ERASMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS
MSc Accounting, Auditing and Control

The Effect of the COVID-19 Pandemic on Capital Structure and on its Relation Towards Firm Profitability and Firm Value

Evidence from S&P 500 Companies

Author: Marco Zandbergen

Student number: 509947

Thesis supervisor: Dr. Y. Li

Second assessor: Dr. J.P.M. Suijs

Abstract

This paper examines the impact of the COVID-19 pandemic on capital structure and investigates the effect of capital structure on profitability and firm value for U.S. firms during the pandemic. Accordingly, quarterly information is retrieved for 355 companies that were/are listed on the S&P 500 in the fiscal period 2017Q4-2022Q1. The results of the before-after analysis indicate that the COVID-19 pandemic had a significant impact on leverage, which was proxied by three different capital structure metrics. The model included other determinants of capital structure for which a statistically significant negative effect of profitability, liquidity and firm size on capital structure was found. Tangibility and growth opportunities mostly had a positive relation with leverage at a reasonable significance level. Using fixed effects and random effects regression models, significant evidence is found that capital structure has a negative association with firm profitability and firm value, measured by return on assets (ROA) and Tobin's Q, respectively, during the COVID-19 pandemic. The negative relation between capital structure and firm performance is in accordance with the pecking order theory.

Keywords: Capital structure, Profitability, Firm value, COVID-19

JEL Classification: F65, G01, G32, L25

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1. Introduction

On March 11, 2020, the World Health Organization (WHO) officially declared the outbreak of the COVID-19 virus a global pandemic due to a drastic increase in the number of infections and its rapid spread to other countries (Cucinotta & Vanelli, 2020). To combat the spread of the highly contagious COVID-19 virus, countries across the world institute unprecedented restrictions on freedom of movement, privacy and individual liberties (Bolsover, 2020). Consistently, large mobility reductions in the United States are found by Warren and Skillman (2020) that are associated with the emergence of COVID-19 and specific government directives. In addition, these movement restrictions and lockdown measures also have a massive impact on the U.S. economy (Miller, 2020). The restrictive measures prohibited many businesses from remaining fully operational, which resulted in laying off employees to reduce labor costs. Consequently, the unemployment rate spiked to its highest level since the Great Depression and sharp reductions in consumption and economic output were observed (Mazur, Dang & Vega, 2021). Accordingly, the economic recession caused by the exogenous outbreak of the COVID-19 virus poses significant challenges for companies.

1.1 Main Research

Due to the increased uncertainty and public fear induced by the COVID-19 virus, companies had to adjust their business structure (Huang & Ye, 2021). One factor that firms have to reconsider is their capital structure, which is defined as the mix of debt and equity to fund their operations. The capital structure decision is significant since enterprises focus on maximizing returns and because of the impact of the decision on an organization's ability to deal with its competitive environment (Shubita & Alsawalhah, 2012). In general, there are two schools of thought on the optimal capital structure. The former school advocates for optimal capital structure, claiming that a well-balanced combination of debt and equity capital can reduce overall capital costs and maximize firm value (Edim, Atseye & Eke, 2014). The latter school contends that debt and equity financing decisions have insignificant impact on firm value, since the value of a company is believed to be determined by the underlying profitability and risk of investments (Van Horne James, 2002). However, the majority of the existing literature indicates that changes in leverage does affect firm performance. Moreover, prior research has found that the capital structure decision is influenced not just by firm-specific factors, but also by macroeconomic uncertainty and institutional settings (Graham, Leary & Roberts, 2015). Consistently, the study by Alves and Francisco (2015) find evidence that capital structure significantly changed during recent recessions. To assess the effect of the COVID-19 crisis on capital structure and its relation towards profitability and the value of a company during the COVID-19 pandemic, this paper will focus on the following research questions:

Is capital structure affected by the COVID-19 pandemic and how does capital structure relate to firm profitability and firm value during the pandemic?

In accordance with previous research, capital structure is during the study proxied by three different corporate leverage ratios: short-term debt to total assets, long-term debt to total assets and total debt to total assets. The results of the before-after analysis indicate a significant negative impact of the COVID-19 pandemic on short-term debt, while a significant positive effect on long-term debt and total debt is found. These findings are supported by the outcomes of the mean comparison test, which allows the acceptance of the first hypothesis. Furthermore, a statistically significant negative effect of profitability, liquidity and firm size on capital structure was found. Asset tangibility and growth opportunities mostly had a positive association with corporate leverage at a reasonable significance level. The findings of the fixed effects and random effects models explicate that capital structure has a statistically significant negative effect on firm profitability, which is proxied by both return on assets (ROA) and return on equity (ROE). The negative association between capital structure and profitability is in accordance with both the pecking order theory and the second hypothesis. Lastly, the study finds significant evidence for the acceptance of the third hypothesis, which stated that capital structure has a negative effect on firm value proxied by Tobin's Q. Although the literature on the effect of leverage on firm value is quite limited and scattered, the results are in line with the most relatable studies. The acceptance of all three hypotheses illustrates that the findings are consistent with the expectations beforehand, which are based on prior literature.

1.2 Contributions

The major contribution of this paper to the extensive literature on capital structure is that it provides an insight into the impact of the COVID-19 crisis on capital structure decisions of non-financial U.S. firms. By examining the capital structure in times of recession, this research will contribute to the ongoing debate on the optimal capital structure. Previous studies already focused on the impact of the Great Recession in 2008 and found that both equity and debt levels significantly changed during the crisis (Iqbal & Kume, 2014; Proença, Laureano & Laureano, 2014). However, the limited findings of recent research that consider the impact of the COVID-19 pandemic on capital structure vary more widely (Iftikhar, 2021; Closs, 2021; Vo, Mazur & Thai, 2021). Therefore, this research provides additional evidence on the disputable impact of COVID-19 on financial leverage. Finally, this paper will be the first to examine the effect of capital structure on profitability and firm value during the COVID-19 pandemic. The insights of the paper are unique to recessions caused by the outbreak of a global disease and can be useful for companies to better arm their business against future pandemics. Moreover, investors can interpret the outcomes of the study to make more rational investment decisions.

The remaining sections of the paper are organized as follows. The upcoming section provides an overview of the existing literature on capital structure, after which various hypotheses are formulated. Subsequently, the fourth section discusses the methodology that is used to test the hypotheses. The collection of the data is mentioned in section five, whereas the results of the research are presented and explained in section six. The paper ends with the conclusion of the study in section seven along with the discussion of the research.

2. Literature Review

Companies fund their operations by raising capital from a variety of distinct resources. The capital structure of the firm is a direct determinant of the overall costs of capital and contributes to the firm's total level of risks (Dao & Ta, 2020). These various sources of capital have important consequences for the value of a company and hence shareholder wealth (Baker & Martin, 2011). Since financing decision is one of the most crucial elements of corporate finance, it has attracted considerable attention from academics. However, previous research has not yet reached a consensus on the optimal capital structure, which is the proportion of debt and equity that maximizes firm value and minimizes the average cost of capital (Cheng, Liu & Chien, 2010). Because of these mixed theoretical and empirical results, research towards the effects of the capital structure on profitability and firm value is still quite relevant, especially in times of financial recessions.

2.1 Capital Structure Theories

The publication of Modigliani and Miller (1958) started the discussion on capital structure by arguing that firm value is independent of financing structure and that there is no optimal capital structure for a specific firm. However, the capital structure irrelevance principle is based on some idealized assumptions, as it assumes perfect and frictionless capital markets (Myers, 2001). In the subsequent paper, Modigliani and Miller (1963) relaxed the assumption of perfect capital markets by incorporating corporate tax benefits as determinants of the capital structure of companies. In the real world, financing decisions are influenced by taxation as the interest is considered a tax-deductible expense. Therefore, firm value is increased through the use of debt in the capital structure of a company, due to the tax advantage of interest payments (Cheng Liu & Chien, 2010). By including the tax benefit of debt financing into the model, Modigliani and Miller (1963) now conclude that the capital structure is actually relevant for firm performance and state that financing operations entirely with debt is most beneficial for a company.

After Modigliani and Miller (1963) revised their statement about the irrelevance of capital structure by incorporating tax advantages, the financing decision attracted more academic attention. Lots of research was conducted on the determinants of capital structure, from which multiple alternative theories of optimal capital structure have been developed. These theories incorporated a variety of elements in the capital structure model, such as agency cost, bankruptcy cost, transaction cost, time to market, etc. (Javed & Jahanzeb, 2012). However, the two most acceptable theories on capital structure are the traditional trade-off theory and the pecking order theory (Mostafa & Boregowda, 2014). According to Fama and French (2002), some firms follow the traditional trade-off theory, while others pursue the pecking order theory, but neither theory can be rejected. Therefore, these two dominant competitive theories are the focus of the paper and will be discussed in more detail.

2.1.1 Traditional Trade-Off Theory

The longest standing theory of capital structure is the traditional trade-off theory, which was developed in response to the debate on the theorem of Modigliani and Miller (1963). After including corporate income tax in the capital structure model, a tax advantage of debt was identified since it served to shield earnings from taxes (Luigi & Sorin, 2009). Since the theorem does not consider the costs of additional debt, the Modigliani-Miller proposition implies that companies should be entirely financed with debt. Later, it was recognized that advantages of the tax shield of debt are largely offset by the costs of financial distress (Kraus & Litzenberger, 1973). Consistently, the trade-off theory not only includes the tax benefits of debt financing, but also considers the costs of financial distress.

The most controversial statement of the traditional trade-off theory is the proposition that every firm has an optimal capital structure. This debt ratio equals the point where the marginal benefit of debt arising from the interest tax shield equals the marginal cost of debt associated with the increased probability of bankruptcy (Abel, 2018). Accordingly, firms increase their financial leverage until it reaches its target debt ratio, which is not directly observable but may be computed from different firm variables such as debt-to-equity, size, growth options, etc. (Fama & French, 2002). Since the traditional trade-off theory also considers the costs of financial distress, companies with more costs of financial distress are expected to have less debt within their capital structure (Mostafa & Boregowda, 2014). Highly profitable firms have capacity for greater levels of debt, taking substantial advantage of debt tax shields (MacKie-Mason, 1990). These profitable companies are more likely to be able to meet debt and interest payback obligations, resulting in a lower risk of bankruptcy.

2.1.2 Pecking Order Theory

The pecking order theory proposed by Myers (1984) and Myers and Majluf (1984), states that there is a hierarchy of firm performance regarding the financing of their investments. Due to information asymmetry between managers/owners and investors, firms prefer internal to external financing. Therefore, financing projects with retained earnings is the most preferable option. When outside funds are necessary, debt is preferred over equity because of lower information costs associated with debt issues (Frank & Goyal, 2003). Consequently, when there is an inadequate amount of retained earnings, the choice between debt and equity can serve as a signal to the market. Since equity is generally only issued as a last resort, the market will interpret equity issues as proof that the shares are overvalued, which will have a negative impact on the stock price (Sánchez-Vidal & Martín-Ugedo, 2005). Companies will only issue equity when the net benefit of an investment, including the share price drop, is positive. Unlike the traditional trade-off theory, the financing hierarchy of the pecking order theory predicts that highly profitable firms have a low debt ratio (Serrasqueiro & Caetano, 2015). These profitable firms have a greater capacity to accumulate retained profits, hence there is less need for external financing.

2.2 Capital Structure during Recessions

Since the beginning of the 20th century, there have been three financial crises prior to the COVID-19 crisis. The first of which was the bursting of the dot.com bubble in 2000, leading to a subsequent two-year recession (Wheale & Amin, 2003). The stock market bubble was caused by excessive speculation of investors in the internet sector, since internet use and adoption had grown massively in the late 1990s (Cassidy, 2003). The internet-based tech companies could not keep up with investors' earnings expectations, which led to highly overvalued stocks. When investors realized the mispricing of the stocks, the bubble burst. The subprime mortgage crisis in 2008 is considered the most severe financial crisis since the Great Depression due to its worldwide impact. When the housing bubble burst in the United States, homeowners were left with a mortgage loan that was greater than the value of their home (Baker, 2008). Homeowners abandoned their mortgages, resulting in lower values of mortgage-backed securities by investment banks. The bankruptcy of major investment banks in combination with the interconnectedness of the global financial system turned the financial disruption in the U.S. into a global financial crisis (Mishkin, 2011). The impact of the global financial crisis has also contributed to the third financial crisis, which is the European sovereign debt crisis that peaked in the period 2010-2012 (European Financial Stability Facility, 2019). Lenders sought higher interest rates from Eurozone countries due to growing concerns about excessive sovereign debt. These higher interest rates forced several European countries into further financial distress (Lane, 2012).

Research conducted by Alves and Francisco (2015) concludes that during these three recent financial crises, companies increase short-term borrowing while decreasing long-term issuance. Moreover, the authors find evidence that companies increase leverage ratios in periods of economic distress. Due to the exogenous character and the severe global impact on financial markets, the COVID-19 crisis can best be compared to the financial crisis in 2008. In addition, lots of research has been conducted into the impact of the Great Recession on capital structure and financial markets. The researchers Iqbal & Kume (2014) support the finding that corporate leverage increases during the global financial crisis in 2008, but also indicate that leverage ratios decrease in the post-crisis period. However, multiple studies find significant evidence of companies adjusting their leverage ratios downward during the global financial crisis (Proença, Laureano & Laureano, 2014; Demirgüç-Kunt, Martinez Peria & Tressel, 2015; D'Amato, 2020). The discrepancy of the empirical research findings illustrates the importance of additional evidence of capital structure during economic recessions. Looking at the association between capital structure and profitability during the financial crisis, the inferences are more consistent. Both Harrison and Widjaja (2014) and Banerjee (2017) conclude that during the financial crisis, corporate leverage is negatively correlated with profitability. Companies prefer to finance investments internally rather than externally, which is in line with the pecking order theory. However, the opposite sign is observed in the post-crisis period, suggesting that companies act in accordance with the trade-off theory.

3. Hypothesis Development

Since the publication of the findings of Modigliani and Miller (1958), lots of research has been conducted regarding the finance structure of companies. However, capital structure and its relation towards profitability and firm value is still a continuing controversy due to inconsistent findings. This paper contributes to the extant literature on capital structure by examining its implications and influence on a company in times of economic distress caused by the exogenous outbreak of the COVID-19 virus. Therefore, three different hypotheses are developed to answer the main research question of this paper.

3.1 Impact of COVID-19 on Capital Structure

To assess the relevance of the research, the first hypothesis will focus on the impact of the COVID-19 crisis on capital structure. As discussed in Section 2.2, companies are found to change their leverage ratios significantly during and after the global financial crisis in 2008. However, researchers do not reach a consensus on the sign of the change. Diverse findings also appear in the limited literature on capital structure during the COVID-19 pandemic. Studying companies located in the United States, Closs (2021) found no statistically significant change in corporate leverage between the pre-pandemic period and the pandemic period. Consistently, Iftikhar (2021) finds no significant change in overall capital structure during the COVID-19 pandemic when considering Pakistani companies. On the contrary, studies by Vo, Mazur and Thai (2021) and Mohd Azhari, Mahmud and Shaharuddin (2022) do find significant evidence that firms adjust leverage ratios due to the COVID-19 pandemic. To further investigate the differing results and thereby assessing the relevance of this research, the first hypothesis that will be tested equals:

H1: Capital structure significantly changed after the outbreak of the COVID-19 pandemic

3.2 Capital Structure and Profitability

As explicated in Section 2.1, the relation between capital structure and firm profitability has been investigated by numerous researchers. These different studies resulted in several different theories, from which the trade-off theory and the pecking order theory are the most widely accepted. Consistent with the trade-off theory, some studies found evidence for a positive relation between corporate leverage and firm profitability (Roden & Lewellen, 1995; Gill, Biger & Mathur, 2011). However, the majority of empirical research observes a negative association between capital structure and profitability, which is in line with the pecking order theory (Friend & Lang, 1988; Wald, 1999; Huang & Song, 2006). Moreover, there is substantially more evidence in favor of the pecking order theory in times of a recession. Thus, in order to gain more insight into the relation between capital structure and profitability during the COVID-19 pandemic, the following hypothesis will be tested:

H2: Profitability is negatively affected by capital structure during the COVID-19 pandemic

3.3 Capital Structure and Firm Value

Firm value is defined as the investor's perception toward the success of a company and is often affiliated with the stock market price (Sumaryati & Tristiarini, 2018). Hunt (2009) states that the firm value equals the total market capitalization of the company, which is equity plus net debt, known as market value. Hence, high stock prices create a high firm value. A high firm value demonstrates not only the credibility of the firm performance, but also indicates the firm's prospect in the future (Setiadharma & Machali, 2017). Research by Haugen and Baker (1996) argued that the higher the profitability of the firm, the more profit can be allocated to the shareholders, which increases the value of the company. Moreover, stable earnings communicate positive signals to the stock market, increasing firm value (Chen & Steiner, 2000; López-Iturriaga & Rodríguez-Sanz, 2001). Interestingly, the results of previous studies on the relation between capital structure and firm value are equally scattered as the results on the association between capital structure and profitability. Where Hirdinis (2019) finds a positive effect of leverage on firm value for Indonesian companies, the study by Kodongo, Mokoaleli-Mokoteli and Maina (2015) finds no significant impact of capital structure on firm value when considering firms in Kenya. However, when looking at the limited studies that focus on U.S. companies, a negative effect of corporate leverage on firm value predominates (Aggarwal & Zhao, 2007). Yet, no studies have been conducted on the relation between capital structure and firm value in times of the COVID-19 pandemic. Accordingly, the following hypothesis will be tested:

H3: Capital structure has a negative effect on firm value during the COVID-19 pandemic

4. Methodology

Testing the three formulated hypotheses requires two different regression models. The first model concerns a before-after analysis to examine the impact of the COVID-19 pandemic on capital structure decisions. After establishing the effect of the pandemic on corporate leverage, the effect of capital structure on profitability and firm value during the COVID-19 pandemic is estimated using both fixed effects and random effects models. Control variables are included in all regression models to limit the influence of confounding variables. All calculations, regressions and analyses are performed on the statistical software Stata.

4.1 Before-After Analysis

In order to test the first hypothesis, which states that companies changed their capital structure significantly in response to the COVID-19 pandemic, a before-after analysis will be conducted. Similar to Morri and Artegiani (2014) who examined the effect of the global financial crisis on capital structure, a fixed effects panel data regression model is used to capture the impact of the COVID-19 pandemic. The dependent variable of the model is capital structure, which is measured in previous research using three different debt ratios: short-term debt to total assets (*STDTA*), long-term debt to total assets (*LTDTA*) and total debt to total assets (*TDTA*) (Jordan, Lowe, & Taylor, 1998; Cassar & Holmes, 2003; Abor, 2005). The main variable of interest in the different models is the dummy-variable *COVID* which takes a value of one for periods in which the COVID-19 virus was active and zero otherwise. The significance of these coefficients indicates whether capital structure significantly changed after the outbreak of the COVID-19 pandemic. Moreover, following Mohd Azhari, Mahmud and Shaharuddin (2022), all models include firm-specific factors that may influence leverage ratios. Accordingly, the equations of the before-after analysis are equal to:

$$STDTA_{it} = \beta_0 + \beta_1 COVID + \beta_2 PROFIT_{it} + \beta_3 OPP_{it} + \beta_4 TANG_{it} + \beta_5 LIQ_{it} + \beta_6 SIZE_{it} + \varepsilon_{it} \quad (1)$$

$$LTDTA_{it} = \beta_0 + \beta_1 COVID + \beta_2 PROFIT_{it} + \beta_3 OPP_{it} + \beta_4 TANG_{it} + \beta_5 LIQ_{it} + \beta_6 SIZE_{it} + \varepsilon_{it} \quad (2)$$

$$TDTA_{it} = \beta_0 + \beta_1 COVID + \beta_2 PROFIT_{it} + \beta_3 OPP_{it} + \beta_4 TANG_{it} + \beta_5 LIQ_{it} + \beta_6 SIZE_{it} + \varepsilon_{it} \quad (3)$$

4.1.1 Control Variables

Profitability is included in the model as a control variable for capital structure due to its ambiguous association with capital structure, as indicated in multiple studies. Following Titman and Wessels (1988), the independent variable *PROFIT* is measured by the ratio of earnings before interest and tax expenses (EBIT) to total assets. The use of EBIT is preferred over other measures of profitability since it is presumed to be independent from the capital structure of a company. Without the EBIT correction, a negative correlation between leverage and profitability is expected: when the debt-to-equity ratio rises, interest rates are expected to be higher, resulting in lower net income over the same amount of total assets.

The study by Myers (1977) states that corporate leverage is expected to be negatively related with growth opportunities. Firms with high debt levels are more likely to forego profitable investment opportunities due to restrictive debt covenants, known as the debt overhang problem. High-growth firms might be reluctant to issue debt to exercise the investment, since it would effectively transfer wealth from stockholders to creditors (Titman & Wessels, 1988). In accordance with Zarebski and Dimovski (2012), the variable *OPP* is measured as the market-to-book value ratio which represents the growth opportunities of a company. The choice of a market value measure has the benefit of being an ex-ante and forward-looking forecast. Stock prices are considered to reflect future growth opportunities of a company, since investors make forecasts about the firm's potential for growth.

Tangible assets might be utilized as collateral, which is considered a critical factor in determining the capital structure of a company. Consequently, the financial risk of the creditor is inversely related to the ratio of tangible assets (Booth, Aivazian, Demirgüç-Kunt & Maksimovic, 2001). When the fraction of tangible assets is greater, the risk of default to the creditor would be smaller and vice versa. Consistent with prior literature, a positive relation between tangibility and capital structure is expected (Rajan & Zingales, 1995; Huang & Song, 2006; Delcoure, 2007). Since tangibility is systematically found to positively influence corporate leverage, the variable *TANG* is incorporated in the models. The firm's tangibility is proxied as the fixed assets scaled by total assets.

The net effect of liquidity is more ambiguous, as Mouamer (2011) concluded that it has both positive and negative impacts on capital structure. Firms with high liquidity ratios may have high debt levels, because they have to meet debt obligations. This indicates that liquidity and corporate leverage are positively related. However, most empirical studies find significant evidence of a negative relation (Eriotis, Vasiliou & Ventoura-Neokosmidi, 2007; De Jong, Kabir & Nguyen, 2008; Shahzad, Azeem, Nazir, Vo & Linh, 2021). The variable *LIQ* represents the company's liquidity and is measured using the quick ratio, which is calculated by current assets minus inventories and then dividing it by current liabilities.

The effect of firm size on capital structure is the most unequivocal. Previous research seems to agree that company size has a positive effect on corporate leverage even if their explanation varies (Jahanzeb, Bajuri & Ghori, 2015). Larger firms may be able to take advantage of economies of scale when issuing debt, while lending for smaller firms is more costly due to fixed costs of financial transactions. Moreover, large firms are considered more transparent to outside investors, because of adequate financial records to document performance, which should give easier access to credit. Lastly, Rajan and Zingales (1995) argue that large companies tend to have higher survival rates because they have a tendency to be more diversified, which reduces the likelihood of defaulting on their debt obligations. Company size is represented in the regression models by the variable *SIZE*, which is measured by the natural logarithm of total sales.

4.2 Fixed Effects and Random Effects

After establishing whether capital structure significantly changed after the outbreak of the COVID-19 pandemic, the association between capital structure and firm performance during the pandemic is examined. Following Kodongo, Mokoaleli-Mokoteli and Maina (2015), who studied the influence of capital structure on profitability and firm value for Kenyan companies, both fixed effects and random effects models are performed. The main difference between the two models is that fixed effects models control for time-invariant unobserved individual characteristics that can be correlated with the observed independent variables, while random effects models assume there is no correlation. The Hausman test will be performed to decide which model produces the most consistent estimates. The null hypothesis states that there is no correlation between the unique errors and the regressors in the model. Consistently, the null hypothesis is that the random effects model is the preferred model, whereas the alternative hypothesis favors the fixed effects model.

Following the same reasoning as in the before-after analysis, capital structure, which is the main variable of interest, is measured by three different debt ratios: short-term debt to total assets (*STDTA*), long-term debt to total assets (*LTDTA*) and total debt to total assets (*TDTA*). The dependent variable of the various models is the performance of the company, which assesses how well a company executes its business and strategy. In addition, firm-specific and macroeconomics control variables are included to limit the influence of confounding variables. Consequently, the equations for the individual regression models are equal to:

$$PERF_{it} = \beta_0 + \beta_1 STDTA_{it} + \beta_2 TANG_{it} + \beta_3 LIQ_{it} + \beta_4 SIZE_{it} + \beta_5 SG_{it} + \beta_6 EG_{it} + \varepsilon_{it} \quad (4)$$

$$PERF_{it} = \beta_0 + \beta_1 LTDTA_{it} + \beta_2 TANG_{it} + \beta_3 LIQ_{it} + \beta_4 SIZE_{it} + \beta_5 SG_{it} + \beta_6 EG_{it} + \varepsilon_{it} \quad (5)$$

$$PERF_{it} = \beta_0 + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 LIQ_{it} + \beta_4 SIZE_{it} + \beta_5 SG_{it} + \beta_6 EG_{it} + \varepsilon_{it} \quad (6)$$

4.2.1 Performance Measures

The performance of a company is first proxied by its profitability to test the second hypothesis, which mentions that firm profitability is negatively affected by capital structure during the COVID-19 pandemic. Previous research measures profitability using two widely accepted financial performance ratios: return on assets (ROA) and return on equity (ROE). The main difference between the ratios is that the ROA divides net income (*NI*) by total assets (*TA*) to measure the overall profitability of a company, whereas ROE divides net income by total equity to compute the return on shareholder equity (Petersen & Schoeman, 2008). This paper will use ROA as a proxy for firm profitability and checks the robustness of the results using the ROE ratio. The formula for the return on assets equals:

$$ROA_{it} = \frac{NI_{it}}{TA_{it}} \quad (7)$$

To test the third hypothesis, which states that capital structure has a negative effect on firm value, firm performance is measured using the ratio developed by Tobin (1969). Similar to the vast majority of previous research, this study will use Tobin's Q as a proxy for firm value. When the Tobin's Q of a company is greater than 1, the market value of the firm is greater than the replacement of its recorded assets costs (Ali, Mahmud & Lima, 2016). Considering Tobin's premise that firm value should be equal to the value of its assets, values above 1 indicate that companies theoretically are overvalued while values less than 1 suggest that firms are undervalued. Following Lang, Lins and Maffett (2012), the ratio (*TOBINS'Q)* is defined as the value of a company's total assets (*TA*) plus the market value of equity minus the book value of equity (*CEQ*) scaled by total assets. The market value of equity equals the number of common shares outstanding (*CSO*) multiplied by the closing stock price (*PRCC*). In summary, the formula for Tobin's Q is equal to:

$$TOBIN'S\ Q_{it} = \frac{TA_{it} + (CSO_{it} * PRCC_{it}) - CEQ_{it}}{TA_{it}} \quad (8)$$

4.2.2 Control Variables

As extensively discussed in section 4.1.1, previous research suggests that several financial factors are important determinants of capital structure. Moreover, additional studies conclude that most of these factors significantly affect firm performance. To isolate the causal effect of capital structure on profitability and firm value, these fundamentals are included in the regression equation as control variables. In the subsequent paragraphs, the association between the control variables and firm performance will be briefly discussed.

The financial fundamentals asset tangibility (*TANG*), liquidity (*LIQ*) and firm size (*SIZE*) will be measured using the same proxies as in the before-after analysis. Asset tangibility is expected to have a negative effect on firm performance, since companies with higher levels of tangible assets are anticipated to hold less liquid assets. Firms with higher liquid assets were found to have a greater ability to discover long-term investment opportunities (Işık, 2017). The liquidity ratio of a company indicates the firm's ability to meet its short-term obligations (Sondakh, 2019). Consequently, firms with high liquidity ratios are considered financially healthy and stable, which stimulates its performance. Consistent with numerous previous studies, firm size is also expected to have a positive effect on performance. For example, Pervan and Višić (2012) argue that larger companies tend to enjoy economies of scale.

In the before-after analysis, growth opportunities were measured using a forward-looking approach since capital structure anticipates future investments. However, firm performance is mostly determined by historical financial information. Following Gill, Biger and Mathur (2011), growth opportunities are now approximated by sales growth (*SG*) measured in percentages and is expected to positively influence firm performance. Lastly, the variable for economic growth (*EG*) is proxied by the rate of quarterly GDP growth to control for macroeconomic impact.

5. Data

The sample that will be used throughout the paper contains all the companies listed on the Standard & Poor's 500 (S&P 500) index for the fiscal period 2017Q4-2022Q1, since it is considered one of the best representations of the U.S. stock market (Montenegro & Molina, 2020). The index contains the 500 largest companies ranked by market value and is continually updated to maintain a representative index. Accordingly, the S&P 500 index constitutes for about 83 percent of the market capitalization of all regularly traded stocks on the New York, American and NASDAQ exchanges (Siegel & Schwartz, 2006). This section first describes the sample period in more detail, after which the criteria for the S&P 500 companies is discussed. Thereafter, the descriptive statistics of the data is summarized.

5.1 Data Collection

According to the Centers for Disease Control and Prevention (CDC, 2022), the first laboratory-confirmed case of COVID-19 in the U.S. was observed on January 18, 2020, in Washington state. The rapid spread of the highly contagious virus led to the declaration of an official pandemic on March 11, 2020. Consequently, the effect of the COVID-19 pandemic may first be observed in the first fiscal quarter of 2020. Therefore, this study considers the pandemic period from 2020Q1 to 2022Q1, which is the most recent quarterly financial information at the time of writing. To counterbalance the data during the pandemic, an equal number of quarters will be included from before the outbreak of the virus, representing the fiscal period from 2017Q4 to 2019Q4. Ultimately, each company will have nine quarters of financial data for both the pre-pandemic and the pandemic period. The study deliberately chose to consider quarterly data, since it increases the number of observations as the pandemic is still continuing. Moreover, the consequences of the pandemic may be more pronounced in fiscal quarters than in fiscal years due to constantly evolving government regulations. Additionally, the U.S. Securities and Exchange Commission (2022) requires all public companies to file quarterly reports on Form 10-Q. The whole sample period is used to test the first hypothesis, while the second and the third hypothesis only considers the pandemic period. All required information for the control variables, independent variables and ratios are retrieved from Compustat, whereas information on the quarterly GDP growth rate is provided by the Organisation for Economic Co-operation and Development (OECD, 2022).

According to Chan, Kot and Tang (2013), the most common reason for being delisted from the S&P 500 index is that companies are declining in market capitalization. To reduce survivorship bias, the sample data includes all companies that have been or are still listed on the S&P 500 index in the considered sample period. If the sample only included companies listed for the entire period, the results may be biased as these firms have all proven to be financially stable and profitable. Other reasons for being delisted is when firms are merged, liquidated or filed for bankruptcy (Jain, 1987). However, these companies are excluded from the sample as they lack financial information.

In addition, companies in the financial and securities sector with beginning SIC codes 60-67 are omitted from the sample since these companies have substantially different financial characteristics and use of leverage than other firms (Diamond & Rajan, 2000; Pandey, 2004). Furthermore, companies operating in the transportation service and airline sector, SIC codes starting with 47 and 45, respectively, are excluded from the sample as these sectors receive additional resources to mitigate the excessive impact of the COVID-19 pandemic on these specific sectors (U.S. Department of the Treasury, n.d.). Lastly, companies that have five consecutive quarters of missing data for one of the variables or only have annual data available on Compustat for more than two years are eliminated from the sample. Ultimately, the final sample consists of 355 companies, which is summarized in Table A.1 and Table A.2.

5.2 Descriptive Statistics

After collecting all relevant information for the sampled firms, the few remaining missing values are estimated using linear interpolation, which is in accordance with the findings of Noor, Al Bakri Abdullah, Yahaya and Ramli (2015). Subsequently, all variables are winsorized to mitigate the impact of outliers except for the COVID-19 dummy variable and the variable for economic growth, since these are actual values. Looking at the descriptive statistics of the data in Table 1, it appears that capital structure strongly varies, especially for long-term debt and total debt. In addition, the sampled companies seem to be generally financially healthy, indicated by positive mean values for profitability, return on assets and Tobin's Q. The high values for firm size show that the companies are relatively large. Lastly, the correlation matrix presented in Table A.3 indicates that multicollinearity is not a major concern, since the correlation coefficients between the explanatory variables are generally low.

Table 1 Descriptive statistics of the variables

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Short-term debt to total assets (STDTA)	6,390	0.03357	0.03536	0	0.18861
Long-term debt to total assets (LTDTA)	6,390	0.31038	0.16652	0	0.90324
Total debt to total assets (TDTA)	6,390	0.34437	0.17475	0	0.92470
COVID-19 dummy-variable (COVID)	6,390	0.5	0.50004	0	1
Profitability (PROFIT)	6,390	0.02723	0.02161	-0.03429	0.09829
Growth opportunities (OPP)	6,390	6.18005	6.53266	0.47686	26.0398
Tangibility (TANG)	6,390	0.28642	0.24440	0.01941	0.87340
Liquidity (LIQ)	6,390	1.37636	1.09178	0.17775	6.57695
Firm size (SIZE)	6,390	7.88106	1.21034	5.01728	11.0673
Return on assets (ROA)	6,390	0.01817	0.02370	-0.07208	0.09220
Return on Equity (ROE)	6,390	0.00829	0.02349	-0.14364	0.07213
Tobin's Q (TOBIN)	6,390	2.88842	2.19308	0.90588	12.4956
Sales growth (SG)	6,390	0.02842	0.16178	-0.45962	0.74847
Economic growth (EG)	6,390	0.00514	0.02863	-0.08937	0.07548

The table shows the descriptive statistics of the variables used in the study. Financial data is retrieved from the Compustat database, whereas data on the quarterly GDP growth rate is provided by the Organisation for Economic Co-operation and Development (OECD). The data includes both nine quarters prior to the COVID-19 pandemic and during the pandemic for the fiscal period 2017Q4-2022Q1 for 355 companies that were/are listed on the S&P 500 in this period. Each variable contains 6,390 observations, making it a balanced panel data.

6. Results

In this section, the evidence of the hypotheses is presented in the order in which they were formulated. First of all, the results of the fixed effects panel data regression model for the before-after analysis are exhibited to test the first hypothesis. Hereafter, the data during the COVID-19 pandemic is first tested on stationarity using the method proposed by Harris-Tzavalis (1999). After establishing that the time series are stationary, the results for the fixed effects and random effects models are presented to examine the second and third hypothesis. This section concludes with assessing the robustness of some evidence found.

6.1 Capital Structure and COVID-19

To determine whether the COVID-19 pandemic has actually had a significant impact on capital structure decisions, as stated in the first hypothesis, a before-after analysis is performed. The results of the model that is estimated using three alternative proxies for financial leverage are presented in Table 2. Overall, the findings of the determinants for capital structure are quite promising, since nearly all coefficients are statistically significant at the one percent level. The main variable of interest is the dummy variable *COVID*, since the coefficient indicates whether the COVID-19 pandemic significantly affected capital structures. Looking at the first equation in the table, it follows that the COVID-19 pandemic had a negative impact on short-term debt to total assets of -0.00143, which is statistically significant at the five percent level. This evidence is consistent with the findings of D'Amato (2020), who concluded that Italian small- and medium-sized enterprises significantly decreased their leverage during the global financial crisis, particularly their short-term debt exposure. However, the coefficients of *COVID* in the second and third equation are equal to 0.02668 and 0.02466, respectively, and are both statistically significant at the one percent level. Accordingly, the COVID-19 pandemic had a positive impact on the long-term debt to total assets and on the total debt to total assets. Compared to the impact of the global financial crisis on capital structure, this finding is in accordance with Iqbal and Kume (2014) who concluded that European countries on average significantly increased leverage ratios from pre-crisis period to crisis period. In contrast to the results of Closs (2021) and Iftikhar (2021), this study finds statistically significant evidence that capital structure changed after the outbreak of the COVID-19 pandemic. Therefore, the first hypothesis is accepted.

In accordance with the trade-off perspective and the empirical literature, evidence is found that tangibility positively affects capital structure for all leverage ratios at the one percent significance level. However, the statistically significant negative coefficients of profitability provide solid support for the pecking order theory, as profitable firms prefer to use internal funds rather than external resources. The evidence for liquidity and growth opportunities is more diversified. Significant evidence indicates that both variables simultaneously reduce the short-term debt ratio, while increasing the long-term ratio. Total debt is significantly negatively affected by liquidity, while the impact of growth opportunities is insignificant.

The most surprising result of the before-after analysis is the effect of firm size on capital structure. The vast majority of previous empirical literature finds support for the trade-off theory, which predicts a positive impact of firm size on leverage due to economies of scale and a lower likelihood of defaulting on debt obligations. However, this study supports the pecking order theory since the coefficients for firm size are negative and significant at the one percent level. According to the pecking order perspective, profitable companies are able to generate funds internally and thus will attract less debt. The adjusted R-squared is highest for the third equation, indicating that the model explains 12.93 percent of the variation in the dependent variable represented by the total debt to total assets ratio.

Table 2 Results of the before-after analysis

	Equation 1	Equation 2	Equation 3
Constant	0.10082***	0.40260***	0.50623***
	(8.92)	(14.33)	(17.22)
COVID	-0.00143**	0.02668***	0.02466***
	(-2.41)	(18.07)	(15.96)
PROFIT	-0.15067***	-0.51654***	-0.66929***
	(-5.52)	(-7.61)	(-9.43)
OPP	-0.00042***	0.00087***	0.00031
	(-4.65)	(3.91)	(1.34)
TANG	0.04843***	0.40607***	0.45169***
	(5.80)	(19.58)	(20.81)
LIQ	-0.01404***	0.00760***	-0.00589***
	(-20.67)	(4.49)	(-3.34)
SIZE	-0.00690***	-0.02837***	-0.03542***
	(-4.92)	(-8.13)	(-9.70)
Number of obs.	6,390	6,390	6,390
Adjusted R-squared	0.0441	0.1152	0.1293
F-value	22.33	124.70	122.99
	[0.000]	[0.000]	[0.000]

The table reports the coefficients of the fixed effects panel data regression models. The equations represent different dependent variables as proxy for financial leverage: short-term debt to total assets, long-term debt to total assets and total debt to total assets. The p-values of the reported test statistics are displayed in square brackets, while the t-values of the coefficients are reported in parentheses. The significance levels of the coefficients are indicated by the number of asterisks, where: * is $p < 0.10$; ** is $p < 0.05$ and *** is $p < 0.01$.

6.2 Profitability

The before-after analysis is performed using the whole sample period (2017Q4-2022Q1) to test whether capital structure significantly changed after the exogenous outbreak of the COVID-19 pandemic. These variables are assumed to differ between the pre-pandemic and the pandemic period. However, to examine the effect of capital structure on profitability and firm value, only data during the COVID-19 pandemic period (2020Q1-2022Q1) is used. The variables included in the pandemic period should be consistent over time to increase the accuracy of the coefficients as spurious regression estimates may occur when time series are non-stationary (Ghouse, Khan & Rehman, 2018).

Therefore, the time series in the COVID-19 pandemic period are tested on stationarity using the panel unit root tests as proposed by Harris-Tzavalis (1999), since this test assumes that the number of panels tends to infinity while the number of time periods is fixed. The null hypothesis of the test states that the panels have a unit root, meaning that the time series are non-stationary. The alternative hypothesis mentions that the time series of the panels are stationary and do not have a unit root. Considering the outcomes of the Harris-Tzavalis unit root test for the individual variables reported in Table 3, it can be concluded that all panels of the variables are stationary. The p-value of the test is equal to 0.00 for each individual variable, allowing the null hypothesis to be rejected at the one percent significance level.

Table 3 Unit root tests results

ROA	ROE	TOBIN	STDTA	LTDTA	TDTA	TANG	LIQ	SIZE	SG	EG
-36.80	-34.55	-14.77	-24.42	-10.93	-8.40	-9.86	-22.77	-20.24	-58.00	-43.71
[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

The table displays the test statistics for the panel unit root tests as proposed by Harris-Tzavalis (1999). The time series of the variables are considered during the COVID-19 pandemic period, which equals the fiscal period from 2020Q1 to 2022Q1. The p-values of the test statistics are presented in square brackets.

The results of the fixed effects and random effects models with return on assets (ROA) as the measure of firm profitability is presented in Table 4. To determine the appropriate model, the method proposed by Hausman (1978) is performed. The null hypothesis, which states that the unique errors are uncorrelated with the regressors, is for each equation rejected. This indicates that the estimates of the fixed effects model are more accurate, which is confirmed by the higher R-squared coefficient. Looking at the fixed effects models in Table 4, the coefficients for the capital structure metrics are equal to -0.0369, -0.0570 and -0.0601. Consistent with the findings of Harrison and Widjaja (2014) and Banerjee (2017), these statistically significant negative coefficients support the pecking order theory. The second hypothesis, which stated that profitability is negatively affected by capital structure during the COVID-19 pandemic, is therefore accepted.

In addition, most control variables have significant coefficients. Asset tangibility appears to have a relatively great impact on firm profitability. The coefficients are negative and significant at the one percent level for all equations, which is in accordance with prior findings. The magnitude of the coefficients for firm size and sales growth is fairly smaller. Yet, the positive coefficients are all significant at the one percent level, which suggests the positive impact on profitability. The positive effect of liquidity on profitability is less pronounced, since the coefficients are smaller and less significant. However, the coefficients are sufficiently significant to support the positive association between liquidity and firm profitability found in previous empirical research. Surprisingly, the coefficients for the macroeconomic control variable measured by quarterly GDP growth are all insignificant, while a positive relation with profitability is expected. Current quarterly GDP growth is apparently not simultaneously anticipated in businesses and therefore not observed in firm profitability.

Table 4 Regression results with ROA as dependent variable

	Equation 4		Equation 5		Equation 6	
	FEM	**REM**	**FEM**	**REM**	**FEM**	**REM**
Constant	-0.1731***	-0.0446***	-0.1544***	-0.0382***	-0.1402***	-0.0338***
	(-13.46)	(-7.12)	(-12.03)	(-5.98)	(-10.61)	(-5.23)
STDTA	-0.0369**	-0.0601***				
	(-2.56)	(-4.34)				
LTDTA			-0.0570***	-0.0336***		
			(-7.90)	(-7.16)		
TDTA					-0.0601***	-0.0375***
					(-8.70)	(-8.31)
TANG	-0.0554***	-0.0254***	-0.0444***	-0.0199***	-0.0486***	-0.0197***
	(-3.77)	(-6.56)	(-3.06)	(-5.06)	(-3.36)	(-5.02)
LIQ	0.0016*	0.0020***	0.0030***	0.0026***	0.0020***	0.0021***
	(1.93)	(2.92)	(3.89)	(4.06)	(2.59)	(3.21)
SIZE	0.0260***	0.0086***	0.0251***	0.0086***	0.0240***	0.0085***
	(19.56)	(12.10)	(19.23)	(12.11)	(18.17)	(11.90)
SG	0.0118***	0.0200***	0.0119***	0.0197***	0.0122***	0.0197***
	(7.33)	(12.45)	(7.50)	(12.39)	(7.72)	(12.41)
EG	-0.0024	0.0089	-0.0009	0.0114	-0.0028	0.0099
	(-0.34)	(1.23)	(-0.13)	(1.59)	(-0.41)	(1.38)
Number of obs.	3,195	3,195	3,195	3,195	3,195	3,195
R-squared	0.2218	0.1685	0.2368	0.1875	0.2403	0.1944
Hausman test	283.48		304.16		300.01	
	[0.000]		[0.000]		[0.000]	

The table reports the coefficients of both the fixed effects and the random effects panel data regression models with return on assets (ROA) as dependent variable. To determine the appropriate model, the method proposed by Hausman (1978) is performed. The various equations include different metrics for capital structure in the model, which is the main variable of interest. The p-values of the reported test statistics are displayed in square brackets, while the t-values of the coefficients are reported in parentheses. The significance levels of the coefficients are indicated by the number of asterisks, where: * is $p < 0.10$; ** is $p < 0.05$ and *** is $p < 0.01$.

6.3 Firm Value

This section measures firm performance using Tobin's Q, which proxies firm value. Looking at the regression results in Table 5, the Hausman test statistics indicate that the estimates of the fixed effects models are more accurate. Consequently, the significant negative coefficients for the metrics of capital structure support the findings of Aggarwal, Kyaw and Zhao (2008). In contrast to the findings of the regression models measuring firm performance with return on assets, most of the coefficients for the control variables are now insignificant. Tangibility, liquidity and sales growth are no significant determinants of firm value. For firm size, the coefficients are still positive and significant at the one percent level. However, the relatively large significant positive coefficients for macroeconomic growth are most noticeable compared to the established insignificant effect on profitability. A possible explanation is that investors are forward-looking and therefore incorporate the current quarterly GDP growth rate into the valuation of the company. Overall, significant evidence is found that capital structure has a negative effect on firm value, meaning that the third hypothesis is accepted.

Table 5 Regression results with Tobin's Q as dependent variable

	Equation 4		Equation 5		Equation 6	
	FEM	**REM**	**FEM**	**REM**	**FEM**	**REM**
Constant	-0.6118	2.2734***	-1.0912*	2.0610***	-0.4533	2.5553***
	(-1.05)	(4.94)	(-1.85)	(4.41)	(-0.75)	(5.35)
STDTA	-3.6781***	-4.0463***				
	(-5.65)	(-6.20)				
LTDTA			-0.6228*	-0.9093***		
			(-1.88)	(-3.01)		
TDTA					-1.3708***	-1.5711***
					(-4.32)	(-5.44)
TANG	0.3696	-1.9200***	0.7426	-1.6835***	0.7438	-1.6104***
	(0.56)	(-5.10)	(1.11)	(-4.43)	(1.12)	(-4.26)
LIQ	-0.0233	0.0074	0.0503	0.0834**	0.0362	0.0638*
	(-0.63)	(0.20)	(1.40)	(2.40)	(1.02)	(1.85)
SIZE	0.4647***	0.1794***	0.5092***	0.2049***	0.4673***	0.1769***
	(7.75)	(3.56)	(8.50)	(4.06)	(7.70)	(3.49)
SG	-0.0298	0.0871	-0.0441	0.0778	-0.0327	0.0837
	(-0.41)	(1.20)	(-0.61)	(1.06)	(-0.45)	(1.15)
EG	1.2390***	1.3265***	1.3631***	1.4737***	1.3219***	1.4188***
	(3.94)	(4.14)	(4.32)	(4.59)	(4.20)	(4.43)
Number of obs.	3,195	3,195	3,195	3,195	3,195	3,195
R-squared	0.0543	0.0429	0.0449	0.0321	0.0499	0.0384
Hausman test	137.16		139.45		133.79	
	[0.000]		[0.000]		[0.000]	

The table reports the coefficients of both the fixed effects and the random effects panel data regression models with Tobin's Q as dependent variable. To determine the appropriate model, the method proposed by Hausman (1978) is performed. The various equations include different metrics for capital structure in the model, which is the main variable of interest. The p-values of the reported test statistics are displayed in square brackets, while the t-values of the coefficients are reported in parentheses. The significance levels of the coefficients are indicated by the number of asterisks, where: * is $p < 0.10$; ** is $p < 0.05$ and *** is $p < 0.01$.

6.4 Robustness Checks

To assess the robustness of the findings that the COVID-19 pandemic has actually had a significant impact on capital structure decisions, the mean of the leverage ratios before and during the pandemic are compared. Looking at the results of the independent samples t-test presented in Table A.4, it follows that the mean difference for the short-term debt ratio is negative and significant at five percent, while the difference is positive and significant at the one percent level for both the long-term debt and total debt ratios. This additional evidence supports prior findings and therefore the acceptance of the first hypothesis. The robustness of the evidence for the negative association between capital structure and profitability is assessed by changing the dependent variable from return on assets (ROA) to return on equity (ROE), for which the results are presented in Table A.5. The negative coefficient for the short-term debt ratio is now insignificant, while the negative coefficients for both the long-term debt and total debt ratios remain significant at the one percent level. Although the evidence is less convincing, the second hypothesis is still accepted.

7. Conclusion

The exogenous outbreak of the highly contagious COVID-19 virus had a severe impact on the U.S. economy due to movement restrictions and lockdown measures imposed by the government. The pandemic increased uncertainty and public fear, compelling companies to adjust their business structure and reconsider capital structure decisions. Consequently, the purpose of this paper was to investigate the impact of the COVID-19 pandemic on capital structure and to gain insights into the effect of capital structure on profitability and firm value during the pandemic. Despite numerous studies on the relation between capital structure and firm performance, the capital structure debate is still a controversial discussion, especially during the COVID-19 pandemic. In order to answer the main research question of the paper, the traditional trade-off theory and the pecking order theory were consulted, since these competitive theories are found most dominant in prior empirical literature. The quarterly data for the fiscal period 2017Q4-2022Q1 relates to 355 firms that were/are listed on the S&P 500 during this period.

7.1 Main Results

The first hypothesis, stating that capital structure significantly changed in response to the COVID-19 pandemic, is accepted. The results of the before-after analysis indicated a negative impact of the COVID-19 pandemic on the short-term debt to total debt ratio at five percent significance. However, the effect of the pandemic was positive for both the long-term debt to total assets and the total debt to total assets ratios at one percent significance level. The mean comparison test confirms these outcomes by performing an independent samples t-test, which produces almost identical estimates. Moreover, the findings support previous empirical evidence of companies that significantly adjusted their leverage ratios during recessions. The significant impact of the COVID-19 pandemic on capital structure is in line with the studies by Vo, Mazur and Thai (2021) and Mohd Azhari, Mahmud and Shaharuddin (2022). However, it contradicts the findings of Closs (2021) and Iftikhar (2021) who found insignificant results.

After establishing that the explanatory variables have stationary time series in the pandemic period, the fixed effects and random effects model regressions were performed in which firm profitability was proxied by the return on assets (ROA). The negative coefficients for the capital structure metrics were minimally significant at the five percent level. Consequently, the second hypothesis, which stated that capital structure negatively affects firm profitability during the COVID-19 pandemic, is accepted. When firm profitability is proxied by the return on equity (ROE), the evidence is less convincing, but still considered sufficient. The negative effect of capital structure on profitability provides evidence for the pecking order theory, which is in accordance with the majority of the empirical literature. More importantly, the findings support the importance of the pecking order theory during recessions. It complements the studies of Harrison and Widjaja (2014) and Banerjee (2017), who found evidence for the pecking order theory during the global financial crisis.

To test whether firm value is negatively affected by capital structure during the COVID-19 pandemic, as stated in the third hypothesis, firm performance is measured using Tobin's Q. In the fixed effects and random effects regression models, nearly all negative coefficients of the capital structure metrics are significant at the one percent level. In contrast to the extant literature on the association between capital structure and firm profitability, the literature on the effect of leverage on firm value is quite limited and scattered. Yet, the findings are in accordance with the most relatable study by Aggarwal and Zhao (2007), who also found significant evidence for the negative impact of capital structure on firm value. Accordingly, the third hypothesis is accepted.

Overall, the findings of this paper contribute to the limited and dispersed recent literature on the effect of the COVID-19 pandemic on capital structure. Statistically significant evidence suggest that companies adjust leverage ratios due to the outbreak of the COVID-19 virus. Moreover, this study is the first that provides statistically significant evidence on the effect of capital structure on firm performance measured by profitability and firm value during the COVID-19 pandemic. Prior empirical literature has previously found significant evidence supporting the pecking order theory in times of recession, but not with respect to the crisis caused by the exogenous outbreak of the COVID-19 pandemic.

7.2 Discussion

To decrease survivorship bias concerns, the conclusions in this study are based on companies that are currently listed on the S&P 500 index and on firms that were delisted in the fiscal period 2017Q4-2022Q1. Unfortunately, data for exactly one hundred companies over this period was unavailable on Compustat. Companies may be merged, liquidated or filed for bankruptcy, which results in incomplete data sets. The inevitable exclusion of these firms causes that concerns about survivorship bias have not been completely eliminated. Also, the study examines the association between the COVID-19 pandemic and capital structure rather than the causal effect, since the paper does not control for confounding events in that time frame. Furthermore, the sample period is relatively short since COVID-19 is still considered a pandemic at the time of writing. Future research will have to investigate the total effect of the COVID-19 pandemic on capital structure by including more observations as the pandemic continues. Moreover, the post-crisis period of the COVID-19 pandemic can be investigated in the future to examine the long-term effect of the pandemic on capital structures.

Since the literature on the capital structure of companies during the COVID-19 pandemic is quite limited and dispersed, the findings of this paper serve as introductory evidence. Now that the pandemic has been suggested to have a significant effect on capital structure in general, future research can conduct more specific research. For example, studies could focus on specific industries, since the influence of the COVID-19 pandemic outbreak on businesses changes for each area. In addition, the effect of the pandemic may vary across different countries due to country-specific COVID-19 regulations imposed by the government.

References

Abel, A. B. (2018). Optimal debt and profitability in the trade-off theory. *The Journal of Finance*, *73*(1), 95-143.

Abor, J. (2005). The effect of capital structure on profitability: an empirical analysis of listed firms in Ghana. *The Journal of Risk Finance, 6*(5), 438-445.

Aggarwal, R., Kyaw, N. A., & Zhao, X. (2008). Leverage and firm value: A global perspective. *Journal of Economics and Business*, *7*(2), 1-36.

Aggarwal, R., & Zhao, X. (2007). The leverage–value relationship puzzle: An industry effects resolution. *Journal of Economics and Business*, *59*(4), 286-297.

Ali, M. R., Mahmud, M. S., & Lima, R. P. (2016). Analyzing Tobin's Q Ratio of Banking Industry of Bangladesh: A Comprehensive Guideline for Investors. *Asian Business Review*, *6*(2), 85-90.

Alves, P., & Francisco, P. (2015). The impact of institutional environment on the capital structure of firms during recent financial crises. *The Quarterly Review of Economics and Finance*, *57*, 129-146.

Baker, D. (2008). The housing bubble and the financial crisis. *Real-World Economics Review*, *46*(20), 73-81.

Baker, H. K., & Martin, G. S. (2011). *Capital structure and corporate financing decisions: theory, evidence, and practice*. John Wiley & Sons.

Banerjee, A. (2017). Capital Structure and its determinants during the pre and post period of recession: Pecking order vs. Trade off theory. *Indian Journal of Finance (Scopus Indexed)*, *11*(1), 44.

Bolsover, G. (2020). Balancing freedoms, rights and responsibilities during COVID in US: a study of anti-and pro-restriction discourse. *Centre for Democratic Engagement*.

Booth, L., Aivazian, V., Demirgüç-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *The Journal of Finance*, *56*(1), 87-130.

Cassar, G., & Holmes, S. (2003). Capital structure and financing of SMEs: Australian evidence. *Accounting & Finance*, *43*(2), 123-147.

Cassidy, J. (2003). *Dot. con: How America lost its mind and money in the internet era*. HarperCollins Publishers.

Centers for Disease Control and Prevention. (2022). *COVID-19 Timeline*. Accessed at https://www.cdc.gov/museum/timeline/covid19.html on June 1, 2022.

Chan, K., Kot, H. W., & Tang, G. Y. (2013). A comprehensive long-term analysis of S&P 500 index additions and deletions. *Journal of Banking & Finance*, *37*(12), 4920-4930.

Chen, C. R., & Steiner, T. L. (2000). Tobin's q, managerial ownership, and analyst coverage: A nonlinear simultaneous equations model. *Journal of Economics and Business*, *52*(4), 365-382.

Cheng, Y. S., Liu, Y. P., & Chien, C. Y. (2010). Capital structure and firm value in China: A panel threshold regression analysis. *African Journal of Business Management*, *4*(12), 2500-2507.

Closs, L. (2021). The Relationship Between COVID-19 and Capital Structure. *University of Western Ontario.*

Cucinotta, D., & Vanelli, M. (2020). WHO declares COVID-19 a pandemic. *Acta Bio Medica: Atenei Parmensis*, *91*(1), 157.

D'Amato, A. (2020). Capital structure, debt maturity, and financial crisis: empirical evidence from SMEs. *Small Business Economics*, *55*(4), 919-941.

Dao, B. T. T., & Ta, T. D. N. (2020). A meta-analysis: capital structure and firm performance. *Journal of Economics and Development*.

De Jong, A., Kabir, R., & Nguyen, T. T. (2008). Capital structure around the world: The roles of firm-and country-specific determinants. *Journal of Banking & Finance*, *32*(9), 1954-1969.

Delcoure, N. (2007). The determinants of capital structure in transitional economies. *International Review of Economics & Finance*, *16*(3), 400-415.

Demirgüç-Kunt, A., Martinez Peria, M. S., & Tressel, T. (2015). The impact of the global financial crisis on firms' capital structure. *World Bank Policy Research Working Paper*, (7522).

Diamond, D. W., & Rajan, R. G. (2000). A theory of bank capital. T*he Journal of Finance*, *55*(6), 2431-2465.

Edim, N. O., Atseye, F. A., & Eke, F. A. (2014). Relationship between capital structure and firm's performance: Theoretical review. *Journal of Economics and Sustainable Development*, *5*(17), 72-76.

Eriotis, N., Vasiliou, D., & Ventoura-Neokosmidi, Z. (2007). How firm characteristics affect capital structure: an empirical study. *Managerial Finance, 33*(5), 321-331.

European Financial Stability Facility. (2019). *European Financial Stability Facility Societe Anonyme*. Accessed at https://www.esm.europa.eu/sites/default/files/2020-06-24_2019_efsf_financial_statements.pdf on May 13, 2022.

Fama, E. F., & French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. *The Review of Financial Studies*, *15*(1), 1-33.

Frank, M. Z., & Goyal, V. K. (2003). Testing the pecking order theory of capital structure. *Journal of Financial Economics*, *67*(2), 217-248.

Friend, I., & Lang, L. H. (1988). An empirical test of the impact of managerial self-interest on corporate capital structure. *The Journal of Finance*, *43*(2), 271-281.

Ghouse, G., Khan, S. A., & Rehman, A. U. (2018). ARDL model as a remedy for spurious regression: problems, performance and prospectus. *Pakistani Institute of Development Economics*.

Gill, A., Biger, N., & Mathur, N. (2011). The effect of capital structure on profitability: Evidence from the United States. *International Journal of Management*, *28*(4), 3.

Graham, J. R., Leary, M. T., & Roberts, M. R. (2015). A century of capital structure: The leveraging of corporate America. *Journal of Financial Economics*, *118*(3), 658-683.

Harris, R. D., & Tzavalis, E. (1999). Inference for unit roots in dynamic panels where the time dimension is fixed. *Journal of Econometrics*, *91*(2), 201-226.

Harrison, B., & Widjaja, T. W. (2014). The determinants of capital structure: Comparison between before and after financial crisis. *Economic Issues*, *19*(2), 55-82.

Haugen, R. A., & Baker, N. L. (1996). Commonality in the determinants of expected stock returns. *Journal of Financial Economics*, *41*(3), 401-439.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of The Econometric Society, 46*(6), 1251-1271.

Hirdinis, M. (2019). Capital structure and firm size on firm value moderated by profitability. *International Journal of Economics and Business Administration, 7*(1), 174-191.

Huang, G. (2006). The determinants of capital structure: Evidence from China. *China Economic Review*, *17*(1), 14-36.

Huang, G., & Song, F. M. (2006). The determinants of capital structure: Evidence from China. *China Economic Review*, *17*(1), 14-36.

Huang, H., & Ye, Y. (2021). Rethinking capital structure decision and corporate social responsibility in response to COVID-19. *Accounting & Finance*, *61*(3), 4757-4788.

Hunt, P. (2009) *Structuring Mergers & Acquisitions: A Guide to Creating Shareholder Value*, 4th Ed. New York: Aspen Publishers.

Iftikhar, A. (2021). *Impact of COVID-19 on the Capital Structure of Listed Firms in Pakistan*. Doctoral dissertation, Capital University.

Iqbal, A., & Kume, O. (2014). Impact of financial crisis on firms' capital structure in UK, France, and Germany. *Multinational Finance Journal*, *18*(3/4), 249-280.

Işık, Ö. (2017). Determinants of profitability: Evidence from real sector firms listed in Borsa Istanbul. *Business and Economics Research Journal*, *8*(4), 689-698.

Jahanzeb, A., Bajuri, N. H., & Ghori, A. (2015). CAPITAL STRUCTURE DETERMINANTS AND HUMAN CAPITAL: POOLED, PANEL AND DYNAMIC PANEL ESTIMATIONS. In *Proceedings of the 7th International Scientific Conference Finance and Performance of Firms in Science, Education and Practice*.

Jain, P. C. (1987). The effect on stock price of inclusion in or exclusion from the S&P 500. *Financial Analysts Journal*, *43*(1), 58-65.

Javed, S. M., & Jahanzeb, A. (2012). A critical review of capital structure theories. *Information Management and Business Review*, *4*(11), 553-557.

Jordan, J., Lowe, J., & Taylor, P. (1998). Strategy and financial policy in UK small firms. *Journal of Business Finance & Accounting*, *25*(1-2), 1-27.

Kodongo, O., Mokoaleli-Mokoteli, T., & Maina, L. N. (2015). Capital structure, profitability and firm value: panel evidence of listed firms in Kenya. *African Finance Journal*, *17*(1), 1-20.

Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of Finance*, *28*(4), 911-922.

Lane, P. R. (2012). The European sovereign debt crisis. *Journal of Economic Perspectives*, *26*(3), 49-68.

Lang, M., Lins, K. V., & Maffett, M. (2012). Transparency, liquidity, and valuation: International evidence on when transparency matters most. *Journal of Accounting Research*, *50*(3), 729-774.

López-Iturriaga, F. J., & Rodríguez-Sanz, J. A. (2001). Ownership structure, corporate value and firm investment: A simultaneous equations analysis of Spanish companies. *Journal of Management and Governance*, *5*(2), 179-204.

Luigi, P., & Sorin, V. (2009). A review of the capital structure theories. *Annals of Faculty of Economics*, *3*(1), 315-320.

MacKie-Mason, J. K. (1990). Do taxes affect corporate financing decisions?. *The Journal of Finance*, *45*(5), 1471-1493.

Mazur, M., Dang, M., & Vega, M. (2021). COVID-19 and the march 2020 stock market crash. Evidence from S&P1500. *Finance Research Letters*, *38*.

Miller, C. (2020). The Effect of COVID-19 on the US Economy.

Mishkin, F. S. (2011). Over the cliff: From the subprime to the global financial crisis. *Journal of Economic Perspectives*, *25*(1), 49-70.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, *48*(3), 261-297.

Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: a correction. *The American Economic Review*, *53*(3), 433-443.

Mohd Azhari, N. K., Mahmud, R., & Shaharuddin, S. N. H. (2022). Capital Structure of Malaysian Companies: Are They Different During the COVID-19 Pandemic?. *The Journal of Asian Finance, Economics and Business*, *9*(4), 239-250.

Montenegro, C., & Molina, M. (2020). Improving the criteria of the investment on stock market using data mining techniques: the case of S & P 500 index. *International Journal of Machine Learning and Computing*, *10*(2), 309-315.

Morri, G., & Artegiani, A. (2014). *Before and after the Global Financial Crisis: capital structure comparison of European property companies*. European Real Estate Society Conference.

Mostafa, H. T., & Boregowda, S. (2014). A brief review of capital structure theories. *Research Journal of Recent Sciences, 3*(10), 113-118.

Mouamer, F. M. A. (2011). The determinants of capital structure of Palestine-listed companies. *The Journal of Risk Finance, 12*(3), 226-241.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics, 5*(2), 147-175.

Myers, S. C. (1984). The capital structure puzzle. *Journal of Finance, 39*, 575-592.

Myers, S. C. (2001). Capital structure. *Journal of Economic Perspectives*, *15*(2), 81-102.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187-221.

Noor, N. M., Al Bakri Abdullah, M. M., Yahaya, A. S., & Ramli, N. A. (2015). Comparison of linear interpolation method and mean method to replace the missing values in environmental data set. *Materials Science Forum*, *803*, 278-281.

Organisation for Economic Co-operation and Development. (2022). *Quarterly GDP.* Accessed at https://data.oecd.org/gdp/quarterly-gdp.htm on June 2, 2022.

Pandey, I. M. (2004). Capital structure, profitability and market structure: Evidence from Malaysia. *The Asia Pacific Journal of Economics & Business*, *8*(2), 78.

Pervan, M., & Višić, J. (2012). Influence of firm size on its business success. *Croatian Operational Research Review*, *3*(1), 213-223.

Petersen, M. A., & Schoeman, I. (2008). Modeling of banking profit via return-on-assets and return-on-equity. In *Proceedings of the World Congress on Engineering,* 2(1), 12-37.

Proença, P., Laureano, R. M., & Laureano, L. M. (2014). Determinants of capital structure and the 2008 financial crisis: evidence from Portuguese SMEs. *Procedia-Social and Behavioral Sciences*, *150*, 182-191.

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance*, *50*(5), 1421-1460.

Roden, D. M., & Lewellen, W. G. (1995). Corporate capital structure decisions: evidence from leveraged buyouts. *Financial Management*, 76-87.

Sánchez-Vidal, J., & Martín-Ugedo, J. F. (2005). Financing preferences of Spanish firms: Evidence on the pecking order theory. *Review of Quantitative Finance and Accounting*, *25*(4), 341-355.

Serrasqueiro, Z., & Caetano, A. (2015). Trade-Off Theory versus Pecking Order Theory: capital structure decisions in a peripheral region of Portugal. *Journal of Business Economics and Management*, *16*(2), 445-466.

Setiadharma, S., & Machali, M. (2017). The effect of asset structure and firm size on firm value with capital structure as intervening variable. *Journal of Business & Financial Affairs*, *6*(4), 1-5.

Shahzad, A., Azeem, M., Nazir, M. S., Vo, X. V., & Linh, N. T. (2021). The determinants of capital structure: Evidence from SAARC countries. *International Journal of Finance & Economics*, *26*(4), 6471-6487.

Shubita, M. F., & Alsawalhah, J. M. (2012). The relationship between capital structure and profitability. *International Journal of Business and Social Science*, *3*(16).

Siegel, J. J., & Schwartz, J. D. (2006). Long-term returns on the original S&P 500 companies. *Financial Analysts Journal*, *62*(1), 18-31.

Sondakh, R. (2019). The effect of dividend policy, liquidity, profitability and firm size on firm value in financial service sector industries listed in Indonesia stock exchange 2015-2018 period. *Accountability*, *8*(2), 91-101.

Sumaryati, A., & Tristiarini, N. (2018). The influence of cost of equity on financial distress and firm value. In *1st Economics and Business International Conference 2017 (EBIC 2017)* (pp. 194-197). Atlantis Press.

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, *43*(1), 1-19.

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, *1*(1), 15-29.

U.S. Department of the Treasury. (n.d.). *Assistance for American Industry.* Accessed at https://home.treasury.gov/policy-issues/coronavirus/assistance-for-american-industry on June 2, 2022.

U.S. Securities and Exchange Commission. (2022). *Exchange Act Reporting and Registration.* Accessed at https://www.sec.gov/education/smallbusiness/goingpublic/exchangeactreporting#:~:text=Annual%20and%20Quarterly%20Reports,statement%20for%20a%20public%20offering. on June 1, 2022.

Van Horne James, C. (2002). *Financial Management & Policy, 12/E*. Pearson Education India.

Vo, T. A., Mazur, M., & Thai, A. (2021). The impact of COVID-19 economic crisis on the speed of adjustment toward target leverage ratio: an international analysis. *Finance Research Letters, 45*.

Wald, J. K. (1999). How firm characteristics affect capital structure: an international comparison. *Journal of Financial research*, *22*(2), 161-187.

Warren, M. S., & Skillman, S. W. (2020). Mobility changes in response to COVID-19. *arXiv 2020,* arXiv:2003.14228.

Wheale, P. R., & Amin, L. H. (2003). Bursting the dot.com 'Bubble': A Case Study in Investor Behaviour. *Technology Analysis & Strategic Management*, *15*(1), 117-136.

Zarebski, P., & Dimovski, B. (2012). Determinants of capital structure of A-REITS and the global financial crisis. *Pacific Rim Property Research Journal*, *18*(1), 3-19.

Appendix

Table A.1 Firms included in the sample

Sampled Firms	Number of Firms
Total number of firms that were/are listed on the S&P 500 in 2017Q4-2022Q1	604
Excluding firms with unavailable quarterly information on Compustat	100
Excluding firms in financial, transportation service and airline sector	115
Excluding firms with abundant missing values	34
Total number of firms included in the sample	**355**

The table illustrates the sampling process of the companies included in the sample. Firms in the financial sector are excluded from the sample based on SIC codes starting with numbers between 60-67. Companies operating in the transportation service sector and the airline service sector are identified by SIC codes starting with 47 and 45, respectively. When firms have five consecutive quarters of missing data for one of the variables or only have annual data available on Compustat for more than two years, the companies are considered to have abundant missing values.

Table A.2 Distribution of sampled firms

Sampled Firms	Number of Firms
Firms listed on the S&P 500 over the entire fiscal period 2017Q4-2022Q1	270
Firms only listed on the S&P 500 on 2022Q1	62
Firms listed on 2017Q4 but delisted before 2022Q1	22
Firms listed after 2017Q4 and delisted before 2022Q1	1
Total number of firms included in the sample	**355**

The sampling procedure initially included all companies that were/are listed on the S&P 500 in the fiscal period 2017Q4-2022Q1 to reduce survivorship bias. After applying all criteria, the sample included 355 companies. This table presents the distribution of the sampled firms regarding the time period in which they were listed on the S&P 500.

Table A.3 Correlation matrix explanatory variables

	COVID	PROFIT	OPP	TANG	LIQ	SIZE	SG	EG
COVID	1.000							
PROFIT	-0.042	1.000						
OPP	0.064	0.385	1.000					
TANG	0.010	-0.171	-0.236	1.000				
LIQ	0.010	-0.141	0.105	-0.237	1.000			
SIZE	0.032	0.044	-0.090	0.092	-0.344	1.000		
SG	0.055	0.195	0.048	0.026	0.021	0.035	1.000	
EG	-0.045	0.064	0.020	-0.005	0.008	0.028	0.226	1.000

The values in the table represent the correlation between the explanatory variables for the sampled companies in the fiscal period 2017Q4-2022Q1. Values close to zero indicate that there is a negligible relation between the two considered variables. Correlation values close to one or minus one indicate perfect correlation, raising multicollinearity issues.

Table A.4 Mean comparison test results of leverage ratios

	STDTA		LTDTA		TDTA	
Group	**Mean**	**T-stat.**	**Mean**	**T-stat.**	**Mean**	**T-stat.**
0	0.03464		0.29628		0.33170	
1	0.03250		0.32448		0.35705	
diff	-0.00214	-2.4171	0.02820	6.7932	0.02535	5.8133
		[0.016]		[0.000]		[0.000]

diff = mean(0) – mean(1)

H0: diff = 0

Ha: diff ≠ 0

The table presents the results of the mean comparison tests using the independent samples t-test method. The variables are: short-term debt to total assets (STDTA), long-term debt to total assets (LTDTA) and total debt to total assets (TDTA). For each of the leverage metrics, the mean value for the pre-pandemic (0) and the pandemic period (1) is calculated. Subsequently, the t-statistic of the difference between the mean values is displayed with the p-values in square brackets.

Table A.5 Regression results with ROE as dependent variable

	Equation 4		Equation 5		Equation 6	
	FEM	**REM**	**FEM**	**REM**	**FEM**	**REM**
Constant	-0.1424***	-0.0315***	-0.1281***	-0.0274***	-0.1161***	-0.0263***
	(-7.60)	(-5.76)	(-6.81)	(-4.89)	(-5.98)	(-4.64)
STDTA	-0.0317	-0.0347**				
	(-1.51)	(-2.03)				
LTDTA			-0.0450***	-0.0151***		
			(-4.26)	(-3.56)		
TDTA					-0.0487***	-0.0161***
					(-4.79)	(-3.93)
TANG	-0.0828***	-0.0131***	-0.0739***	-0.0109***	-0.0772***	-0.0108***
	(-3.88)	(-4.31)	(-3.47)	(-3.51)	(-3.63)	(-3.51)
LIQ	0.0032***	0.0004	0.0044***	0.0004	0.0036***	0.0002
	(2.69)	(0.50)	(3.85)	(0.60)	(3.16)	(0.31)
SIZE	0.0213***	0.0053***	0.0207***	0.0051***	0.0198***	0.0051***
	(11.04)	(8.56)	(10.82)	(8.37)	(10.20)	(8.35)
SG	0.0186***	0.0259***	0.0188***	0.0258***	0.0190***	0.0257***
	(7.98)	(11.58)	(8.05)	(11.55)	(8.17)	(11.54)
EG	-0.0007	0.0138	0.0006	0.0155	-0.0010	0.0148
	(-0.07)	(1.35)	(0.06)	(1.52)	(-0.10)	(1.45)
Number of obs.	3,195	3,195	3,195	3,195	3,195	3,195
R-squared	0.1209	0.0897	0.1257	0.0912	0.1272	0.0930
Hausman test	122.14		132.47		133.50	
	[0.000]		[0.000]		[0.000]	

The table reports the coefficients of both the fixed effects and the random effects panel data regression models with return on equity (ROE) as dependent variable. To determine the appropriate model, the method proposed by Hausman (1978) is performed. The various equations include different metrics for capital structure in the model, which is the main variable of interest. The p-values of the reported test statistics are displayed in square brackets, while the t-values of the coefficients are reported in parentheses. The significance levels of the coefficients are indicated by the number of asterisks, where: * is $p < 0.10$; ** is $p < 0.05$ and *** is $p < 0.01$.