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The Economic Impact of the COVID-19 Crisis on Debt Maturity and Capital Structure Decisions: Evidence from Swedish Listed Firms

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Master's thesis in Accounting and Financial Management

Spring 2025

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Abstract

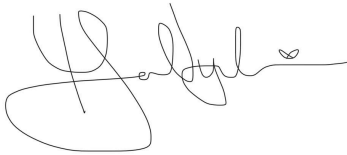
This study investigates how Swedish-listed firms adapted their capital structure in response to economic uncertainty caused by the COVID-19 pandemic. Drawing on previous research, we explored and analyzed shifts in firms' usage of short- and long-term debt before (2018-2020), during (2020-2022), and after the COVID-19 pandemic (2022-2024), to identify potential structural financial adjustments from the crisis. During and after the crisis, our results showed that while both short-term and long-term debt were affected, firms did not consistently prioritize long-term debt, particularly in the crisis period. Instead, firms appeared to focus on maintaining financial flexibility, favoring internal financing. The findings aimed to provide a deeper understanding of how firms respond to financial crises and the strategic role of debt maturity. The results gave insights into financial decision-making and the strategic role of debt maturity in uncertain times such as the crisis of COVID-19.

Keywords: Capital Structure, Debt maturity, COVID-19, Financial crisis, Economic uncertainty, Macroeconomic conditions, Pecking Order Theory, Trade-off Theory.

Acknowledgements

We would like to sincerely thank our supervisor, Ted Lindblom, for his continuous support and valuable input during the writing process. We also want to extend our appreciation to our co-students for their constructive feedback and interesting discussions, which greatly contributed to the development and refinement of this thesis.

Gothenburg, 22nd of May 2025



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1. Introduction

1.1 Background

A firm's capital structure, defined by the distribution of equity and debt that fund firm operations, plays a fundamental role in corporate financial decision-making. Modigliani and Miller (1958) noted that the choice of capital structure and optimal capital structure can affect a firm's cost of capital, risk, and long-term financial stability. The optimal structure is a concept of minimizing a firm's cost of capital while also ensuring financial balance. Given the significance of capital structure decisions, Harris and Raviv (1991) emphasized that managers must carefully consider their decision-making regarding the ratio between debt and equity including potential risks of financial stress and bankruptcy. However, research by Lim et al. (2022) observed that capital structure decision-making has not always followed financial rationality. Baker et al. (2020) argued that the COVID-19 pandemic made 2020 a unique year, triggering global economic disruption. The pandemic led to uncertainties regarding the financial markets, highlighting the vulnerability of firms' financial structures, as argued by Ongsakul et al. (2025). The COVID-19 pandemic led firms to react to external shocks when considering their strategies and capital structure decisions. The authors suggested that greater knowledge and deeper understanding about responses to financial shocks enhance the ability to effectively navigate future crises, including potential pandemics.

The impact of COVID-19 exposure on firms' leverage decisions can be viewed from several theoretical perspectives, however no single widely and universally accepted theory on capital structure decisions exists. Frank and Goyal (2009) argued that the prominent theories in previous research are the Trade-Off Theory (TOT) and the Pecking Order Theory (POT). Previous research by Kraus and Litzenberger (1973), and Myers (1984) has identified several market imperfections such as information asymmetry, transaction costs, and taxes, which impact firms' capital structure decisions. Ongsakul et al. (2025) highlighted the two main, yet conflicting, capital structure theories are the TOT proposed by Kraus and Litzenberger (1973), and the POT introduced by Myers and Majluf (1984). The Market Timing Theory (MTT) demonstrated by Baker and Wurgler (2002), building on earlier capital structure theories and highlighted information asymmetry as a prominent driver of firms' financing decision. The MTT suggested that firms have chosen their financing strategy based on market conditions. However, Shefrin (2001) argued that these theories do consider rational

decision-making, which is an assumption that has been questioned by behavioral corporate finance.

As reported by Avanza (2022), Swedish firms have been operating in a volatile market, even if the overall stock market has been increasing since 2013, the Stockholm Stock Exchange (OMX) has experienced a significantly volatile environment last decade, including the years of COVID-19. Furthermore, D'Amato (2020) stated that capital structure decisions are influenced by country-specific factors. Firms operating in different countries have different economic and macroeconomic environments, which may be shown differently in financial strategies, in response to negative economic conditions. Sweden developed a unique strategy regarding their financial market during the COVID-19 pandemic, as outlined by Ludvigsson (2020). It included country-specific government strategies, focusing on individual responsibility.

1.2 Problem Discussion

Theoretical evidence from finance theories showed attempts to explain capital structure, assuming that firms make rational financing decisions to maximize firm value. The frameworks presented value maximization by balancing benefits and costs of equity, and debt financing. It included Modigliani and Miller's irrelevance theorem (1958), the TOT by Myers (1984), and the POT by Myers and Majluf (1984). These theories represented opposing ends of the theoretical spectrum as highlighted by D'Amato (2020). Furthermore, Lindblom, Sandahl, and Sjögren (2011) discussed that there exists extensive research within the field of corporate finance theories trying to explain firms' optimal capital structure. However, it presented mixed evidence both supporting and challenging these theories regarding optimal capital structure and that it lacks harmonization on how and why firms determine their capital structure decision-making. Ongsakul et al (2025) highlighted that during crises, such as the COVID-19 pandemic, companies faced larger uncertainty which can increase information asymmetry. In theory, according to D'Amato (2020), this can lead firms to prefer debt financing instead of issuing equity to secure liquidity. However, Myers (1984) stated that excessive debt can result in long-term financial risks. Therefore, the identified problem to explore is whether firms' leverage and capital structure adjustments as a result of the COVID-19 pandemic were sustainable or not, aligning with the traditional theories, or if they reflect other, new patterns from the crisis.

Previous research has been done within a similar context on capital structure adjustments, where D'Amato (2020) investigated how small- and medium-sized enterprises (SMEs) in Italy adjusted their capital structure in response to the global financial crisis in 2008. The research revealed that SMEs adjusted their debt maturity, preferring short-term debt in periods of financial uncertainty. Furthermore, previous research by Ongsakul et al. (2025) has shed light on firms' impact from COVID-19 on capital structure decisions. The authors investigated how the pandemic influenced firms' capital structure decisions in Thailand with a text-based approach, by analyzing corporate disclosures and annual reports. The results showed that publicly listed companies with higher uncertainties caused by the COVID-19 pandemic made it harder for companies to comply with their capital structure strategies. In addition, companies faced higher risks of predicting their future cash flows, forcing them to adjust their capital structure by changing their mix of debt and equity to minimize financial distress. The authors Ongsakul et al. (2025) further discussed that firms in developed economies are less affected by the COVID-19 pandemic in terms of strong institutions that provide protection such as through subsidies to mitigate the negative impacts, hence, this study will focus only on listed firms. Sweden has strong institutions that allow for an exploration of how Swedish listed firms adapted their capital structure in response to the crisis. The problem identified by D'Amato (2020) and Ongsakul et al. (2025) was to understand the complex relationship between external shocks and how firms adjusted their capital structure in response. Anderson (2016) stated that crises are often viewed as defining moments that leave persistent political and economic consequences, influencing society and firms for years ahead. This situation provides an opportunity to investigate how Swedish firms adapted their capital structure in response to the crisis of COVID-19, suggesting further analysis of the effects, in comparison to previous research about earlier global financial disruptions.

1.3 Purpose of the Study

This study aims to analyze how firms in Sweden adjust their capital structure in response to macroeconomic shocks from financial crises, specifically focusing on the impact of COVID-19. The purpose is to investigate the impact of the pandemic on the capital structure, in terms of changes in debt maturity on Swedish listed companies. By focusing on Sweden, this study explores how firms within the Swedish context and environment navigated through

this crisis, allowing for a more nuanced understanding of country-specific dynamics that have impacted corporate financial decision-making.

1.4 Research Question

The study seeks to provide insights into how Swedish listed firms adjust their capital structure in response to financial crises as the pandemic, which includes a changing macroeconomic environment. The research question is formulated as follows:

- *How did the COVID-19 pandemic influence the debt maturity of Swedish-listed firms and how were these decisions shaped by firm-specific factors?*

2. Literature Review

2.1 Foundations of Corporate Finance Theories

Modigliani and Miller's (1958) theorem (M&M) provides a fundamental proposition in corporate finance research and exists in two different propositions. Proposing that in a perfect market, without taxes, transaction costs, or information asymmetry, capital structure is irrelevant to a firm's value. However, Modigliani and Miller's (1963) later revision incorporated taxes, whereas debt financing creates a tax shield, hence increasing firm value. While M&M serves as a strong theoretical benchmark, Stapleton (1981) argued that its assumptions do not hold in every real-world financial decision.

2.2 Information Asymmetry

Information Asymmetry, as conceptualized by Akerlof (1970), describes a situation in which one party in a transaction possesses more or better information than the other party. This leads to conflicts and inefficiencies due to one party being more informed than the other. The information asymmetry leads to other problems such as adverse selection, where high-quality products referred to as "peaches", avoid the market due to the fact that they can not get a fair price. As a result, the market becomes dominated by lower-quality products referred to as "lemons", which leads to declining overall product quality in the market, driving the prices down, and in extreme cases, leading to a market failure. Both buyers and sellers are therefore suffering from the lack of transparency and trust. In order to understand how firms determine their capital structure, it is essential to consider market dynamics and the role that information asymmetry plays in influencing financial decisions. Ongsakul et al. (2025) argued that during crises such as COVID-19, information asymmetry tends to increase due to heightened uncertainty.

2.3 Capital Structure

Baker and Wurgler (2002) emphasized that capital structure decisions are influenced not only by theoretical frameworks but also by broader macroeconomic conditions. These conditions are influenced by both firm profitability and investment activity, which aligns with Fama and French's (2002) underlying predictions of the TOT and POT. Previous research by Myers (2001), building on Shyam-Sunder and Myers (1999), supports the POT. While the TOT does

not account for information asymmetry as the POT does, Ongsakul et al. (2025) identified these two as the most central and conflicting theories in the context of capital structure decisions. The MTT suggests that a firm's capital structure is a result of historical financing decisions influenced by market conditions. Baker and Wurgler (2002) revealed that firms do not actively adjust their capital structure after capitalizing on market conditions.

Flannery and Rangan (2006) gave insights into how companies gradually adjusted their leverage ratio to a targeted structure, implying a dynamic process. The authors argued that firms adjusted toward their targeted leverage structure in a dynamic structure due to barriers, such as market conditions and information asymmetry, and that it is costly for firms to adjust debt. Their findings showed a balance between debt-adjusting costs and the costs of equity levels to reach an optimal capital structure. The authors further argued that the ability of firms to reach their targeted capital structure is constrained due to the transaction costs and adjustment costs associated with debt. According to the TOT by Kraus and Litzenberger (1973), profitability is connected to how firms take on more debt due to its tax benefits. Empirical evidence from Modigliani and Miller (1963) suggested that when a firm has higher taxable income, it can take advantage of more tax deductions.

2.3.1 Pecking Order Theory

The Pecking Order Theory (POT) by Myers (1984) and Myers and Majluf (1984) demonstrated a concept of a hierarchical order in how companies prioritize their financing sources. The principle determined the order is based on minimizing costs associated with information asymmetry, emphasizing the information asymmetry's impact on managers and external investors. Firstly, the theory's order posits that firms preferably utilize internal financing by retained earnings to finance projects, because it is less risky and does not require any external parties to evaluate the health of the firm's financials, thereby no costs associated with information asymmetry occur. Secondly, if the internal funds are insufficient, debt financing is the next source of financing in the order. Arguably, debt investors look at the company's ability to repay obligations rather than long-term potential. Thereby, debt financing is assumed to be less sensitive to information asymmetry than equity. Thirdly and least preferred, the theory posits that firms should issue new equity as their last financing source. It is the final one in the hierarchical order because it signals to investors that the shares are overvalued. This signal leads to potential adverse selection and reduction of the

existing shares, consequently the shareholders' value, as discussed by Myers (1984) and Myers and Majluf (1984).

2.3.2 Trade-Off Theory

The Trade-Off Theory (TOT) by Kraus and Litzenberger (1973), suggested that firms aim to find an optimal debt-to-equity ratio, balancing the tax benefits of debt with the costs of financial distress. In contrast to the POT, which focuses on a hierarchy of financing, the TOT emphasizes an optimal mix of capital. The theory means that debt benefits include tax shields (tax-deductible interest payments) and lower costs compared to equity because debt holders have a higher priority if facing bankruptcy. However, firms having high debt increase their risk of financial distress, which leads to direct costs such as legal fees, and indirect costs such as reputational damage. Myers (1984) highlighted that having too much debt limits future fundraising options and reduces financial flexibility. Thus, the optimal capital structure is determined by balancing the marginal benefits and costs of debt, represented by the minimum point on the weighted average cost of capital (WACC) curve, whereas the firm's value is maximized. However, having too much debt increases WACC, due to financial distress and offsets tax benefits that come from using debt, as argued by Myers (1984), building upon Modigliani and Miller (1958). The TOT helps guide managerial decisions on debt levels and helps investors in assessing financial health and default risks. Building on the TOT, DeAngelo and Masulis (1989) extended the capital structure strategy discussion by incorporating both corporate and personal taxation. The authors highlighted that tax benefits of debt are influenced, not only by corporate tax deductibility of interest payments, but also by the presence of non-debt tax shields, such as depreciation and investment tax credits. These non-debt tax shields can substitute for the tax advantage of debt, thereby reducing the marginal tax benefit of additional debt, and thus lowering firms' incentive to increase leverage.

2.4 Firm-Specific and Industry-Specific Factors

Firm-specific and industry-specific factors play a key role in leverage decisions. Harris and Raviv (1991) emphasized that leverage is influenced by firm-specific and industrial factors such as fixed assets, firm size, and investment opportunities. Moreover, Titman and Wessels (1988) and Frank and Goyal (2009) suggested that these factors affect capital structure choices differently across firms. The factors explaining changes in the capital structure are

market-to-book, size, tangibility, and profitability, alongside the level of debt. For instance, larger firms with more tangible assets are typically shown to have easier access to debt financing with resilience to interest rates. Smaller firms are argued to have higher business risk and may rely more on equity issuance or internal financing, due to limited access to external financing, and high transaction and borrowing costs. Furthermore, industry-specific factors significantly influenced the decisions regarding capital structure, as argued by Frank and Goyal (2009). Titman and Wessels (1988) demonstrated that highly profitable firms tend to have lower leverage, which is associated with a positive effect on profitability. However, Norton (1990) highlighted that smaller firms often and preferably avoid debt, focusing more on flexibility.

2.4.1 Macroeconomic Conditions

Flannery and Rangan (2006) discussed that companies strive towards an optimal capital structure, aligned with the TOT. Öztekin and Flannery (2012) proposed that institutional conditions play a crucial role in influencing the speed of adjustment to the optimal capital structure. The role of country-level macroeconomic variables and prominent institutional factors was shown to influence how firms adjusted their capital structure to meet their target levels. Furthermore, firms had several constraints to adjust their leverage to meet their targeted capital structure, gradually adjusted over time. The constraints that impact firms' capital structure are argued to be transaction costs, legal constraints, institutional factors such as the size of the firm and its accessibility to capital markets, and macroeconomic factors such as economic growth. Narjoko and Hill (2007) emphasized that the type and stability of the economy play a key role in shaping firms' access to capital markets and their ability to leverage debt effectively. In stable macroeconomic conditions, firms are more likely to benefit from economies of scale and access debt financing more efficiently.

2.4.2 Asset Structure

Bradley (1984) researched the relationship between firm characteristics and leverage, where the author revealed that companies with more tangible assets and stable earnings tend to take on more debt. This finding supports the idea from the TOT by Kraus and Litzenberger (1973), about firms adjusting their capital structure based on their level of risk. That firms with more tangible assets can risk taking on higher leverage due to the assets serving as securities, which reduces the risk of financial distress. Moreover, firms with higher business

risks or volatile earnings tend to avoid debt. D'Amato (2020) and Daskalakis et al. (2017) discussed that asset structure was crucial for determining a firm's financing decisions and impacts a firm's capital structure across varying industries. The authors Daskalakis and Psillaki (2008) emphasized that firms that have a higher proportion of fixed assets can use it as a security, thereby making it easier to obtain long-term debt. López-Gracia and Sogorb-Mira (2008) revealed that tangible assets reduced lenders' risk, influencing the capital structure decisions. D'Amato (2020) revealed that firms with fewer fixed assets tend to rely more on short-term financing or equity to gain flexibility.

2.4.3 Profitability

The POT's insights by Myers and Majluf (1984) about firms preferring using internal funds over debt, lead to a negative relationship between leverage and profitability. Meanwhile Zeitun and Tian (2007) argued that capital structure negatively impacts profitability, meaning that when firms increase their debt it tends to decrease their market valuation and profitability due to increased financial risk. Profitability is crucial as firms prefer using internally generated funds as a source of financing, according to POT by Myers and Majluf (1984). The POT suggested that external borrowing is considered mainly for its tax advantages, and equity issuance profitability affects the capital structure. Fama and French (2002) argued that firms with higher profitability that have fewer investment opportunities usually tend to pay higher dividends. In contrast, Faulkender et al. (2012) suggest that firms rather use their available resources, focusing on cash flows to adjust their capital structure. The authors revealed that firms having higher net earnings led to stronger cash flows, resulting in the ability to finance their investments and operations, hence gaining more flexibility. These conclusions were supported by the TOT by Kraus and Litzenberger (1973), whereas the trade-off is between costs and tax benefits affecting the firm's cash flows. Faulkender et al. (2012) emphasized that profitability influences capital structure decisions as more profitable firms can use their earnings to take on debt, make investments, or reinvest in growth.

2.4.4 Firm Risk

Bradley (1984) highlighted that firm risks negatively impact leverage. Meaning, when bankruptcy costs are high, larger firms are discouraged to increase their debt, to mitigate the probability of facing financial distress. Higher firm risk is theoretically associated with lower leverage, aligning with the TOT by Myers (1984). Furthermore, Wald (1999) discussed how

firm characteristics impact capital structure decisions and compared multiple countries. The result revealed that firm characteristics such as firm size have higher risks. Larger firms was shown to have diversified strategies, leading to higher operational and financial risk due to more fluctuating profitability and cash flows. Therefore, limiting their debt financing due to unpredictable cash flows and the risks associated. However, previous research by Ongsakul et al. (2025) revealed that larger firms tend to have more financial stability and therefore have a reduced risk of bankruptcy. Firm risk can be denoted by a firm's ability to generate earnings in relation to its total assets. Alipour, Mohammadi, and Derakhshan (2015), and Boateng et al. (2022) highlighted that high profit volatility increases the risk of having limited access to long-term financing.

2.4.5 Liquidity

De Jong et al. (2008) discussed that firms with more liquid assets have been shown to be less likely to be caused by financial distress and bankruptcy in the short term, hence these firms have the ability to increase their debt. In addition, Faulkender et al. (2012) emphasized that firms with higher cash reserves have a better position to make investments when it is more costly to take on more debt or if it is unavailable. Firms having greater cash flows gave them more financial flexibility, which enabled them to adjust their capital structure to their targeted level. Furthermore, when markets are imperfect and borrowing costs are expensive, higher liquidity is concluded to be crucial for operations and growth. D'Amato (2020) stated that firms having more liquid assets are positively related to long-term debt. Liquidity can hence affect debt maturity in different ways, meaning that long-term debt can cause financial distress to worsen over time if it lacks sufficient liquidity. As a result, firms have shown to maintain liquidity in the short term to strengthen their capacity to take on long-term debt.

2.4.6 Firm Size

Hall, Hutchinson, and Michaelas (2004) examined the relationship between firm size and leverage, and noted that this relationship may vary depending on the maturity structure of debt due to their high profit volatility. Therefore, small firms face greater bankruptcy risks, limiting their access to long-term financing. According to Narjoko and Hill (2007), firm size and leverage are affected and depend on the type of economy. Hence, when the economy is stronger or developed, larger companies have easier access to financial resources, which enables the firms to take on more debt if needed. The opposite in weaker economies or

developing economies, smaller firms avoid taking on debt due to the higher risks of debt costs. On the one hand, the size of firms and leverage have a positive relationship with capital structure. On the other hand, previous research by Titman and Wessels (1988), and Rajan and Zingales (1995) has highlighted that company size has a negative relationship with capital structure. Large companies tend to have better protection against bankruptcy, considering their high value of realizable net assets, which reduces their need and reliance on external debt financing. Öztekin and Flannery (2012) pointed out that larger companies tend to have greater access to capital markets, which allows them to access flexible, secure financing. Consequently, having a better ability to adjust quicker to their target capital structure compared to smaller firms. Furthermore, the importance of the institutional environment is highlighted, as more well-developed financial systems with more efficient capital markets have shown to have a quicker adjustment. In contrast, Myers (2001) discussed that firms, regardless of their size, follow the POT.

Previous research by Hamid, Abdullah and Kamaruzzaman (2015), Kim and Sorensen (1986), Serghiescu and Văidean (2014), Thippayana (2014) and Tongkong (2012) stated that larger companies are expected to use high levels of funding due to their borrowing capacities, indicating a positive relationship between firm size and leverage. Furthermore, the insights from Frank and Goyal (2009) about larger firms tended to have lower leverage and prioritized retained earnings, thus internal financing instead of debt, aligns with the POT by Myers (1984), and Myers and Majluf (1984). This highlights a contradiction, suggesting a disconnection between theory and practice observed in previous research. According to Kraus and Litzenberger (1973), the TOT implied a positive relationship with leverage. However, the POT by Myers and Majluf (1984) implied a negative relationship. Building on this negative relationship, Frank and Goyal (2009) argued that larger firms may rely more on internal financing over external debt.

2.5 The Financial Crisis and Its Effect on Companies' Capital Structure in Sweden

The World Health Organization (WHO, n.d.) declared the outbreak that came in January 2020 a pandemic on the 11th of March 2020. On May 5th 2023, WHO announced that COVID-19 was no longer considered a Public Health Emergency of International Concern (PHEIC). The European Investment Bank (EIB) Survey (2021) reveals that 8% of Swedish firms increased

their debt levels due to the COVID-19 pandemic. Andersson and Arvidsson (2024) conducted a study in 2020 and 2021 of Swedish-listed firms on the OMX Nasdaq stock exchange. The authors disclosed findings that the following economic downturns from the pandemic led to firms reallocating their resources, with less priority on sustainability efforts, and more priority on short-term financial stability. Furthermore, the Government of Sweden (2025) published a statement on the 19 of March 2025, that Sweden had entered a recovery phase after COVID-19 in the second half of 2024. The GDP increased by 0.8% in Q4 of 2024, and household investments and consumption had started to grow. However, business investments were shown to grow more slowly due to uncertainties in geopolitics, inflation and trade policies. The heightened uncertainties caused by the pandemic also introduced potential increased costs, which could influence firms' financing decisions as they balance debt and equity. Angelov and Waldenström (2023) provided insights into the general economic impact of COVID-19, and found that the effects in Sweden from the pandemic were significant. The report highlighted a profound impact on firm sales across Sweden, with an average decline of 6.1% in sales during the early stages of the pandemic and faced increased uncertainty. The regions that faced a higher spread of the virus had stricter restrictions and lockdowns, which led to greater financial strain for the companies.

Yazdanfar, Öhman and Homyoun (2019) highlighted that Sweden's financial landscape got significantly affected by the financial crisis in 2008. They noted that both imports and exports fell by 17% between 2008 and 2009, showing that firms in Sweden are dependent on international markets. Yazdanfar et al. (2019) discussed how the financial crisis changed firms' capital structure, whereas firms tended to shift toward short-term debt instead of relying on internal financial resources, which were shown to be stronger during decreased profitability. Moreover, Andersson and Arvidsson (2024) discussed that previous research has primarily examined the impact of the strategies in the context of global economic crises or natural disasters, where COVID-19 is characterized as having a unique scope, suggesting a different impact compared to previous crises. Lu and Khan (2023) demonstrated that while COVID-19 can be seen as a temporary crisis, the large impact and its lessons learned can help firms become more resilient to future disruptions.

2.6 Hypothesis development

The first hypothesis examined whether the COVID-19 pandemic led to a shift in the debt maturity structure of Swedish listed firms, specifically a decreased reliance on short-term debt during the crisis period. Kraus and Litzenberger (1973) through the TOT, emphasizes that firms balance the tax benefits of debt against the cost of financial distress. Myers (1984) argued by the POT that firms preferred internal financing to avoid the costs of external financing. Prior research by Flannery and Rangan (2006) has shown that the maturity of debt decisions are critical in shaping capital structure, as longer maturities reduce refinancing risk and increase financial stability. This is particularly important during periods of uncertainty, as argued by Ongsakul et al. (2025). Moreover, D'Amato (2020) stated that in times of crisis, firms may shift from short-term debt to long-term debt to reduce refinancing pressure and maintain financial stability.

H₁: The COVID-19 pandemic led to a shift in the debt maturity structure of Swedish listed companies, with a reduced reliance on short-term debt, toward being more reliant on long-term debt during the crisis period.

D'Amato (2020) and Ongsakul et al. (2025) argued that during crises such as the COVID-19 pandemic, heightened uncertainty can increase information asymmetry, leading to firms preferring internal financing over debt to secure liquidity. Faulkender et al. (2012) further stated that firms prioritizing long-term debt can take advantage of tax benefits from having debt, but excessive leverage without enough cash flow can weaken a company's financial stability.

H₂: The COVID-19 pandemic significantly impacted the capital structure of Swedish listed companies, with higher reliance on internal financing, reducing overall debt during the crisis period.

3. Methodology

3.1 Method Description

This study adopted a deductive quantitative research design to systematically examine the relationship between capital structure determinants and firm-specific factors of Swedish-listed firms. The authors Patel and Davidson (2019) discussed the applicability of this methodological approach in analyzing numerical data and delivering as objective results as possible. The report used panel data regression models to analyze the interactions between firm-specific variables, market conditions and firms' leverage decisions. The output aimed to provide insights into how corporate financial strategies evolve over time. The statistical testing was done in Stata since it is argued by Cameron and Trivedi (2010), to be well-suited for the amount of data and handling panel data regression. This study explored firm adjustments on short-term and long-term debt by examining whether the COVID-19 crisis led to firms adjusting their capital structure. The study aimed to analyze and understand how firms in Sweden responded to an extreme macroeconomic event by examining leverage adjustments. It assessed how firms adjusted their capital structure during the crisis, explored how it was adjusted after the crisis, and compared it to the pre-crisis environment. The pre-crisis period was defined as 2018-2020, the crisis period extended from 2020-2022, and the post-crisis period covered 2022-2024. This provided insights for identifying the different impacts that crises had on firms in varying industries. This study focused on Swedish-listed companies, including those listed on both domestic and international exchanges, excluding micro-enterprises and SMEs.

3.1.1 Statistical Analysis Model

This study used panel regression models with panel data to explore the relationship between capital structure and the selected control variables across multiple firms and periods. It included cross-sectional and time-series variations. Two common models used when handling observations across multiple firms over time were the Fixed Effects Model (FEM) and Random Effects Model (REM) to control for unobserved heterogeneity that could influence the dependent variable (leverage). To determine which model was best to use in this study, a Hausman test was performed to see which model was most suitable to examine the relationship between the variables. In this test, a $\alpha = 5\%$ was used as the significance level.

According to Baltagi (2013), if the test rejects the null hypothesis, FEM is preferred, conversely, if the test does not reject the null hypothesis the REM is preferred.

The panel data analysis is a methodological approach that can be seen as a pooled time-series of cross-sections according to Mavruk (2025). Panel data distinguishes itself from single cross-sectional or time-series analyses by having the ability to track these units over time. Hence, providing deeper insights into these units' behavior. Furthermore, it introduced greater variation, allowing for more efficient estimation of key coefficients. Observing units over time provided deeper insights into their dynamics, allowing the study and control of individual heterogeneity, which enhanced the robustness of the analysis.

3.1.2 Data Collection

The firm-specific and financial data were collected from Capital IQ, gathering financial information from annual and quarterly reports from 2018 to 2024. This source was chosen due to its broad database and availability. Furthermore, a random sample of 20 observations was conducted to ensure accurate data was obtained from Capital IQ by comparing it with the companies' annual reports. Since the study aimed to analyze Swedish-listed firms for the chosen time period, the data were sorted according to the criteria of Swedish publicly-listed firms and company status as an operating company. Therefore, it was limited to Swedish companies that were both operating and listed during the studied period, including those listed on both domestic and international exchanges. Given the study's purpose, firms in banking, financial institutions, and real estate sectors were excluded from the data collection because their capital structure and equity are regulated and controlled by governance structures.

3.1.3 Sample

The initial sample consisted of 724 companies, based on the data collection from Capital IQ. The sample of listed companies was chosen to ensure access to high-quality, reliable accounting data. Listed firms are subject to stricter reporting standards and their financial information is more accessible. Thus, the financial information in this sample was more consistent and comparable across firms and over the years, providing an accurate representation of the dataset. After sorting and excluding companies founded between 2018-2024, 690 companies remained. The exclusion was made because these companies did

not provide a complete analysis due to their limited operational history. As these excluded companies are relatively new, their financial data was incomplete, leading to missing values. Furthermore, companies with missing equity values were removed, resulting in a final sample that included 597 companies, with a total of 3,582 observations collected between 2018 to 2024.

3.1.4 Methodological Limitations

According to Mavruk (2025), the main limitation of panel data is the data collection problem, meaning that it could include incomplete information on the units over time. This can be compared with problems with surveys that have nonresponse, self-selectivity or attrition and survivorship bias. However, it is more problematic in settings of panel data, due to the need to be collected over time. More limitations of panel data include the short time-series dimension, which is common in corporate finance studies that examine firm-level (micro) data. A limited time frame increases the risk of survivorship bias, as only the data of the firms that survive over the period are included in the analysis. To address this, the study incorporated an extended time dimension to ensure a sufficient and credible dataset. Mavruk (2025) discussed that panel data can suffer from both heteroskedasticity and autocorrelation, which may result in inefficient tests for the coefficient's significance, misleading the conclusions. To address this inference issue, the study employed heteroscedasticity and autocorrelation-consistent standard errors. Furthermore, clustered standard errors were used to address heteroscedasticity and autocorrelation problems in panel data.

3.1.5 Transparency Statement on the Use of Generative AI

In line with The School of Business, Economics, and Law's guidance on using generative AI in higher education, the transparent usage of such tools is disclosed. Generative AI, through ChatGPT by OpenAI, was used as a support tool to provide suggestions for language refinement, aimed at enhancing structure and clarity. Furthermore, Grammarly was used for grammar and spelling correction, aimed at improving language and readability. All content has been edited, finalized and critically reviewed by the authors. We fully acknowledge and take full responsibility for the academic integrity of all content in this thesis.

3.2 Research Design

Given the thesis objectives and the formulated hypotheses, a quantitative research strategy was identified as the most appropriate approach to analyze the relationship between capital structure, macroeconomic crisis, and firm-specific factors. The articles used in the analysis model were taken from highly ranked international research journals. Highly ranked journals according to the Chartered Association of Business Schools (2021), included articles published in journals at levels from 2-4 in the Academic Journal Guide (AJG). The analysis model used in this report builds upon D'Amato (2020), but was adapted to the Swedish context. The article was published in an AJG-ranked level 3 journal, which helped to enhance its credibility. In the previous study that this research builds upon, the author examined small-, and medium-sized enterprises (SMEs) over the period from 2006 to 2016, exploring how the global financial crisis influenced their capital structure decisions and the factors that shaped these decisions. The variables used in the model from D'Amato (2020) were applied in the analysis and regression model. However, another period was investigated instead of the global financial crisis. The study investigated the impact of the COVID-19 pandemic and its crisis, as it was the most severe economic disruption since the global financial crisis of 2008 according to OECD (2021). Hence, the investigation period was between 2018 to 2024.

3.3 Variable Descriptions

The dependent variable in the study, as specified in the panel model of D'Amato (2020), was financial leverage which was defined as the ratio of total debt to total assets (D/TA) for firm i in year t . Furthermore, as the aim of the study was to analyze the impact on the debt maturity, the total debt ratio was separated into sub-variables. Long-term debt (LTD/TA) and short-term debt (STD/TA), both measured as the share of total assets, were used as the dependent variables. The metrics were used to evaluate how firms balanced debt and equity for financial stability, showing to what extent a company relies on debt to finance its assets. Debt maturity, as defined in the research question, was measured using the proportion of short-term and long-term debt, serving as a proxy for firms' debt maturity preferences.

3.3.1 Variable Definition

All the following variables listed below in Table 1 were firm-specific and were therefore included in $X_{i,t}$, the vector of firm-specific explanatory variables in the regression model.

Book values were used instead of market values in the descriptive statistics and throughout the empirical analysis. This decision followed the approach by D'Amato (2020) and was motivated by both data availability, comparability and methodological consistency.

Table 1 Variable Definition

Variable	Definition	Reference	Source
Firm age	Natural log of the age of firm i in the year t	D'Amato (2020)	Capital IQ
Firm size	Natural logarithm of sales of firm i in year t	D'Amato (2020)	Capital IQ
Asset structure	The ratio between fixed assets and total assets of firm i in year t	Daskalakis et al. (2017); Daskalakis and Psillaki (2008); López-Gracia and Sogorb-Mira (2008); D'Amato (2020)	Capital IQ
Profitability	The ratio between earnings before interest, tax depreciation and amortization (EBITDA) and total assets of firm i in year t	Denis and Kruse (2000); D'Amato (2020)	Capital IQ
Firm risk	Proxied by profit volatility: Standard deviation of earnings before interest and taxes (EBIT) / Total assets of firm i in year t	D'Amato (2020); Alipour et al. (2015); Boateng et al. (2022)	Capital IQ
Growth opportunities	Annual growth rate of the sales of firm i in year t	Daskalakis et al. (2017); Hall et al. (2004); López-Gracia and Sogorb-Mira (2008); Palacín-Sánchez et al. (2013)	Capital IQ
Liquidity	Ratio of current assets to current liabilities of firm i in year t	D'Amato (2020)	Capital IQ
Non-debt tax shield (NDTS)	Ratio of total depreciation expenses to total assets of firm i in year t	Titman and Wessels (1988); D'Amato (2020)	Capital IQ

3.3.2 Explanation of Variables

Several variables presented in Table 1 require further explanation due to their complexity and the specific context of their use. Given that the methodological approach and metrics used were based on D'Amato (2020), sales were used as an indicator of firm size due to their reflection of firms' ability to generate revenue, linked to financial flexibility and access to capital markets. The calculation of firm size was done by taking the natural logarithm of sales to measure the firm size, to reduce skewness in the distribution of sales data, providing a standardized measure and thereby allowing an enhanced comparison across firms. Thus, the metric *firm size* (S) is defined as $\ln(S)$. Moreover, Alipour, Mohammadi, and Derakhshan

(2015), and Boateng et al. (2022) highlighted that high profit volatility increases the risk of having limited access to long-term financing. Therefore, *firm risk* is assessed by calculating the standard deviation of earnings before interest and taxes (EBIT) relative to total assets. The metric captures financial vulnerability and is defined as the standard deviation of EBIT divided by total assets. Furthermore, Faulkender et al. (2012) emphasized that profitability influences capital structure decisions as more profitable firms can use their earnings to take on debt. The author D'Amato (2020) used EBITDA (earnings before interest, taxes, depreciation and amortization) divided by total assets, showing how efficiently a firm uses its assets in order to generate earnings. Hence, EBITDA was better than ROI and ROE due to being less vulnerable to accounting manipulations from the treatment of amortization and depreciation argued by Denis and Kruse (2000). Thus, the *profitability* measure is defined as the ratio between EBITDA and total assets.

3.3.3 Regression Equation

The following panel model was used to test the hypothesis:

$$\text{Leverage}_{i,t} = \alpha + \beta X_{i,t} + \gamma C_t + \lambda PC_t + \theta_i + \varepsilon_{i,t}$$

where:

$\text{Leverage}_{i,t}$ = Represented the dependent variable. Leverage is the ratio of total debt to total assets (D/TA), long-term debt to total assets (LTD/TA), and short-term debt to total assets (STD/TA) of the firm i at time t .

α = The intercept term.

$X_{i,t}$ = Denoting the numerous explanatory variables, for firm i in year t .

β = Represented a vector, representing the coefficients associated with the firm-specific explanatory variables ($X_{i,t}$).

C_t = Represented a dummy variable for the crisis period. Meaning, equal to 1 during the crisis years and 0 otherwise.

PC_t = Represented a dummy for the post-crisis period. Meaning, equal to 1 for years after the crisis, and 0 otherwise.

γ and λ = Represented the coefficients for the dummies.

θ_i = Represented a constant for firm-fixed effects, to address omitted variable bias.

$\varepsilon_{i,t}$ = Error term

3.3.4 Descriptive Statistics

To limit the influence of extreme observations and control for outliers, the dataset was winsorized at the 1st and 99th percentiles. The regression analysis began with descriptive statistics, providing an overview of the variables and data. Table 2 displays all variables in the dataset, with the dependent variables listed first. The number of observations ranged from 2,093 to 3,582 across the variables, which were shown to likely be due to limited data availability for firms with long-term debt. The variable with the widest range was liquidity, which ranged from a minimum of 0.274 to a maximum of 14.725. The wide range highlighted the importance of controlling for firm-specific characteristics in the regression analysis to avoid biased interpretations.

Table 2 Descriptive Statistics

Variables	Observations	Mean	SD	Min	Max
D/TA	3582	0.454	0.327	0.005	6.055
LTD/TA	2093	0.140	0.168	0.000	3.155
STD/TA	3582	0.313	0.274	0.002	6.055
Firm age (log)	3582	3.081	0.932	0.000	6.026
Firm size	3413	5.095	3.021	-0.936	11.366
Asset structure	3582	0.113	0.163	0.000	0.933
Profitability	3582	-0.136	0.422	-5.284	2.495
Firm risk	3582	-0.174	0.393	-1.881	0.344
Growth rate	3317	0.361	0.972	-0.702	5.332
Liquidity	3582	2.757	2.949	0.274	14.725
NDS	2494	0.064	0.069	0.000	0.429

Table 2 shows the descriptive statistics of all the variables in our regression analysis.

The descriptive statistics are displayed and show that on average, Swedish-listed firms used debt to finance approximately 45% (D/TA). Moreover, their short-term debt (STD/TA) was used to finance approximately 30% of the firm's assets and 14% were financed with long-term debt (LTD/TA).

Table 3 Firm Distributions by Industry Sectors

Industry Classification	No. Observations	Proportions (%)
Health Care	924	25.80%
Information Technology	822	22.95%
Industrials	810	22.61%
Consumer Discretionary	366	10.22%
Communication Services	282	7.87%
Materials	186	5.19%
Consumer Staples	126	3.52%
Energy	36	1.01%
Utilities	30	0.84%
<i>Total</i>	<i>3582</i>	<i>100%</i>

Table 3 shows the distribution of firms across industry sectors in our sample.

The industries Health Care, Information Technology, Industrials, and Consumer Discretionary, together accounted for over 80% of the firms included. The dominant industries in the sample were Health care, Information technology and Industrials, which together accounted for 71.36% of the total sample. Utilities represented the smallest industry, accounting for only 0.084% of the total sample. Firms in banking, financial institutions, and real estate were excluded in the sample due to regulatory constraints on their capital structure and equity.

3.3.5 Correlation Matrix

Table 4 Correlation Matrix

Variable	D/TA	LTD/TA	STD/TA	Firm age	Firm size	Asset structure	Profitability	Firm risk	Growth rate	Liquidity	NDTS
D/TA	1										
LTD/TA	0.5985***	1									
STD/TA	0.8372***	-0.0252	1								
Firm age	0.1591***	0.0280	0.0131	1							
Firm size	0.2506***	0.0825***	0.0454***	0.6479***	1						
Asset structure	0.1654***	0.0846***	-0.0259	0.2952***	0.2731***	1					
Profitability	-0.0619***	-0.0373*	-0.1884***	0.3686***	0.5564***	0.1551***	1				
Firm risk	-0.2188***	-0.0461**	-0.3468***	0.2740***	0.4515***	0.1163***	0.6332***	1			
Growth rate	-0.0129	0.0205	-0.0097	-0.0332*	-0.0425**	0.0362**	-0.0098	-0.0150	1		
Liquidity	-0.3886***	-0.1182***	-0.3222***	-0.1762***	-0.3280***	-0.1594***	-0.0497***	-0.0153	0.0232	1	
NDTS	0.0537***	0.0338	0.0794***	-0.0611***	-0.0728***	-0.0219	-0.2189***	-0.6816***	-0.0075	-0.0456**	1

*** $p < 0.01$. ** $p < 0.05$ and * $p < 0.10$

Table 4 shows the Pearson correlation coefficients between variables of all pairs in the dataset. The values indicate the variables' strength of pairs and direction of their linear relationship from the range -1 to 1 (inverse relationship or a positive relationship).

The correlation coefficients between the variables in our study is shown in Table 4. It displays correlations between each pair, where values closer to 0 indicate weaker relationships, and the closer to 1 or -1 indicates stronger relationships, with a perfect linear relationship of -1 or 1. The correlations were statistically significant, however the coefficients were moderate which suggests that multicollinearity can be a problem in the study. There was a negative relationship between the dependent variable and profitability and liquidity. There was a slight positive relationship between the dependent variable D/TA and firm age. The output could be interpreted as firms with greater profitability and liquidity tend to have lower leverage. The results showed no statistically significant relationship between growth rate and financial leverage. The correlations were close to zero, which suggests that growth rate or growth opportunities on their own were not a determining factor for leverage in our sample.

3.4 Model Assumptions and Robustness Checks

To evaluate the validity and robustness of our regression results, several robustness checks were conducted. The following parts include tests of key panel data assumptions, including panel data justifications, model specifications, heteroskedasticity, serial correlation and multicollinearity. The results from the test showed strong support for using fixed effects models with cluster-robust standard errors to ensure the reliability of our findings.

3.4.1 Panel Structure Justification

The Breusch-Pagan test is commonly used to detect heteroskedasticity in a linear regression model. In contrast, the Breusch-Pagan Lagrange Multiplier (LM) test is used in panel data analysis to determine whether a random effects model is more appropriate than pooled Ordinary Least Squares (OLS). In the analysis, the Breusch-Pagan LM test was used to assess whether panel data modeling was appropriate for the analysis. The test for random effects was conducted on each of the three dependent variables D/TA, LTD/TA and STD/TA. The results presented in Table 5 strongly rejected the null hypothesis of no panel-level variance for all models. These results confirmed that significant unobserved heterogeneity existed across firms, thus justifying the use of panel data techniques. In the analysis all regression models were estimated using fixed effects with cluster-robust standard errors at the firm level to account for both firm-level differences and heteroskedasticity.

Table 5 Breusch & Pagan Test for Random Effects

Dependent variable	Test	X ²	p-value	Conclusion
D/TA	Breusch–Pagan LM	1569.41	0.000	Reject H ₀ → Panel model is justified
LTD/TA	Breusch–Pagan LM	1167.04	0.000	Reject H ₀ → Panel model is justified
STD/TA	Breusch–Pagan LM	995.86	0.000	Reject H ₀ → Panel model is justified

3.4.2 Model Choice: Fixed vs. Random Effects

Table 6 below illustrates the result of the Hausman-test that was conducted to determine whether a fixed effects or random effects estimation was more appropriate for the panel data model. The test was conducted for each of the dependent variables (D/TA, LTD/TA and STD/TA). The results showed that in all three models, the null hypothesis of no systematic difference between fixed and random effects was rejected at a 1% level, indicating that fixed effects estimators were more appropriate.

Table 6 Hausman-test

Dependent variable	X ²	p-value	Conclusion
D/TA	106.43	0.0000	Fixed effects preferred
LTD/TA	28.49	0.0004	Fixed effects preferred
STD/TA	95.41	0.0000	Fixed effects preferred

3.4.3 Heteroskedasticity

To test the assumption of constant error variance, Breusch-Pagan Cook-Weisberg tests for heteroskedasticity were conducted for the dependent variables. The results in Table 7 show that the null hypothesis of homoscedasticity is rejected in all models. This indicates the presence of heteroskedasticity in our models. To address these results and ensure valid inference, our regression models were estimated using cluster-robust standard errors at the firm level.

Table 7 Breusch-Pagan Cook-Weisberg

Dependent variable	Test	X ²	p-value	Conclusion
D/TA	Breusch–Pagan Cook–Weisberg	462.40	0.000	Heteroskedasticity detected
LTD/TA	Breusch–Pagan Cook–Weisberg	303.65	0.000	Heteroskedasticity detected
STD/TA	Breusch–Pagan Cook–Weisberg	1728.05	0.000	Heteroskedasticity detected

3.4.4 Serial Correlation

To test whether the panel data model had correlation over time within the same firm, serial correlation, a Wooldridge-style test for first-order serial correlation was conducted for all the dependent variables. The test was made manually by estimating each model and then testing if the residuals were related to the previous year’s residuals (D/TA, LTD/TA and STD/TA). The result indicated no evidence of serial correlation in the D/TA and STD/TA models ($p=0.353$, respectively $p=0.098$). However, the test revealed evidence of serial correlation in the LTD/TA model ($p<0.001$). This result is theoretically reasonable, as long-term debt decisions often can be long-lasting commitments shaped by business strategy or financial limitations. To address this serial correlation and ensure robust inference, the regression models were estimated using fixed effects with cluster-robust standard errors at the firm level. Thus accounting for both within-firm serial correlation and heterogeneity.

3.4.5 Multicollinearity

Multicollinearity occurs when two or more independent variables are highly correlated in a regression model. This can lead to increased standard errors of the estimated coefficients, making it difficult to determine the individual effect of each independent variable on the dependent variable. While multicollinearity can decrease the statistical reliability of certain coefficients, it does not bias the overall model predictions or model fit. Thus, to test for multicollinearity, a Variance Inflation Factor (VIF) test was conducted to assess whether the presence of highly correlated predictors could affect the interpretations of the results. Most variables exhibited VIF values below the critical threshold of 10. However, three variables, *Firm risk* (VIF=52.28), *NDTS* (VIF= 16.43) and *Profitability* (VIF=27.26), indicated a high degree of multicollinearity with coefficients exceeding 0.6. Although these variables are important, their interdependence may inflate the standard errors and decrease the reliability

and precision of individual coefficient estimates. To address this issue, three alternative models were estimated, each excluding one of the highly correlated variables at a time. These models confirmed that the main findings remained consistent. Further information is presented in Table 8.

Table 8 *Multicollinearity; Individual Coefficient Estimates*

Model	Excluded variable	R ²	Key Effects
Model 1	Profitability	0.3068	<i>Firm risk</i> and <i>NDTS</i> remain strong and significant.
Model 2	Firm risk	0.3044	<i>Profitability</i> becomes strong; <i>NDTS</i> loses significance.
Model 3	NDTS	0.2967	<i>Firm risk</i> and <i>Profitability</i> both remain significant and stable.

Table 8 suggests an overlapping explanatory power between the variables. However, the model's explanatory power ($R^2 = 0.3068$) remained comparable to the full specification, suggesting robust model performance even without *profitability*. Model 2 suggested that even without *firm risk*, profitability became strongly negative and significant, while *NDTS* lost significance. The $R^2=0.3044$ remained statistically strong, indicating minimal loss in overall explanatory power. In model 3, where *NDTS* is excluded, both *firm risk* and *profitability* remained statistically significant and retained negative signs. This thus supported the robustness of their effect on the dependent variables when multicollinearity from *NDTS* is excluded. Model 3 still retained a good fit of $R^2=0.2967$, slightly less than model 1 and 2, but still retained high validity and consistency across key predictors.

All three models showed similar explanatory power, R^2 between 0.2967 and 0.3068, indicating that the overall model fit was not substantially affected by multicollinearity. While there existed interdependence between the variables, the key effects remained consistent. Therefore, the three variables were retained in the final model due to their theoretical importance, however the interpretations of their individual coefficients will be made with caution.

4. Results & Analysis

Book values were used instead of market values in the descriptive statistics and throughout the empirical analysis, following the approach of D'Amato (2020). Given to Narjoko and Hill (2007), firm size and financial leverage may be affected differently depending on the characteristics and stability of the economy. Economic conditions included whether the economy is in a period of growth or decline at different stages, such as before, during, and after the crisis.

4.1 Shifts in Firms' Capital Structure Across Crisis Periods

Figure 1 Annual Average D/TA-, and Equity/TA ratio

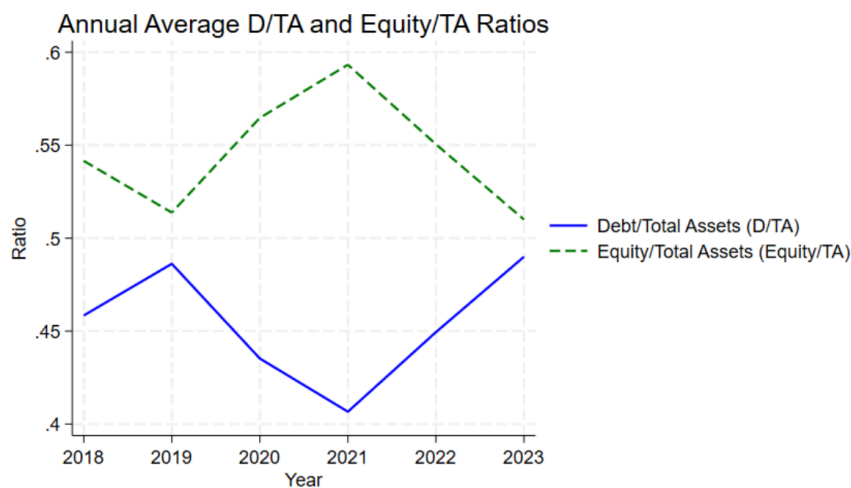


Figure 1 presents the annual average effects of adjustments in D/TA and Equity/TA. The sample period ranges from 2018 to 2024.

Figure 1 shows an increase in average Equity/TA and at the same time a decrease in D/TA from 2019 (pre-crisis) to 2021 (crisis period). This trend suggests that listed firms may have responded to heightened financial uncertainty during the crisis by adjusting their leverage and reliance on debt, and conversely, strengthening their equity base. After 2021, levels returned on average gradually to figures similar to those observed before the crisis in 2018. The observed pattern indicates that firms balanced tax advantages from debt with bankruptcy risks, in line with TOT. During the crisis, increased uncertainty appeared to have made firms more risk-averse, prompting a shift in preference toward financial flexibility over additional leverage.

Figure 2 Annual Average STD/TA-, and LTD/TA ratio

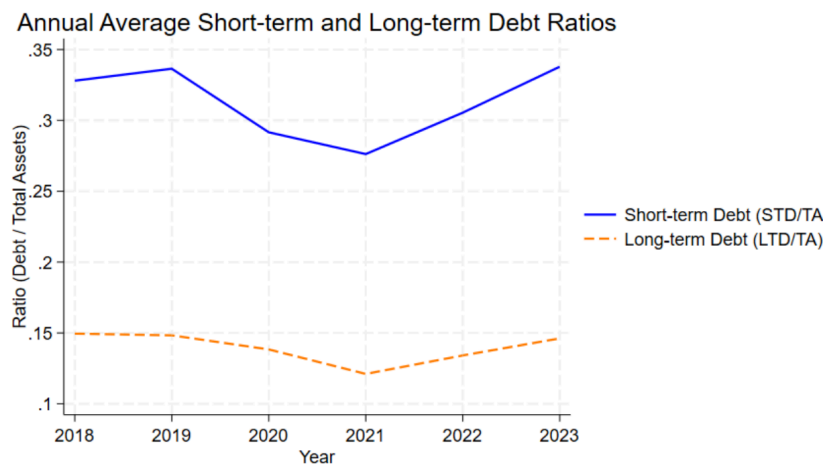


Figure 2 presents the annual trend in the average ratios of STD/TA and LTD/TA. The sample period ranges from 2018 to 2024.

Figure 2 shows that the short-term debt ratio experienced greater fluctuations compared to the long-term debt ratio. Between 2018 and 2019, the STD/TA ratio remained relatively stable, but then declined steadily, reaching a low of approximately 27% in 2021. Afterward, it began to rise again in the post-crisis period, eventually returning to its pre-crisis level. In contrast, the long-term debt ratio remained relatively stable throughout the observed period, with only a slight dip of around 5% in 2021, before also recovering to its original level. This suggests that short-term debt was more responsive to the crisis-related conditions, likely due to its greater flexibility compared to long-term debt, which is often subject to stricter contractual obligations and constraints.

4.2 Debt Maturity for Capital Structure Determinants

Table 9 Regression Results for Capital Structure Determinants Including Crisis-Related Dummy Variables

	(1) D/TA	(2) LTD/TA	(3) STD/TA
Firm_age	0.017** (0.048)	0.018* (0.038)	0.053* (0.045)
Firm_size	0.026*** (0.009)	-0.010** (0.010)	0.022*** (0.008)
Asset_structure	0.300*** (0.103)	0.151** (0.072)	0.009 (0.069)
Profitability	0.065 (0.121)	0.237** (0.123)	0.051 (0.120)
Firm_risk	-0.399** (0.180)	-0.223** (0.131)	-0.388** (0.182)
Growth_rate_	0.004 (0.005)	-0.002* (0.003)	0.003 (0.005)
Liquidity	-0.014*** (0.004)	-0.002** (0.002)	-0.012*** (0.003)
NDTS	-0.409** (0.191)	0.013 (0.084)	-0.399** (0.194)
crisis	-0.034*** (0.009)	-0.019* (0.011)	-0.035*** (0.009)
post_crisis	-0.020** (0.014)	-0.012** (0.023)	-0.032** (0.014)
Constant	0.276* (0.142)	0.117** (0.119)	0.089** (0.138)
Firm FE	Yes	Yes	Yes
Adj. R ²	0.259	0.014	0.269
R ²	0.262	0.021	0.272
F-stat	11.451	2.572	11.348
Obs.	2347.000	1368.000	2347.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9 presents the regression results from our model, which uses our three subsample periods: i) total debt ratio, ii) short-term debt ratio, and iii) long-term debt ratio as dependent variables, respectively. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$. The model was estimated by using clustered robust standard errors to account for heteroskedasticity and serial correlation. The periods crisis respectively post-crisis are dummies.

In Table 9, several statistically significant relationships between the independent variables and the dependent leverage variables are shown. The *dummy variable* for the *crisis* period showed a significant negative relationship with all three dependent variables; D/TA ($\beta = -0.034$), LTD/TA ($\beta = -0.019$), and STD/TA ($\beta = -0.035$). The *post-crisis* dummy showed a significant negative relationship with all three dependent variables; D/TA ($\beta = -0.020$), LTD/TA ($\beta = -0.012$), and STD/TA ($\beta = -0.032$).

In line with the TOT, *asset structure* was positively associated with both D/TA and LDT/TA. As argued by Daskalakis and Psillaki (2008), firms with more tangible assets are more likely to increase the debt levels, especially long-term debt, since such assets can serve as security and thereby the firm experiences lower expected bankruptcy cost. Moreover, *NDTS* showed a negative relationship with both D/TA and STD/TA. This aligns with the findings of DeAngelo and Masulis (1980), who suggested that firms with alternative tax shields are less dependent on tax benefits. This is partly in line with TOT, which holds that the marginal effects of debt decrease if other shields are available. In practice, this implies that firms with alternative tax shields, such as depreciation, may have less incentive to increase leverage for the sole purpose of gaining tax benefits.

The results in Table 9 show support for the POT. The independent variable *liquidity* was negatively associated with both D/TA and STD/TA, indicating that firms with greater retained earnings and internal funds prefer these over external debt financing. These findings are consistent with POT assumptions, which suggests that firms prioritize internal financing in order to avoid asymmetric information and financing costs. Moreover, *Firm risk* was negatively associated with all three leverage measures, suggesting that firms with higher earnings volatility were more cautious when taking on debt. These findings are in line with POT by Myers and Majluf (1984), and further discussed by Frank and Goyal (2009), who argued that risk-averse firms use internal funds to avoid the likelihood of financial distress.

Profitability showed a positive relationship with leverage, though only statistically significant for LTD/TA. These results suggest that more profitable firms tended to use long-term debt, potentially to benefit from tax shields. These findings contradict the POT, which proposes a negative relationship between profitability and leverage, but supports the TOT by Kraus and Litzenberger (1973), which posits that profitable firms may increase leverage to maximize tax shields in the long term. *Firm size* was positively and statistically significantly related to

D/TA and STD/TA, but negatively related to LDT/TA. Frank and Goyal (2009) and Titman and Wessels (1988) emphasized that larger firms typically faced less information asymmetries and had better access to the credit market, which should lead to higher reliance on long-term debt, which was not consistently observed in this sample. *Growth rate* showed no significant effect on any of the dependent leverage levels. This suggests that expected growth opportunities did not influence leverage decisions in this model. While previous research by Öztekin and Flannery (2012) and Faulkender et al. (2012) showed mixed results regarding growth rate and capital structure, these findings indicate that growth rate was not a key determinant for leverage decisions in this period.

Hypothesis H₁ suggested that the COVID-19 pandemic led to a shift in the debt maturity structure, with a reduced reliance on short-term towards being more reliance on long-term debt during the crisis period. The regression result from Table 9 showed that both short-term and long-term debt decreased during the crisis period. The crisis dummy variable was significantly negatively related to STD/TA ($\beta = -0.035$), indicating that firms reduced their usage of short-term debt during the crisis period, which is also shown in Figure 2. LTD/TA, decreased during the crisis ($\beta = -0.019$) however, not as much as the STD/TA and rebounded in the post-crisis period, to be noted LTD/TA was only significant at $p < 0.10$. These results suggest that while the short-term debt declined, it was not consistently replaced by long-term debt in the crisis period. These results were not statistically sufficient to reject the null hypothesis. Moreover, the regression results presented in Table 9 showed that larger firms used more short-term debt and less long-term debt during the crisis period. This result goes against the H₁, which examined a shift in debt maturity and that firms reduced reliance on short-term debt during the COVID-19 crisis. Based on the analysis and evidence gathered, no evidence was found for the hypothesis H₁. Thus, it failed to reject the null hypothesis as the results did not show a statistically significant reduction in short-term debt that was replaced with long-term debt during the crisis period. No sufficient evidence was found to support H₁.

Hypothesis H₂ stated that the COVID-19 pandemic significantly impacted the capital structure of Swedish listed companies, with higher reliance on internal financing, reducing overall debt during the crisis period. This is supported by the regression result in Table 9, and illustrated in Figure 1 showing a rise in equity-to-assets and a simultaneous drop in D/TA during the crisis. The crisis and post-crisis dummy variables were negatively and significantly associated with all three dependent variables. These findings suggest that firms

systematically reduced their debt levels during and after the crisis. These results align with the findings of Ongsakul et al. (2025) and D'Amato (2020), that firms tend to prioritize financial flexibility and internal financing in response to uncertainty. The significant negative relationship between liquidity and debt supports the POT, that firms with access to internal funds avoid taking on debt in times of uncertainty and increased risks. From the results presented, the null hypothesis was rejected, as evidence was found supporting H_2 .

4.3 Regression Results by Crisis Period and Debt Type

Table 10 Regression Results for the Pre-crisis, Crisis, and Post-crisis Periods

	(1) D/TA (pre)	(2) D/TA (crisis)	(3) D/TA (post)	(4) STD/TA (pre)	(5) STD/TA (crisis)	(6) STD/TA (post)	(7) LTD/TA (pre)	(8) LTD/TA (crisis)	(9) LTD/TA (post)
Firm_age	0.199 (0.142)	-0.263** (0.133)	0.598*** (0.190)	0.227 (0.141)	-0.128 (0.108)	0.441** (0.190)	-0.056 (0.041)	-0.432*** (0.138)	0.060 (0.082)
Firm_size	0.003 (0.023)	0.007 (0.027)	0.059** (0.026)	0.009 (0.023)	0.005 (0.016)	0.056** (0.024)	-0.011 (0.011)	0.040 (0.033)	0.006 (0.011)
Asset_structure	0.497** (0.199)	0.595*** (0.153)	0.298 (0.242)	-0.096 (0.157)	0.155 (0.175)	0.115 (0.227)	0.045 (0.162)	0.306 (0.228)	-0.026 (0.092)
Profitability	1.719 (1.294)	-0.185 (0.527)	0.074 (0.086)	1.502 (1.234)	0.065 (0.495)	0.035 (0.077)	0.124 (0.331)	-0.814 (0.565)	0.190 (0.136)
Firm_risk	-2.203 (1.447)	0.028 (0.530)	-0.517** (0.239)	-2.002 (1.387)	-0.207 (0.502)	-0.473** (0.239)	-0.122 (0.333)	0.755 (0.600)	-0.216 (0.165)
Growth_rate	-0.001 (0.010)	0.016 (0.031)	0.013 (0.010)	0.002 (0.010)	0.007 (0.014)	0.012 (0.011)	-0.001 (0.005)	-0.271 (0.305)	-0.066*** (0.023)
Liquidity	-0.014* (0.008)	-0.009** (0.004)	-0.011* (0.006)	-0.014 (0.008)	-0.009** (0.004)	-0.009* (0.006)	-0.003* (0.002)	0.002** (0.001)	-0.008 (0.011)
NDTS	-0.997*** (0.374)	0.306 (0.394)	-0.547** (0.268)	-1.000** (0.392)	0.305 (0.426)	-0.501* (0.268)	0.116 (0.302)	0.493 (0.504)	0.009 (0.103)
Constant	-0.201 (0.501)	1.078*** (0.315)	-1.678*** (0.617)	-0.372 (0.495)	0.611** (0.265)	-1.314** (0.616)	0.336*** (0.108)	1.165*** (0.310)	-0.079 (0.287)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ²	0.335	0.155	0.360	0.325	0.144	0.334	0.012	0.122	0.071
R ²	0.342	0.164	0.366	0.332	0.153	0.341	0.029	0.137	0.088
F-stat	14.245	7.585	14.585	11.198	5.551	15.170	3.367	2.565	3.537
Obs.	745.000	792.000	810.000	745.000	792.000	810.000	457.000	456.000	455.000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10 presents the regression outcomes from the regression model, grouped into the periods: *pre-crisis*, *crisis*, and *post-crisis* for the dependent variables *D/TA*, *STD/TA*, and *LTD/TA*, respectively. Significance is indicated as *** at the 0.1% level, ** at the 1% level, * at the 10% level. Table 10 gives insights into how Swedish listed firms adjusted their capital structure across the different time periods.

4.3.1 Pre-Crisis Period, 2018-2020

The regression results in Table 10 for the pre-crisis period indicate that firms' capital structure decisions were influenced by the variables *asset structure*, *liquidity*, and *NDTS*. The *asset structure* was positively associated with total leverage D/TA ($\beta=0.497$), indicating that firms with higher fixed assets in relation to total assets tend to have a higher leverage ratio during the years 2018-2020. Daskalakis and Psillaki (2008) argued that fixed assets serve as collateral, which reduces the expected bankruptcy costs. This result can be explained by the TOT, meaning that firms may have used tangible assets as a security to reduce bankruptcy risks, thus allowing higher debt levels before the crisis. Furthermore, *liquidity* and *NDTS* were both negatively associated with D/TA. *Liquidity*, with $\beta= -0.014$ and a significance of $p<0.1$ suggests that firms that had higher liquidity ratios tend to have lower leverage. Indicating that firms rather used internal funds than take on external debt before the crisis. This result supported the POT, as higher liquidity indicates that firms have sufficient internal financing, thereby having less reliance on external debt. Similarly, the coefficient for *NDTS* of $\beta= -0.997$ was statistically significant at the $p<0.001$ for D/TA, indicating that firms with non-debt tax shields, such as depreciation, had lower leverage ratios in the pre-crisis period. These findings are consistent with DeAngelo and Masulis (1980) and support both POT and TOT.

4.3.2 Crisis Period, 2020-2022

During the crisis period, *firm age* was statistically significantly negative for D/TA ($\beta= -0.263$) and LTD/TA ($\beta= -0.432$). *Firm age* had a negative coefficient of $\beta= -0.263$ at the $p<0.01$, indicating that on average, older firms tend to have lower debt ratios. This suggests that as firms mature, they become less reliant on debt financing, which can be explained by how mature firms tend to rely more on retained earnings instead. These findings align with the POT, which proposed that firms prefer internal financing. Similarly, Ongsakul et al. (2025) emphasized that in times characterized by uncertainty, firms with more internal resources tend to avoid debt to maintain flexibility, which is consistent with the behaviour of Swedish listed firms during COVID-19. Furthermore, *Liquidity* remained significantly negative related to D/TA, and became significantly related to STD/TA, indicating that firms with higher internal cash reserves avoided short-term debt during the crisis, aligning with the POT. However, there was a small positive relationship between *Liquidity* and LTD/TA. *Asset structure* showed a significant positive relationship with D/TA ($\beta= 0.595$), indicating that

firms with higher fixed assets tend to have higher debt during the crisis period, however, there were no significant results regarding STD/TA and LTD/TA.

4.3.3 Post-Crisis Period, 2022-2024

In the post-crisis period, the relationship between *firm age* and D/TA shifted, and became significantly positive at $p < 0.001$ with the coefficient $\beta = 0.598$ (*Firm age* during crisis, $\beta = -0.263$). This indicates that mature firms proceeded with taking on debt once uncertainty decreased, reflecting a more normalized market condition. As argued by Akerlof (1970), when information asymmetry decreases, market efficiency improves as it reduces adverse selection risks, hence, the market participants become more confident. This suggests that uncertainties such as information asymmetry decreased in the post-crisis period, allowing mature firms to secure debt financing more effectively, benefiting from a normalized capital market. However, the *growth rate* was negatively and statistically significantly associated with LTD/TA in the post-crisis period ($\beta = -0.066$). This indicates that firms were reluctant to take on long-term debt, which may be due to a bigger focus on organic growth after the crisis. This contradicts the TOT, which argues that firms use debt to gain tax benefits.

4.3.4 The Impact of Firm-Specific Determinants on Debt Maturity

To assess how firm-specific determinants shifted over time, this chapter summarizes the key statistically significant variables across the periods, based on Table 10.

Asset structure had a significant positive effect on total debt (D/TA) in both pre-crisis and crisis periods, increasing slightly during the crisis. However, it showed no significant impact on short-term debt (STD/TA) or long-term debt (LTD/TA) in any period. *Liquidity* had a consistently significant negative effect on total debt across all periods, with a stronger effect during the crisis as firms prioritized cash availability and flexibility. However, liquidity showed no significant impact on short-term debt pre-crisis or long-term debt post-crisis. *Firm age* had a significant negative effect on total and long-term debt during the crisis, suggesting older firms reduced long-term commitments in uncertain times. In the post-crisis period, its effect turned positive for total and short-term debt, indicating a shift back to debt financing. These findings partly support the POT. However, no significant effect was found in the pre-crisis period. *Firm size* was only statistically significant in the post-crisis period, positively affecting total and short-term debt. This suggests larger firms increased their debt

after the crisis, likely due to improved market conditions. No significant effects were found for long-term debt or other periods. *NDTS* had a significant negative effect on total debt in the pre- and post-crisis periods, indicating firms with higher other tax shields used less debt, consistent with DeAngelo and Masulis (1989). It also negatively affected short-term debt in these periods but showed no significance during the crisis.

Hypothesis H_1 examined whether the COVID-19 pandemic led to a shift in the debt maturity structure of Swedish listed companies, with a reduced reliance on short-term debt, toward being more reliant on long-term debt during the crisis period. Table 10 shows that liquidity negatively affected short-term debt, and firm age reduced long-term debt, indicating a partial shift in debt maturity. However, the evidence is insufficient to reject the null hypothesis and to support the H_1 .

Hypothesis H_2 stated that the COVID-19 pandemic significantly impacted the capital structure of Swedish listed companies, with higher reliance on internal financing, reducing overall debt during the crisis period. Liquidity was negatively significant across all periods, indicating firms preferred internal funds for flexibility, aligning with the POT and prior research from Ongsakul et al. (2025). The results support H_2 , rejecting the null hypothesis.

5. Discussion & Conclusions

Based on the comprehensive sample of Swedish listed firms covering the period from 2018 to 2024, it can be observed that the COVID-19 crisis in 2020-2022 had a noticeable impact on capital structure. The first hypothesis H_1 tied to debt maturity was not supported by the empirical results. The result in Table 9 showed mixed results regarding maturity shifts, with short-term debt decreased on average, but this was not accompanied by an increase in long-term debt. Thus, no significant debt maturity changes took place. The findings suggest deleveraging patterns rather than a shift in debt maturity distribution. Thus, H_1 is not supported, hence fails to reject the null hypothesis, since the data show no statistically significant shift from short-term to long-term debt. This could indicate that the market conditions did not enable long-term borrowing, possibly due to uncertainty and caution. These findings provide an interesting insight, contradicting previous research on debt maturity during uncertainty, such as a crisis. The evidence challenges the theory that firms automatically rely more on long-term debt during uncertain times to increase safety and stability.

Hypothesis H_2 examined whether the COVID-19 pandemic significantly impacted the capital structure, with higher reliance on internal financing, reducing overall debt during the crisis period. The regression analysis shows that the crisis period had a significant negative effect on overall debt, short-term, and long-term debt, indicating that firms lowered their debt level during the crisis. Furthermore, certain behaviour can be explained through key explanatory factors for the decreased reliance on debt during the crisis. Older and more liquid firms influenced the capital structure decision toward a more internal financing strategy. Aligning with the POT, these firms may rely on internal financing or retained earnings, rather than maintain debt. Hence, evidence for H_2 rejects the null hypothesis of no change in financing behaviour during COVID-19, and accepts that the pandemic caused a shift toward internal financing. The findings underscore the relevance of POT during times of uncertainty, and also proposing an interesting reinterpretation of TOT under crisis conditions. There is strong support for firms utilizing internal funds in times of crisis when information asymmetry and adverse selection problems worsen, making external financing less desirable. The results from H_1 might conflict with the predictions of TOT, that firms would increase long-term debt to secure financial safety. However, TOT can still explain the observations if a broader context is considered. The heightened uncertainty during the crisis could have increased the

risk of financial distress to such a degree that the optimal capital structure shifted. Thus, under these conditions, firms, rather than rebalance toward longer debt, reduced debt overall.

Our study contributes to the capital structure literature by providing new empirical evidence on how corporate finance theories explain the influence of macroeconomic conditions and firm-specific factors on firms' capital structure during periods of economic crisis. While previous research has mainly focused on broad downturns such as the 2008 financial crisis, few empirical studies have explored how the COVID-19 crisis affected capital structure within Sweden's unique economic context. To address our research question, *How did the COVID-19 pandemic influence the debt maturity of Swedish-listed firms and how were these decisions shaped by firm-specific factors?*, strong support was found for H₂. The COVID-19 pandemic had an impact, influencing capital structure decisions through changes in debt decisions in several ways. The COVID-19 crisis led firms to reduce their debt and instead rely more on internal financing. Previous literature highlighted increased short-term debt or shifts in financing behaviour due to uncertainty, however, our findings reveal a different pattern in the Swedish context. This shift in capital structure decision-making suggests that firms mitigate their risk and rather prioritize flexibility, aligning with the POT. Hence, in periods of uncertainty, our empirical evidence showed that firms preferred internal financing and equity financing over debt as a response to heightened uncertainty.

Recommendations for future research could be to combine regression analysis with qualitative methods to further deepen the understanding of a firm's capital structure. Complementing our quantitative study with qualitative research could provide insights into the decision-making rationale. Focusing on a shifted direction of behavioral bias may give deeper insights into the management. Thus, questioning management's motivations behind financial decision-making can offer a more nuanced understanding of capital structure research. Thus, potential findings from qualitative research might add variables to future regression models. A further suggestion for future research could be to conduct a comparative, cross-country study examining how countries with differing governmental structures managed the COVID-19 crisis, and whether these differences influenced firms' capital structures and financial strategies. This could enhance insights into country-specific factors influencing capital structure decisions in response to different economic contexts.

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