrials	0.1639176	0.008027	3.45821	0.1329071	-0.0255175	11.45667
Consumer Goods	0.1816077	0.0069532	5.887543	0.1412584	-0.0974338	11.59994
Healthcare	0.1686889	0.0048297	2.787445	0.1254477	-0.0880655	10.82287
Consumer Services	0.1942401	0.0110882	3.010157	0.132553	-0.1082881	11.1854
Telecommunications	0.1110011	0.0028766	3.962073	0.1456893	-0.0018328	10.01175
Utilities	0.1739921	0.0075223	2.623141	0.1310332	-0.1234286	11.02057
Technology	0.1741382	0.0153395	3.979903	0.1010521	-0.2101998	11.34235

Table A.5.3 Confidence Interval and Mean of Leverage Each Year

year	Mean	Std. Err.	[95% Conf.	Interval]
1995	0.1745	0.0095	0.1558	0.1932
1996	0.1791	0.0093	0.1609	0.1973
1997	0.1832	0.0095	0.1646	0.2019
1998	0.1981	0.0096	0.1791	0.2170
1999	0.2094	0.0101	0.1895	0.2293
2000	0.1843	0.0089	0.1668	0.2017
2001	0.1846	0.0086	0.1676	0.2016
2002	0.2014	0.0090	0.1838	0.2190
2003	0.2001	0.0090	0.1824	0.2177
2004	0.1958	0.0086	0.1789	0.2126
2005	0.1735	0.0077	0.1584	0.1886
2006	0.1647	0.0070	0.1509	0.1786
2007	0.1709	0.0069	0.1574	0.1844
2008	0.1842	0.0071	0.1702	0.1982
2009	0.1905	0.0073	0.1762	0.2048
2010	0.1670	0.0067	0.1538	0.1802
2011	0.1562	0.0064	0.1437	0.1686
2012	0.1623	0.0066	0.1494	0.1752
2013	0.1668	0.0067	0.1536	0.1800
2014	0.1624	0.0069	0.1490	0.1759

Table A.5.4 Mean of Macroeconomic Variables Each Year

Year	Corporate Tax Growth Rate	Industrial Production Growth Rate	M3 Growth Rate	Risk Premium	Commercial Paper Spread	FTSE100 Return	UK Corporate Tax Rate
1995	0.2674	0.0756	0.1299	0.37	0.2412	-0.7878	0.33
1996	0.1929	0.0146	0.1239	0.18	0.2804	0.1863	0.33
1997	0.2574	0.0135	0.1017	0.08	0.2679	0.1110	0.32
1998	0.0578	0.0098	0.0751	0.41	0.5714	0.2213	0.31
1999	-0.0410	0.0106	0.0206	0.31	0.3890	0.1362	0.3
2000	0.0496	0.0191	0.1081	0.16	0.2485	0.1642	0.3
2001	0.0197	-0.0174	0.0876	0.36	0.3094	-0.1074	0.3
2002	-0.1441	-0.0159	0.0384	0.14	0.1283	-0.1757	0.3
2003	0.0135	-0.0063	0.0807	0.14	0.1501	-0.2798	0.3
2004	0.1060	0.0071	0.0879	-0.05	0.0891	0.1284	0.3
2005	0.2027	-0.0071	0.1189	0.1	0.1848	0.0733	0.3
2006	0.2240	0.0063	0.1228	-0.01	0.1383	0.1551	0.3
2007	-0.0907	0.0027	0.1193	-0.02	0.3292	0.1023	0.3
2008	0.0793	-0.0261	0.1624	0.37	0.8933	0.0377	0.29
2009	-0.2904	-0.0906	0.0255	0.12	0.2952	-0.3748	0.28
2010	0.1459	0.0314	0.0535	0	0.0629	0.2001	0.28
2011	0.0398	-0.0058	-0.0259	0.01	0.1669	0.0867	0.27
2012	-0.0491	-0.0276	0.0275	0.19	0.3033	-0.0565	0.25
2013	-0.0189	-0.0080	0.0165	0.2	0.1901	0.0574	0.23
2014	0.0053	0.0140	-0.0036	0.12	0.1142	0.1353	0.22

Table A.5.5 Mean of Firm Specific Variables Each Year

Year	Tangibility	Current ratio	Growth Opportunity	Profitability	Size
1995	0.0068	1.6527	0.5394	0.0650	11.8049
1996	0.0084	1.7662	0.1277	0.0858	11.4273
1997	0.0103	1.8937	0.1218	0.0500	11.3973
1998	0.0096	1.8350	0.1052	0.0389	11.4151
1999	0.0077	2.3775	0.0776	-0.9670	11.3521
2000	0.0066	2.8186	0.1794	-0.0009	11.3211
2001	0.0084	3.2846	0.1482	-0.1625	11.2576
2002	0.0097	2.7129	0.0883	-0.1350	10.9985
2003	0.0074	3.0597	0.1082	-0.1903	10.8265
2004	0.0097	3.8815	0.2031	-0.1240	10.7087
2005	0.0095	4.2488	0.1733	-0.0436	10.7973
2006	0.0072	5.6917	0.2310	-0.0589	10.8982
2007	0.0106	7.1609	0.2068	-0.0436	11.0951
2008	0.0070	3.2690	0.1818	-0.3725	11.2088
2009	0.0088	2.8208	0.0114	-0.2310	11.1685
2010	0.0085	3.0360	0.0771	-0.1011	11.2723
2011	0.0109	3.5195	0.0976	-0.0638	11.3935
2012	0.0109	3.4153	0.0500	-0.2857	11.3787
2013	0.0136	3.0879	0.0409	-0.1168	11.4314
2014	0.0108	3.0089	0.0232	-0.0441	11.6629