The key drivers of corporate long-term debt variation

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Abstract

The objective of this thesis is to study the determinants of the variation of corporate long-term debt, using data for US firms between 1976 and 2023. This thesis shows that both small and medium firms were the main drivers of the downward trend of corporate long-term debt, from 1976 to 2000 and of the upward trend in the two following decades. From 2021 to 2023 it is reported a downward trend caused by small, medium and large firms. Using an OLS estimator for the regressions, this thesis includes firm specific characteristics, related to hypotheses stated in previous literature, and macroeconomic variables which influence the supply and demand of credit. This thesis reports a negative relation between information asymmetry and corporate long-term debt, robust to all specifications and to different proxies for corporate long-term debt. There is also evidence that the maturity matching hypothesis consistently explains its variation, however, this relationship is not robust to different definitions of corporate long-term debt. The downward trend of corporate long-term debt was explained by the increase of the proportion of long-term US treasuries and by the decrease of the proportion of bonds owned by insurance companies. The increase of corporate long-term debt was partially explained by the decrease of the proportion of insured deposits to bank´s total assets. This thesis suggests that both firm characteristics and macroeconomic variables are relevant in explaining the variation of corporate long-term debt, even though macroeconomic variables become less meaningful, after 2000.

Keywords: corporate long-term debt, firm specific characteristics, macroeconomic variables

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Resumo

O objetivo desta tese é estudar os determinantes da variação do endividamento de longo prazo das empresas, utilizando dados de empresas norte-americanas entre 1976 e 2023. Esta tese demonstra que pequenas e médias empresas foram as principais responsáveis pela tendência descendente do endividamento de longo prazo das empresas entre 1976 e 2000 e pela tendência ascendente nas duas décadas seguintes. Entre 2021 e 2023, observa-se uma tendência descendente, atribuída a empresas de todas as dimensões. Utilizando um estimador OLS, as regressões incluíram características específicas das empresas, com base em hipóteses da literatura anterior, e variáveis macroeconómicas que influenciam a oferta e a procura de crédito. Esta tese relata uma relação negativa entre a assimetria de informação e o endividamento de longo prazo das empresas, robusta a todas as especificações e a diferentes proxies para endividamento de longo prazo das empresas. Além disso, a hipótese de correspondência de maturidade explica a sua variação, no entanto, essa relação não é robusta para diferentes definições do endividamento de longo prazo das empresas. A sua tendência decrescente foi explicada pelo aumento da proporção de títulos do Tesouro norte-americano de longo prazo e pela diminuição da proporção de obrigações detidas por seguradoras. Contudo, o seu aumento foi parcialmente explicado pela redução da proporção de depósitos segurados face aos ativos totais dos bancos. Conclui-se que as características das empresas e as variáveis macroeconómicas são relevantes para explicar a variação do endividamento de longo prazo das empresas, embora estas últimas se tornem menos significativas após 2000.

Palavras Chave: endividamento de longo prazo das empresas, caraterísticas específicas da empresa, variáveis macroeconómicas

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1. Introduction

In a dynamic world which is marked by several advances in technology but also by unprecedent events such as COVID-19 and the recent inflationary crisis, the management of corporate debt maturity structure constitutes an essential tool for companies' financial stability. Several authors have explored the topic of what can explain its variation, using several methodologies and reaching a wide range of conclusions.

Managing the corporate debt maturity structure involves a decision between issuing long-term or short-term debt, each with its own advantages and disadvantages. On one hand, long-term debt mitigates refinancing risk, however it can also increase the debt overhang problem according to Myers (1977). On the other hand, while the issuance of more short-term debt reduces debt overhang it also increases the exposure of companies to refinancing risk, according to Diamond (1991).

This thesis contributes to the literature on the determinants of corporate debt maturity structure by extending the work of Custodio et al (2013) until 2023. By doing so, it determines whether the COVID-19 pandemic and the recent inflationary crisis significantly changed the factors explaining corporate long-term debt variation. This thesis also examines which macroeconomic variables effectively predict variations in corporate long-term debt, using data up to 2023, complementing the work of Byun et al (2021), who conducted a similar study on corporate intermediate-term debt with data up to 2017.

This paper finds that the downward trend of the proportion of debt maturing in more than 3 years, which is a proxy for corporate long-term debt, between 1976 and 2000, was primarily driven by small and medium firms, consistent with the findings of Custodio et al (2013). Additionally, the subsequent reversal of this trend, in the two following decades, was also largely driven by small and medium firms. Between 2021 and 2023, large, medium and small firms started to use more short-term debt. There was also evidence that firms with more information asymmetry use more short-term debt, being this relation robust to several proxies for corporate long-term debt and to the inclusion of a time trend, providing further proof to the results of Custodio et al (2013). When the proportion of debt maturing in more than 4 years is the proxy for corporate long-term debt, the maturity matching hypothesis is statistically significant in explaining the variation of corporate long-term debt, even after adding firm and year fixed effects.

Regarding the macroeconomic variables used in this thesis, there was evidence that almost half lost their statistical significance in the period after 2000. Between 1976 and 2000, the increase of the proportion of long-term US treasuries and the decrease of the proportion of bonds owned by insurance companies, explained the downward trend of corporate long-term debt. Between 2000 and 2019, only the decrease of the proportion of insured deposits to bank´s total assets partially explained its upward trend, challenging the findings of Paligorova et al (2016). This indicates that the macroeconomic variables proposed in previous literature did not perform well in explaining the variation of corporate long-term debt, especially in the period after 2000. These results suggest that the macroeconomic variables initially proposed for explaining the downward trend of corporate long-term debt became less meaningful after 2000.

This paper will be organized in the following order. Section 2 is going to address relevant literature, with the goal of giving the necessary theoretical framework to understand the several contributions made in this thesis. Section 3 describes in detail the data used and the trend of corporate long-term debt. Section 4 will present the summary statistics, the results for firm specific characteristics and several robustness tests. Section 5 analyzes the results for macroeconomic variables and determines which are most successful in predicting the variation of corporate long-term debt. Section 6 presents the main findings of this paper and Section 7 approaches some limitations while also providing elements for further research.

2. Literature Review

In the following section I will explain some theories developed in previous research regarding the fundamentals of debt maturity. The current literature regarding the fundamentals of corporate debt maturity addresses several hypotheses. According to Stohs et al (1996), Ozkan (2000) and Orman et al (2017), the main ones are the agency costs hypothesis, the signaling and liquidity hypothesis, the tax hypothesis and the maturity matching hypothesis. Macroeconomic factors may also influence debt maturity since they influence the supply and demand of debt. To provide the necessary theoretical background for this thesis, I will talk about each theory.

2.1. Agency cost hypothesis

This theory is one of the most widely important in finance related literature. Its existence is reported in different papers such as Fama et al (1983) and Jensen et al (1976). The agency cost hypothesis, regarding this topic, says that corporate debt maturity can be influenced by conflicts

between the managers, shareholders and the debtholders. Myers (1977) found that risky debt agency costs lead to a suboptimal investment policy, if the firm has a large set of growth opportunities. One solution provided in Myers (1977) is matching the maturity of liabilities with assets which he states as being effective in reducing debt agency costs. Another solution also provided in Myers (1977) is the preference for debt that has a shorter maturity, which matures before an investment option is exercised. On one hand that gives borrowers the option to switch to an all-equity financing more easily. On the other hand, if the debt matures before the investment option is exercised, the debt overhang problem no longer exists. However, Diamond et al (2014) discovered that short-term debt only reduced the under-investment problem during good times. Managerial agency costs happen when managers, instead of maximizing shareholder value, prefer to retain higher cash holdings in order to get higher compensations, for instance. Ranjan et al (2010) found that the issuance of long-term debt reduces managerial agency costs, because it disciplines the managers, while Brockman et al (2010) reported that short-term debt has the same effect in the managerial agency costs. Regarding this hypothesis, based on previously literature, the reduction of debt maturity reduces the debt agency costs. The emission of debt, independently of the maturity, reduces managerial agency costs.

2.2. Signaling and liquidity hypothesis

The signaling and liquidity hypothesis describes the trade-off between issuing more short-term debt to signal financial soundness and the increased exposure to liquidity risk that such issuance may create. This hypothesis is deeply related to the concept of information asymmetry since the company has more information about itself than the market has. Having that into account, the maturity of the debt emitted serves as a signal for the market regarding the quality and prospects of growth for a company. According to this theory, companies with good credit ratings that anticipate good news are more likely to issue short-term debt, as the benefits of refinancing after the positive news outweigh the risk of a bigger exposition to liquidity risk, if a negative surprise occurs. According to this theory, companies with low ratings will issue debt with shorter maturity, because they have no other choice. The companies which have an intermediate credit rating are the only ones that issue long-term debt. The results in Diamond (1991) and Orman et al (2017) support this theory, however the findings in Byun et al (2021) state that this hypothesis is not statistically significant in explaining the variation of intermediate-term debt.

2.3. Tax hypothesis

The tax hypothesis refers to the fact that tax benefits might influence companies' choice regarding their debt maturity. Brick et al (1985), conceptualize that short-term debt is optimal when there is a decreasing term structure of interest rates, because, the interest payments are larger relatively to long-term debt, which maximizes the interest tax shield. According to Kane et al (1985), optimal debt maturity increases if tax rate decreases. That happens because, with a smaller interest tax shield, companies begin to prioritize long-term debt in order to have less flotation costs. The authors also found that, when firms are less volatile, they rebalance their capital structure less often, which means that there is an inverse relation between debt maturity and the volatility of asset returns. The tax hypothesis was not a statistically significant driver of the corporate debt maturity in recent literature (Byun et al (2021), Custodio et al (2013)).

2.4. Maturity matching hypothesis

This hypothesis suggests that firms should finance short-term liabilities with short-term assets and long-term liabilities with long-term assets. This principle is essential when determining the ideal capital structure of a certain firm, since it can greatly reduce the risks associated with debt. Its neglect may lead to severe damages to a firm, being one example of that the fall of the Silicon Valley Bank. If that bank had matched the maturities of their assets and liabilities, the likelihood that it had suffering a bank run would have been far lower. Even though this hypothesis is frequently mentioned in previous literature, Byun et al (2021) found that it does not provide a relevant explanation for the variation of the debt maturity.

2.5. Macroeconomic factors

The reasoning behind the potential effect of macroeconomic factors in the debt maturity is related to the fact that macroeconomic conditions influence the supply of debt by lenders and debt issuance by borrowers. These effects are related in Erel et al (2012), where the authors found that, in poor macroeconomic conditions, firms issue more short-term debt. The authors also found that in poor macroeconomic conditions firms have a lower ability to raise capital at all. Custodio et al (2013) and Byun et al (2021) found that macroeconomic variables are statistically significant in explaining the variation of both long-term and intermediate-term debt. Byun et al (2021) also found that some macroeconomic variables can successfully predict the variation of intermediate-term debt.

3. Data

This thesis used data from the COMPUSTAT database between 1976 and 2023. Similarly to Byun et al (2021) and Custodio et al (2013), companies from the utilities and financial sectors (SIC codes from 4000 to 4999 and from 6000 to 6999 respectively) are excluded, since the regulation for the companies of these sectors is different which also makes their capital structure substantially different. Following the methodology of Custodio et al (2013), the observations where debt maturity variables are smaller than 0% or bigger than 100% are trimmed, the observations where total assets are negative are excluded and the firm specific characteristic variables, except for dummy variables, are winsorized, at 1%. The final sample consists in 131981 observations of 15557 unique firms.

3.1. Trend of corporate debt maturity

Figure 1 displays the time series of the average, median and aggregate proportion of Debt Maturing in more than 3 years, which is the proxy used for long-term debt, following the methodology of Custodio et al (2013). To provide a comprehensive analysis, the mean of this variable is examined to highlight its overall trend throughout the sample period, the median is analysed to assess the influence of outliers on its variation, and an aggregate measure is included to evaluate whether its evolution depends on firm size.

To see if, for different proxies of corporate long-term debt, the evolution would be similar, Figure 2, displays the results for the proportion of Debt Maturing in more than 2 years and Figure 3 displays them for the proportion of Debt Maturing in more than 4 years. Table A.1, in the appendix, displays a table which represents the results for the three proxies of long-term debt.

In Figure 1 it is reported a downward trend regarding the average and median of Debt Maturity > 3, between 1976 and 2000. After that, both measures start to rise and, if you look at the value comparison between 1976 and 2021, in Table A.1, in the appendix, you may see that the average and median of this variable are higher in 2021. For example, in 2000, the average Debt Maturity > 3 was only 55% of the 1976 level, however, in 2021 that value increased to 110%. In 2000, the value of the median Debt Maturity > 3 was only 21% of the 1976 level, however in 2021 that value increased to 115%. One curious trend is that, between 1976 and 2000, the level of aggregate debt maturity decreases much less relatively to the two other measures. This may be explained by the fact that while larger firms opted for more long-term debt, softening the decline in aggregate debt maturity, the majority of smaller firms chose more short-term debt, which

drove down the average and median measures more significantly. As you can see as well, starting in 2021, Debt maturity > 3 consistently decreased until 2023. By looking at Figures 2 and 3, Debt Maturity > 2 and Debt Maturity > 4 experienced comparable trends to Debt Maturity > 3.

The temporary rise of short-term debt after the 2008 financial crisis and the rise of short-term debt, between 2021 and the end of the sample, might be an indication that, in times of macroeconomic uncertainty, companies have more preference for short-term debt or have a harder time in getting long term financing, because their credit quality might get worse Diamond (1991).

Figure 1: Time series of the proportion of debt Maturing in more than 3 years in %

Time series of the average, median and aggregate proportion of debt maturing in more than 3 years, between 1976 and 2023. The proportion of debt maturing in more than 3 years is computed by subtracting to long-term debt the debt which matures in 3 years and in 2 years and then scaling that result by total debt.

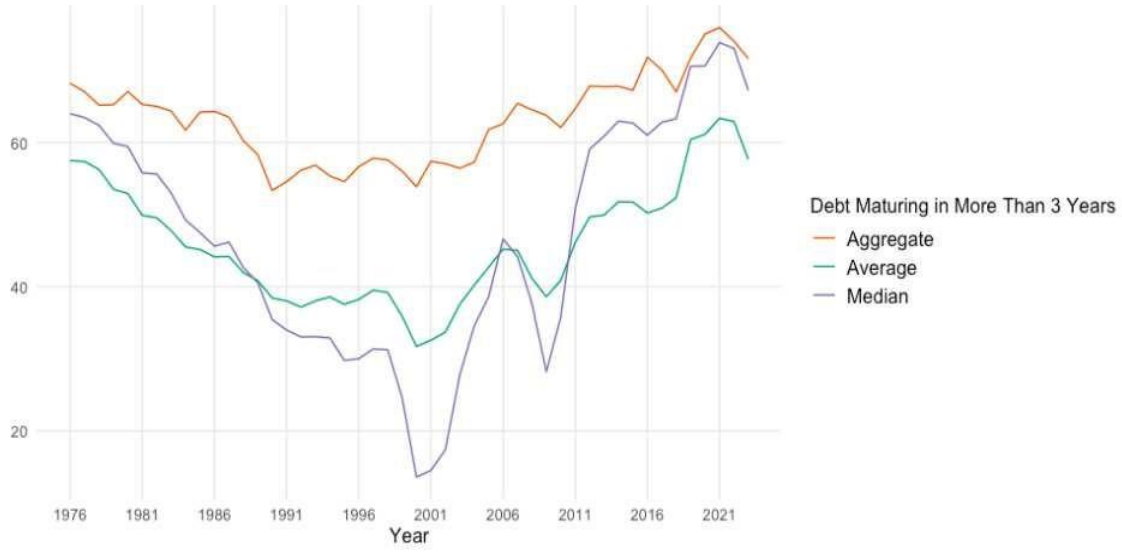


Figure 2: Time series of the proportion of debt Maturing in more than 2 years in %

Time series of the average, median and aggregate proportion of debt maturing in more than 2 years, between 1976 and 2023. The proportion of debt maturing in more than 2 years is computed by subtracting to long-term debt the debt which matures in 2 years and then scaling that result by total debt.

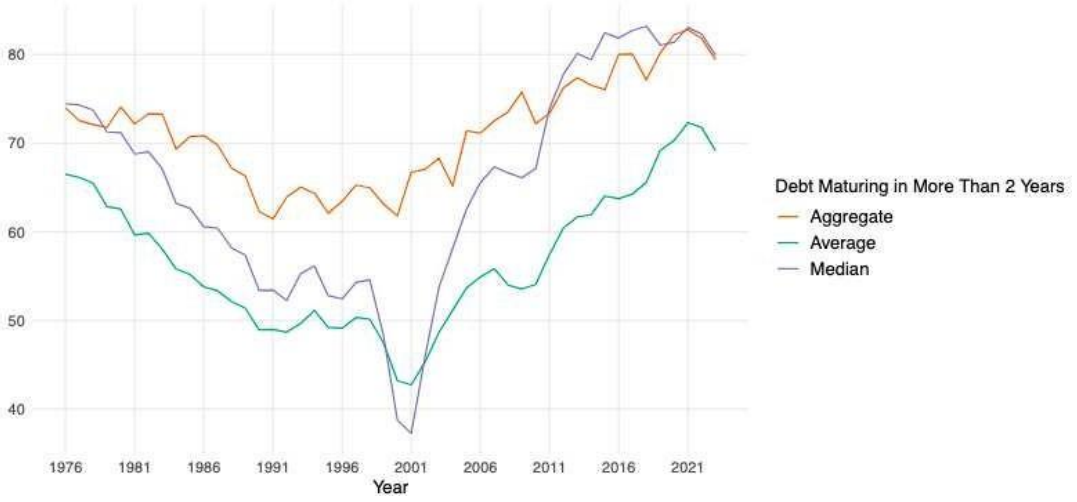
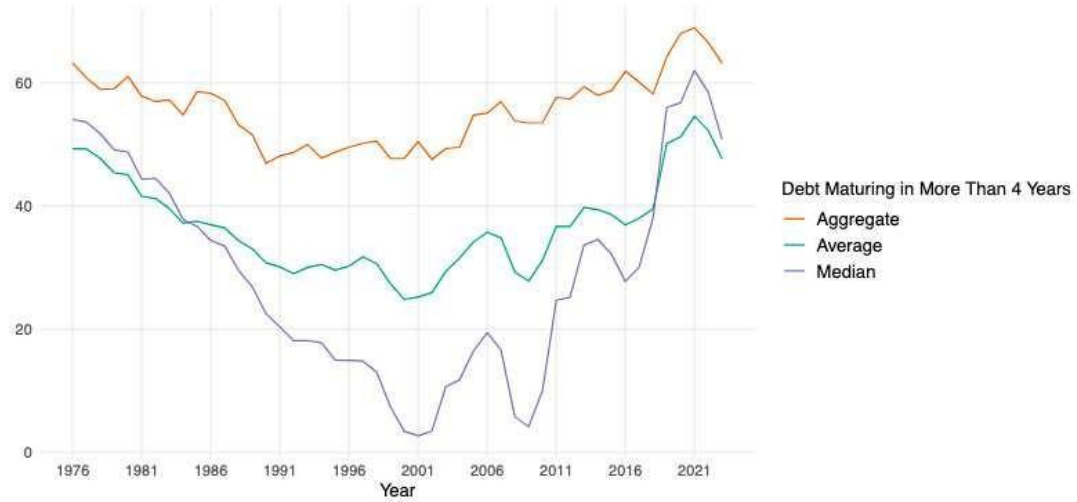


Figure 3: Time series of the proportion of debt Maturing in more than 4 years in %

Time series of the average, median and aggregate proportion of debt maturing in more than 4 years, between 1976 and 2023. The proportion of debt maturing in more than 4 years is computed by subtracting to long-term debt the debt which matures in 4 years, in 3 years and in 2 years and then scaling that result by total debt.



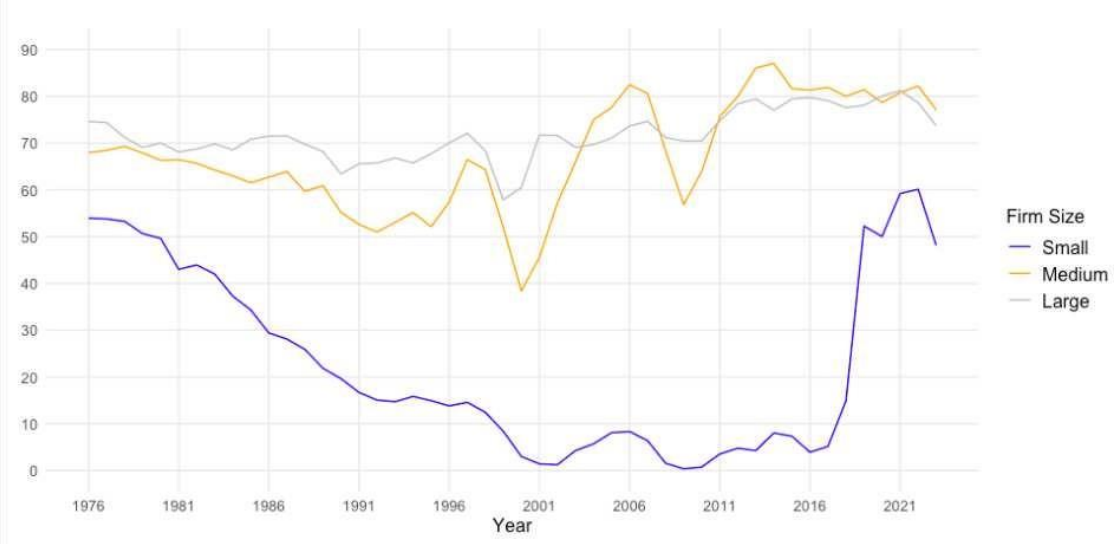
3.2. Debt maturity by firm size

In Figure 1, the aggregate Debt Maturity > 3 displayed significantly less variation than the median. So, to see if the evolution of the median Debt Maturity > 3 is conditional on firm size, Figure 4, plots the time series of this variable for large, medium and small firms. Following the

methodology of Custodio et al (2013), a firm is categorized as small, medium, or large based on its market capitalization relative to the NYSE market capitalization: firms below the 20th percentile are categorized as small, those between the 20th and 50th percentiles as medium, and those above the 50th percentile as large. Table A.2, in the appendix, displays the actual values of the time series of the median Debt Maturity > 3 for, small, medium and large firms.

Figure 4: Median proportion of Debt Maturing in more than 3 years in %, by firm size

Time series of the median proportion of debt maturing in more than 3 years, conditional on firm size, between 1976 and 2023. Firms below the 20th percentile are categorized as small, those between the 20th and 50th percentiles as medium, and those above the 50th percentile as large.



Looking at Figure 4, both small firms and medium firms were the main drivers of the decrease of the median Debt Maturity > 3, between 1976 and 2000. In Table A.2, in the appendix, it is possible to see that, in 1976, that value was 54.0% for small firms, however, in 2000 it had reduced to 3.0%. In Table A.2 it is also displayed that the median Debt Maturity > 3, for medium firms, was 68.0% in 1976 but in 2000 it was just 38.4%. These results are also documented in Custodio et al (2013). The increase of corporate long-term debt, from 2000 to 2021, was also due to both small and medium firms. In 2000, according to Table A.2, median Debt Maturity > 3 was 38.4% for medium firms and in 2021 that value had gone up to 80.8%. For small firms, in 2000, their median Debt Maturity > 3 was 3.0% and, in 2021, that value had gone up 59.2%. The downward trend which goes from 2021 until 2023, the end of the sample, was driven by small, medium and large firms.

4. Firm characteristics as determinants of debt maturity

To pursue the goal of analysing what are the determinants of corporate debt maturity, this thesis evaluates if firm specific characteristics used in previous literature are statistically significant in explaining the variation of corporate debt maturity structure in a panel dataset which includes the COVID-19 pandemic and the recent inflationary crisis. The firm specific characteristics are computed according to Custodio et al (2013) methodology and they assess if the different theories approached in the literature review are influential in explaining the variation of corporate long-term debt. The firm specific characteristics used are *Size*, Size^2, *Market to Book*, *Abnormal Earnings*, *Asset Maturity*, *Asset Volatility*, *Leverage*, *R&D* and *Dividend Payer*.

Size represents the percent of NYSE firms that have the same or smaller market capitalization. In previous literature like Custodio et al (2013), Byun et al (2021) and Fama et al (2001), this definition of Size was used in order to use a consistent measure across all years in the sample. In previous literature such as Barclay et al (1995), the authors found that corporate long-term debt varies positively with firm size, due to the fact that small firms have more information asymmetry. Size^2 is also included as an explanatory variable, because previous papers such as Custodio et al (2013), Byun et al (2021) and Diamond (1991) reported a nonlinear relation between size and corporate long-term debt. Having this into account, corporate long-term debt should vary positively with *Size* and negatively with $Size^2$.

Market to Book represents the market to book ratio and its inclusion as an explanatory variable is made in order to be a proxy for investment opportunities, according to Custodio et al (2013). So, firms with a higher market to book ratio also have more growth opportunities. The under-investment hypothesis, due to the agency costs of risky debt, of Myers (1977) states that firms with a higher set of investment opportunities should have more short-term debt so, according to that, the signal of *Market to Book* should be negative.

Abnormal Earnings corresponds to the excess earnings that a company generates, relatively to its equity value. It is included in this analyzes because it serves as a proxy for the quality of a company projects, Custodio et al (2013), Barclay et al (1995). So, firms with higher abnormal earnings are presumably firms with better prospects. According to the signaling and liquidity hypothesis, firms with higher abnormal earnings should issue debt with shorter maturity to avoid issuing overpriced long-term debt, according to Flannery (1986) and Custodio et al (2013). So, according to this hypothesis, the signal of *Abnormal Earnings* should be negative.

Asset Maturity represents the time that it takes for the assets of a company to be used or replaced. According to the maturity matching hypothesis defined in the literature review, firms should match the maturities of both their assets and liabilities, in order to minimize their exposure to liquidity risk. According to this hypothesis, *Asset Maturity* should have a positive signal. Myers (1977) also states that matching the maturity of assets and liabilities also reduces the agency costs of risky debt so, according to the agency cost hypothesis stated in that paper, *Asset Maturity* should also have a positive signal.

Asset Volatility corresponds to the volatility that a company has regarding its assets. According to the tax hypothesis in Kane et al (1985), if the volatility of returns is higher, debt maturity is smaller, which makes sense, since the underlying risk for the lender is higher if the borrower displays returns with high levels of volatility. So, according to the tax hypothesis, firms with higher asset volatility should display debt with shorter maturity, which means that the signal of *Asset Volatility* should be negative.

Leverage is the variable which represents the ratio of book leverage to total assets of a firm. According to previous literature, such as Barclay et al (1995), the coefficient of *Leverage* should be positive. A positive coefficient goes in line with the signaling and liquidity hypothesis, because, according to that theory, firms with more leverage are more exposed to liquidity risk so they are going to issue more long-term debt in order to minimize that Jansen (2007). However, according to the agency cost hypothesis of Myers (1977), firms with more leverage should issue more short-term debt, because more levered firms have more risky debt agency costs.

R&D corresponds to the ratio of Research and Development expenditures to total assets. According to Aboody et al (2000), firms which are R&D intensive also have more information asymmetry. The authors justify that claim by pointing out that, for instance, most R&D is unique to a specific firm and that it is impossible to have any information regarding the productivity of the R&D of a company by looking at its peers. Previous literature, such as Diamond (1991), Flannery (1986) and Berger et al (2005), show that companies which have more information asymmetry use more short-term debt, to signal financial soundness. So, according to the literature on this matter, *R&D* should have a negative signal.

Dividend Payer is a dummy variable equal to 1 if a company paid dividends during the fiscal year. According to the evidence in Custodio et al (2013), firms that do not pay dividends are more likely to be financially constrained, which makes them more likely to rely on short-term

debt, relatively to firms that pay dividends. Fama et al (2001) also reports that the typical non dividend payers are small firms which have a large set of growth opportunities. So, according to previous literature, the signal of *Dividend Payer* should be positive.

4.1. Summary statistics

Table 1 presents the summary statistics for the proxy of corporate long-term debt, which is the proportion of debt maturing in more than three years, as used in Custodio et al (2013). It also includes the firm-specific characteristics that will be used as control variables in this thesis. To reduce the influence of outliers, all variables (except dummy variables) are winsorized at the 1% level, consistent with Custodio et al (2013). This table offers additional insights into the sample used throughout the thesis.

Table 1: Summary statistics, winsorized at 1%

Debt Maturity > 3 represents the ratio between long-term debt minus debt which matures in 3 years and in 2 years and total debt. *Size* is the percent of firms with the same or smaller market capitalization. *Market-to-Book* is the market value of assets scaled by the book value of assets. *Abnormal earnings* is the ratio of the change in income before extraordinary items between t and t−1, adjusted for equity value. *Asset Maturity* is the weighted sum of the ratio of property, plant, and equipment to depreciation, times their proportion in total assets and the ratio of current assets to the cost of goods sold, times their proportion in total assets. *Leverage* is total debt scaled by total assets. *R&D* is Research and Development expenses scaled by total assets. *Dividend Payer* is a dummy variable equal to 1 if a firm paid dividends during the fiscal year and *Asset Volatility* is equal to the standard deviation of the stock returns times the market value of equity scaled by the market value of assets.

Variable	N	Mean	Median	SD	25th	50th	75th
Debt Maturity > 3	131981	0.448	0.477	0.358	0.033	0.477	0.776
Size	131981	0.278	0.171	0.280	0.035	0.171	0.476
Market-to-Book	131981	2.174	1.396	2.626	1.044	1.396	2.151
Abnormal Earnings	131981	-0.020	0.006	0.582	-0.045	0.006	0.038
Asset Maturity	131981	9.946	6.368	11.967	3.013	6.368	12.346
Leverage	131981	0.311	0.252	0.309	0.112	0.252	0.412
R&D	131981	0.048	0.000	0.114	0.000	0.000	0.040
Dividend Payer	131981	0.342	0.000	0.474	0.000	0.000	1.000
Asset Volatility	131981	0.291	0.236	0.211	0.143	0.236	0.381

In Table 1, debt maturing in more than 3 years represents, on average, 45% of total debt, with a standard deviation of 36%. Table 1 also reports that, on average, the companies in the sample have negative abnormal earnings while their asset returns have, on average, 29% of annualized volatility. 34% of the companies in the sample are also dividend payers. The average of market to book ratio is 2.17 and, on average, book leverage is 31%. The average ratio of R&D to assets is 0.05. On average, the firms of the COMPUSTAT sample have an asset maturity of 9.95 years.

4.2. Results for firm specific characteristics

In column 1 of Table 2, all coefficients are statistically significant at 1%. *Size* and $Size^2$ have the expected signs, confirming a nonlinear relationship between firm size and corporate long-term debt which was already defined in literature such as Custodio et al (2013), Byun et al (2021) and Diamond et al (1991). The fact that *Size* is positive also confirms the hypothesis that firms with more information asymmetry use more short-term debt. The *Asset Maturity* coefficient is positive constituting an evidence of the maturity matching hypothesis and the agency cost hypothesis of Myers (1977). The coefficient of *R&D* is negative, following the findings of Barclay et al (1995) which states that firms with more information asymmetry should use more short-term debt. The positive sign of *Leverage* provides favorable evidence to the signaling and liquidity hypothesis, since companies with more leverage are more exposed to liquidity risk, however it goes against the agency cost hypothesis. *Market to book* serves as a proxy for investment opportunities so the fact that it has a negative sign goes in line with the agency cost hypothesis of Myers (1977). The coefficient of *Abnormal Earnings* has an opposite sign relatively to the one expected, which provides contrary proof to the signaling and liquidity hypothesis, *Asset Volatility* has a negative sign which goes in line with the tax hypothesis and *Dividend Payer* has a positive sign which is consistent with the agency cost hypothesis.

The results of column 1 only change significantly when both firm fixed effects and year fixed effects are introduced in column 5. After doing that, both *Dividend Payer* and *Asset Maturity* stop being statistically significant, and *Asset Maturity* also changes its signal. The change on both variables provides conflicting evidence to both the maturity matching hypothesis and agency cost hypothesis. In column 3 it is possible to see that, even after controlling for all firm specific characteristics, the decade dummies are negative and statistically significant which means that, across the decades of this sample, there is a statistically significant variation of corporate long-term debt which is not explained by the control variables.

By analyzing the results of Table 2, there is evidence that, across the hypothesis stated in the literature review, only the Tax hypothesis is statistically significant in explaining corporate long-term debt variation, across all specifications. The results of Table 2 also show that there is a negative relation between corporate long-term debt and information asymmetry, which is also robust across all specifications. The results show that firm specific characteristics are an important component when it comes to explain the variation of corporate long-term debt, proxied by Debt Maturity > 3.

Table 2: Panel regression of firm specific characteristics

This table displays the OLS regressions with Debt Maturity > 3 as the dependent variable and firm size, firm size squared, asset maturity, R&D, book leverage, market to book ratio, abnormal earnings, asset volatility and dividend payer as the independent variables. In regression 3, decade dummies are also included as independent variables. Standard errors are in parenthesis and clustered at the firm level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)	(4)	(5)
Variables					
Constant	0.266***		0.398***		
	(0.004)		(0.006)		
Size	1.01***	0.993***	1.17***	1.18***	0.811***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.030)
$Size^2$	-0.662***	-0.636***	-0.764***	-0.772***	-0.399***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.031)
Asset Maturity	0.002***	0.001***	0.002***	0.002***	-3.34×10^{-5}
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
R&D	-0.165***	-0.153***	-0.137***	-0.136***	-0.088***
	(0.012)	(0.014)	(0.012)	(0.012)	(0.017)
Leverage	0.216***	0.205***	0.224***	0.225***	0.174***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Market-to-book	-0.027***	-0.026***	-0.026***	-0.026***	-0.017***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)
Abnormal Earnings	0.009***	0.009***	0.007***	0.008***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Asset Volatility	-0.138***	-0.131***	-0.131***	-0.130***	-0.063***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Dividend Payer	0.079***	0.073***	0.036***	0.031***	0.004
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
1980s Dummy			-0.087***		
			(0.004)		
1990s Dummy			-0.182***		
			(0.005)		
2000s Dummy			-0.226***		
			(0.006)		
2010s Dummy			-0.196***		
			(0.006)		
2020s Dummy			-0.087***		
			(0.007)		
Fixed-effects					
Industry (41)		Yes			
year (48)				Yes	Yes
firm (15,556)					Yes
Fit statistics					
Observations	131,981	131,981	131,981	131,981	131,981
R^2	0.288	0.299	0.318	0.323	0.571

Clustered (gvkey) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

4.3. Robustness tests

In previous literature, such as Barclay et al (2003), it is proven that *Leverage* and corporate debt maturity are determined simultaneously which means that *Leverage* is an endogenous variable. Since *Leverage* is included as an explanatory variable of the set of regressions in Table 2, its estimations are biased and inconsistent. The inclusion of an endogenous regressor might also cause a spurious relation between other control variables and the dependent variable, which would mean that a certain variable could have a positive signal, in the set of regressions of Table 2, when, in fact, it influences negatively corporate long-term debt. Table 3 shows the same set of regressions of Table 2, without *Leverage* as a control variable.

Table 3: Panel regression of firm specific characteristics without Leverage

This table displays the OLS regressions with Debt Maturity > 3 as the dependent variable and firm size, firm size squared, asset maturity, R&D, market to book ratio, abnormal earnings, asset volatility and dividend payer as the independent variables. In regression 3, decade dummies are also included as independent variables. Standard errors are in parenthesis and clustered at the firm level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)	(4)	(5)
Variables					
Constant	0.359***		0.487***		
	(0.004)		(0.005)		
Size	0.959***	0.936***	1.10***	1.12***	0.707***
	(0.022)	(0.021)	(0.021)	(0.021)	(0.030)
$Size^2$	-0.621***	-0.594***	-0.720***	-0.735***	-0.335***
	(0.026)	(0.026)	(0.025)	(0.025)	(0.032)
Asset Maturity	0.002***	0.001***	0.002***	0.002***	0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
R&D	-0.166***	-0.143***	-0.142***	-0.140***	-0.060***
	(0.013)	(0.014)	(0.012)	(0.012)	(0.017)
Market-to-book	-0.016***	-0.015***	-0.014***	-0.014***	-0.010***
	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0006)
Abnormal Earnings	0.007***	0.007***	0.005***	0.007***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Asset Volatility	-0.277***	-0.259***	-0.275***	-0.283***	-0.138***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Dividend Payer	0.062***	0.058***	0.022***	0.017***	0.0005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
1980s Dummy			-0.082***		
			(0.004)		
1990s Dummy			-0.176***		
			(0.005)		
2000s Dummy			-0.211***		
			(0.006)		
2010s Dummy			-0.182***		
			(0.006)		
2020s Dummy			-0.064***		
			(0.007)		
Fixed-effects					
Industry (41)		Yes			
year (48)				Yes	Yes
firm (15,556)					Yes
Fit statistics					
Observations	131,981	131,981	131,981	131,981	131,981
R^2	0.263	0.277	0.292	0.298	0.563

Clustered (gvkey) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

By looking at Table 3, the set of results of Table 2 do not significantly change when *Leverage* drops as a coefficient which means that, even though it is an endogenous variable, its inclusion does not change the signals of the other coefficients. This could mean that the signals of the control variables arise from their relationship with Debt Maturity > 3, however, the exclusion of *Leverage* means that there is an omitted variable bias which also makes the estimates biased and inconsistent. So, even though Table 3 might indicate that the signals of the control variables arise from their relationship with corporate long-term debt, that can´t be inferred, because of the omitted variable bias which may also cause spurious relations in the model.

As another test to the robustness of the results achieved in Table 2, Table 4 assesses whether the firm-specific characteristics identified earlier are also relevant in explaining the variation of corporate long-term debt when Debt Maturity > 2 is used as a proxy, instead of Debt Maturity > 3.

Table 4: Panel regression of firm specific characteristics using Debt Maturity > 2

This table displays the OLS regressions with Debt Maturity > 2 as the dependent variable and firm size, firm size squared, asset maturity, R&D, book leverage, market to book ratio, abnormal earnings, asset volatility and dividend payer as the independent variables. In regression 3, decade dummies are also included as independent variables. Standard errors are in parenthesis and clustered at the firm level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)	(4)	(5)
Variables					
Constant	0.381***		0.495***		
	(0.005)		(0.006)		
Size	1.11***	1.09***	1.24***	1.25***	0.848***
	(0.021)	(0.021)	(0.020)	(0.021)	(0.030)
$Size^2$	-0.791***	-0.766***	-0.881***	-0.889***	-0.494***
	(0.025)	(0.025)	(0.024)	(0.024)	(0.030)
Asset Maturity	0.002***	0.0009***	0.002***	0.002***	-0.0004**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
R&D	-0.189***	-0.178***	-0.168***	-0.168***	-0.115***
	(0.013)	(0.015)	(0.013)	(0.013)	(0.019)
Leverage	0.212***	0.202***	0.219***	0.219***	0.168***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Market-to-book	-0.029***	-0.028***	-0.029***	-0.029***	-0.017***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)
Abnormal Earnings	0.012***	0.012***	0.010***	0.011***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset Volatility	-0.139***	-0.133***	-0.129***	-0.129***	-0.053***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)
Dividend Payer	0.066***	0.062***	0.030***	0.025***	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
1980s Dummy			-0.077***		
			(0.004)		
1990s Dummy			-0.159***		
			(0.005)		
2000s Dummy			-0.199***		
			(0.006)		
2010s Dummy			-0.158***		
			(0.006)		
2020s Dummy			-0.069***		
			(0.007)		
Fixed-effects					
Industry (41)		Yes			
year (48)				Yes	Yes
firm (15,556)					Yes
Fit statistics					
Observations	131,981	131,981	131,981	131,981	131,981
R^2	0.290	0.301	0.313	0.317	0.579

Clustered (gvkey) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

It is possible to see in Table 4 that the coefficients maintain the same statistical significance and signals whether the dependent variable is Debt Maturity > 3 or Debt Maturity > 2, across the

first 4 specifications. However, when adding year and firm fixed effects, the coefficient of *Asset Maturity* remains statistically significant at 5%.

In the appendix, in Table A.3, it is demonstrated that, when Debt Maturity > 4 serves as the proxy for corporate long-term debt, the results for firm specific characteristics remain similar, however, *Asset Maturity* remains with a positive coefficient and statistically significant at 5%, after the inclusion of year and firm fixed effects. This means that, when the proportion of Debt maturing in more than 4 years is the proxy for corporate long-term debt, the maturity matching hypothesis is statistically significant in explaining the variation of corporate long-term debt, across all specifications.

As another robustness test, the results displayed in Table 5 evaluate if the inclusion of a linear time trend changes significantly the signals and statistical significance of the coefficients which are in Table 2. By including the trend as a control variable, the variation in the dependent variable resulting from the passage of time is accounted, ensuring that the coefficients accurately capture the true relationships between the dependent variable and the control variables.

In the set of regressions of Table 5, a specification with year fixed effects is excluded to avoid multicollinearity issues arising from the inclusion of both year fixed effects and a time trend. Similarly, a specification with decade dummies is not included for the same reason.

In the results of Table 5, even after the inclusion of firm fixed effects, the signs and statistical significance of the coefficients remain similar, except for *Dividend Payer* which remains statistically significant, even after the inclusion of firm fixed effects. This means that the results in Table 2 are robust even after controlling for the trend. The coefficient of the linear time trend remains statistically significant at 1%, which means that there is a statistically significant variation of corporate long-term debt, which is not explained by the firm specific characteristics included.

Table 5: Panel regression of firm specific characteristics including time trend

This table displays the OLS regressions with Debt Maturity > 3 as the dependent variable and firm size, firm size squared, asset maturity, R&D, book leverage, market to book ratio, abnormal earnings, asset volatility, dividend payer and trend as the independent variables. Standard errors are in parenthesis and clustered at the firm level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)
Variables			
Constant	0.313***		
	(0.005)		
Size	1.10***	1.08***	0.689***
	(0.021)	(0.021)	(0.030)
Size^2	-0.677***	-0.652***	-0.263***
	(0.026)	(0.025)	(0.032)
Asset Maturity	0.002***	0.001***	0.0001
	(0.0001)	(0.0001)	(0.0002)
R&D	-0.128***	-0.125***	-0.126***
	(0.013)	(0.014)	(0.018)
Leverage	0.225***	0.215***	0.177***
	(0.006)	(0.006)	(0.007)
Market-to-book	-0.026***	-0.025***	-0.017***
	(0.0006)	(0.0006)	(0.0007)
Abnormal Earnings	0.008***	0.008***	0.006***
	(0.001)	(0.001)	(0.001)
Asset Volatility	-0.139***	-0.134***	-0.067***
	(0.007)	(0.007)	(0.007)
Dividend Payer	0.055***	0.051***	0.029***
	(0.004)	(0.004)	(0.005)
trend	-0.288***	-0.274***	-0.244***
	(0.015)	(0.015)	(0.025)
Fixed-effects			
Industry (41)		Yes	
firm (15,556)			Yes
Fit statistics			
Observations	131,981	131,981	131,981
R^2	0.295	0.305	0.558

Clustered (gvkey) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

5. Macroeconomic Variables as determinants of debt maturity

Even tough firm specific characteristics may be influential in explaining the variation of corporate long-term debt, the overall conditions of the economy are just as important and, in previous literature, they were proven to be statistically significant in explaining the variation of both corporate long-term debt (Custodio et al (2013)) and intermediate-term debt (Byun et al (2021)). This paper uses macroeconomic variables defined in previous literature with the goal of assessing both their statistical significance and predictive power regarding the variation of corporate long-term debt across the sample.

To accurately capture the overall economic conditions and the determinants of supply and demand of credit, this paper uses the same variables as Byun et al (2021), which are *Term spread, Short-term Rate, Real Short-term Rate, Default spread, Inflation, Recession, Bank stock*

index return, *Government share*, *Insurer Share* and *Insured deposits*. Because real GDP growth is also a relevant component of the overall macroeconomic conditions and can serve as a proxy for investment opportunities, according to Orman et al (2017), the variable *GDP*, which represents the annual percentual change of the real GDP growth, is also included. Detailed descriptions of these variables are in the appendix.

In Section 3, a structural break in the trend of corporate long-term debt was identified around the year 2000. To evaluate whether the explanatory power of the selected macroeconomic variables changed significantly after that, univariate OLS regressions were computed using data from the period 1976 to 2000. Subsequently, the same regressions were performed using data from the entire sample period. Following the methodology of Byun et al 2021, those regressions have standard errors clustered at the firm level.

Since all control variables are macroeconomic variables, which means that the main source of variation is time, in the appendix, in Tables A.4 and A.5, the same univariate OLS regressions were computed using standard errors clustered at the year level.

Table 6: Macroeconomic factors using standard errors clustered at the firm level, pre 2000 sample

This table displays univariate OLS regressions with Debt Maturity > 3 as the dependant variable, for the period between 1976 and 2000, except for Insured deposits, since the data for this variable is only available starting in 1984. Standard errors are in parenthesis and clustered at the firm level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Variables											
Constant	0.394***	0.339***	0.350***	0.354***	0.429***	0.433***	0.444***	-0.189***	0.457***	0.766***	0.452***
	(0.004)	(0.006)	(0.005)	(0.005)	(0.003)	(0.004)	(0.003)	(0.025)	(0.013)	(0.012)	(0.003)
Inflation	1.01***										
	(0.043)										
Short-term rate		1.31***									
		(0.061)									
Real short-term rate			1.35***								
			(0.064)								
Default spread				7.47***							
				(0.373)							
Recession					0.047***						
					(0.003)						
GDP						0.063					
						(0.057)					
Bank stock index return							-0.062***				
							(0.005)				
Insurer share								1.76***			
								(0.069)			
Insured deposits									-0.385***		
									(0.087)		
Government share										-1.62***	
										(0.057)	
Term spread											-1.72***
											(0.112)
Fit statistics											
Observations	72,945	72,945	72,945	72,945	72,945	72,945	72,945	72,945	52,568	72,945	72,945
R^2	0.011	0.013	0.011	0.011	0.003	1.23×10^{-5}	0.002	0.021	0.0005	0.032	0.003

Clustered (gvkey) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

5.1. Results for macroeconomic variables

Looking at Table 6, all variables, besides *GDP*, are statistically significant at 1%, in the pre 2000 sample. *Inflation*, *Short-term rate* and *Real short-term rate* have a positive coefficient, which is evidence that, in a high-interest rate environment, firms prefer to issue long-term debt, which might be explained by the fact that higher interest rates lead to increasing financing costs, which increases the refinancing risk associated with short-term debt. *Recession* has a positive coefficient which means that, during poor overall macroeconomic conditions, firms will resort to higher levels of long-term debt, which is consistent with the results of Section 3. However, the negative sign of *GDP,* although not statistically significant, presents conflicting evidence to the findings of Section 3. The negative coefficient of *Bank stock index return*, and the positive coefficient of *default spread* are consistent with the findings in Erel et al (2012) which states that the deterioration of debt markets lead to firms using more short-term debt. The positive coefficient of *Insurer share*, which represents the proportion of U.S. corporate bonds owned by insurance companies relative to total U.S bonds outstanding, supports the findings of Butler et al (2021). Their study suggests that a higher proportion of bonds owned by insurance companies leads to increased issuance of long-term bonds, as these institutions primarily hold long-term debt. *Insured deposits*, which is equal to the asset-weighted average of the proportion of the bank's assets which are financed by insured deposits, is negative which provides contrary proof to the findings of Paligorova et al (2016), which states that, if banks rely more on wholesale funding instead of insured deposits, they reduce the maturity of their loans, in order to reduce rollover risk. *Government share*, which is equal to the proportion of US treasuries which have a remaining maturity of 5 years or longer has a positive coefficient. That confirms the findings of Greenwood et al (2015) which states that firms act as macro liquidity providers, absorbing supply shocks. This means that if, for instance, the government changes its debt maturity structure by issuing more long-term debt, corporate debt maturity decreases. The negative coefficient of *Term spread* contradicts the Tax Hypothesis proposed by Brick et al (1985) and instead supports the idea that firms actively time the market, opting to issue more short-term debt when it is cheaper to do so.

Looking at the results for the full sample, in Table 7, only *Inflation*, *Default spread*, *Bank stock index return*, *Insured deposits*, *Government share* and *Term spread* are statistically significant in explaining the variation of corporate long-term debt. The coefficients for *Inflation* and *Short-term rate* are still positive, however, *Real short-term rate* has a negative signal, meaning that interest rate variables provide mixed results. Within the variables which proxy interest rate

environment, *Inflation* is the only which remains statistically significant. *Recession* and *GDP* are not statistically significant which means that the relation between overall macroeconomic conditions and corporate long-term debt is not statistically significant, when accounting for the full sample. *Default spread* and *Bank stock index return* maintain the same signals and statistical significance which means that, when debt market conditions deteriorate, companies use more short-term debt. *Insurer share* stops being statistically significant and *Government share*, *Insured Deposits* and *Term spread* maintain the same signals and statistical significance.

Looking at the results in Tables A.4 and A.5, in the appendix, it is possible to see that, when the standard errors are clustered at the year level, *Term spread* is statistically significant at 10% and *Recession*, *Bank stock index return* and *Insured deposits* lose their statistical significance, in the pre 2000 sample. In the full sample, *Inflation* is statistically significant at 5% and both *Default spread* and *Bank stock index return* lose their statistical significance.

These results suggest a structural break in the significance of the variables used to explain the variation of corporate long-term debt, after 2000. Specifically, in the analysis for the full sample, variables that proxy the interest rate environment and overall macroeconomic conditions have lost their statistical significance.

Table 7: Macroeconomic factors using standard errors clustered at the firm level, full sample

This table displays univariate OLS regressions with Debt Maturity > 3 as the dependant variable, for the period between 1976 and 2023, except for Insured deposits, where the data is only available between 1984 and 2020, and Government Share, where there is data only until 2013. Standard errors are in parenthesis and clustered at the firm level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Variables											
Constant	0.431***	0.447***	0.448***	0.421***	0.448***	0.448***	0.450***	0.429***	0.518***	0.597***	0.473***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.014)	(0.006)	(0.010)	(0.003)
Inflation	0.541***										
	(0.034)										
Short-term rate		0.031									
		(0.052)									
Real short-term rate			-0.005								
			(0.056)								
Default spread				2.52***							
				(0.253)							
Recession					0.002						
					(0.002)						
GDP						0.015					
						(0.053)					
Bank stock index return							-0.020***				
							(0.004)				
Insurer share								0.062			
								(0.041)			
Insured deposits									-0.904***		
									(0.048)		
Government share										-0.740***	
										(0.043)	
Term spread											-2.25***
											(0.091)
Fit statistics											
Observations	131,981	131,981	131,981	131,981	131,981	131,981	131,981	131,981	104,473	109,836	131,981
R^2	0.003	9.87×10^{-6}	1.83×10^{-7}	0.001	3.77×10^{-6}	5.96×10^{-7}	0.0002	7.76×10^{-5}	0.013	0.011	0.006

Clustered (gvkey) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

5.2. Predictive power of macroeconomic variables

As demonstrated in Table 6, all macroeconomic variables, besides *GDP*, are statistically significant in explaining the variation of Debt Maturity > 3 in the pre 2000 sample. To assess if those variables can effectively predict and, therefore, explain the variation of the average proportion of debt maturing in more than three years over the period between 1976 and 2023, the sample was divided into two periods: an In-Sample period (1976 to 2000), which is the period for which the OLS coefficients are computed, and an Out-of-Sample period (2000 to 2019). Afterwards, the Out-of-Sample period was extended to 2023 to assess whether the emergence of COVID-19 had a significant impact on the predictive power of the chosen variables.

Following the methodology of Byun et al (2021), in Table 8, the average of each macroeconomic variable in 1976, in 2000, in 2019 and in 2023 was computed in columns 2, 3, 4 and 5, respectively. Afterwards, the predicted change in debt maturity, for the period between 1976 and 2000, was computed, for each variable, by doing $(\text{Average } 2000 - \text{Average } 1976) \times$ OLS estimate pre 2000. Afterwards, the values of column 6, in Table 8, were calculated by dividing the values of the predicted change in debt maturity by the change in the average proportion of Debt Maturing in more than 3 years, between 1976 and 2000. For columns 7 and 8, the computations followed the same reasoning.

By looking at the results in Table 8, it is evident that, although 5 variables correctly predict the change in the average corporate long-term debt, In-Sample, only 2 capture significant portions of that change. Those variables are *Government share*, which predicts 88% and *Insurance share*, which predicts 47%. However, Out of Sample, no variable can predict a significant portion of the change of the average Debt Maturity > 3 and only 2 can correctly predict it. Those variables are *Default spread* which only predicts 2% of that change and *Insured deposits* which predicts 10%. So, the results of column 7 show that, Out of Sample, the predictive power of the set of variables decreases substantially, relatively to the In-Sample period. As demonstrated in column 8, when the Out of Sample is extended until 2023, *Term spread*, *Bank stock index return*, *Default spread*, *GDP* and *Insured deposits* are the only variables which correctly predict the variation of the average Debt Maturity > 3. However, the variable that performs better in doing that is *Insured deposits* despite only predicting 12% of that change. This suggests that, even with slight improvements in predictive power post-COVID-19, the selected variables still underperform compared to the In-Sample period.

Table 8: Predicting pre-and post-2000 debt maturity trends using OLS estimates until 2000

This table represents the performance of each variable in predicting the variation of the average proportion of debt maturing in more than 3 years. The values of column 6 are the ratio between the predicted variation of the average Debt Maturity > 3, which is equal to (Average 2000 − Average 1976) × OLS estimate pre 2000, and the actual variation in the average Debt Maturity > 3, between 1976 and 2000. The values of columns 7 and 8 followed the same reasoning. The In-sample period extends from 1976 to 2000, while the Out-of-sample period covers 2000 to 2019 in column 7 and 2000 to 2023 in column 8.

					1976 to 2000	2000 to 2019	2000 to 2023
Variables	**1976 Average**	**2000 Average**	**2019 Average**	**2023 Average**	**Change IS (%)**	**change OOS (%)**	**change OOS (%)**
Term spread	0.018	-0.002	0.003	-0.010	-13.188	-3.135	5.394
Government share	0.140	0.280	0.320	0.320	88.051	-22.645	-25.041
Bank stock index return	0.256	0.163	0.367	0.112	-2.327	-4.529	1.156
Default spread	0.012	0.008	0.009	0.009	11.637	2.439	2.697
Real short-term rate	0.042	0.055	0.014	0.050	-6.982	-19.161	-2.697
Short-term rate	0.054	0.058	0.017	0.050	-1.939	-18.812	-4.238
Inflation	0.056	0.036	0.030	0.029	7.758	-2.090	-2.697
Recession	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GDP	0.054	0.041	0.026	0.029	0.388	-0.348	-0.385
Insurance share	0.367	0.299	0.286	0.280	46.547	-8.013	-12.713
Insured deposits	0.146	0.119	0.041	0.035	-3.879	10.451	12.328

5.3. In Sample test

In section 3, it is reported a clear structural break in the trend of corporate long-term debt, starting in 2000. So, because of that, the poor Out of Sample performance of the variables used might be reasoned by the fact that they start to influence in a different way corporate long-term debt, which would mean that the OLS estimates of the pre 2000 sample would not be appropriate to predict the variation of corporate long-term debt, for the entire sample. To account for that, following the methodology of Byun et al (2021), an In-Sample test is also performed. The steps to do this test are the same as the previous one, however, the OLS estimates for the full sample are used, so there isn´t an Out of Sample period.

The results for the In-sample test are reported in Table 9. In there, it is possible to see that, for the period between 1976 and 2000, *Government share, Default spread, Inflation and Insurance share* are the only variables which correctly predict the variation of corporate long-term debt. Similarly to the previous test, *Government share* is the variable which performs better, predicting 40% of that change. Between 2000 and 2019, only *Insured deposits*, which predicts 25% of the variation of the average Debt Maturity > 3, can somewhat explain the variation of corporate long-term debt. The second variable which performs better is *Default spread*, which predicts only 1% of that variation. When the time series is extended until 2023, the variables perform slightly better, however, the only one which significantly explains the variation of the

average Debt Maturity > 3 is *Insured deposits*, which predicts 29%. This means that the decrease of *Insured deposits*, between 2000 and 2023, partially explains the upward trend of corporate long-term debt, challenging the findings of Paligorova et al (2016).

Table 9: Predicting pre-and post-2000 debt maturity trends using OLS estimates for full sample

This table represents the performance of each variable in predicting the variation of the average proportion of Debt Maturing in more than 3 years. The values of column 6 are the ratio between the predicted variation of Debt Maturity > 3, which is equal to (Average 2000 − Average 1976) × OLS estimate full sample, and the actual variation in the average Debt Maturity > 3, between 1976 and 2000. The values of columns 7 and 8 followed the same reasoning. In this test there isn´t an Out of Sample period.

Variables	1976 Average	2000 Average	2019 Average	2023 Average	1976 to 2000 Change IS (%)	2000 to 2019 change IS (%)	2000 to 2023 change IS (%)
Term spread	0.018	-0.002	0.003	-0.010	-17.455	-3.832	6.935
Government share	0.140	0.280	0.320	0.320	40.341	-10.451	-11.558
Bank stock index return	0.256	0.163	0.367	0.112	-0.776	-1.394	0.385
Default spread	0.012	0.008	0.009	0.009	3.879	1.045	1.156
Real short-term rate	0.042	0.055	0.014	0.050	0.000	0.000	0.000
Short-term rate	0.054	0.058	0.017	0.050	0.000	-0.348	0.000
Inflation	0.056	0.036	0.030	0.029	4.267	-1.045	-1.541
Recession	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GDP	0.054	0.041	0.026	0.029	0.000	0.000	0.000
Insurance share	0.367	0.299	0.286	0.280	1.552	-0.348	-0.385
Insured deposits	0.146	0.119	0.041	0.035	-9.309	24.735	29.279

6. Conclusion

This paper examines the trend of corporate long-term debt, proxied by the proportion of debt maturing in more than 3 years, between 1976 and 2023, using a sample of US firms from all sectors, excluding financial and utilities sectors. In this paper it is reported a reduction of corporate long-term debt, between 1976 and 2000 and an increase between 2000 and 2021. Starting in 2021, corporate long-term debt started to go down, which was driven by small, medium and large firms. Both the decrease between 1976 and 2000 and the trend reversal in the next 2 decades, of corporate long-term debt, were mainly driven by small and medium firms.

Relatively to the hypotheses stated in the literature review, only the tax hypothesis consistently explains the variation of corporate long-term debt across all specifications that only include firm specific characteristics as the coefficients. The maturity matching hypothesis is successful and statistically significant in explaining the variation of corporate long-term debt except when year and firm fixed effects are introduced. When macroeconomic variables are included in the analysis, the tax hypothesis does not explain the variation of corporate long-term debt. It is also

reported a negative relation between the level of information asymmetry and corporate debt maturity, which is robust to different proxies of corporate long-term debt and to the inclusion of a time trend. When using the proportion of debt maturing in more than 4 years as the proxy of corporate long-term debt, the maturity matching hypothesis is statistically significant at 5%, even after the inclusion of both firm and year fixed effects. Even after the inclusion of firm fixed effects, the trend of Debt Maturity > 3 is statistically significant at 1%. The set of results for firm-specific characteristics is consistent with the findings of Custodio et al (2013).

The results for the tests assessing the predictive power of the set of macroeconomic variables show that the downward trend of corporate long-term debt, between 1976 and 2000, can be explained by the increase of the proportion of long-term US treasuries and by the decrease of the share of US bonds held by insurance companies, thus confirming the findings of Grenwood et al (2015) and Butler et al (2021), respectively. This dissertation also reports that the trend reversal, which starts in 2000, can be partially explained by the decrease of the proportion of insured deposits to bank´s total assets, which challenges the findings of Paligorova et al (2016). This result highlights the complex relation between *Insured deposits* and corporate long-term debt and the need for further studies which can explain a possible reason for the negative relation between both variables. Additionally, the inclusion of the years after COVID-19 slightly improved the performance of macroeconomic variables in predicting the variation of corporate long-term debt.

Finally, the results achieved in this paper suggest a structural break not only in the trend of corporate long-term debt but also in the statistical significance of macroeconomic variables in explaining its variation. The variables selected in this paper were initially proposed, by previous literature, to explain the decline of corporate long-term debt in the period until 2000, however, between 2000 and 2023, they lost statistical significance and predictive power. This indicates that, although the overall conditions which influence the supply and demand of credit are still important determinants of the corporate debt maturity structure, they become less meaningful in the period after 2000.

7. Potential limitations and further Research

One limitation of this paper is the inclusion of the variable *Leverage*, in the set of regressions of firm specific characteristics. That variable was included to increase the explanatory power of the set of regressions, however, previous literature, such as Barclay et al (2003), proved that

it is endogenous. Even tough, in Section 4, it is possible to see that the signals and statistical significance of the other control variables do not change if that coefficient is dropped from the regression, there should not be an actual causal interpretation of the coefficients, because the estimations are biased and inconsistent, even after the exclusion of *Leverage* as a coefficient. A solution, which solves the endogeneity problem while also keeping the explanatory power of the set of regressions for the firm specific characteristics, is the use of Instrumental Variables.

Another limitation of this thesis is the use of univariate OLS regressions when assessing the statistical significance and predictive power of the macroeconomic variables selected. As it was proven in Section 4, firm specific characteristics are relevant in explaining corporate long-term debt, so, by using univariate OLS regressions, the model has an omitted variable bias, which makes the estimates biased and inconsistent and can cause spurious relations in the model.

Another limitation of this thesis is the fact that *Insured deposits* only has data from 1984 to 2020, and *Government share* only has data until 2013. When performing the tests to evaluate the predictive power of these variables, missing values were replaced with the data point from the closest available year. For instance, the mean of *Government share* in 2019, which was a missing value, was substituted with the mean of *Government share* from 2013. While this approach ensured the completion of the dataset, it potentially reduces the validity of the tests, as the imputation method may not accurately reflect the true values for the missing years. The fact that both variables don´t have observations for the full sample also reduces the validity of the coefficient for *Government share*, in Table 7, and reduces the validity of the coefficient for *Insured deposits*, in Tables 6 and 7.

Relatively to further research, studying the key drivers of corporate long-term debt variation for different economies such as the Eurozone or China could provide key insights related to the differences in the financing decisions of the companies across the 3 biggest world economies. Doing this study using data which also includes the period after the COVID-19 pandemic could also provide valuable insights related to the differences in the impact that it had in these economies.

Another interesting point for further research would be to assess the statistical and predictive power of the macroeconomic variables using regressions which also incorporated firm specific characteristics, instead of using univariate OLS regressions. Doing that would provide valuable insights regarding the relationship between macroeconomic variables and corporate long-term debt

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Appendix

Table A.1: Time series for different proxies of long-term debt

This table displays the average, median and aggregate Debt Maturity > 2, Debt Maturity > 3 and Debt Maturity > 4. Debt Maturity > 2 is computed by subtracting to long-term debt the debt which matures in 2 years and then scaling that result by total debt. Debt Maturity > 3 is computed by subtracting to long-term debt the debt which matures in 3 years and in 2 years and then scaling that result by total debt. Debt Maturity > 4 is computed by subtracting to long-term debt the debt which matures in 3 years, which matures in 2 years and the debt which matures in 4 years and then scaling that result by total debt.

year	Aggregate Debt Maturity > 2	Mean Debt Maturity > 2	Median Debt Maturity > 2	Aggregate Debt Maturity > 3	Mean Debt Maturity > 3	Median Debt Maturity > 3	Aggregate Debt Maturity > 4	Mean Debt Maturity > 4	Median Debt Maturity > 4
1976	73.991	66.516	74.448	68.204	57.480	63.989	63.217	49.318	54.052
1977	72.558	66.152	74.339	67.040	57.354	63.463	60.813	49.254	53.615
1978	72.121	65.495	73.748	65.177	56.260	62.386	58.925	47.706	51.741
1979	71.798	62.862	71.285	65.231	53.519	59.897	59.036	45.390	49.146
1980	74.097	62.571	71.193	67.071	52.910	59.438	61.027	45.083	48.765
1981	72.162	59.670	68.800	65.283	49.890	55.789	57.841	41.576	44.371
1982	73.333	59.856	69.056	64.999	49.555	55.616	56.981	41.225	44.494
1983	73.299	58.075	67.089	64.365	47.768	52.974	57.232	39.539	42.054
1984	69.345	55.815	63.234	61.712	45.507	49.256	54.763	37.225	37.793
1985	70.755	55.189	62.667	64.215	45.140	47.488	58.559	37.539	36.705
1986	70.863	53.806	60.596	64.315	44.125	45.621	58.314	36.953	34.397
1987	69.816	53.342	60.416	63.534	44.196	46.179	57.331	36.449	33.513
1988	67.187	52.150	58.193	60.252	41.970	42.655	53.214	34.388	29.552
1989	66.317	51.389	57.395	58.327	40.828	40.581	51.579	33.035	26.876
1990	62.304	48.940	53.582	53.366	38.433	35.439	46.897	30.780	22.499
1991	61.458	48.991	53.438	54.566	38.017	33.968	48.124	30.091	20.349
1992	63.920	48.684	52.262	56.159	37.162	33.026	48.686	28.980	18.138
1993	65.064	49.649	55.285	56.851	38.021	33.064	49.384	30.040	18.168
1994	64.366	51.140	56.147	55.343	38.579	32.893	47.791	30.499	17.783
1995	62.091	49.214	52.795	54.577	37.547	29.769	48.727	29.589	14.973
1996	63.452	49.135	52.431	56.654	38.232	30.008	49.555	30.243	14.918
1997	65.286	50.338	54.294	57.821	39.508	31.363	50.177	31.765	14.806
1998	64.980	50.142	54.590	57.578	39.197	31.247	50.533	30.643	13.052
1999	63.140	47.452	48.260	56.056	35.914	24.671	47.741	27.417	7.364
2000	61.795	43.193	38.751	53.861	31.710	13.588	47.693	24.840	3.429
2001	66.759	42.739	37.255	57.394	32.566	14.493	50.461	25.218	2.685
2002	67.068	45.321	45.899	57.056	33.691	17.371	47.548	25.944	3.465
2003	68.338	48.653	53.735	56.436	37.549	27.735	49.320	29.372	10.644
2004	65.181	51.166	58.168	57.283	40.191	34.513	49.560	31.543	11.792
2005	71.403	53.676	62.600	61.798	42.697	38.592	54.739	34.138	16.423
2006	71.147	54.908	65.555	62.604	45.207	46.604	55.076	35.751	19.415
2007	72.530	55.834	67.343	65.423	45.030	44.169	56.968	34.816	16.595
2008	73.540	54.000	66.665	64.543	41.155	37.687	53.821	29.275	5.779
2009	75.781	53.552	66.113	63.763	38.603	28.205	53.473	27.795	4.157
2010	72.226	54.079	67.154	62.085	40.866	35.768	53.529	31.156	10.036
2011	73.367	57.467	73.939	64.712	46.121	50.748	57.645	36.683	24.664
2012	76.233	60.441	77.778	67.837	49.673	59.070	57.364	36.660	25.206
2013	77.398	61.669	80.137	67.749	49.932	60.869	59.355	39.744	33.636
2014	76.548	61.931	79.430	67.808	51.778	62.971	57.982	39.411	34.565
2015	76.055	64.049	82.461	67.233	51.744	62.698	58.727	38.600	32.160
2016	80.039	63.754	81.870	71.825	50.232	61.023	61.887	36.900	27.741
2017	80.065	64.283	82.731	70.075	50.899	62.799	60.109	38.063	30.093
2018	77.154	65.591	83.216	67.037	52.343	65.322	58.164	39.477	34.059
2019	80.177	69.198	83.074	71.706	60.414	70.568	64.227	50.143	56.021
2020	82.234	70.302	81.386	75.072	61.146	70.637	68.009	51.221	56.773
2021	82.813	72.331	83.071	75.946	63.374	73.878	68.933	54.561	62.001
2022	81.833	71.769	82.311	74.065	62.911	73.061	66.535	52.272	58.450
2023	79.460	69.166	79.959	71.634	57.667	67.216	63.163	47.637	50.803
2000 as % of 1976	83,511	64.928	52.048	78.974	55.157	21.238	75.451	50.365	6.346
2023 as % of 2021	95.943	95.631	96.256	94.312	91.005	90.985	91.629	87.317	81.955
2021 as % of 1976	111.934	108.734	111.578	111.364	110.228	115.456	109.032	110.624	114.709

Table A.2: Median proportion of Debt Maturity > 3 in %, by firm size.

This table displays the actual values of the time series of the median proportion of debt maturing in more than 3 years, conditional on firm size, between 1976 and 2023. Firms below the 20th percentile are categorized as small, those between the 20th and 50th percentiles as medium, and those above the 50th percentile as large.

	Median Debt Maturity > 3		
year	Small	Medium	Large
1976	53.952	67.981	74.618
1977	53.794	68.444	74.368
1978	53.269	69.300	71.221
1979	50.651	67.896	69.054
1980	49.631	66.307	70.009
1981	43.007	66.447	68.103
1982	43.952	65.683	68.756
1983	41.997	64.231	69.802
1984	37.270	63.003	68.567
1985	34.319	61.512	70.822
1986	29.412	62.729	71.491
1987	28.105	63.886	71.556
1988	25.894	59.706	69.730
1989	21.860	60.898	68.181
1990	19.639	55.180	63.402
1991	16.689	52.601	65.564
1992	15.052	50.983	65.758
1993	14.701	53.057	66.812
1994	15.847	55.164	65.743
1995	14.922	52.134	67.755
1996	13.808	57.413	70.027
1997	14.575	66.446	72.120
1998	12.475	64.351	68.382
1999	8.387	51.947	57.873
2000	2.994	38.392	60.513
2001	1.412	45.564	71.715
2002	1.236	57.143	71.651
2003	4.261	65.995	69.088
2004	5.688	74.989	69.693
2005	8.092	77.617	71.074
2006	8.340	82.468	73.644
2007	6.375	80.593	74.650
2008	1.550	68.297	71.181
2009	0.361	56.840	70.459
2010	0.727	63.904	70.476
2011	3.534	75.666	74.803
2012	4.767	79.952	78.401
2013	4.264	86.076	79.442
2014	8.020	87.036	77.013
2015	7.336	81.623	79.449
2016	3.919	81.333	79.716
2017	5.143	81.897	79.079
2018	14.905	80.028	77.566
2019	52.238	81.423	78.092
2020	50.016	78.638	80.058
2021	59.202	80.800	81.219
2022	60.122	82.196	78.635
2023	48.117	77.098	73.705

Table A.3: Panel regression of firm specific characteristics using Debt Maturity > 4

This table displays the OLS regressions with Debt Maturity > 4 as the dependent variable and firm size, firm size squared, asset maturity, R&D, book leverage, market to book ratio, abnormal earnings, asset volatility and dividend payer as the independent variables. In regression 3, decade dummies are also included as independent variables. Standard errors are in parenthesis and clustered at the firm level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)	(4)	(5)
Variables					
Constant	0.193***		0.327***		
	(0.004)		(0.005)		
Size	0.800***	0.780***	0.968***	0.981***	0.670***
	(0.021)	(0.020)	(0.020)	(0.020)	(0.029)
$Size^2$	-0.465***	-0.441***	-0.566***	-0.575***	-0.271***
	(0.025)	(0.025)	(0.024)	(0.025)	(0.031)
Asset Maturity	0.002***	0.001***	0.002***	0.002***	0.0003**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R&D	-0.118***	-0.106***	-0.082***	-0.079***	-0.055***
	(0.012)	(0.013)	(0.011)	(0.011)	(0.016)
Leverage	0.185***	0.174***	0.194***	0.196***	0.151***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Market-to-book	-0.022***	-0.021***	-0.021***	-0.021***	-0.014***
	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0006)
Abnormal Earnings	0.005***	0.005***	0.003**	0.004***	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Asset Volatility	-0.114***	-0.106***	-0.113***	-0.113***	-0.051***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Dividend Payer	0.088***	0.082***	0.041***	0.037***	0.009*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
1980s Dummy			-0.084***		
			(0.004)		
1990s Dummy			-0.180***		
			(0.005)		
2000s Dummy			-0.228***		
			(0.005)		
2010s Dummy			-0.222***		
			(0.006)		
2020s Dummy			-0.098***		
			(0.007)		
Fixed-effects					
Industry (41)		Yes			
year (48)				Yes	Yes
firm (15,546)					Yes
Fit statistics					
Observations	131,617	131,617	131,617	131,617	131,617
R^2	0.249	0.260	0.285	0.291	0.542

Clustered (gvkey) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table A.4: Macroeconomic factors using standard errors clustered at the year level, pre 2000 sample

This table displays univariate OLS regressions with Debt Maturity > 3 as the dependant variable, for the period between 1976 and 2000, except for Insured deposits, since the data for this variable is only available starting in 1984. Standard errors are in parenthesis and clustered at the year level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively.

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Variables											
Constant	0.394***	0.339***	0.350***	0.354***	0.429***	0.433***	0.444***	-0.189**	0.457***	0.766***	0.452***
	(0.017)	(0.022)	(0.023)	(0.022)	(0.014)	(0.028)	(0.016)	(0.088)	(0.048)	(0.035)	(0.016)
Inflation	1.01***										
	(0.289)										
Short-term rate		1.31***									
		(0.235)									
Real short-term rate			1.35***								
			(0.270)								
Default spread				7.47***							
				(1.47)							
Recession					0.047						
					(0.032)						
GDP						0.063					
						(0.735)					
Bank stock index return							-0.062				
							(0.049)				
Insurer share								1.76***			
								(0.261)			
Insured deposits									-0.385		
									(0.296)		
Government share										-1.62***	
										(0.179)	
Term spread											-1.72*
											(0.849)
Fit statistics											
Observations	72,945	72,945	72,945	72,945	72,945	72,945	72,945	72,945	52,568	72,945	72,945
R^2	0.011	0.013	0.011	0.011	0.003	1.23×10^{-5}	0.002	0.021	0.0005	0.032	0.003

Clustered (year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table A.5: Macroeconomic factors using standard errors clustered at the year level, full sample

This table displays univariate OLS regressions with Debt Maturity > 3 as the dependant variable, for the period between 1976 and 2023, except for Insured deposits, where the data is only available between 1984 and 2020, and Government Share, where there is data only until 2013. Standard errors are in parenthesis and clustered at the year level. Asterisks ***, **, and * represent a statistical significance of 1%, 5% and 10% respectively

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Variables											
Constant	0.431***	0.447***	0.448***	0.421***	0.448***	0.448***	0.450***	0.429***	0.518***	0.597***	0.473***
	(0.014)	(0.021)	(0.020)	(0.026)	(0.013)	(0.023)	(0.013)	(0.061)	(0.022)	(0.043)	(0.017)
Inflation	0.541**										
	(0.223)										
Short-term rate		0.031									
		(0.289)									
Real short-term rate			-0.005								
			(0.331)								
Default spread				2.52							
				(1.87)							
Recession					0.002						
					(0.031)						
GDP						0.015					
						(0.687)					
Bank stock index return							-0.020				
							(0.048)				
Insurer share								0.062			
								(0.186)			
Insured deposits									-0.904***		
									(0.169)		
Government share										-0.740***	
										(0.190)	
Term spread											-2.25***
											(0.790)
Fit statistics											
Observations	131,981	131,981	131,981	131,981	131,981	131,981	131,981	131,981	104,473	109,836	131,981
R^2	0.003	9.87×10^{-6}	1.83×10^{-7}	0.001	3.77×10^{-6}	5.96×10^{-7}	0.0002	7.76×10^{-5}	0.013	0.011	0.006

Clustered (year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Macroeconomic variables definitions

- Term Spread: Annual Difference between the yields of the 10 year and 1 year US treasury securities (DGS10 - DGS1). Data was retrieved from the FRED website.

- Short-term rate: Yield of the 1-year US treasury security (DGS1). Data was retrieved from the FRED website

- Real Short-term rate: Yield of the 3 Month US treasury security (TB3MS). Data was retrieved from the FRED website

- Default spread: Annual difference between the yield of BAA rated bonds and the yield of AAA rated bonds (BAA-AAA). Data was retrieved from the FRED website

- Inflation: Annual percentual change of the Consumer Price Index (CPIAUCSL_PCH). Data was retrieved from the FRED website

- Recession Dummy: Dummy variable equal to 1 if, during at least 1 month of a certain year, there was a recession according to NBER. Data was retrieved from the NBER website

- Bank Stock Index Return: Excess returns of the banking sector. Retrieved from the 48x48 portfolio of Kenneth and French website (industry 44).

- Government Share: Share of US government treasuries with a maturity larger than 5 years. Data was retrieved from Figure 1 of Greenwood et al (2015)

- Insurer Share: Proportion of US bonds owned by insurance companies, relatively to total bonds outstanding in US (FL523063005.A/FL893063005.A). Data was retrieved from the FRED website.

- Insured deposits: Asset weighted average of the proportion of the banks assets which are financed by insured deposits. Insured Deposits $= \sum \left(\frac{\text{timedeple100k}}{\text{assets}} \times \text{assets} \right)$. Data was retrieved from Drechsler et al (2017).

- GDP: Annual percentual change of the real GDP growth (GDPC1_PCH). Data was retrieved from FRED website.