

# The Impact of Covid-19 on Portfolio Allocation in the UK Equity Market

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## Abstract

We examine the impact of Covid-19 on portfolio allocation in the UK stock market, using UK FTSE All-Share sectoral data. We estimate the optimal portfolio composition using a Mean Variance Portfolio approach and compare it with other common investment strategies. We find that relative to pre-Covid-19, the composition of the optimal portfolio became more concentrated, including only the Health Care and the Consumer Goods sectors. As the lockdown measures eased, the optimal portfolio allocation became more diversified, although the weight on the Health Care sector remained significantly higher than in the pre-Covid period.

JEL numbers: G10, G11

Keywords: Covid-19, equity market, portfolio allocation

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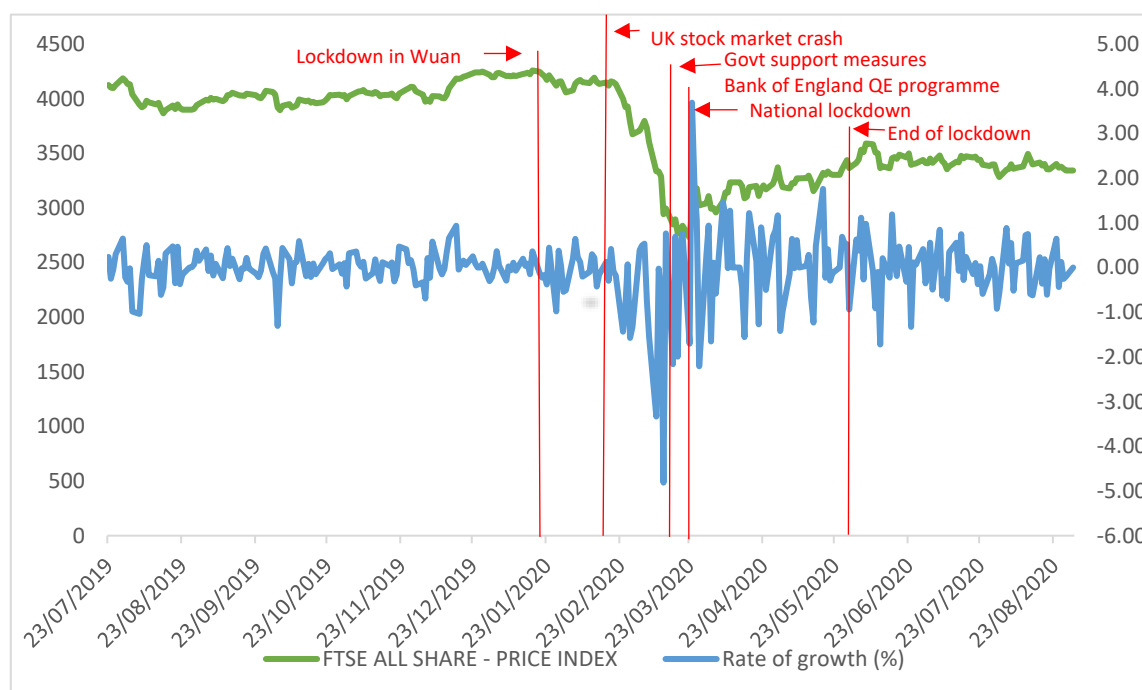
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## 1. Introduction

The spread of the Covid-19 virus around the world during 2020 had major macroeconomic and financial consequences, which were reflected in dramatic falls in world stock market indices and increases in market volatility especially during the early part of the year (some of the key Covid-related events affecting UK equity prices in early 2020 are illustrated in Figure 1). Despite some differences in the incidence of the virus across different jurisdictions and nature of the domestic policy response, equity markets in the advanced economies all fell by broadly similar amounts.

**Figure 1 – FTSE ALL-SHARE INDEX prices and returns**



Source: Authors own calculation on Thomson Reuters datastream data and news from Eikon

In this study we focus on the implications of these developments for investor portfolio allocation, using data for the UK equity market, the second largest stock market in Europe by market capitalisation. More specifically, we investigate how the portfolio composition of FTSE All-Share minimum variance portfolio (MVP), calculated over specific periods or using a rolling window approach, changed in response to the equity market turbulence related to Covid-19. MVP strategies have become popular with investors in recent years, with such strategies combining minimum risk and strong returns (see eg Clarke, De Silva and Thorley, 2006 and 2011; Haugen and Baker, 1991). We show whether this has been the case during the present crisis and how this portfolio strategy would have fared relative to the capitalization weighted and equally-weighted portfolio strategies, two common benchmarks. We also examine the extent to which changes in portfolio allocation brought about by the market volatility in response to the pandemic persisted as lockdown measures were eased in

the UK in response to falling infection rates, before worries about a second wave of infections started in September 2020.

As well as contributing some insights on the robustness of MVP relevant for the literature on portfolio allocation, our paper also contributes to the emerging literature on Covid-19 and equity markets. To date there has little written on the reaction of the UK equity market. To the authors knowledge the only paper on the UK by Griffith, Levell and Stroud (2020) provides a description of the impact on sectoral share prices, but does not consider the implications for portfolio allocation. Most of the existing literature on the stock market effects of Covid-19 focusses on the US equity market. Baek et al (2020), for example, analyses the effect of Covid-19 on the volatility of the US stock market by using a Markow switching regime model, finding a heterogeneous impact on volatility across industries. Similarly, Albulescu (2020) using a multiple regression model found that the effect of Covid-19 increased the overall volatility of the US stock market proxied by the VIX index. Ramelli and Wagner (2020) examine US firms' stock price reactions to COVID-19 and show that the return of US companies was negatively affected by the degree of exposure to international trade, especially China. Corbet et al. (2020) analyse the potential diversification effects, for the Chinese stock market, of gold and cryptocurrencies and conclude that neither were an alternative form of investment during this pandemic.

There are also some cross-country comparisons. For example, Ashraf (2020), focusing on stock markets of 64 countries, argues that stock market performance worsens with the increase in Covid-19 cases. Eyden and Eyden (2020) carry out an event study analysis for the US and European stock markets and find that the markets reacted strongly to the announcement of the first Covid-19 death. Lyócsa et al (2020) investigate the effect of fear of the Covid-19 virus on the major stock markets and suggest that the higher volatility seems to be predicted by the increase in the number of Google searches for Coronavirus. Zhang et al. (2020), show via some correlation analysis, that after the WHO announcement only some Asian equity markets become more correlated.

The next section explains our methodology and data. It also motivates the choice of the three periods of our investigation. Empirical results and conclusions follow.

## 2. Methodology and data

Our main focus in this Letter is to investigate the implications of a portfolio strategy based on the Minimum Variance Portfolio (MVP), which might be considered as the preferred portfolio allocation strategy of risk-averse UK-focused investors. This has become an increasingly popular investment strategy for institutional and retail investors, who may have limited knowledge of foreign stock markets and feel more comfortable investing exclusively in the UK stock market.

This risk-averse investor will choose a MVP strategy to create a portfolio with the lowest possible variance. The MVP approach is solely based on the second moment of the assets in the portfolio, and it is implemented in accordance with the following minimization problem:

$$\text{Min } \sigma_P^2 = \sum_{i=1}^N \sum_{j=1}^N w_i w_j \text{cov}(r_i, r_j), \quad 0 \leq w_i \leq 1 \text{ and } \sum_i^N w_i = 1 \quad (1)$$

Portfolio theory suggests that diversifying across  $n$  assets or sectors will reduce portfolio risk, provided the assets are not perfectly positively correlated (Markowitz, 1952). The impact of

Covid-19 may have increased the possibilities for diversifying away risk in this way, given the heterogeneous sectoral response to the virus, as we shall come on to discuss. Our methodology involves re-estimating the equity market MVP in different periods, in order to take into account, the information in returns associated with the virus.

We compare MVP with two benchmarks. The capitalization-weighted portfolio (CWP), constructed using the relative size of each sector by market value, and the Equal-Weighted Portfolio (EQWP), based on equal holdings of each FTSE All-Share sector. The CWP can be motivated in terms of the “market portfolio” of Sharpe’s (1963) market model, with a return proxying the market. In practice, investors may also be attracted to it because the largest capitalised companies are also likely to be the most liquid and the fact that it requires minimum rebalancing to implement. The EQWP is an even simpler strategy that requires no rebalancing, as its composition remains constant over time, and might be thought of as the desired portfolio of a naïve investor (for applications of this approach, see De Miguel et al., 2009; Guidi and Ugur, 2014; Sukumaran et al., 2015; Guidi et al., 2016).

In equation (2), the expected portfolio return,  $E(r_p)$ , is given by the weighted sum of expected returns,  $E(r_i)$ , of each of the FTSE sectoral indices included in the portfolio:

$$E(r_p) = \sum_{i=1}^N w_i E(r_i) \quad (2)$$

where the portfolio weights indicated by  $w_i$  will differ according to the portfolio strategy being pursued (eg for EQWP,  $w_i = w = 1/N$ ).

The portfolio variance for each of our portfolio strategies is given below:

$$\sigma_p^2 = \sum_{i=1}^N \sum_{j=1}^N w_i w_j \sigma_{ij}(r_i, r_j) \quad (3)$$

where  $\sigma_{ij}$  is the covariance between the sectors. We implemented the MVP, CWP and EQWP strategies by excluding short selling, which implies that weights should not be negative, that is  $w_i \geq 0$ , for  $i = 1, N$ .

For our empirical analysis, we used FTSE All-Share daily prices for the sectoral indices<sup>3</sup> as identified by the Industry Classification Benchmark (ICB) breakdown over the period 23 July 2019 to 31 August 2020. Daily stock market prices were taken from Thomson Reuters DataStream and are in GBP. Table 1 presents the descriptive statistics for the ten sector indices. Over the full sample, daily average returns of the Oil and Gas sector were the lowest (-0.27%), while the highest were for the Health Care sector with a daily average of 0.025%. The former was also the more volatile with an average standard deviation of 3.14%, while the least volatile were the average returns of the Consumer Goods sector, with an average daily standard deviation of 1.45%.

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<sup>3</sup> The ICB is the official sector classification used across FTSE Russell indexes for analysis, attribution, and performance measurement of companies by industry and sector.

**Table 1 – Summary statistics of stock returns (%), 23 July 2019 -31 August 2020**

	Mean	St dev
FTSE UK Consumer Goods	-0.056	1.451
FTSE UK consumer Services	-0.048	1.703
FTSE UK Financials	-0.129	2.071
FTSE UK Industrials	0.00	1.981
FTSE UK Basic Materials	-0.045	2.395
FTSE UK Health Care	0.025	1.581
FTSE UK Oil and Gas	-0.274	3.143
FTSE UK Technology	-0.093	2.158
FTSE UK Telecom	-0.09	2.133
FTSE UK Utilities	0.006	1.841

Source: Authors' own calculation on Thomson Reuters Eikon data.

We divide our period of investigation into three main periods. The first period is from 23 July 2019 until 20 February 2020. The start date coincides with the election of Boris Johnson as the new UK Prime Minister and the end date is just before the Covid-related UK stock market crash. Over this period, the worst performing sector was Oil & Gas, with a cumulative return of -22%, while the best performing one was Utilities with a cumulative return of 26%. The second period runs from 21 February 2020 until 31 May 2020, which was the end of lockdown in the UK. The Health Care sector was the best performer over this period with cumulative return of 5%, while the Financial sector performed worst (-38%). The third period starts on 1 June 2020 and ends on 31 August, before the start of a second wave of infections in the UK.<sup>4</sup> The Telecom sector reported the worst performance (-17%) in this period, with the best sector being Basic Materials (9%).

### 3. Empirical Results

Table 2 reports the results of the portfolio analysis over the three sub-periods using the MVP, CWP and the EQWP strategies. The MVP has the lowest risk in each period, as expected, but also outperforms the other portfolio strategies in terms of relative returns in Periods 1 and 2. The superiority of the MPV strategy is most striking in Period 2, after the virus outbreak, when risk increases and returns become negative across all portfolios. Although all three strategies lead to negative returns, the average daily return for the MPV (-0.05%) is six times smaller than for the CWP (-0.3%) and four times smaller than the EQWP (-0.19%). In terms of risk, the standard deviation of the MVP (1.96%) is only two-thirds that of the CWP (2.96%) and three-quarters that of the EQWP (2.64%). In terms of the other two strategies, the more diversified EQWP dominates the CWP in each period.

Over the three periods, the MVP portfolio composition shows some substantial changes. In Period 1, Consumer Goods and Consumer Services have a combined weight of about two thirds of the portfolio, with the other major sectors being, Oil and Gas and Utilities. After the Covid-19 outbreak in Period 2, however, an investor adopting the same strategy would have concentrated their portfolio in Health Care (53%) and Consumer Goods (47%) companies. In Period 3, associated with the end of lockdown in the UK, the MVP investor would have

<sup>4</sup> In July and August 2020, the number of new infections in the UK had remained low but in September it started to increase exponentially (<https://coronavirus.data.gov.uk/cases>). At the beginning of September there was also a clear and consistent increase in the hospitalisation rate in the UK, which was matched by a similar trend in the number of mortalities (<https://coronavirus.data.gov.uk/>).

started to diversify into a wider range of sectors. Following the MVP strategy, just under 30% would have been invested in both Consumer Goods and Utilities companies, 20% in Health care companies, 11% in Basic Materials companies, and 10% on Technology companies. But the MVP portfolio composition in Period 3 remained substantially different from that in Period 1.

**Table 2 – Portfolio performances**

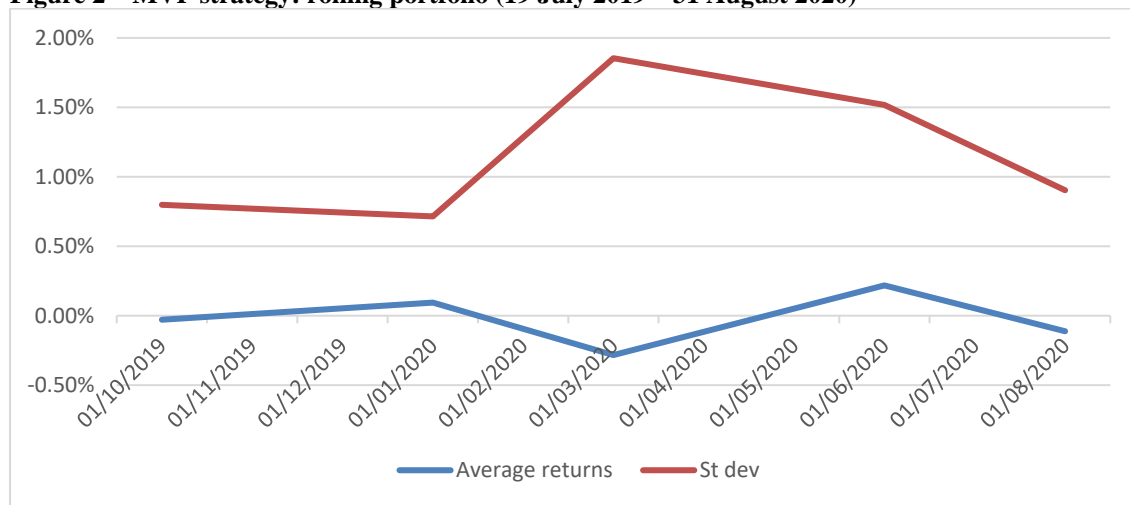
	(1)	(2)	(3)
	MVP	CWP	EQWP
<b>Panel A: Period 1</b>			
Average daily returns	0.014%	0.00%	0.006%
Standard deviation	0.724%	0.805	0.785%
<b>Weight:</b>			
FTSE UK Consumer goods	38%	14.05%	10%
FTSE UK Consumer services	28%	11.8%	10%
FTSE UK Financials	-	26.27	10%
FTSE UK Industrials	-	12.12	10%
FTSE UK Basic materials	-	7.45	10%
FTSE UK Health care	8%	9.44%	10%
FTSE UK Oil and Gas	15%	12.21%	10%
FTSE UK Technology	1%	1.12%	10%
FTSE UK Telecom	-	2.71%	10%
FTSE UK Utilities	13%	2.83%	10%
<b>Panel B: Period 2</b>			
Average daily returns	-0.049%	-0.3%	-0.194%
Standard deviation	1.964%	2.956%	2.641%
<b>Weight:</b>			
FTSE UK Consumer goods	47%	16.15%	10%
FTSE UK Consumer services	-	11.68%	10%
FTSE UK Financials	-	25.21%	10%
FTSE UK Industrials	-	11.49%	10%
FTSE UK Basic materials	-	7.43%	10%
FTSE UK Health care	53%	11.95%	10%
FTSE UK Oil and Gas	-	9.19%	10%
FTSE UK Technology	-	1.07%	10%
FTSE UK Telecom	-	2.29%	10%
FTSE UK Utilities	-	3.54%	10%
<b>Panel B: Period 3</b>			
Average daily returns	-0.064	-0.043	-0.057
Standard deviation	1.173	1.371	1.333
<b>Weight:</b>			
FTSE UK Consumer goods	29%	15.7%	10%
FTSE UK Consumer services	-	11.52%	10%
FTSE UK Financials	-	25.24%	10%
FTSE UK Industrials	-	12.21%	10%
FTSE UK Basic materials	11%	8.94%	10%
FTSE UK Health care	20%	11.67%	10%
FTSE UK Oil and Gas	-	7.74%	10%
FTSE UK Technology	10%	1.21%	10%
FTSE UK Telecom	-	2.25%	10%
FTSE UK Utilities	29%	3.52%	10%

*Notes:* This table presents results for portfolios strategies on UK equity market returns. Portfolio strategies are the Minimum Variance Portfolio (MVP), the Weighted Capitalization Portfolio (CWP) and the Equally Weighted Portfolio (EQWP).

We also consider an MVP strategy that allows the investor to change the composition of her portfolio more frequently in order to adapt it to market conditions. For this, we use a

rolling windows approach, with a 60 day centred window, where the investor is allowed to change the composition of her portfolio every 30 days, by dropping the first 30 days from the window and rolling the portfolio ahead 30 days. The results of this additional analysis are presented in Figure 2, which shows that the resulting portfolio would have earned negative returns from the beginning of March to the first half of April. At the end of May 2020, with the end of the lockdown, our analysis shows that both the average returns of the portfolio and the volatility declined. We can interpret this as a gradual return to the pre-Covid period in the portfolio allocation. Similarly, the standard deviation seems to also return to values before the pandemic.

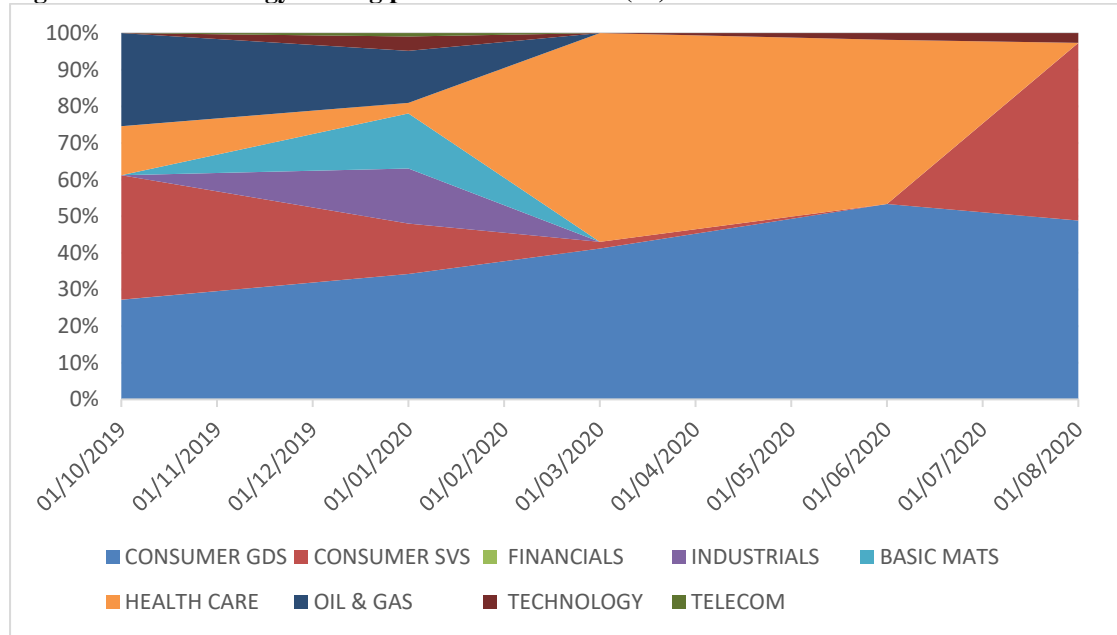
**Figure 2 – MVP strategy: rolling portfolio (19 July 2019 – 31 August 2020)**



Source: Authors' own calculation on Thomson Reuters Eikon data.

The rolling windows portfolio analysis (Figure 3) clearly shows that the Consumer Goods sector remained a major component of the rolling MVP across the entire period of analysis. Consumer Services were an important sector before the virus outbreak and after lockdown ended, but their weight diminished sharply with Covid-19. At the same time, the Health Care sector became increasingly important after the virus appeared and replaced investment in other sectors, including the Oil and Gas, Industrials and Consumer Services sectors which gradually disappeared from the rolling MVP.

**Figure 3 – MVP strategy: rolling portfolio allocations (%)**



Source: Authors' own calculation on Thomson Reuters Eikon data.

#### 4. Conclusions

This study compares the performance of different sectoral equity portfolio strategies for the FTSE all-share over a sample period between July 2019 and August 2020. This period encompasses three periods that we identify in accordance with events related to the Covid-19 pandemic. To test the robustness of our analysis, we also include a rolling windows portfolio analysis to identify how a portfolio being rebalanced every 30 days would have changed its composition as a consequence of major events taking place over the period. Two main results emerge. First, the MVP does particularly well in the period after the virus outbreak, where its performance in terms of relative risk and return is substantially better than the CWP and the EQWP strategies. Secondly, our analysis reveals that the composition of the MVP portfolio after the end of the UK lockdown in May 2020 did not return immediately to the way it was in pre-pandemic period, even as the virus abated. This suggests that UK equity market investors were still fearful of a resurgence of the pandemic and a slower recovery of the UK economy, even before the emergence of a second wave.



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