UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Bachelor's project within the Business and Economics Bachelor Programme

Exploring the Influence of Firm Size on Leverage
Evidence from OMX Stockholm Small Cap

Abstract:
This study examines the relationship between leverage and firm size for a sample of 83 firms listed on OMX Stockholm Small Cap between 2018 and 2022. Additionally, it explores the impact of the Covid-19 crisis on this relationship through quarters experiencing negative GDP growth. This study uses panel data and a random effects model to reveal a positive and statistically significant association between different leverage ratios and firm size. However, the actual economic impact of firm size on leverage was found to be minimal. This study, instead, identifies other factors, namely asset tangibility, as having a greater influence on the capital structure of smaller Swedish firms. These findings shed light on the complex dynamics of capital structure decisions and highlight the importance of considering multiple factors beyond firm size alone.

Keywords: Firm size, Capital Structure, Leverage, Constraints, Crisis

JEL Classification: E44; E50; G32; L25

Bachelor Thesis 15 hp
Albin Claesson
Jonathan Hernandez
Supervisor: Christer Ljungwall
Spring term 2023

Acknowledgement

We would like to express our greatest gratitude to our supervisor Christer Ljungwall for his expertise, encouragement, feedback, and mentorship during the course of this thesis. Furthermore, we would like to acknowledge Aineas Mallios for his invaluable support and guidance throughout the progression of our thesis. Lastly, thanks to all fellow students and colleagues for their support and insightful discussion in and outside seminars, which greatly contributed to the quality of our thesis. Collectively, their support has been fundamental to this thesis's success.

Table of Contents

1. Introduction 1
1.1 Background 1
1.2 Problem Description and Problem Analysis 2
1.3 Aim of the Study 3
2. Theoretical Framework 5
2.1 Trade-off Theory 5
2.2 Pecking Order Theory 5
2.3 Asymmetric information 6
2.4 Monetary Policy 7
3. Literature Review 8
3.1 Summary of previous studies 8
3.2 Hypothesis development 11
4. Method and Data 14
4.1 Methodology 14
4.2 Robustness test for the method 16
4.3 Model Specification 18
4.4 Variables 19
4.5 Data Collection 24
4.6 Limitations 26
5 Empirical results 27
5.1 Results of the Correlation Matrix 27
5.2 Regression results 29
5.3 Robustness of the result 34
6. Discussion 35
7. Conclusion 39
Reference list 40
Appendix 45

1. Introduction

1.1 Background

Corporate capital structure has been an area of interest for several decades because of its influence on firm value, survivability, and growth. It is surrounded by theories discussing theoretical pathways firms use to choose their capital structure. Furthermore, previous global financial crises have led to changes in the macroeconomic state of the world's economies. These crises introduced questions regarding how firms adjust their corporate capital structure in the changing macroeconomic climate. One of these is whether size influences how smaller firms act in the changing macroeconomic states.

After many years of research, capital structure is still a subjective topic. One explanation could be that all firms have no determined unified common optimal point of leverage. According to Modigliani and Miller (1958), maximization of firm value is the goal, where capital structure becomes a key component in maximizing the value of the firm. Value-maximizing for a firm is, on the other hand, also subjective depending on the size, economic environment, size, industry, legal systems, and other factors that could affect the choice of capital structure.

Modigliani and Miller (1958) presented a theorem widely used as a foundation in many theories regarding capital structure. The first release in 1958 assumed perfect market conditions with no transaction-, and bankruptcy costs or taxes included. A revised version was released in 1963, presenting a positive correlation between corporate value and leverage. The increased company value could be explained through the tax shield that comes with increased leverage (Modigliani & Miller, 1963).

Moreover, determining SMEs' capital structure is a scientific area that has captured substantial research interest in recent years. There are two main reasons for this. Firstly, there is a recognition of SMEs' significant impact on the economy, and secondly, the acknowledgment that SMEs exhibit different financing dynamics than larger firms (Daskalakis, Balios, and Dalla, 2017).

To further extend the discussion, Small and Medium Enterprises (SMEs) are accountable for a large portion of the global economy. However, there are several definitions of SMEs, which the literature has yet to agree upon. There is no universally accepted definition, but while mostly quantitative measures are used, they tend to have an ownership structure and management characteristics that distinguish them from large businesses. SMEs are within the EU defined as companies with less than 250 employees (Berisha & Pula, 2015). Yazdanfar, Öhman, and Homayoun (2019) studied SMEs' behavior in the Swedish market and their choice of debt maturity issuance during and after the financial crisis 2008. They concluded that firm size seems to be a determinant factor when choosing the debt maturity structure and that this choice may impede the attempts to reach the optimal target ratio.

1.2 Problem Description and Problem Analysis

There are a lot of different theories touching upon describing the decision-making regarding capital structure and firm choice of the target level. All theories provide somewhat simplified frameworks but tend to have issues explaining the actual financing behavior. Daskalakis et al. (2017) state that SMEs tend to be more constrained and thus affected in their choice during crises. This is further supported by Jõeveer's (2013) assumptions based on Korajczyk and Levy's (2003) research.

Furthermore, debt's maturity structure seems to depend on firm-specific and macroeconomic factors. In periods of growth, firm-specific factors are an explanation for the issuance of short-term debt. In contrast, macroeconomic factors are shown to be more important for the issuance of long-term debt, especially in periods of recession. Since firm-specific variables are most likely to be somewhat controlled by managers during times of growth but less so in periods of recession, the decision-making regarding the company's financial policies in good macroeconomic conditions is crucial (Daskalakis et al., 2017).

Previous research has, at large, found significant results regarding the influence of both firm-specific and macroeconomic variables on the choice of corporate capital structure (Daskalakis et al., 2017; Jõeveer, 2013). The results of all previous studies are mixed, and no precise conclusion can be drawn concerning the exact relation of firm-specific- and macroeconomic variables to the choice of capital structure of a firm.

During the last decade, the Swedish economy experienced a zero-interest rate policy and even had a negative interest rate for periods. The economy took a downturn during the global Covid-19 pandemic, and the current increasing inflation has forced policymakers to counteract the increased inflation. The increased interest rate is yet to decrease the rampant inflation, which has changed the macroeconomic landscape for firms, especially exposing SMEs.

Considering the problem of smaller firms allegedly facing greater financial constraints and limited ability to adjust their capital structure in changing macroeconomic states, the following research problem is formulated;

How does size relate to the capital structure during non-crisis and crisis periods for smaller listed Swedish firms?

1.3 Aim of the Study

With mixed results on the topic, previous studies use the matter of size as one of the explaining factors to examine how firms choose their capital structure. The size of a company seems to impact the determination significantly. Furthermore, previous research indicates that both macroeconomic states of the economy, as well as firm-specific variables, have significant power in describing the choice of issuance. In today's uncertain economic environment, more research on the determinants of a firm's capital structure will be increasingly demanding. To our knowledge, no study has examined the impact of the world's latest crisis period, Covid-19, and its effect on the capital structure of firms listed on OMX Stockholm Small Cap. Thus, our aim is to investigate this area and further contribute with our findings.

With the recent ongoing crisis, this study will potentially guide financial decision-making for managers of smaller firms. It will additionally shed light on how both crisis and non-crisis periods can impact the dynamics of the capital structure as the firm grows larger. With increasing inflation- and subsequent increased interest rate, managers need guidance to navigate today's more uncertain economy.

1.4 Outline of this paper

The remainder of this study will be structured as follows: Section 2 provides fundamental theories on the topic of capital structure. Section 3 presents the literature review. Section 4 provides the methodology for our work, chosen regression model, and an overview of the variables included. Section 5 includes the expected results of our study and the empirical results of our regression, while Section 6 discusses and analyzes the results in regard to previous studies. Lastly, in Section 7, the study is concluded.

2. Theoretical Framework

Different theories describe the decision-making regarding capital structure and choice of target leverage. The theories presented in this study are a selection of theories that serve as a reliable framework for reasoning about the different outcomes. Theories such as the trade-off- and the pecking order theory are central and recurrently used in research investigating firm-specific factors that affect firms' capital structure choices. Asymmetric information is present in both theories and thus introduced to further broaden the discussion.

2.1 Trade-off Theory

The trade-off theory, first presented in 1973 by Alan Kraus and Robert H. Litzenberger, is a tax-based theory guiding a firm to allocate an optimal capital structure. The theory presents a model that unveils that taxable firms have an optimal point of their debt-to-equity ratio that they should strive for to maximize their firm value. The trade-off theory states, in line with Modigliani & Miller Theorem Proposition II (1963), that the value of a levered firm is equal to the value of its unlevered form plus the present value of its tax shields. The firm can reduce its taxable income by increasing the amount of debt. However, together with additional debt financing comes an increased risk of financial distress and potential bankruptcy (Kraus & Litzenberger, 1973). Myers (1984) argues that riskier firms should reduce their amount of borrowing due to their chance of defaulting on their debt claim. On the other hand, stable firms should increase their debt due to the advantages of the tax shield and reduced cost of capital.

Furthermore, Myers (1984) states that the static trade-off theory in perfect capital markets without further cost of adjustment would be correct. Still, today's high adjustment costs force corporations away from their optimal capital structure, making the theory weak in practice.

2.2 Pecking Order Theory

The pecking order theory departs from the thought of achieving an optimal capital structure. When a firm needs funding to invest in a positive net present value (NPV) project, it should either use acquired internal funds or need to issue external funding according to the theory's hierarchical framework. According to the theorem, managers should prefer internal- to external funding. More specifically, they should mainly prefer internal funds, secondly debt, and equity as a last alternative. Debt, or safer securities, will be preferred over equity or other

issuing that requires a higher cost in the form of return. This is because of the asymmetric information between managers and investors, which enforces additional costs at the moment of issuance (Myers, 1984). According to Park, Lee, and Park (2020), firms with lower information asymmetry are treated more favorably and have easier access to financial markets, these firms are referred to as larger firms.

The asymmetric information between the two agents creates uncertainty that implies costs when issuing equity. This since announcements of equity issuance is, to the rational investor, a sign of overpricing and will reduce their willingness to pay, lowering the share price. Thus, the firm is required to issue more shares to fill the gap of the underpricing to receive enough funding for the investment. Therefore, in accordance with the theory, firms must weigh the benefit of a potential investment opportunity with the cost of capital (Myers, 1984).

Avoiding a positive NPV project could be costly due to the opportunity cost, and the firm encounters a dilemma if retained earnings are unavailable. If the firm wishes to invest despite the lack of retained earnings, the managers could end up in a situation where they either increase the risk of financial distress or risk issuing equity when the stock price is too low (Myers, 1984). According to this reasoning, the pecking order theory displays the problem of accessing capital when funding new investment opportunities.

Criticism of the pecking order theory is commonly highlighted by the fact that, in the theory´s most extreme interpretation, companies should never issue equity, given that issuance of debt is available (Alves, Couto, and Francisco, 2015).

2.3 Asymmetric information

Asymmetric information is a theory stating its presence in the theories mentioned above. Managers and stakeholders may have different incentives and thus act differently. Some managers tend to have compensation-based salaries related to profitability or stock price performance and therefore have incentives to be over-optimistic about investment opportunities.
Agency cost is closely related to asymmetric information, which emerges and increases with information asymmetry. The agency costs are the costs arising as a compensating premium for the leap of information between the agents. To reduce the agency problem, a substantial

increase in free cash flow could either be used to increase dividends or to change the capital structure by repurchasing equity. A dividend increase might, however, introduce a downside since future cuts in dividends generate negative market reactions (Jensen, 1986).

Long-term debt is more sensitive to agency problems than short-term debt. Smaller firms, containing higher asymmetric information with less collateral, tend to be considered riskier and thus unable to rely on debt from financial institutions (Michaelas, Chittenden, and Poutziouris, 1999; Gao & Zhu, 2015). Kurshev and Stebulaev (2006) state that the choice in time and amount of debt issuance depends on the corporation's size. This is mainly because of asymmetric information, where larger firms have lower agency costs and thus can adjust their capital structure more frequently to a lower cost of issuance. Asymmetric information and related agency costs thus impede smaller firms from accessing external financing from financial institutions and relying on other financing sources.

2.4 Monetary Policy

Monetary policies are actions instructed by the central bank to stabilize the economy through adjustments in monetary supply or interest rates. A monetary expansion will, in the short run, improve the economy’s output and thus could be used to stimulate unemployment. A monetary contraction will, on the other hand, be used to control inflation through increased interest rates and a reduced money supply (Mokhova & Zinecker, 2014).

A well-known target policy is maintaining a constant inflation rate. The central bank tries to fix the inflation rate and keep it with minor fluctuation around its target with the help of interest rate and other monetary tools. Inflation expectations and its rate of change affect both investment opportunities and credit risks. Therefore, both the debt market and the stock market are influenced by higher inflation (Mokhova & Zinecker, 2014).

The interest rate is the main instrument for monetary policy regimes to keep inflation low and stable. Increasing interest rates could make companies increase their debt ratio because of the tax benefits or lower it to consider the risk of bankruptcy. Consequently, changing the demand for money through different monetary policies could influence the equilibrium of the financial markets, which may change financing channels and financial constraints for firms (Mokhova & Zinecker, 2014).

3. Literature Review

The presented literature treats firm-specific and macroeconomic variables' effect on leverage in one way or another. This in relation to firm size, the current state of the Swedish market, SMEs' tendency to deviate from theory, reasons for constraints, macroeconomic states, and uncontrollable factors affecting the managers' decision-making. Lastly, the previous literature is used to develop hypotheses.

3.1 Summary of previous studies

Firm Size and capital structure - Kurshev and Strebulaev (2006)

Kurshev and Strebulaev (2006) conducted a study investigating the relationship between capital structure and firm size. Their findings show that small firms choose higher leverage at the moment of refinancing in order to compensate for less frequent rebalancing. Firms tend to seek their optimal leverage ratio but have issues reaching this point due to imperfect markets.

The economic intuition behind the findings is that firms will choose their optimal leverage ratio that balances the trade-off between expected tax benefits and distress costs. Without fixed costs, the corporation will subsequently increase its ratio to restore the optimal balance. Fixed costs do, however, reduce the benefits of restructuring the capital structure too often. Thus, the management must incorporate fixed costs when estimating the timing of the changing structure. The infrequency lowers expected tax benefits, which leads to firms taking on more leverage at each refinancing (Kurshev & Strebulaev, 2006).

The authors explain the relationship between capital structure and firm size through the ”cycle effect” analogy. The initial phase is the phase of issuing, where the firms issue debt. Secondly, the firm has to weigh the benefit of having more debt with the increasing cost of issuance. Illustrating the risk of financial distress, higher costs of debt will increase the time between debt issuances. This will generate an infrequency in refinancing, allowing the growing equity to reduce the leverage ratio. The cost of financing decreases with size, thus enabling more frequent rebalancing toward optimal target ratio, closing the cycle (Kurshev & Strebulaev, 2006).

Due to differences in provided information between small and large firms, asymmetric information entails a higher fixed cost for debt issuance for small firms. It thus implies that

smaller firms tend to restructure less often. Therefore, the differences in size inevitably lead to a positive relation between firm size and leverage ratio. Furthermore, the effect of fixed costs will be reduced for larger firms, allowing them to adjust their capital structure more beneficially (Kurshev & Strebulaev, 2006).

Financial crisis and SME capital structure: Swedish empirical evidence - Yazdanfar, Öhman, and Homanyoun (2019)

Yazdanfar et al. (2019) investigated Swedish small and medium enterprises (SMEs) in the Swedish market and their capital structure during the crisis and post-crisis. The study examines SMEs' capital structure and its foundation in the form of short-term and long-term debt, considering the financial crisis in 2008-2009 as their crisis period. Yazdanfar et al. (2019) further state that Beck et al. (2008) argue that crises influence leverage and financial decision-making regarding profitability. Bad macroeconomic states affect the economy and make the economy end up in crisis periods associated with uncertainty, agency- and bankruptcy costs which further affect the creditworthiness of firms.

The findings from Yazdanfar et al. (2019) show that retained earnings are initially the primary financing source for the targeted categorization, aligning with the pecking order theory. Furthermore, the crisis period and profitability are negatively significant and related to both examined ratios. Additionally, the authors argue that SMEs use less external capital regarding leverage post-crisis as profitability increases.

According to Michaelas et al. (1999), larger companies enhance less information asymmetry allowing them to borrow cheaper and thus motivate the use of more long-term debt. Furthermore, smaller firms are more likely to use short-term debt as a substitution to deal with agency costs of debt. This is, however, contradictory to the findings of Yazdanfar et al. (2019), showing that firm size is unrelated to long-term debt but positively related to short-term debt, which shows that larger SMEs have a higher probability of having a higher short-term debt ratio than smaller ones.

Macroeconomic conditions and capital structure adjustment speed - Cook and Tang (2010)

Cook and Tang tried in 2010 to estimate if there is any significant impact of several macroeconomic factors on the speed of capital structure adjustment toward target leverage. They find evidence that firms tend to adjust towards their target leverage ratio faster in good

macroeconomic states relative to bad ones. The authors analyze the role of macroeconomic conditions over a 30- years sample period to investigate the pattern of changing the leverage ratio in different periods. To identify the impact of mentioned conditions, Cook and Tang base their "good" and "bad" states on the variables of the term spread, GDP growth, default spread, and dividend yield.

Cook and Tang (2010) show that macroeconomic variables are important in analyzing firms' financing choices. The impact of macroeconomic conditions displays that firms adjust faster in good rather than bad states. Additionally, the result thus indicates that poor economic conditions impede the adjustment to the target leverage ratio.

The behavior of SMEs' capital structure determinants in different macroeconomic states - Daskalakis, Balios, and Dalla (2017)

Daskalakis et al. (2017) investigated the relative importance and relationship between macroeconomic variables and firm-specific determinants in different macroeconomic states. Moreover, the debt firms acquired during these states are of interest when conducting the study. The authors of the paper state, using previous studies, that theories regarding firm size have limited applicability to small and medium enterprises (SMEs) and thus emphasize the relevance of their unique study. The model was initially inspired by Cook and Tang (2010), who examined the effect of changing macroeconomic conditions on firms independent of firm size. Cook and Tang further introduced a dummy variable that symbolizes the bad states to account for changed coefficients on the specific variables. Considering Cook and Tang's study, Daskalakis et al. (2017) set the cutting point between growth (good states) and recession (bad states) in 2009 when annual GDP growth became substantially negative and average total assets and debt began to drop.

Capital structure choice: Macroeconomic conditions and financial constraints - Korajczyk and Levy (2003)

The paper by Robert A. Korajczyk and Amnon Levy in 2003 provides a new outlook on how macroeconomic factors affect the corporate capital structure.

The data collected from the sample contains 5623 quarters containing significant changes in the corporate capital structure. The sample is later split into two sub-samples based on the degree of financial constraint, constrained and unconstrained firms. Furthermore, the study

models the firms' target capital structures as a function of macroeconomic factors and firm-specific variables.

Unconstrained firms have leverage that varies counter-cyclically with macroeconomic conditions. Therefore, managers will prefer debt financing when compensation is low following low returns in the equity market or due to low profits (i.e., recessions). On the other hand, the leverage of constrained firms varies pro-cyclically with macroeconomic conditions. Thus, borrowing more when the economy is in a good state and the securities are at their peak, in other words, when experiencing high returns in the equity market or corporate profits. Based on the empirical results of the paper, macroeconomic factors were significant in explaining the change in the corporate capital structure for the unconstrained sample but, to a lesser extent, for the constrained sample (Korajczyk & Levy, 2003).

3.2 Hypothesis development

The relationship between the dependent variable, leverage, and the independent variable, size, will be examined in three different ratios, total (TDA), short-term (STDA), and long-term (LTDA) debt to assets. TDA is the primary ratio of interest, although STDA and LTDA will additionally be studied to analyze how companies of varying sizes issue different debt maturities. To further investigate the macroeconomic environment's impact on the ratios, two hypotheses will be tested on each leverage ratio to further analyze the problem in detail.

Firm size and leverage are shown to have a positive relationship where larger firms can adjust their capital structure when needed. In contrast, smaller firms need to a higher degree, consider the cost of capital to benefit from debt issuance (Kurshev & Strebulaev, 2006). Fama and French (2002) state that size and leverage are positively associated because larger companies can reduce issues related to asymmetric information, bankruptcy risk, and financial distress. This aligns with the pecking order theory, where financing decisions depend on a firm's profitability, making them more likely to strive for internal funding over external (Myers, 1984). As stated, Kushev and Strebulaev (2006) argue that larger firms tend to have a larger leverage ratio due to greater flexibility when determining the choice of financing. Considering this, the relationship between firm size and TDA is expected to be positive. To reject the null hypothesis at a 5% significance level, the H_01 is stated to be negative.

According to Proença, Laureano R.M.S, and Laureano L.M.S (2014), Warner (1977) argues that due to lower transaction costs of external financing, larger firms easier access debt compared to smaller firms. Building upon this argument, one can argue that in severe macroeconomic conditions, smaller companies may struggle to access capital when needing external financing. The possibility of accessing capital in bad macroeconomic states should thus increase with firm size. Furthermore, in severe macroeconomic states, Mokhova and Zinecker (2014) state that macroeconomic policies tend to entail increased interest rates implicating more expensive debt. Kushev and Strebulaev (2006) argue that larger firms can choose when to issue debt but will do so in beneficiary periods. Thus, in crisis periods, alternative sources of financing should become relatively cheaper than debt, lowering the leverage ratio and indicating a negative relationship. To reject the null hypothesis at a 5% significance level, the H_02 is specified as positive.

H_01: There is a negative relationship between firm size and TDA
H_02: There is a positive relationship between firm size in crisis periods and TDA

There are somewhat contradictory findings in determining the size effect on STDA and LTDA related to the capital structure of SMEs. Michaelas et al. (1999) argue that there is a negative relation between firm size and STDA and a positive relation between LTDA and size. Smaller firms tend to have a low proportion of long-term financing and larger amounts of short-term debt. Thus, they tend to be lower geared than larger firms. Michaelas et al. (1999) conclude that firm size has a greater effect on LTDA, and by growing successively, larger firms transform their capital structure from relying heavily on short-term debt towards more long-term debt. This is also confirmed in Proença et al.'s (2014) study, which found a positive relationship between firm size and LTDA and a negative one between the variable and STDA. Based on the reasoning above, firm size is expected to affect STDA in non-crisis periods negatively. To reject the null hypothesis at a 5% significance level, the H_03 is stated to be positive.

More recent findings show that SMEs will increase their short-term debt in crisis periods to compensate for lower retained earnings. Thus, issuing short-term debt could be considered alternative financing aligned with the pecking order theory (Yazdanfar et al., 2019). Furthermore, financial institutions tend to be more restrictive in their lending policies in crisis periods which thus makes smaller firms, regarding asymmetric information, unable or less

likely to issue long-term debt (Carbo-Valverde et al., 2016 as stated in Yazdanfar et al., 2019). Kushev and Strebulaev (2006) conclude that firms tend to issue more LTDA as they grow larger. This aligns with Warner's (1977) previous argument that larger firms access debt more easily than smaller ones. STDA is seemingly the main financing source of smaller firms, and as the firm grows larger, it exchanges STDA for more LTDA. Thus, one could expect a negative relationship between firm size and STDA in crisis periods. To reject the null hypothesis at a 5% significance level, the H_04 is specified as positive.

H_03: There is a positive relationship between firm size and STDA
H_04: There is a positive relationship between firm size in crisis periods and STDA

Unanimously to previous studies, the sign of the independent variable, firm size, should be positive when estimating its effect on long-term debt (Michaelas et al., 1999; Proença et al., 2014). As the firm grows, the agency cost and related asymmetric information decrease and enables the corporation to proportionally issue more long-term debt (Kushev & Strebulaev, 2006). Therefore, the variable of interest and LTDA should have a positive relationship. To reject the null hypothesis at a 5% significance level, the H_05 is stated to be negative.

The long-term debt ratio in bad macroeconomic environments is, on the other hand, ambiguous. Yazdanfar et al. (2019) do not find any significant explainable relation between LTDA and size, thus making it unable to interpret. Daskalakis et al. (2017) found that SMEs tend to slow down their adjustment speed on long-term debt and focus on short-term debt during recessionary periods. Based on this reasoning, the relation between the independent variable and LTDA should be negative. To reject the null hypothesis at a 5% significance level, the H_06 is specified as positive.

H_05: There is a negative relationship between firm size and LTDA
H_06: There is a positive relationship between firm size in crisis periods and LTDA

4. Method and Data

This study will be conducted based on a quantitative method where public data on variables defining macroeconomic factors as well as firm-specific factors will be used. The data is quarterly gathered between the years 2018 to 2022 to investigate the adjustments and changes in the capital structure to find patterns defining the companies on the list. Control variables will complement the dependent and independent variable to reduce the model's omitted variable bias. In the end, a concluding list of variables, Table 2, is included to specify the definitions.

4.1 Methodology

General method

A panel data regression model is used to analyze the data across different macroeconomic- and firm-specific variables and their impact on the leverage ratio in several time series. The error term in the panel data models is assumed to be uncorrelated with the independent variable over the same period (Wooldridge, 2002, pp. 247-251). The relation between the two uncorrelated variables is known as the assumption of exogeneity. Exogeneity is one of the numerous assumptions panel data relies on, which could be tested by plotting the independent variable and the residuals. Figure B1 in the Appendix displays the relation between the error term and the independent variable addressing the heterogeneity and endogeneity. Depending on the nature of the data, a fixed- or random effect model can be used to address the issue of the endogeneity displayed in Figure B1.

Fixed- and Random effect model

The fixed- and random effect models are different approaches used to control for unobserved variables in a panel data regression, built on the assumptions of OLS and GLS, respectively. To reduce the omitted variable bias in the model, observed determinants of the dependent variable correlating with the independent variable should be included. If the sample is large enough, the models should provide a normal estimation of the effect since the use of it reduces the effect from the unobserved effect. (Wooldridge, 2002, pp. 252, 265-269.; Stock & Watson 2019, pp. 367-368). This is with the reservation that the assumptions of the used method are satisfied, if not, the estimator fails to estimate the true effect.

The variation in the fixed effect, which varies across entities but not over time, comes from the omitted variables. The random effect model combines this effect and the random effect into a single parameter known as the random effect. This is to capture the variation within and between the panel data. The fixed effect model allows arbitrary correlation between the individual and unobserved variables, which is not the case in the random effect model (Wooldridge, 2002, pp.251-260; Stock & Watson 2019, pp. 373-374). The random effect model is superior in most cases but is dependent on the data analyzed (Bell, Fairbrother, and Jones, 2019).

Moreover, the Hausman test provides certainty and control for whether a fixed- or random effect model is more appropriate to use when analyzing the data. There is, however, some uncertainty related to the test. The random effect model should be used if the test does not reject the null hypothesis. One should, nevertheless, be aware of the risk associated with proceeding with the model based on the test results. The failure to reject the null hypothesis in this context may be indicative of an underlying type II error, where the assumption of exogeneity between the random effect and independent variable is not rejected (Wooldridge, 2002, p. 291).

Table 1 - Hausman test

H0: Differences in coefficients are not systematic		
Dependent variable	**F-statistic**	**Prob > F**
TDA	3.132	0.08

H_0 specifies the test's null hypothesis and states that the random effect model should be used.

As seen in Table 1, we cannot reject the null hypothesis of the Hausman test for the model of TDA.[1] Therefore, with the knowledge of the risk of conducting a type II error, the random effect model will be used in further analyzing the data.

Justification of the random effect model

To extend the justification beyond the Hausman test, the independent variable exhibits considerable variation within the variable, meaning that the firms' different sizes fluctuate

[1] The Hausman test, as well as the following tests in Section 4.2 is tested for the main model of TDA.

substantially. This is displayed in Figure B2 in the Appendix. Considering this and the fact that the number of observations is fewer than 200 observations per unit, the random effect model should be used to reduce the variance between the independent variable and the error term (Clark & Linzer, 2014).

4.2 Robustness test for the method

Conducted robustness tests serve as guidance and assurance for using the most appropriate model for the data's nature. The tests are used to test the reliability of the model.

Chi-squared and unit-root test

To control whether the model is fit for the purpose of the data, a chi-square test is conducted. If the given value exceeds the critical value, we reject the null hypothesis at a 5% significance level, thus confirming a good fit. The chi-squared values will be found in Table 5.

The Fisher-type unit-root test provided by STATA controls for stationarity in the error term variable since the error term defines the unexplained variance in the dependent variable. The fisher-type test is used when unbalanced data is analyzed, which means the data is missing values, thus preferable in this study. Stationarity implies that the independent normal variables random variables in the error term have a fixed mean of zero and variance of $\boldsymbol{\sigma}^2$. Further, these should not exhibit a systematic trend to imply stationarity (Dickey & Fuller, 1979). Moreover, stationarity is assumed to be present in the error term when conducting a panel data regression. The null hypothesis states that all panels contain unit roots and will be rejected at a 5% significance level. If the test is rejected, at least one panel is stationary. The results of the test, found in Appendix Table A1, show that at least one panel is stationary in the regression.

Non-linearity and Autocorrelation

Autocorrelation is commonly observed in time series data, where what happens in one year tends to be correlated with the following year (Stock & Watson, 2019, p. 375). We conduct a Wooldridge test for autocorrelation with a null hypothesis stating that the model has no autocorrelation at a 5% significance level. The given test result is displayed in Appendix

Table A2 and shows that we cannot reject the null hypothesis in the model for TDA. Thus, we cannot conclude that there is autocorrelation in our panel data regression.

Furthermore, a linearity test is conducted to determine whether the assumption of linearity holds. The test is conducted to ensure that there is a linear relationship between firm size and the leverage ratio. The null hypothesis states that the model has no linearity at a 5% significance level. The result from the test is further to be found in Appendix Table A3. Unlike in the test for autocorrelation, we can reject the null hypothesis and thus conclude that the relationship between independent- and dependent variables is linear.

Multicollinearity and Heteroscedasticity

A correlation matrix will be used to reject potential multicollinearity affecting the data. The matrix will provide an indication of the relations between the variables and ensure that there is no multicollinearity adding bias to the model. The correlation matrix is presented in Table 4.

A high correlation score can cause different problems and affect the regression results in several ways. Multicollinearity can be an issue in the model and arise from two explanatory variables being too highly correlated, i.e., having a strong linear relationship introducing bias to the model. A multicollinearity problem in the model can result in imprecise coefficients, and it can be hard to distinguish the sole influence of the independent variables and control variables on the dependent variable. Furthermore, multicollinearity can also lead to insignificance of important variables and even result in the wrong signs of the coefficients (Jaggia & Kelly, 2019, p. 571).

To further ensure that there is no multicollinearity in the model, a VIF test will be conducted to strengthen or reject conclusions drawn from the correlation matrix. James, Witten, Hastie, and Tibshirani (2013) state that a VIF ≥ 5 indicates considerable collinearity and must be considered. The results are to be found in Appendix Table A4 and do not indicate any multicollinearity. The correlation matrix or VIF test will not include the interaction variables.[2]

[2] Aineas Mallios, School of Business, Economics, and Law at University of Gothenburg (Personal Communication, 2023).

To detect heteroscedasticity within the sample data, a Breusch- Pagan test is conducted to maintain the variance of the residuals constant. If the test is rejected at a 5% significance level, the sample contains heteroscedasticity within the models and is found in Appendix Table A5. The results violate one of the assumptions of the random effect model, which assumes constant variance or homoscedasticity. Thus, the effect of heteroscedasticity could infer bias in the model, which could be reduced by using clustered standard errors.

The clustered standard errors can be used to treat the impact of heteroscedasticity. The usual standard errors are invalid if the model has either autocorrelation or heteroscedasticity. Introducing clustered standard errors allows arbitrary correlation within a cluster but assumes uncorrelated regression error across clusters. Furthermore, the clusters consist of an ”entity” in the context of the used method of analyzing, and by using clustered standard errors, we allow autocorrelation and heteroscedasticity in the error term (Stock & Watson 2019, pp 375.; Wooldridge, 2002, pp. 264-265).

4.3 Model Specification

Conducted panel data regression is inspired by Daskalakis et al. ‘s (2017) model, a model estimated by Cook and Tang (2010). Three kinds of leverage ratios, total-, short-term- and long-term debt to assets, will be used as dependent variables in separate regressions. The leverage ratios in the model will be defined by (DR), while the independent variable will be (X) and additional control variables (M). These will be accompanied by a dummy variable (C), taking the value one if containing a quarter of negative GDP growth (crisis) and zero if being in a positive one (non-crisis).

$$DR_{i,t} = \alpha + \alpha^{C}C_t + \beta X_{i,t} + \beta^{C}C_t X_{i,t} + \gamma M_{i,t} + \gamma^{C}C_t M_{i,t} + v_{i,t}$$

where $v_{i,t} = u_t + \varepsilon_{i,t}$

- $\varepsilon_{i,t}$ is the error term
- u_t is the random effect
- $v_{i,t}$ is the composite error
- $\alpha^{C}, \beta^{C}, \gamma^{C}$ is defining the coefficients of the crisis periods

The development process of the model with included control variables will be presented in the result in Table 5.

4.4 Variables

Dependent variables

Leverage ratio

The determination of leverage is differing among previous literature. It is, however, necessary to define leverage. Several empirical definitions exist, but book or market leverage is the most commonly used (Frank & Goyal, 2009). Shyam-Sunder and Myers (1999) argue that managers should focus on book leverage rather than market leverage since assets better support debt than growth opportunities. Furthermore, there is uncertainty regarding market fluctuations which could provide an unreliable basis for corporate financial decision-making. Fama and French (2002) agree with this statement, arguing that book ratios are not influenced by external factors beyond the firm's direct control.

Used theories cannot agree on whether a firm-specific optimal target ratio exists. Despite this, Graham and Harvey (2001) suggest that there is moderate evidence showing that CFOs act in accordance with the trade-off theory, rooting their decisions on the benefits and costs of debt.

The dependent variable will be defined in three forms of book leverage to examine the relation between the dependent and independent variables in good and bad states. Measurements used will be total- (TDA), short-term- (STDA), and long-term- (LTDA) debt to assets. The three different measures of debt maturity, aligned with previous literature, provide an insight into Swedish firms on OMX Stockholm Small Cap adjustment to current market conditions.

Independent variables

Total assets

Dang, Li, and Yang (2018) investigated 100 research papers and concluded that the most popular measures for firm size are total sales, total assets, and market value of equity. Forty-nine of the investigated papers used total assets, twenty used market value of equity, and only sixteen used total sales. Total assets measure the firm's resources, while market capitalization represents growth opportunities and general market conditions. Dang et al. (2018) conclude that total assets are the best measure for estimating the effect of firm size on capital structure. We have therefore decided to use total assets as our independent variable and estimate its effect on the capital structure by taking the natural logarithm of total assets.

Several studies have likewise examined the relationship between firm size, STDA, and LTDA to investigate whether firm size affects the choice of debt maturity when issuing new debt (Daskalakis et al., 2017; Cook & Tang, 2010; Yazdanfar et al., 2019; and others). Thus, will the independent variable, size, and its relationship to the three leverage ratios be examined.

Control variables

GDP Growth

The variable GDP growth will represent the changing macroeconomic conditions as the dummy variable and take the value one if the GDP growth is negative in the quarter and zero if the GDP growth is positive. This is somewhat different from the model Daskalakis et al. (2017) used, who defines a time frame dependent on positive respective negative growth for a certain period. Furthermore, the changing GDP defines the cutting point between the two time frames. Based on this, the variable will be used to separate a crisis- from a non-crisis period.

In the model, interaction variables are generated to estimate the effect of size on the financing choice in periods of less growth. Yazdanfar et al. (2019) also argue that the economic environment influences the leverage ratio.

Profitability rate

As the pecking order theory states, a firm should prefer internal funds over external funds since external funds in the form of debt could increase future costs of bankruptcy. Profitability increases a firm's retained earnings which increases a firm's internal funds. Therefore, profitability should have a negative relationship with leverage. Song (2005) conducted a study and found, in line with the pecking order theory, a negative relationship between profitability coefficients and all leverage measures used.

On the other hand, Harris and Raviv (1991) found a positive relationship between profitability ratio and leverage. This since when the marginal profit of the firm's output is large, a firm may increase its leverage as higher leverage creates incentives to increase the output.

Stock Price Performance

The variable stock price performance is defined as the percentage change in the firm's stock price compared with the previous period. This is to capture the volatility of the stock. High asymmetric information affects the stock price at the point of issuance of equity (Myers, 1984). The fluctuation of the stock price will present more beneficiary periods of issuing equity, implying a potential change in the capital structure, in accordance with the pecking order theory. Furthermore, Dimitrov and Jain (2008) argue that increased performance is negatively related to the leverage ratio since firms are able to issue or buy back equity when the stock is over- or undervalued. Actions in this matter thus entail a change in the capital structure and the firm's financing policy.

Asset Tangibility

Firms with higher amounts of tangible assets, indicating higher liquidation value, will take on more debt and have higher market value than firms with lower tangible assets. Consequently, in case of financial distress, they could utilize their higher proportion of sellable tangible assets to pay off outstanding debt (Harris & Raviv, 1991). In accordance with the trade-off theory, a higher degree of asset tangibility can decrease the cost of debt, thus increasing the benefits of additional debt. A positive relationship between leverage and tangible assets is found for constrained firms by Campello, and Giambona (2013). This is confirmed by Song (2005), who found a positive relationship between asset tangibility, TDA, and LTDA, but a negative one for STDA.

Effective Tax Rate

Fundamental theories such as Modigliani and Miller´s theorem (1963) and Trade-off Theory (Kraus & Litzenberger, 1973) argues that tax rate is an important cornerstone in explaining capital structure. Despite these arguments, some previous research concludes a negative relationship between tax rate and leverage. Booth, Aivazian, Demirguc-Kunt, and Maksimovic (2001) researched capital structure in developing countries and, in most cases, found a negative relationship between tax rate and book leverage. Jõeveer (2013) also confirmed the negative relationship between tax rate and leverage. On the other hand, Feld, Heckemeyer, and Overesch (2013) predicted and found a positive relationship between tax rate and leverage. This aligns with the trade-off theory that a higher tax rate should indicate greater benefits from an increased tax shield.

Inflation Rate (CPI)

Inflation rate is one of the macroeconomic variables used by previous studies to investigate the relationship between capital structure and macroeconomic variables. As of today, the results continue to be mixed. Hanousek and Shamshur (2011) find a significant, positive relationship between expected inflation and capital structure. Contradictory, Gajurel (2006) argues a negative impact on the TDA and STDA but a positive influence on the LTDA. Basto et al. (2009) do not find any significant impact of the annual inflation rate, which is supported by Frank and Goyal (2009), who further do not find any significant impact on book leverage.[3]

Interest rate

Interest rate can influence the amount of leverage for a firm, either increasing it through its tax benefits or decreasing it because of the increasing cost of debt, which increases bankruptcy costs (Mokhova & Zinecker, 2014).

Sigitas Karpavičius and Fan Yu (2017) argue that the impact is zero or moderately negative but only negative when the expected GDP growth is negative. The two authors argue that high adjustment costs make firms work towards a target debt-to-assets point rather than adjusting their capital structure when interest rates change. [4]

[3] The theoretical background on the impact of Inflation rate on capital structure is discussed under *Monetary Policy* in Section 2 *"Theoretical Framework"*

[4] The theoretical background on the impact of interest rate on capital structure is discussed under *Monetary Policy* in Section 2 *"Theoretical Framework"*

Table 2 - List of Variables

Variable	Definition of variable	Code
Dependent Variables		
Total Debt to Total Assets*	Total Debt/Total Assets	TDA
Short-term Debt to Total Assets*	Short-term Debt/Total Assets	STDA
Long-term Debt to Total Assets*	Long-term Debt/Total Assets	LTDA
Independent Variables		
Total Assets*	Log(Total Assets)	Size
Dummy		
GDP Growth**	1 when negative GDP growth, and 0 when positive GDP growth	C
Control Variables		
Asset Tangibility*	PPE/Total Assets	Tangibility
Profitability*	EBIT/Total Assets	Profitability Rate
Effective Tax Rate*	(Net Income Before Taxes - Net Income After Taxes)/Net Income Before Taxes	Tax Rate
Stock Price Performance*	$LN(StockPrice_1) - LN(StockPrice_0)$	Stock Performance
Interest Rate***	Quarterly Interest Rate	Interest Rate
Inflation**	Quarterly Inflation	Inflation
Interaction Variable	GDP Growth * Variable	C_Variable

*Table 2 displays the different variables used in the different models and their definition. The code defines the name used in the regressions in Table 5. *Gathered from Refinitiv, ** Capital IQ ***Riksbanken*

The control variables specified above will be used to reduce the omitted variable bias in the model, thus reducing the risk of omitted variables affecting the result and inferring bias to the regression results.

4.5 Data Collection

The listed firms and the variables were collected from Refinitiv Eikon, Capital IQ, and Riksbanken. The data on firm-specific variables was collected from Refinitiv with the help of its screener function. A template was generated with chosen firm-specific variables where the firms furthered got excluded depending on the availability of data. The macroeconomic variables were furthermore collected from Capital IQ and Riksbanken.

The sample contains data from firms listed OMX Stockholm Small Cap. Furthermore, real estate- and financial firms were excluded since their capital structure substantially differs from the majority of the firms in the sample. The firms within the sector possess a unique capital structure, thus, excluded companies reduce the potential skewness of the result. After the initial exclusion, the sample contained 88 firms.

The second and final exclusion was on duplicates of firms with both A- and B shares to ensure that the data is clear and unbiased. The only variable affected by duplicates is stock price performance which varies depending on the type of share. Yahoo Finance was used to clarify whether to exclude A- or B-shares in case of duplicates in our sample. A-shares were excluded from the sample since B-shares had the highest average trading volume, providing a better proxy for the stock price. Five duplicates were detected and further removed from the sample.

After the last exclusion, only 83 firms from the listed market remained, constructing the data in a panel data manner. The data contains firm-specific and macroeconomic data measured quarterly from 2018 through 2022, providing each firm with 20 quarters of data per variable used. Furthermore, some of the data was only available in monthly observation. To obtain the correct time frame for these variables, the average three following months, constructing a quarter, were calculated in order to obtain proxy fair and measurable quarterly data.

Descriptive statistics

The total observations for each variable are approximately 1500, with the lowest being asset tangibility with 1447 observations. A sample with this many observations is still considered a

significant and sufficient sample, especially considering the investigated area and time period for the collected sample.[5]

The standard deviation of firm size, inflation, and interest rate are distinguished in Table 3. To begin with, the high deviation of firm size is necessary to enable the size effect on capital structure. Secondly, the standard deviation of the macroeconomic variables inflation and interest rate indicates that the sample includes the recent crisis period defined by high inflation and increasing interest rates. This is also confirmed by the max values of the two variables.

Table 3 - Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max	1%	99%
TDA	1559	.162	.167	0	.692	0	.668
STDA	1560	.053	.071	0	.391	0	.322
LTDA	1560	.099	.126	0	.574	0	.551
Size	1520	20.138	.892	17.938	22.034	18.086	21.955
Tangibility	1444	.149	.192	0	.931	0	.823
Tax Rate	1519	.103	.176	-.624	.848	-.465	.617
Stock Performance	1515	-.027	.224	-.746	.534	-.627	.476
Profitability Rate	1522	-.019	.069	-.309	.071	-.272	.065
Inflation	1660	2.58	2.939	-.35	11.55	-.277	11.55
Interest Rate	1660	-.001	.55	-.5	2.008	-.5	2.008
C	1660	.221	.415	0	1	0	1

Table 3 presents an in-depth description of each variable and presents the number of observations, mean, and minimum and maximum value of the variables. Additionally, the 1st and 99th percentile are presented.

The dataset of the sample was winsorized at the 2.4th percentile and the 97.6th percentile to enable the exclusion of extreme outliers affecting the data. All the variables except the macroeconomic variables were winsorized since the effect from inflation and interest rate in

[5] Aineas Mallios, School of Business, Economics and Law at University of Gothenburg (Personal Communication, 2023)

all periods are essential to include. After the winsorization, the regression result was based on a final sample of 76 firms.

4.6 Limitations

The use of Refinitiv Eikon limited the gathering of variables due to missing data. Refinitiv Eikon furthermore limited further enlargement of our sample, and we were unable to gather indices, including companies smaller than the ones listed on OMX Stockholm Small Cap. In the EU SMEs are defined as companies with up to 250 employees (Berisha & Pula, 2015). Some firms in our sample do not necessarily follow this definition of small and medium enterprises. However, throughout the analysis, we rely on the generalization of small firms at OMX Stockholm to find general patterns.

Additionally, the quarters previous Q1 2018 did not contain sufficient data and were thus excluded for further analysis. Moreover, recessions are usually defined as two following quarters of negative GDP growth. The exclusion of time periods before Q1 2018 constrained the study from containing a sufficient amount of actual periods of recession. Thus, we will investigate the impact of one quarter with negative GDP growth as a crisis period.

5 Empirical results

The following section provides the results from the correlation matrix and regression results. Further, Table 5 displays the development of - and results from the regression models. All regressions will be interpreted at a 5% or lower significance level.

5.1 Results of the Correlation Matrix

As seen in Table 4, no correlation value between variables included in the same regression exceeds the +/- 0.8 threshold, and therefore, there is no indication of multicollinearity (Jaggia & Kelly, 2019, p. 571). The high correlation between TDA and LTDA can thus be neglected since they will be dependent variables in separate regressions. Despite this, inflation and interest rate still have a considerably high correlation. This is not anomalous since an increased interest rate is used to reduce inflation when running a monetary contractionary policy. Moreover, tangibility has a correlation of 0.60, 0.34, and 0.56 with TDA, STDA, and LTDA, respectively. The positive relationship between tangibility and the leverage ratios could depend on the variable's close relation to leverage.

Table 4 - Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) TDA	1.000										
(2) STDA	0.619	1.000									
(3) LTDA	0.892	0.196	1.000								
(4) Size	0.504	0.232	0.495	1.000							
(5) Tangibility	0.605	0.337	0.560	0.443	1.000						
(6) Stock Performance	-0.001	-0.010	0.005	0.026	0.034	1.000					
(7) Tax Rate	0.155	0.164	0.099	0.177	0.186	0.046	1.000				
(8) Profitability Rate	0.315	0.241	0.254	0.350	0.262	0.138	0.354	1.000			
(9) Inflation	0.034	0.014	0.034	0.057	0.089	-0.076	0.014	-0.035	1.000		
(10) Interest Rate	0.014	0.008	0.012	0.049	0.076	0.082	0.011	-0.024	0.757	1.000	
(11) C	-0.022	0.001	-0.028	-0.019	0.011	0.114	0.016	-0.047	0.049	0.369	1.000

Table 4 presents Pearson's correlation matrix, including all variables used to compute our regression results. The results of each correlation coefficient can take the number between -1 and 1, indicating whether there is a negative or positive relationship between the two sets of variables.

To further strengthen the results in Table 4, the results of the VIF test show neither problematic scores nor multicollinearity issues, according to James et al. (2013). The conducted VIF test can be found in Appendix Table A4.

5.2 Regression results

Table 5 displays the development of the model, adding control variables for a better fit. Initially, control variables related to the pecking order are included. Secondly, trade-off theory linked variables, asset tangibility, and tax rate are added. Lastly, the final model introduces the variables of interest rate and inflation related to the monetary contraction policy are included.[6]

The initial stages (1), (2), (3), and (4) are based on the development of TDA and are to be further used in the remaining analysis of the leverage ratios STDA (5) and LTDA (6). Furthermore, the number of observations decreases for each step of additional observations. This depends on the missing values and data cleansing, as previously mentioned. The observations gathered are in the finalized models 1135, 1135, and 1141 respectively. As referred to in Section 4.2, the chi-squared value exceeds the critical value and rejects all regressions' null hypotheses. R-squared could be used as a controlling function for the chi-squared test, whereas our model returns a value of 0.30, 0.09, and 0.31, respectively. The value for the STDA ratio is low, but all models could be interpreted such that they all fit the data when describing the leverage ratio.

[6] The different stages of inclusion refer to column (1), (2) and (3) in Table 5.

Table 5- Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**TDA**	**TDA**	**TDA**	**TDA**	**STDA**	**LTDA**
Size	0.06***	0.07***	0.05***	0.05***	0.01	0.04***
	(0.019)	(0.021)	(0.016)	(0.017)	(0.006)	(0.012)
Profitability Rate		-0.34**	-0.20**	-0.21**	-0.05	-0.14*
		(0.132)	(0.094)	(0.094)	(-0.038)	(0.072)
Stock Performance		0.01	-0.02***	-0.02**	-0.02***	0.01
		(0.010)	(0.007)	(0.009)	(0.006)	(0.009)
Tangibility			0.59***	0.60***	0.13***	0.49***
			(0.068)	(0.069)	(0.031)	(0.043)
Tax Rate			-0.04*	-0.04*	0.01	-0.02
			(0.023)	(0.023)	(0.016)	(0.023)
Inflation				0.00	0.00	0.00
				(0.002)	(0.001)	(0.001)
Interest Rate				-0.01	0.00	-0.02**
				(0.018)	(0.008)	(0.010)
C	0.07	0.02	0.43*	0.42*	0.10	0.24
	(0.171)	(0.189)	(0.222)	(0.223)	(0.086)	(0.160)
C_Size	0.00	0.00	-0.02**	-0.02**	-0.01	-0.01
	(0.009)	(0.010)	(0.010)	(0.012)	(0.004)	(0.008)
C_Profitability Rate		-0.01	0.08	-0.08	-0.02	-0.03
		(0.042)	(0.054)	(0.056)	(0.045)	(0.060)
C_Stock Performance		-0.02	0.04***	0.05***	0.02	0.01
		(0.025)	(0.015)	(0.016)	(0.011)	(0.015)
C_Tangibility			0.18***	0.19***	0.09*	0.04
			(0.060)	(0.059)	(0.045)	(0.050)
C_Tax rate			0.04	0.04	-0.03	0.05
			(0.039)	(0.039)	(0.023)	(0.037)
C_Inflation				0.01	0.00	0.00
				(0.006)	(0.006)	(0.006)
C_Interest Rate				-0.03	-0.02	0.01
				(0.032)	(0.031)	(0.032)
Constant	-1.07***	-1.23***	-0.85***	-0.88***	-0.07	-0.82***
	(0.372)	(0.429)	(0.321)	(0.336)	(0.129)	(0.247)
Observations	1481	1336	1335	1335	1335	1441
R-square	0.05	0.06	0.29	0.30	0.09	0.31
Chi-square	10.73	17.39	178.47	192.55	46.43	186.41
Prob > Chi- square	0.01	0.01	0.00	0.00	0.00	0.00

*Table 5 reports the regression results of the model in Section 4.3 with TDA (1-4), STDA (5), and LTDA (6). The clustered standard error is reported in parentheses. Significance at level * p<.1, ** p<.05, ***p<0.01.*

The impact on Total-debt ratio

Table 5 investigates the relations between TDA and chosen determination variables. One can observe that the variable of interest in both non-crisis and crisis periods is significant at a 1% and 5% significance level, respectively. In addition, a few control variables are also significant, further to be reported below.

In the non-crisis period, firm size, measured as the logarithm of total assets, is significant at a 1% significance level. Due to being logged with a positive coefficient of 0.05, a one percent increase in total assets will increase TDA by 0.05 percentage points.

The firm-specific control variables during a non-crisis period are all, except for the effective tax rate, significant on at least a 5% significance level. The first control variable to be treated is the profitability rate which is significant at a 5% significance level, taking a negative coefficient of -0.21. This implies that a one percentage point increase in profitability rate would decrease TDA by 0.21 percentage points. Secondly, the stock price performance is significant at a 5% significance level with a negative coefficient of -0.02, indicating that a one percentage point increase in the ratio would lead to a decrease of the TDA ratio with -0.02 percentage points. Furthermore, asset tangibility is significant at a 1% significance level with a positive coefficient of 0.60, indicating that a one percentage point increase in the tangibility ratio will result in a 0.60 percentage point increase in TDA. The effective tax rate is only significant at a 10% level, thus not interpreted further in Section 5.2.

As for the macroeconomic variables, both inflation and interest rate are insignificant and seemingly so in explaining any change in TDA during non-crisis periods. The dummy variable, defining the crisis period, is not significant at a 5% significant level and, therefore, not interpreted. Thus, we cannot conclude how quarters experiencing negative GDP growth affect the firms.

Further on, firm size in a crisis period could be observed to have a contractionary sign of the coefficient to the non-crisis period, being significant at a 5% significance level. Since the variable is logarithmic, the negative coefficient of -0.02 means that a one percent increase in total assets will decrease TDA by 0.02 percentage points.

The results regarding the small economic impact of size on leverage and the reported signs are confirmed by Daskalakis et al. (2017). The authors further found the size to have a positive coefficient of 0.001 in non-crisis periods followed by a negative coefficient of -0.002 in crisis periods, measured against TDA. Michaelas et al. (1999) further support the small economic impact of the coefficient.

Continuing with the integrated firm-specific control variables, profitability during a crisis period is insignificant at a 5% significance level and will not be further interpreted. On the other hand, the stock price performance is significant at a 1% significance level, indicating that a one percentage point increase in stock price performance would increase TDA by 0.05 percentage points. Asset tangibility is further significant in the crisis periods at a 1% significant level. The positive coefficient of 0.19 implies that with an increase in the ratio of one percent unit, the TDA ratio increases by 0.19 percentage points. As for the effective tax rate, the variable is insignificant at a 5% significance level. Furthermore, the macroeconomic variables, interest rate, and inflation are also insignificant at a 5% significance level in crisis periods.

The impact on Short-term debt ratio

The model examining the variables' effect on STDA gives several insignificant results. The variable of interest is neither significant in the non-crisis nor crisis periods.

Previous research on this matter has reported mixed results. Yazdanfar et al. (2019) have presented a small positive relationship between size and STDA, while Michaelas et al. (1999) reported a small negative relationship. On the other hand, Daskalakis et al. (2017) provide a somewhat similar result with an insignificant relationship between size and STDA in crisis periods and a small significant positive relationship in non-crisis periods.

Asset tangibility and stock price performance are the only control variables significant on at least a 5% significance level in a non-crisis period. The first mentioned variable is significant at a 1% significance level, indicating an effect of 0.13. This implies that a one percentage point increase in the tangibility ratio would lead to a corresponding increase in the STDA by 0.13 percentage points. Stock price performance is further, with a coefficient of -0.02 significant at a 1% significance level. Thus, a one percentage point increase in the stock

performance decreases the STDA ratio with 0.02 percentage points. As for the rest of the control variables during non-crisis and crisis periods, they are all insignificant. Thus, no further interpretation regarding their relationship to STDA can be made.

The impact on Long-term debt ratio

Lastly, the model using LTDA as the outcome variable shows more significant relations affecting the choice of issuance.

As for the variables of interest, the period of non-crisis is significant. Firm size is in this period significant at a 1% level, indicating a positive coefficient of 0.04, implying that a one percent increase in the amount of assets will increase the LTDA by 0.04 percentage points. The independent variable is, during crisis, insignificant.

Our results contradict the results of Daskalakis et al. (2017), who did not find any significant relationship between size and LTDA in non-crisis periods but found a significant negative relationship during crisis periods. Furthermore, our result aligns with the result of Michaelas et al. (1999), who find a small positive significant relationship between size and LTDA.

Asset tangibility follows the previous pattern from the other leverage ratios during non-crisis periods being significant at a 1% level with a coefficient of 0.49. This means that for every percentage point unit increase in the ratio of asset tangibility, the LTDA will increase by 0.49 percentage points. The interest rate is significant at a 5% significance level, and the coefficient shows a negative sign of 0.02, implying that a one percentage point increase in interest rate will decrease the LTDA ratio by 0.02 percentage points.

During non-crisis periods, the control variables profitability, stock price performance, effective tax rate, and inflation are all insignificant at a 5% significance level. Therefore, we are not able to draw any conclusion about their impact on LTDA. Likewise, for the crisis period of STDA, all control variables are insignificant during crisis periods, and we are likewise unable to draw any conclusion regarding their impact on LTDA.

5.3 Robustness of the result

The development of the model in Table 5 also treats the robustness of the results. In the process of expanding the model, the used control variables are added to improve the significance of the independent variable in two periods. The sign and effect of the coefficients remain relatively stable and do not fluctuate with the additional control variables introduced into the model. Table 5 demonstrates how added control variables affect the relation between TDA and size, this pattern is also to be found in the two excluded leverage ratios displayed in Appendix Table A6. The increasing significance for each added control variable stage validates and strengthens their inclusion in the original model.

6. Discussion

Previous research has unanimously argued that firm size influences the choice of capital structure. In our empirical research, the question is to investigate to what extent firm size affects capital structure in different macroeconomic environments. As seen in Table 5, a firm listed on OMX Stockholm Small Cap has an increasing TDA ratio during non-crisis periods and decreasing TDA in crisis periods as the firm grows larger. The relation between firm size and leverage is insignificant in STDA and LTDA, with the exception of size in the non-crisis period and LTDA. We are thus unable to draw any broad conclusions regarding STDA and LTDA. Due to this fact, the following discussion will mainly focus on the independent variables and their relation to the TDA ratio.

The empirical results reject hypotheses H_01 *and* H_02 regarding firm size effect on TDA, stating a positive relation in non-crisis periods and a negative one in crisis periods, respectively. An explanation for the positive relationship between the two variables in the non-crisis periods might be the asymmetric information affecting the issuance of debt. According to Kurshev and Strebulaev (2006), larger firms are able to issue debt cheaper than smaller firms. A higher information asymmetry requires a higher premium compensating for potential risk and therefore entails more expensive debt. Because of this, smaller firms issue more debt but do so less often than larger firms, and the lower frequency of issuance reduces the average leverage ratio for small firms. The fixed cost of issuing debt decreases as the firm grows larger, and consequently, the relative benefit from additional debt is greater. Larger firms are, because of this, to a higher degree, able to more easily reach their optimal target leverage ratio and thus optimize their trade-off between the gain of tax shield and the risk of financial distress (Kurshev & Strebulaev, 2006). This could be one reason for our result's positive relation between size and TDA.

The contradictory signs in the crisis periods, with a negative effect of firm size on TDA during crisis periods, indicate a pro-cyclical behavior in accordance with Korajczyk and Levy (2003). However, according to Korjazyk and Levy (2003), firms that take debt pro-cyclically should be more financially constrained. The conclusion that the larger a firm grows, the more financially constrained it gets seems unreasonable, especially as some sources state or assume that larger firms are less financially constrained than smaller firms (Daskalakis et al., 2017;

Jõeveer, 2013). The negative relationship between TDA and firm size can instead be explained through the framework of the pecking order theory. Instead of financing investments with debt, other financing sources could present themselves as cheaper, thus lowering their leverage ratio in crisis periods.

Considering the STDA, the independent variable in both periods is insignificant in the regression determining firm size effect on STDA. Thus, we cannot reject either of the two null hypotheses, H_03 or H_04. The relationship between LTDA and size indicates a small but significant positive effect in non-crisis periods, thus rejecting H_05. This is, however, only applicable in the non-crisis period, which makes us unable to reject or draw any conclusions regarding H_06.

To broaden the discussion about STDA and LTDA, Michaelas et al. (1999) state that smaller firms tend to be unable to access long-term debt and thus rely more on short-term debt. Conversely, this should imply that as the firm grows larger, it increases its LTDA and decreases its STDA, indicating that larger firms substitute their short-term debt for long-term debt. The results can validate that as a firm grows, it increases its LTDA in non-crisis periods. However, we are unable to confirm a negative effect of size on STDA, and thus only able to partially support Michaelas et al. (1999) argument presented above.

Although the independent variable and its effect on TDA are mainly examined in this study, a few control variables seem to affect the capital structure significantly. Because of this, they will be further discussed to complement the previous discussion. The pecking order states that firms will choose the cheapest source of financing. Additional debt will be issued if retained earnings are insufficient for future investment. Larger profitability will increase retained earnings if all profits are not paid out as dividends. Profitable firms tend to grow faster, enabling the use of internally generated profits, and thus rely less on acquired debt. With the result of the variable in non-crisis periods, the sign of the coefficient in our regression indicates that increased profitability could be a reason. To extend the discussion further, a hypothetical discussion will be held regarding the role of profitability during a crisis period since the variable is insignificant. When facing a crisis period, larger firms can rely more heavily on the previously generated internal capital and other cheaper financing options, thus decreasing their leverage ratio during crisis periods.

Moreover, the results show that the assets tangibility coefficient is positive and significant in all periods except for determining the effect on LTDA and STDA during a crisis period. While the economic impact of firm size is small, our empirical results show that the amount of tangible assets a firm possesses seems to have high-explanatory power and economic impact in determining the amount of debt a firm has.

According to Harris and Raviv (1990, as cited in Daskalakis et al., 2017), banks demand guarantees from SMEs to grant loans. A larger proportion of tangible assets increase the probability of accessing loans since they form collateral for the loan. The positive sign of the variable is aligned with the trade-off theory stating that firms should take on more debt because of the insurance in the collaterals. Contradictory, according to Myers (1984), increasing tangible assets should correlate with less debt because of the access to an active secondary market, while firms holding growth opportunities or intangible assets should increase their ratio. Access to a second market would provide incentives to seek funding other than external financing. However, Michaelas et al. (1999) state that a higher level of tangible assets should reduce the information asymmetry between managers and creditors. Less information asymmetry will increase the likelihood of better terms and lower financing costs. Therefore, aligned with the trade-off theory, higher asset tangibility should have a positive relationship with leverage, which is further confirmed in our study.

Considering the high inflation and increasing interest rate affecting the last periods of the sample, an interesting insight is that neither inflation nor interest rate affects either of the regressions. Nevertheless, there is one exception where interest rate affects LTDA in the non-crisis period. On the other hand, the high correlation between inflation and interest rate could potentially infer bias in the regression. The consequence of the presented bias could lead to incorrect inferences regarding the sign of the coefficient. The positive sign of interest rate seems questionable since increased interest rates should imply more expensive debt. Intuitively this should entail resistance to issuing more debt and therefore be carefully interpreted.

In regard to the mostly insignificant macroeconomic variables, Karpavičius and Yu (2017) found that interest rates have zero or slightly negative impact on firms' financing policies. Karpavičius and Yu (2017) argue that the reason for this is the mistiming between the market

and the firm’s target ratio. Adjustment costs prevent firms from adjusting to the macroeconomic environment, which may infer a delayed effect on the leverage ratio. Based on this argument and our results, the monetary contractions policy has arguably not yet affected the capital structure of smaller listed firms in Sweden.

7. Conclusion

This study analyzes how firm size relates to the capital structure during non-crisis and crisis periods for smaller listed Swedish firms. The empirical result shows several significant variables, whereas the independent variable, firm size, is significant in both periods in relation to total debt to assets. This aligns with the used theoretical framework and previous literature, providing insight into firms' financing policy during the economic implications of the most recent crisis periods. The small economic impact of size on the leverage ratios is aligned with previous studies. In this study, other variables are found to have a greater economic impact on firms' capital structure adjustment during the latest crisis periods. Asset tangibility seems to give a good explanation, complementing the economic impact of the firm size on total debt to assets. Additionally, firm size does not seem to affect short-term debt, while the variable has a small but significant effect on long-term debt. These findings contradict previous research in this area.

The conducted study provides insight into how different macroeconomic environments affect the relationship between size and the firm's leverage ratio. It unravels the different dynamics of a firm's capital structure and the complexity of financial policies smaller firms face. This study aims to contribute to the current literature and increase the comprehension of managerial issues related to smaller firms' capital structure, while emphasizing the role of economic- and macroeconomic theories in this context.

To summarize, the conducted study could potentially be premature to the analysis of current monetary policy changes. These effects may introduce a greater future impact on firms' capital structure, listed on OMX Stockholm Small Cap. Thus, future research could add further insight into the area of exploring how size relates to leverage ratios in different macroeconomic environments by analyzing the effects of current monetary policy contractions.

Reference list

Alves, P., Couto, E.B. and Francisco, P.M. (2015). Board of directors' composition and capital structure. *Research in International Business and Finance*, 35, pp.1–32. doi:https://doi.org/10.1016/j.ribaf.2015.03.005.

Bell, A., Fairbrother, M. and Jones, K. (2019). Fixed and random effects models: making an informed choice. *Quality & Quantity*, [online] 53(2), pp.1051–1074. doi:https://doi.org/10.1007/s11135-018-0802-x.

Berisha, G. and Pula, J. (2015). *Defining Small and Medium Enterprises: a critical review*. [online] Available at: https://www.researchgate.net/publication/276294683_Defining_Small_and_Medium_Enterprises_a_critical_review.

Booth, L., Aivazian, V., Demirguc-Kunt, A. and Maksimovic, V. (2001). Capital Structures in Developing Countries. *The Journal of Finance*, 56(1), pp.87–130. doi:https://doi.org/10.1111/0022-1082.00320.

Campello, M. and Giambona, E. (2013). Real Assets and Capital Structure. *Journal of Financial and Quantitative Analysis*, 48(5), pp.1333–1370.doi:https://doi.org/10.1017/s0022109013000525.

Clark, T.S. and Linzer, D.A. (2014). Should I Use Fixed or Random Effects? *Political Science Research and Methods*, 3(2), pp.399–408. doi:https://doi.org/10.1017/psrm.2014.32.

Cook, D.O. and Tang, T. (2010). Macroeconomic conditions and capital structure adjustment speed. *Journal of Corporate Finance*, [online] 16(1), pp.73–87. doi:https://doi.org/10.1016/j.jcorpfin.2009.02.003.

Dang, C., Frank) Li, Z. and Yang, C. (2018). Measuring firm size in empirical corporate finance. *Journal of Banking & Finance*, 86, pp.159–176. doi:https://doi.org/10.1016/j.jbankfin.2017.09.006.

Daskalakis, N., Balios, D. and Dalla, V. (2017). The behaviour of SMEs' capital structure determinants in different macroeconomic states. *Journal of Corporate Finance*, [online] 46, pp.248–260. doi:https://doi.org/10.1016/j.jcorpfin.2017.07.005.

Dias Basto, D., Nakamura, W.T. and Basso, L.C. (2009). Determinants of Capital Structure of Publicly-Traded Companies in Latin America: The Role of Institutional and Macroeconomics Factors. *SSRN Electronic Journal*. doi:https://doi.org/10.2139/ssrn.1365987.

Dickey, D.A. and Fuller, W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, 74(366), pp.427–431. doi:https://doi.org/10.2307/2286348.

Dimitrov, V. and Jain, P.C. (2008). The Value-Relevance of Changes in Financial Leverage Beyond Growth in Assets and GAAP Earnings. *Journal of Accounting, Auditing & Finance*, 23(2), pp.191–222. doi:https://doi.org/10.1177/0148558x0802300204.

Fama, E.F. and French, K.R. (2002). Testing Trade-Off and Pecking Order Predictions About Dividends and Debt. *Review of Financial Studies*, 15(1), pp.1–33. doi:https://doi.org/10.1093/rfs/15.1.1.

Feld, L.P., Heckemeyer, J.H. and Overesch, M. (2013). Capital structure choice and company taxation: A meta-study. *Journal of Banking & Finance*, 37(8), pp.2850–2866. doi:https://doi.org/10.1016/j.jbankfin.2013.03.017.

Frank, M.Z. and Goyal, V.K. (2009). Capital Structure Decisions: Which Factors Are Reliably Important? *Financial Management*, 38(1), pp.1–37. doi:https://doi.org/10.1111/j.1755-053x.2009.01026.x.

Gajurel, D.P. (2006). Macroeconomic Influences on Corporate Capital Structure. *SSRN Electronic Journal*. doi:https://doi.org/10.2139/ssrn.899049.

Gao, W. and Zhu, F. (2015). Information asymmetry and capital structure around the world. *Pacific-Basin Finance Journal*, 32(32), pp.131–159. doi:https://doi.org/10.1016/j.pacfin.2015.01.005.

Graham, J.R. and Harvey, C.R. (2001). The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics*, 60(2-3), pp.187–243. doi:https://doi.org/10.1016/s0304-405x(01)00044-7.

Hanousek, J. and Shamshur, A. (2011). A stubborn persistence: Is the stability of leverage ratios determined by the stability of the economy? *Journal of Corporate Finance*, [online] 17(5), pp.1360–1376. doi:https://doi.org/10.1016/j.jcorpfin.2011.07.004.

Harris, M. and Raviv, A. (1991). The Theory of Capital Structure. *The Journal of Finance*, [online] 46(1), p.297. doi:https://doi.org/10.2307/2328697.

Jaggia, S. and Kelly, A. (2018). *Business Statistics: Communicating with Numbers*. 3rd ed. McGraw-Hill Higher Education, p.571.

James, G., Witten, D., Hastie, T. and Tibshirani, R. (2013). *An introduction to statistical learning : with applications in R*. SECOND ed. Springer, pp.101–102.

Jensen, M.C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *The American Economic Review*, [online] 76(2), pp.323–329. Available at: https://www.jstor.org/stable/1818789 [Accessed 29 Apr. 2023].

Jõeveer, K. (2013). What do we know about the capital structure of small firms? *Small Business Economics*, [online] 41(2), pp.479–501. Available at: https://www.jstor.org/stable/43552879 [Accessed 19 Apr. 2023].

Karpavičius, S. and Yu, F. (2017). The impact of interest rates on firms' financing policies. *Journal of Corporate Finance*, 45, pp.262–293. doi:https://doi.org/10.1016/j.jcorpfin.2017.05.007.

Korajczyk, R.A. and Levy, A. (2003). Capital structure choice: macroeconomic conditions and financial constraints. *Journal of Financial Economics*, [online] 68(1), pp.75–109. doi:https://doi.org/10.1016/s0304-405x(02)00249-0.

Kraus, A. and Litzenberger, R.H. (1973). A STATE-PREFERENCE MODEL OF OPTIMAL FINANCIAL LEVERAGE. *The Journal of Finance*, [online] 28(4), pp.911–922. doi:https://doi.org/10.1111/j.1540-6261.1973.tb01415.x.

Michaelas, N., Chittenden, F. and Poutziouris, P. (1999). Financial Policy and Capital Structure Choice in U.K. SMEs: Empirical Evidence from Company Panel Data. *Small Business Economics*, 12(2), pp.113–130. doi:https://doi.org/10.1023/a:1008010724051.

Modigliani, F. and Miller, M.H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review*, [online] 48(3), pp.261–297. Available at: https://www.jstor.org/stable/1809766 [Accessed 20 Mar. 2023].

Modigliani, F. and Miller, M.H. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. *The American Economic Review*, [online] 53(3), pp.433–443. Available at: https://www.jstor.org/stable/1809167 [Accessed 15 Mar. 2023].

Mokhova, N. and Zinecker, M. (2014). Macroeconomic Factors and Corporate Capital Structure. *Procedia - Social and Behavioral Sciences*, [online] 110, pp.530–540. doi:https://doi.org/10.1016/j.sbspro.2013.12.897.

Myers, S.C. (1984). The Capital Structure Puzzle. *The Journal of Finance*, [online] 39(3), pp.574–592. doi:https://doi.org/10.1111/j.1540-6261.1984.tb03646.x.

Park, H., Lee, P. and Park, Y.W. (2020). Information asymmetry and the effect of financial openness on firm growth and wage in emerging markets. *International Review of Economics & Finance*, 69, pp.901–916. doi:https://doi.org/10.1016/j.iref.2020.06.004.

Proença, P., Laureano, R.M.S. and Laureano, L.M.S. (2014). Determinants of Capital Structure and the 2008 Financial Crisis: Evidence from Portuguese SMEs. *Procedia - Social and Behavioral Sciences*, 150, pp.182–191. doi:https://doi.org/10.1016/j.sbspro.2014.09.027.

Shyam-Sunder, L. and C. Myers, S. (1999). Testing static tradeoff against pecking order models of capital structure. *Journal of Financial Economics*, 51(2), pp.219–244. doi:https://doi.org/10.1016/s0304-405x(98)00051-8.

Song, H-S. (2005). Capital Structure Determinants An Empirical Study Study of Swedish Companies. Royal Institute of Technology, CESIS - Centre of Excellence for Science and Innovation Studies. https://ideas.repec.org/p/hhs/cesisp/0025.html

Stock, J.H. and Watson, M.W. (2020). *Introduction to econometrics*. Harlow, Uk I Pozostałe: Pearson Education Limited, pp.370–376.

Strebulaev, I.A. and Kurshev, A. (2006). Firm Size and Capital Structure. *SSRN Electronic Journal*. doi:https://doi.org/10.2139/ssrn.676106.

Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panal Data*. The MIT Press , pp.247–297.

www.riksbank.se. (n.d.). *Styrränta (tidigare reporänta), in- och utlåningsränta*. [online] Available at: https://www.riksbank.se/sv/statistik/sok-rantor--valutakurser/styrranta-in--och-utlaningsranta/.

Yahoo Finance (2023). *Yahoo Finance - Business Finance, Stock Market, Quotes, News*. [online] Yahoo Finance. Available at: https://finance.yahoo.com/.

Yazdanfar, D., Öhman, P. and Homayoun, S. (2019). Financial crisis and SME capital structure: Swedish empirical evidence. *Journal of Economic Studies*, 46(4), pp.925–941. doi:https://doi.org/10.1108/jes-04-2018-0147.

Appendix

Appendix A

The tables below display tests referred to in Section 4 except for Table A6 which is from Section 5. The Tables A1- A5 are conducted on variables or regressions based on the main dependent variable TDA.

Table A1 - Fisher-type unit root test

H0: All panel contain unit roots

Dependent variable	Chi-Square	Prob > Chi-square
TDA	264.72	0.00

H_0 specifies the test's null hypothesis and states that all panels contain unit roots.

Table A2 - Wooldridge test

H0: No first-order autocorrelation

Dependent variable	F-statistic	Prob > F
TDA	3.13	0.08

H_0 specifies the test's null hypothesis and states that there is no autocorrelation in the random effect model.

Table A3 - Test for Linearity

H0: No linearity

Dependent variable	Chi-square	Prob > Chi-square
TDA	158.35	0.00

H_0 specifies the test's null hypothesis and states non-linearity.

Table A4 - VIF

TDA	VIF	1/VIF
Interest Rate	3.04	.329
Inflation	2.672	.374
Size	1.339	.747
C	1.322	.757
Profitability Rate	1.308	.764
Tangibility	1.266	.79
Tax Rate	1.155	.866
Stock Performance	1.073	.932
Mean VIF	**1.647**	.

Table 4 displays VIF, indicating whether there is multicollinearity or not.

Table A5 - Breusch-Pagan test

H0: No heteroscedasticity

Dependent variable	Chi-square	Prob > Chi-square
TDA	2994.67	0.00

H_0 specifies the test's null hypothesis and states that the data is homoscedastic.

Table A6 - STDA & LTDA

	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Variable	**STDA**	**STDA**	**STDA**	**STDA**	**LTDA**	**LTDA**	**LTDA**	**LTDA**
Size	0.01 (0.005)	0.01* (0.006)	0.01 (0.007)	0.01 (0.006)	0.05*** (0.015)	0.06*** (0.016)	0.04*** (0.012)	0.04*** (0.012)
Profitability Rate		-0.08** (0.040)	-0.05 (0.039)	-0.05 (-0.038)		-0.21** (0.089)	-0.11* (0.066)	-0.14* (0.072)
Stock Performance		-0.02*** (0.006)	-0.02*** (0.006)	-0.02*** (0.006)		0.01 (0.011)	0.00 (0.008)	0.01 (0.009)
Tangibility			0.13*** (0.030)	0.13*** (0.031)			0.46*** (0.044)	0.49*** (0.043)
Tax Rate			0.01 (0.016)	0.01 (0.016)			-0.02 (0.022)	-0.02 (0.023)
Inflation				0.00 (0.001)				0.00 (0.001)
Interest Rate				0.00 (0.008)				-0.02** (0.010)
C	-0.12 (0.075)	-0.10 (0.084)	0.10 (0.086)	0.10 (0.086)	0.1 (0.147)	0.04 (0.147)	0.23 (0.160)	0.24 (0.160)
C_Size	0.01 (0.004)	0.01 (0.004)	-0.01 (0.004)	-0.01 (0.004)	-0.01 (0.008)	0.00 (0.008)	-0.01 (0.008)	-0.01 (0.008)
C_Profitability Rate		0.02 (0.057)	-0.02 (0.045)	-0.02 (0.045)		-0.03 (0.065)	-0.03 (0.059)	-0.03 (0.060)
C_Stock Performance		0.00 (0.012)	0.016 (0.010)	0.02 (0.011)		0.01 (0.015)	0.01 (0.013)	0.01 (0.015)
C_Tangibility			0.08* (0.046)	0.09* (0.045)			0.05 (0.051)	0.04 (0.050)
C_Tax rate			-0.03 (0.024)	-0.03 (0.023)			0.05 (0.038)	0.05 (0.037)
C_Inflation				0.00 (0.006)				0.00 (0.006)
C_Interest Rate				-0.02 (0.031)				0.01 (0.032)
Constant	-0.09 (0.098)	-0.16 (0.124)	-0.06 (0.140)	-0.07 (0.129)	-0.99*** (0.291)	-1.09*** (0.321)	-0.76*** (0.230)	-0.82*** (0.247)
Observations	1486	1336	1335	1335	1482	1338	1141	1441
R-square	0.01	0.03	0.09	0.09	0.07	0.07	0.30	0.31
Chi-square	6.38	16.09	44.97	46.43	14.79	15.84	170.87	186.41
Prob > Chi- square	0.09	0.02	0.00	0.00	0.00	0.03	0.00	0.00

*Table A6 displays the step-by-step inclusion of the variables described in Section 5.2. The clustered standard error is reported in parentheses. Significance at level * p<.1, ** p<.05, ***p<0.01.*

Appendix B

Appendix B displays Figures from Section 4.

Figure B1 – Endogeneity and Heterogeneity

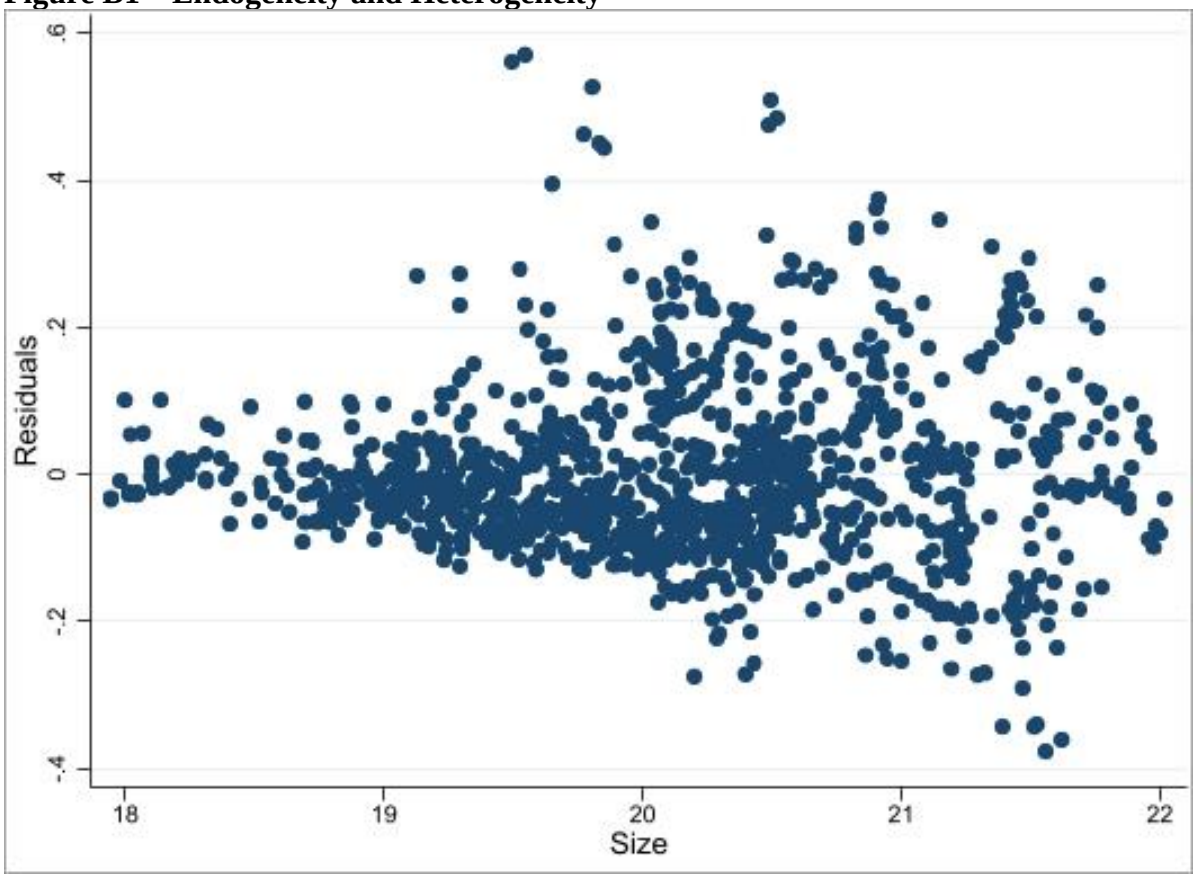

Figure B1 displays the error term plotted against the independent variable.
Source: STATA

Figure B2 - Within Variation for Independent Variables

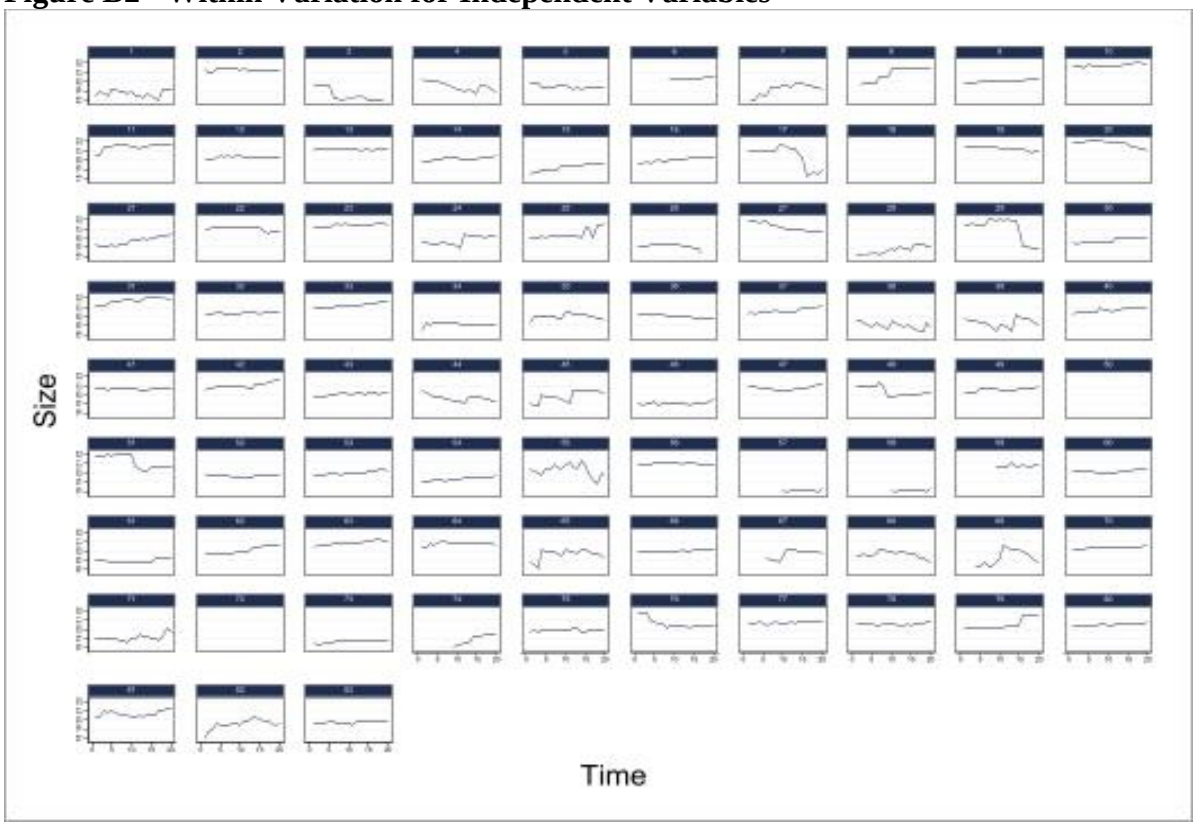

Figure B2 displays each firm's variation in size over the analyzed sample period.
Source: STATA