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The Credit Sentiment Effect:

An analysis of behavioral credit cycles on capital structure

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Abstract:

Imperfect capital markets are more often identified to affect firm's decision making. To further analyze the influence of supply side factors of the credit market on firm's capital structure, this paper describes, with the use of a formulation of behavioral credit cycles, a panel data analysis of leverage ratios and net debt issues of US non-financial businesses between 1987 and 2018. Results indicate the presence of a credit sentiment effect on both capital structure measures, although accounting for only a small part of the variation. An increase in the credit sentiment index, specifically the difference in probability to default of firms issuing a high compared to a low level of debt, is therefore associated with an increase in leverage and debt issuance. Furthermore, findings suggest a higher credit sentiment effect on long-term debt and on net debt issues for firms facing higher financial constraints. No significant reversal of the initial increase in leverage and debt issuance was found in the following two to three years.

Table of Contents

List of Tables

List of Figures

1. Introduction

The sources with which firms finance themselves remains one of the main research topics in corporate finance. Research into this field was initiated by Modigliani and Miller (1958) who proposed two propositions: the value of a firm is independent of its capital structure, and this is explained through a cost of equity that increases with the percentage of debt. These hypotheses only hold under the specific assumptions of efficient markets. Subsequently, a multitude of literature focused on relaxing these assumptions and making the theory more relevant and applicable to the real world. Remarkably, little attention has been paid to the supply side of capital, which was assumed to be elastic by Modigliani and Miller (1958).

As Titman (2002) has suggested, capital markets have imperfections and different capital markets might not be perfectly integrated which should be examined in further research. This impact of supply effects on capital structure decisions is confirmed by survey findings of Graham and Harvey (2001) and Bancel and Mittoo (2004). They concluded that financial flexibility and credit ratings are main concerns for managers when deciding on the source of financing. Since then a multitude of literature has been written on the source's firms use to finance themselves and which firm and macro-economic factors affect this decision. Faulkender and Petersen (2006) found that access to the public debt market, affects a firm's leverage. In addition, Leary (2009) showed results, using two exogenous shocks to bank credit, on the difference in leverage ratio between bank-dependent firms and firms with access to public debt. Bhamra, Kuehn and Strebulaev (2010) developed a model to investigate macroeconomic conditions on firm's capital structure choices, concluding that leverage ratios are pro-cyclical at firm-level.

These are a few examples of analyses performed to identify the supply effect. However, the use of an instrument based on the behavioral phenomenon of investor sentiment, as has been suggested by Baker (2009), has rarely appeared in literature up to now. In this paper investor sentiment is incorporated through the formulation of behavioral credit cycles. Despite the size of literature on credit cycles, there is still a lot of uncertainty on its exact causes and effects, making it an interesting topic for further evaluation. The cyclical movement in the financial markets are often explained by transmission mechanisms that transfer the movements from the real economy, for example through improvement of fundamentals or requirements of collateral (Bernanke & Gertler, 1989; Kiyotaki & Moore, 1997). However, it came to the attention that the instability of the financial market is inherent to its nature, it is not driven by external factors but is endogenous (Minsky, 1977). An explanation for the drivers of this endogenous effect was found in the behavior of investors, which is often irrational (Greenwood & Hanson, 2013). Modelling these behavioral credit cycles made it possible to analyze the effect of the financial market on the real economy, such as real GDP growth, investments or employment (López-Salido, Stein and Zakrajšek, 2017;

Gulen, Ion, and Rossi, 2018). The research in this paper aims to extent this by specifically focusing on capital structure decisions of firms.

The objective of this paper is hence twofold. To further confirm the hypothesis that firm's leverage ratios are influenced by supply side factors of the credit market, and to broaden the analysis on behavioral credit cycles. Specifically, the combination of both is what brings a unique element to this analysis. To sum up, this paper will investigate if there is an effect of moving between the different stages of the credit cycle on the sources of capital of non-financial firms in the US between 1987 and 2018.

As it is not within the scope of the paper to develop a macroeconomic model comparable to for example Bhamra et al (2010), this paper follows the example of Gulen et al (2018). They evaluate the credit market cycle in relation to a firm's investment, using an index created by Greenwood and Hanson (2013) as proxy for the movement of the credit cycle. This index (CME), which is based on credit sentiment, focuses on the quality of credit issuers, as Greenwood and Hanson (2013) find that the deterioration of the quality of credit issuers is a reliable signal of credit market overheating.

This paper will follow with an overview of empirical literature. In Section 3 the different hypotheses that will be evaluated are presented. Furthermore, the data and methods used in this analysis will be explained in Section 4, and the results will be described in Section 5. Finally, this paper concludes with a conclusion of the discovered results and an accompanying discussion.

2. Literature review

2.1 The Supply Effect

Modigliani and Miller's (1958) irrelevance views are often considered the first generally accepted theory on a firm's capital structure and cost of capital. Two of the more well-known theories resulting from this main framework are the static trade-off theory (Kraus & Litzenberger, 1973) and the pecking order theory (Myers & Majluf, 1984). Both relax different assumptions Modigliani and Miller (1958) made, including the exclusion of taxes and costs of financial distress, but are still not able to explain the low leverage ratio's that can be observed in firms. This capital structure puzzle, as Myers (1984) referred to the inadequacy of the theories at the time to match theory to practice, is a recurring obstacle for researchers trying to explain firm's behavior. Many, such as Myers (1984), tried to improve the static trade-off or pecking order theory to incorporate for example problems of asymmetric information and agency costs.

As one of the first, Titman (2002), started the dialogue on the effect of the supply side on capital structure decisions. In their framework, Modigliani and Miller (1958) assumed perfect capital markets, indicating firms do not need to consider changing market conditions or demands of investors when deciding on financing decisions. To his astonishment, there was only little literature on relaxing this assumption. Even though he believed complete markets are not necessary for the framework to hold, only financial intermediaries that in a competitive and costless manner offer any cash flow stream, there are still frictions in the capital market and different debt markets are not perfectly integrated. Therefore, he is convinced it is necessary to look deeper into this assumption in order to fully explain differences in capital structure. This belief is shared by Baker (2009) who sees the focus of this supply effect as the intersection of asset pricing and corporate finance theories, where the demand of investors in asset pricing and the supply of capital in corporate finance are seen as equal.

Their conviction is confirmed by surveys of Graham and Harvey (2001) and Bancel and Mittoo (2004). Both questioned managers of firms, in the US and Europe respectively, on their considerations when making financing decisions. Next, to earnings per share and recent stock price changes, financial flexibility, i.e. the firm's ability to react to unexpected expenses or investment opportunities, and credit ratings are managers primary concerns when making financing decisions. The latter was also confirmed by Kisgen (2006), who found that firms close to a credit rating upgrade or downgrade were less likely to issue debt relative to equity. Graham and Harvey (2001) only found little evidence supporting the trade-off and pecking order theory. Therefore, they suggested a deeper look into the assumptions of the capital structure theories, including perfect capital markets, as they are not in accordance with the actions of practitioners.

According to Baker (2009), the inadequacy of capital markets can be explained by investor tastes that differ from fundamental value, intermediaries that are limited in maintaining the law of no arbitrage, which together lead to opportunity's firms can take advantage of. The key to identifying supply effects is finding data or events related to one of these factors and unrelated to firm's fundamental values. For this purpose, Baker (2009) offers different instruments, including shocks to intermediary capital, measures for limited intermediation such as constraints or specific firm characteristics, and measures for investor tastes. Multiple examples of studies making use of a variety of these instruments are discussed below.

In 2006, Faulkender and Peterson evaluated the leverage ratio of firms with and without access to the public debt market, using the existence of a debt rating as proxy. Even after controlling for firm characteristics and the endogeneity of a debt rating, firms with access to the public debt market were found to have a significantly higher leverage ratio. This, intuitively, seems logical as firms without a debt rating are more informationally opaque leading to higher costs of monitoring and financial contracting. Their findings suggest that shocks to certain parts of the capital markets could affect the capital structure of different firms differently.

This belief is supported by Leary (2009), who found that the effect of access to the public debt market on capital structure increases when credit market conditions tighten. The change in credit market conditions is evaluated using two natural experiments that resulted in an expansion and contraction of access to bank credit: the emergence of a market for CD's (certificates of deposit) in 1961 and the 1966 credit crunch, respectively. Contrary to Faulkender and Peterson (2006), he measured the difference in access to public debt markets using the size of the firm. In accordance with his beliefs, the summary statistics depict small firms as largely bank-dependent compared to large firms. Both the leverage ratio and the likelihood of issuing debt compared to equity decrease more for bank-dependent firms following a contraction, and vice versa. Furthermore, firms with access to the public debt market increase their public debt share subsequent to a contraction in bank debt access. Even though there is the belief that bank loan supply shocks only affect short term financing, Leary (2009) has found the same effects for long-term debt.

Similarly, Lemmon and Roberts (2010) used multiple exogenous shocks to the supply of credit in order to evaluate its effect on a firm's financing and investment decisions. However, by focusing on the supply of below-investment-grade bank debt, their sample is more specific, and their shocks affect a more well-defined segment, making the experiment easier to control. Their results indicate a decrease in net debt issuance and net investment for speculative-grade firms, compared to investment-grade firms. Nonetheless, only limited evidence for substitution to alternative sources of financing was found, explaining the decline in net investment proportional to the decline in debt issuance, which also resulted in stable leverage ratios. This is in contrast with earlier findings, leading Lemmon and Roberts (2010) to conclude that changes in capital supply strongly affect capital structure and investment decisions, but the effect on leverage ratios is possibly limited to specific instances. Furthermore, the control groups used by earlier literature, which those authors assumed were not or only slightly affected by supply shocks, have the same characteristics as the sample used by Lemmon and Roberts (2010), which are affected by the shocks. These include access to the public debt market (Faulkender & Peterson, 2006), large firm size (Leary, 2009), and lower risk than bank-dependent firms without a credit rating. This indicates that the effects of shifts in capital supply not just affect small bank-dependent firms and possibly that the effect measured by other authors might be smaller than the actual effect.

Rise and Strahan's (2010) findings support the above conclusion that the supply effect is dependent on circumstances. They evaluated differences in competition between banks, comparing different states in the United States with and without restrictions to stop national banks from entering the state following the 1997 Interstate Banking and Branching Efficiency Act. Their evaluation shows that in states allowing banks to expand across state lines which results in more credit competition, small firms can borrow at lower interest rates and are more likely to borrow. In conclusion, the supply of credit is affected, but no effect is found on the level of debt firms borrow. The small firm size of the sample could be one of the factors explaining this finding, as it introduces adverse selection and moral hazard problems, disrupting the relation between credit supply and capital structure. Nonetheless, Rise and Strahan (2010) suggest their findings indicate the effect on capital structure depends on the cause of the supply expansion.

Chernenko and Sunderam (2012) evaluated the effect of market segmentation in investment- and speculative-grade firms. They found significant divergence in the investment and bond issuance of firms just below-investment-grade relative to their matched investment-grade firms for shocks to high-yield mutual fund flows. This divergence is even greater for financially constrained firms, either depending on external financing or having only limited ability to switch to other sources of capital (i.e. banks loans). In addition, until now evidence on the supply effect was only found for significant changes in the institutional environment. This research shows that this effect occurs often and indicates the possibility of it being a continuous phenomenon.

Sufi (2009) also focuses on responses to credit ratings. With the 1995 introduction of syndicated bank loan ratings by Moody's and S&P as an exogenous shock, he evaluates the effect of rating on firm's financing and investment decisions. Firms that have been given a bank loan rating increase their level of bank debt. Results also show that obtaining a rating increases the access to capital from less informed investors including non-bank institutional investors and that firms with lower credit quality or without a public debt rating before the shock experience a stronger increase in their debt level. These results suggest an expansion of available debt. Further research on adjustments in ratings evaluates the effect of Moody's unannounced 1982 credit rating refinement on debt access and financing decisions (Tang, 2009). Firms receiving an upgrade in the refinement have lower borrowing costs, issue more debt, invest more and have less cash accumulation compared to firms receiving a downgrade. Decreasing the information asymmetry between lenders and borrowers through the refinement has therefore shown to affect firm's capital structures and, through investments, the real economy.

Next to this problem of information asymmetry, credit supply uncertainty (CSU) is also considered in combination with capital structure literature. Massa and Zhang (2008) evaluated the effects of CSU resulting from the risk of institutional investors withdrawing. An increase in CSU led to a significant supply shift as the likelihood of issuing equity and acquiring bank debt increased and the likelihood of issuing bonds decreased. However, because a decrease in leverage was visible, they inferred no perfect substitution of public and private debt. Furthermore, the sample only consists of firms with access to the public debt market, supporting the conclusion of Lemmon and Roberts (2010) that the supply effect is not limited to bank-dependent firms. Similar to Leary (2009), Morellec, Valta, and Zhdanov (2012) focused on the difference between private and public debt in their evaluation of CSU. Results show that CSU affects both the likelihood of finding informed private lenders and through the bargaining power of lenders the cost of private debt. They conclude that a stronger capital supply leads to a higher likelihood of choosing private debt. Using a dynamic model, Hugonnier Malamud and Morellec (2014) found for more uncertainty in the future supply of credit, i.e. increase in search frictions, an increase in the frequency of capital structure changes, as the value-maximizing restructuring threshold decreases. Weaker credit supply also leads to firms issuing more debt when restructuring, because they are afraid for weak supply in times of high profitability.

In 2006, Hackbarth, Miao and Morellec, developed a framework that measured the effect of macroeconomic conditions, either a boom or a recession, on capital structure decisions and credit risk. The leverage ratios found in their model, which are similar to observed ratio's in practice, are counter-cyclical due to the present value of future cash flows following the business cycle. Moreover, they concluded firms would be better of adjusting their capital structure more and in smaller amounts in booms compared to recessions. In accordance with findings from Hackbarth et al (2006) and Korajczk and Levy (2003), Bhamra, Kuehn, and Strebulaev (2010) conclude that at the aggregate level leverage ratios are counter-cyclical. However, when focusing on the refinancing dates on firm level, leverage ratios are pro-cyclical. This can be explained by increasing marginal benefits of debt as the state of the economy, and thus profits, improve[1]. In addition, Bhamra et al (2010) offer macroeconomic risk as a possible explanation for the capital structure puzzle raised by Myers (1984), as their model's optimal leverage ratio in a downturn is

[1] Supported by Covas & Den Haan (2007) and Korteweg (2010)

lower than the unconditional leverage ratio. Furthermore, they note that the changes in leverage are asymmetric, because it is easier to restructure upwards in leverage than downwards. Therefore, it is crucial to look at the dynamics and not the refinancing point values only. Moreover, a strong path-dependence in financing decisions is visible, indicating capital structure is also affected by the economic state at the time of the previous refinancing.

It comes to the attention that instruments related to investor tastes are tested only very little. The evaluation of behavioral credit cycles, which signal the time-variance of investor's credit sentiment, can fill this gap and will be the focus in this paper. Therefore, I will continue with an overview of the literature on credit cycles and the development of the specific behavioral credit cycle applied in this paper's research.

2.2 Credit Cycles

One of the earlier topics on credit supply included the relation between financial markets and the real economy, through so called transmission mechanisms. Bernanke and Gertler (1989) found this mechanism in the improvement of fundamentals during economic booms, making it easier for a firm to acquire credit and leading to an increase in real investments. Kiyotaki and Moore (1997) assumed every loan requires a collateral and therefore identified the prices of the durable goods used as collateral as driver of the changes in credit supply. In these papers the existence of cyclical movements in the supply of credit has come to the attention. Contrary to Bernanke and Gertler (1989), who blamed exogenous shocks for changes in credit supply, Minsky (1977) believed, as one of the few of his time, that economic downturns were a part of the economic system, a result of economic behavior. In 1977, he formalized his concept in the "Financial Instability Hypothesis" blaming the accumulation of insolvent debt in periods of 'euphoric economy' for the subsequent downturns. Kindleberger (1978), in similar spirit, emphasized the inherent nature of bubbles and their destabilizing effects.

This started the research into the time-variance of credit supply, labelled credit cycles, and their effects on real economic activity. Among others Schularick and Taylor (2012) find that increases in supply of credit are followed by a declining real economy. Furthermore, in a later paper (Jordà, Schularick & Taylor, 2013) they add that the more extreme the expansion of the credit market, the greater the subsequent financial crisis. A focus on specific types of debt have shown that also changes in household debt can indicate the coming state of the economy (Mian, Sufi & Verner, 2015) and an increase in bank credit anticipates greater risk for equity markets (Baron & Xiong, 2014). Additionally, a decrease in bank returns and underperformance of banks is predicted by fast loan growth (Fahlenbrach, Prilmeier & Stulz, 2018). Taken together, these more recent findings (including Gilchrist & Zakrajsek, 2012; Krishnamurthy & Muir, 2015) indicate that an expansion in credit is followed by a recession, in line with Minsky's theory (1977), and provide more facts on credit cycles.

Comparable to Minksy (1977), Greenwood and Hanson (2013) noticed that in these earlier identifications of credit cycles the irrational behavior of investors was often not considered. According to them, the time-variance in beliefs or tastes of investors, in other words the credit sentiment, significantly influences the supply of credit. When credit sentiment is high, financing conditions are good, indicating high amounts of 'cheap' credit, resulting in increased issuance of debt. This improvement of conditions has a disproportionate effect on firms with lower credit quality as it is more difficult for them to find credit. Therefore, Greenwood and Hanson (2013) employ the time-variance in debt issuance of firms with low credit quality as a proxy for the phase of the credit cycle.

This theory is based on earlier findings including Hickman, who already in 1958 made the connection between time-variance in bond quality and periods of overconfidence by investors, leading to debt issued to firms that in times of economic downturn would have not received financing. Atkinson (1967) tested multiple measures for corporate bond quality and found variance in quality over time, which he was not able to explain. Furthermore, Bernanke, Gertler and Gilchrist (1996) provide evidence supporting the so called 'flight to quality', the reasoning that in times of credit shortage borrowers with low quality, i.e. facing higher agency costs, receive disproportionally less financing.

In addition, Greenwood and Hanson (2013) reason that when there is high credit sentiment, more debt will be issued by low credit-quality firms, decreasing the average quality of corporate debt issuers. Following this, risky corporate bonds should underperform default-free government bonds and thereby a lower expected return for bearing credit risk is expected. This does not mean that a change in issuer quality causes a change in corporate bond returns, only that they occur after each other, one predicts the occurrence of the other. After testing this reasoning, results indicated significant higher forecasting power for their measure of debt issuance of low quality firms, compared to other commonly used variables (e.g. aggregate quantity debt issuance and credit spreads).

Bordalo, Gennaioli and Shleifer (2018) dive further into biased investor belief as an explanation for credit cycles. In their model they adopted a similar formalization of Gennaioli and Shleifer's (2010) use of the representativeness heuristic (Kahneman and Tversky, 1972), which they refer to as diagnostic expectations. They assume that when evaluating a situation, an agents' judgements on expectations for the future are dominated by current events in consideration to what they already know (i.e. diagnostic information). With this formalization, the authors include extrapolation and neglect of risk into their framework and evaluate beliefs from a macroeconomic point of view. Their results, all in line with earlier empirical findings, give a depiction of the process of the cycle: at the occurrence of good news credit spreads are found to decrease, the issuance of credit and specifically high risk debt increases, concluding in an effect on the real economy of increasing investments and output. Following this period, credit spreads increase again leading to the reversal of the above mentioned phenomena, with the magnitude of the effect on the real economy moving in line with the magnitude of the credit spread increase. According to Bordalo et al (2018) these first results are not dependent on the use of diagnostic expectations and would also be found in a model with rational expectations. For example, Bernanke and Gertler (1989) find similar results, however they are not able to explain the abnormal negative returns that occur in over-heated debt markets or the systematic errors in expectations. Through the inclusion of the behavioral aspects, Bordalo et al (2018) were able to explain these abnormal returns and found volatility of credit spreads to be larger than volatility of the fundamentals, further contradicting the theory of Bernanke and Gertler (1989). Moreover, they found that the credit spreads as well as the bond returns and the errors and revisions investors make in forecasting future returns are predictable in line with the above described stages of the cycle.

In line with above mentioned papers[2], López-Salido et al (2017) observed time-variation in investor's expected returns for the credit market and turned to a behavioral explanation, investor sentiment, as a key driver of the cycle. However, in contrast to Bordalo et al (2018), they assume the presence of an exogenous factor starting the cycle, instead of trying to model the initial source for time-variation in investor sentiment. What makes their research interesting is the two-step method: the sentiment proxies (past credit spreads and the share of high-yield bond issuance, based on Greenwood and Hanson (2013)) are used to predict future credit spreads using a period of two years, and these fitted values are regressed to real economic variables. The authors argue that by using two steps they can measure specifically the effects caused by changing investor sentiment, excluding confounding factors. Their results are in line with their expectations for all three real economic variables, real GDP growth, business investment and employment: when there is high credit sentiment now, the real economy will face a setback in two years' time. To further confirm that their model measures what it is supposed to, López-Salido et al (2017) discredit a possible alternative explanation for the measured effects. The contractions in real economic variables could be caused by a decrease in credit demand instead of supply. In times of credit booming, all demand for credit is filled, even in the future there are less projects demanding credit as customer demands have been filled, leading to a decrease in the issuance of credit. This reasoning might hold for the implication of a shrinking real economy, but it does not hold when evaluating the composition of firm's external financing. The authors theory implies that a decrease

[2] Among others Bordalo et al (2018) and Greenwood and Hanson (2013).

in issuance of credit is replaced by an increase in equity, whereas in the case of the alternative argument equity would not increase as a firm has no need for additional financing. The author's reasoning is confirmed in the results, further supporting their two-step model. Moreover, results indicate that this effect is more extreme for high yield firms compared to investment grade, as these firms are due to the 'flight of equity' more affected by the decrease in credit demand.

As a result of López-Salido et al's (2017) findings, Gulen, et al (2018) set out to find if a transmission mechanism between the fluctuations in the credit market and its effect on the real economy can be found in corporate investment. Both approaches to this transmission, the rational (Bernanke & Gertler, 1989) and the behavioral explanation (Greenwood & Hanson, 2013) are integrated in the author's framework, with the use of Greenwood and Hanson's credit sentiment proxy. Results indicate a strong effect of this index on corporate investment in the subsequent year, which also holds when controlling for a multitude of aggregate proxies for exogenous shocks and firm-level characteristics. Through comparison of the credit sentiment proxy with other measures used in previous research as indicators for credit supply, they confirm the superiority of the credit sentiment measure. For the long-run (t+4 and t+5), a reversal in investment is found, indicating the subsequent recession after a credit boom. Earlier literature has implied that changes in credit supply will have a larger effect on investment for dept-dependent firms, i.e. firms facing more financial constraints, such as with below-investment grade bank debt (Lemmon & Roberts, 2010; Chernenko & Sunderam, 2012). This effect is confirmed by Gulen et al (2018), who used multiple existing measures for financial constraints by among others Hadlock and Pierce (2010) and Whited and Wu (2006), including the absence of a debt rating as in accordance with findings of Faulkender and Petersen (2006).

In contrast to Gulen et al (2018), Ma (2018) presented results supporting the notion of firms merely acting a cross-market arbitrageurs. If the supply of credit varies, and thus the relative valuation of both equity and credit, firms will adjust their capital structure composition accordingly. This would mean an increase of issuance of debt is merely a replacement of equity, and as a result, an increase in credit sentiment would not influence the investment level of firms. Gulen et al (2018) find in their sample only little effect of credit sentiment on equity issuance or on capital structure in the long-run. Only for large sized firms do they find results which are, to some extent, consistent with Ma's (2018) results.

In conclusion, Gulen et al (2018) deduce from their results that credit cycles bring about corporate investment cycles. They believe that the approach based on financial frictions alone is not enough to explain the reversal visible in the long-term. Two findings confirm the tight link to errors in expectations and the systematic over-extrapolation of fundamentals: credit cycles move together with analyst's expectations, and after a credit market boom, analysts revise their earnings forecasts downward. Furthermore, findings of greater booms and subsequent reversals for firms with more optimistic investors and larger debt issuance, and negative forecast errors in the long-run for firms with more optimistic analyst revisions confirm the framework of predictable credit cycles.

3. Hypotheses

In line with Gulen et al (2018), this paper will use the index of Greenwood and Hanson (2013) as a proxy for credit sentiment to evaluate the effect of time-varying credit supply on firm's capital structures. When firms of low quality are issuing a relatively high amount of debt (compared to firms of high quality), investors are more willing to invest, indicating high credit sentiment. Thus, when the index increases, one would expect that firms issue more debt. This would be visible in an increase of their net debt issuance, and if equity stays constant or does not increase more, in an increase in leverage ratio.

1. When credit sentiment (as measured by CME) increases, firms leverage ratios and/or net debt issuance will also increase.

To exclude confounding factors, multiple controls for firm-specific characteristics and macroeconomic conditions will be used. Then, this paper will evaluate the types of debt that firms hold in times of high credit sentiment compared to low, in order to assess how these are differently affected by the cycle. This will include short-term compared to long-term debt and bank debt compared to public debt. As Gulen et al (2018) found a relatively higher increase for long-term debt, and Leary (2006) saw in times of expansion of credit supply a relatively higher increase for bank debt, the second hypothesis is as below:

2. When credit sentiment increases, firms increase their share of long-term debt relatively more than their short-term debt and/or increase their bank debt relatively more than their public debt.

Furthermore, I will analyze if financially constrained firms are more affected by changes in credit sentiment, using four different measures: the financial constraints indices of Whited and Wu (2006), Hadlock and Pierce (2010) and Schauer, Elsas and Breitkopf (2019), and the technique employed by Faulkender and Petersen (2006) of evaluating the access to the public debt market using the presence of a debt rating. Firms that are more financially constrained are expected to acquire relatively more debt in times of high credit sentiment, which is also in line with evidence found by Gulen et al (2018) regarding investment.

3. When credit sentiment increases, firms that are (more) financially constrained experience a larger increase in leverage ratio and/or net debt issuance.

In line with this, a firm's specific debt rating can also be expected to affect, the change in capital structure due to varying credit sentiment. Within the debt rating system, the cutoff point at investment-grade and below-investment grade is of specific interest as it is often guiding investor decisions (Chernenko and Sunderam, 2012). Therefore, the next hypothesis will test if firms with below investment grade debt, who can be seen as being more financially constrained, experience a larger increase in debt level during a period of high credit sentiment.

4. When credit sentiment increases, firms with below investment grade rated debt experience a larger increase in leverage ratio and/or net debt issuance.

Unlike the hypotheses above, which only evaluated the short-term effect (t+1), the following hypotheses will assess the effects on leverage ratio and net debt issuance in the long-run. Previous research has shown that following a period of market overheating, economic activity moves back to its previous level (López-Salido et al, 2017; Baron and Xiong, 2017). To evaluate if this also applies to capital structure decisions of firms, I will evaluate firm's leverage ratio and net debt issuance for the years t+1 up to t+5 in line with Jordà's (2005) local projection method (Gulen et al, 2018; Brugnoli, 2018).

5. When credit sentiment increases, firm's leverage ratio and/or net debt issuance increases at first, after which it will decrease/move back in the direction of its original value in the second half of the measured period (t+4 and t+5).

4. Data

4.1 Data collection

In this paper an unbalanced panel data set is analyzed, consisting of 128,525 firm year observations of firms from the United States, in the period 1987 to 2018. Annual firm financials, stock price data and credit ratings were gathered from Compustat, CRSP and Mergent FISD, respectively. Financial firms (SIC: 6000-6999), utility firms (SIC: 4900-4999) and government entities (SIC: 9000-9999) were excluded, as well as firms incorporated outside the USA, after which the sample consisted of 183.242 firm-year observations. In addition, observations with missing (and negative or equal to 0) information on Total Assets (AT), Total Liabilities (LT) and Stockholder equity (SEQ) were deleted[3], as well as observations with missing short (LTC) and long term liabilities (DLTT). In order to exclude firms in financial trouble, observations with negative sales or in times of bankruptcy (Compustat variable STALT equal to TL) were excluded, and firms with assets less than 1 million. Additional checks to ensure the validity of the data included that total assets should be larger than total liabilities and total liabilities should be larger or equal to short-term or long-term liabilities, resulting in the final sample of 128.525 observations. On average, every year consists of 4,016 firms, the distribution of firms per year can be found in table 1. All variables were winsorized at the 1st and 99th percentile.

Table 1: Distribution of sample firms over time period

Year	Nr. firms	Year	Nr. firms
1987	4,377	2003	4,174
1988	4,282	2004	4,058
1989	4,117	2005	3,925
1990	4,061	2006	3,800
1991	4,139	2007	3,645
1992	4,319	2008	3,388
1993	4,676	2009	3,317
1994	4,904	2010	3,236
1995	5,102	2011	3,098
1996	5,620	2012	3,031
1997	5,682	2013	3,057
1998	5,324	2014	3,025
1999	5,316	2015	2,828
2000	5,129	2016	2,698
2001	4,654	2017	2,641
2002	4,304	2018	2,598
Average	4,016		

[3] Missing stockholder's equity (SEQ) observations were first replaced by book value of common equity (CEQ) plus book value of preferred stock (PSTK) or total assets minus total liabilities minus minority interest (MIB).

4.2 Capital structure variables

The dependent variables employed in this paper consist of two leverage ratios, liabilities over book- and market-value of total assets, and net debt issues, which are calculated following Greenwood and Hanson (2013).[4] Market value of total assets is calculated by subtracting the book value of equity from the book value of assets and adding the market value of equity, as suggested by Faulkender and Petersen (2006). In these variables, non-debt liabilities such as capitalized leases are included, as Graham and Leary (2011) point out in their empirical review that this inclusion is in the literature more often seen as beneficial for capital structure analysis. As additional check, a narrow version of leverage ratio and net debt issues is calculated, excluding non-bond and non-loan liabilities from the denominator of both ratios. Specifically, the narrow net debt issuance, as used by Greenwood and Hanson (2013), is the change in short-term debt (DLC) with the change in long-term liabilities (DLTT) divided by lagged assets. Similarly, the narrow leverage ratio consists of short-term debt and long-term liabilities over total assets.

Table 2: Summary statistics

This table presents summary statistics for the main variables used in the analysis, with a sample period from 1987 to 2018. Panel A and B consist of firm-year observations, while the variables in panel C are time series. For size the proxy logarithm of total assets is used, profitability is calculated by dividing operating income before depreciation with lagged assets. For the median industry leverage, industries are based on the 4-digit SIC code and the book leverage ratio is used. Age represents the number of preceding years information on total assets was available on Compustat. The variables GDP growth, expectations on inflation and the spread calculated by Moody are in percentages. Aggregate debt is in trillions (i.e. a million millions), representing total liabilities from nonfinancial businesses of the US economy from the Fund of Flow table of the Federal Reserve. The public debt ratio indicates the level of these total liabilities that consists of corporate debt and commercial paper.

	Mean	Median	Std. dev.	Min	Max
Panel A: Dependent variables					
Leverage ratio	.479	.482	.231	.037	.982
Market leverage ratio	.348	.305	.243	.004	.999
Net debt issues	.091	.022	.318	-.552	3.144
Net equity issues	.231	.012	.871	-.324	17.880
Short-term leverage ratio	.256	.215	.161	.019	.845
Long-term leverage ratio	.165	.107	.181	.000	.747
Interest coverage ratio	8.016	2.871	199.042	-2009.3	2644.923
Narrow leverage ratio	.215	.181	.198	.000	.810
Narrow net debt issues	-.026	.000	.203	-1.813	.698
Panel B: Control variables					
Tangibility	.270	.197	.233	.000	.935
Size	5.018	4.914	2.221	.217	11.486
Market-to-book ratio	2.054	1.437	1.965	.380	34.018
Profitability	.061	.114	.314	-4.262	2.538
Median industry leverage	.474	.472	.134	.031	.998

[4] Net debt issues is calculated as the change in book equity value deducted from the change in assets scaled by lagged assets. Where book equity value is stockholder's equity (SEQ) + deferred taxes (TXDB) + investment tax credits (ITCB), if this information is available.

Age	15.423	11	13.727	1	68
Public	.960	1	.195	0	1
Cash-dividend	.000	0	.013	0	1
Credit rating	.100	0	.300	0	1
Investment grade	.047	0	.211	0	1
Panel C: Macroeconomic controls					
GH-index	-.049	-.044	.030	-.117	-.001
GDP growth (%)	5.021	5.700	1.783	-1.800	7.900
Inlation expectation (%)	3.026	2.975	.437	2.433	4.133
Moody's spread (%)	2.250	2.056	.622	1.512	4.027
BW Sentiment index	.167	-0.21	.596	-.696	2.245
Aggregate debt (trill)	14.800	14.500	7.796	5.269	33.900

In table 2 panel A, descriptive statistics of the different dependent variables are presented. The leverage ratio based on book value of assets is on average lower than the leverage ratio based on market value of assets. This implies that market value of assets in this sample are on average larger than book assets, which can also be seen in the market to book ratio. This could be explained by either the sample including a high level of growth firms or by the mismeasurement of market value of equity, which is considerably higher than the book value of equity. Furthermore, following expectations, the narrow leverage ratio is lower than both the book and market value based leverage ratios. Also, short-term leverage ratio is on average larger than the long-term leverage ratio, possibly indicating our sample holds more short than long-term debt. In addition, net equity issues are on average larger than net debt issues. Moreover, narrow net debt issues are significantly smaller than its counterpart, displaying on average a decrease in debt issuance.

4.3 Credit sentiment measure

Credit sentiment is measured throughout the paper with the index developed by Greenwood and Hanson in 2013. This index, based on the concept of low credit quality firms issuing more debt in times of high credit sentiment, is calculated as the difference in probability to default between firms issuing a high and low amount of debt, see formula 1.

$$CSE_t = \frac{\sum_{i\in} EDF_{it}^{High\,ndi}}{N_t^{High\,ndi}} - \frac{\sum_{i\in} EDF_{it}^{Low\,ndi}}{N_t^{Low\,ndi}} \qquad (1)$$

Where, for each firm i and year t, EDF is an estimate for default probability using a simplified version of Merton's distance to default method[5], N is the number of firms, and ndi the firm's net debt issues, based on which the sample is divided into a $High$ and Low quintile. Specifically, EDF is calculated as follows:

$$EDF_{it} = \varphi(-\frac{\ln\frac{E_{it}+F_{it}}{F_{it}} + \mu_{it} - 0.5\sigma_{V_{it}}^2}{\sigma_{V_{it}}}) \quad (2)$$

With E denoting the market equity value of firm i at time t, F denoting face value of debt[6], μ is the one-year lagged annualized monthly stock return (i.e. asset drift), φ ( ) is the standard normal cumulative distribution function (CDF) and σ_V the asset volatility. Of which the last, as in the simplified version of Bharath and Shumway (2008), is calculated as follows:

$$\sigma_{V_{it}} = (\frac{E_{it}}{E_{it}+F_{it}})\sigma_{E_{it}} + (\frac{F_{it}}{E_{it}+F_{it}})(0.05 + 0.25\sigma_{E_{it}}) \quad (3)$$

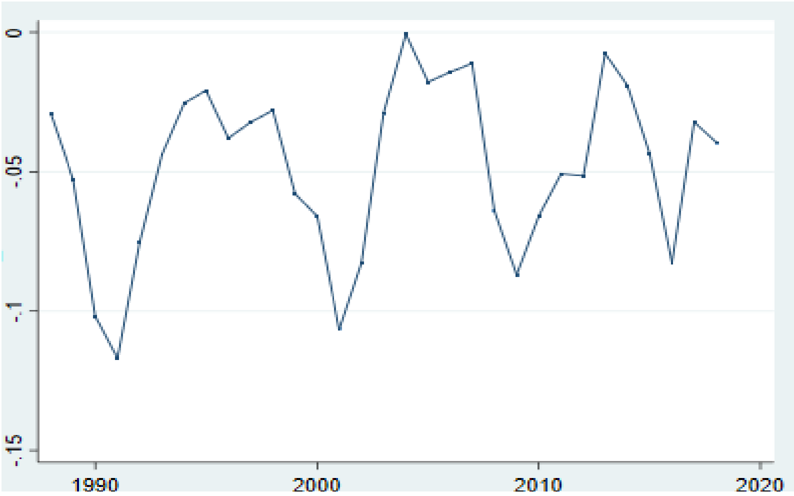
Where the σ_E denotes the annualized volatility of monthly stock returns of firm i in year t. Following these instructions, a similar index to the one of Greenwood and Hanson (2013) is constructed. While assuming this index will follow the same pattern as the original index, I expect it to diverge slightly in the exact values due to a few minor differences in its composition. When dividing the sample into net debt issues quintiles, Greenwood and Hanson (2013) use NYSE breakpoints, whereas in this paper the division in quintiles is based on the complete sample collected from Compustat and CRSP. In addition, they make use of average deciles of EDF instead of the raw values which are applied in this paper.

Evaluating the actual differences between the indices in figure 1, it stands out that this paper's index almost only has negative values, whereas the CME has both positive and negative values. Comparing the changes in sentiment instead of the absolute level indicate a similar trend for both, with notable instances in 1992 and 2002, where both display a distinct drop in sentiment. Because the focus of this paper's analysis is on measuring the effect of a change in credit sentiment on capital structure variables, the difference in absolute values should not necessarily be a problem, as long as the relative values of the index are consistent.

[5] Bharath and Shumway (2008) created a naïve alternative to the Merton distance to default predictor that could be calculated by hand, assuming firm's risk of debt is correlated to their equity risk and a firm's return on assets is equal to the firm's stock return of the previous year.

[6] Calculated by adding short term debt (DLC) to one half of long term debt (DLTT), or when this information was not available by multiplying total liabilities by 0.75 (thereby assuming the liabilities to be equally divided between short and long-term).

Panel A: Credit sentiment index 1987-2018



Panel B: Original Greenwood & Hanson index 1987-2008

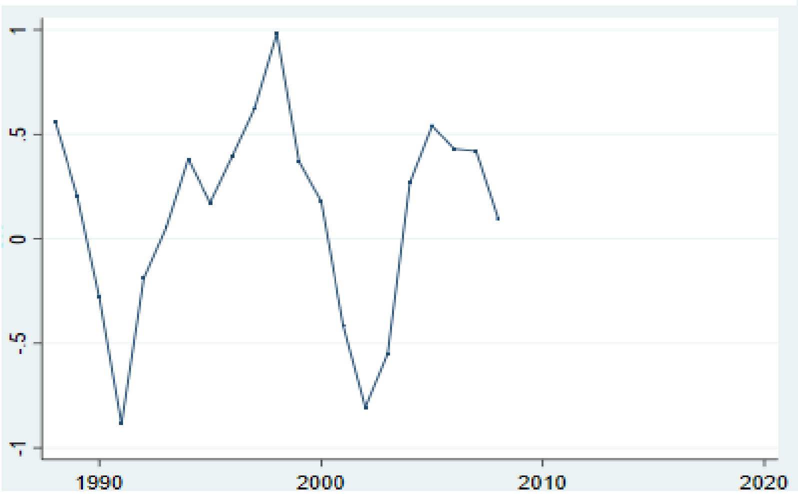


Figure 1: Credit sentiment index (CSE)

Moreover, the variation in absolute values could be explained by the different samples used in the construction of the index. In order to check if this divergence will not have a significant effect on my analysis, multiple characteristics of both indices, as given by Greenwood and Hanson in their 2013 paper, were compared (table 3). This comparison shows that most variables, including leverage ratio, age and EDF (Expected Default Frequency) are similar, with the exemption of market capitalization[7], suggesting the difference in samples is not likely to impact the analysis. Although the reason for the disparity between the indices is not clear, I am assured this index can be used in the analysis, presuming the disparity will be considered when drawing conclusions from the results.

[7] The difference in market capitalization is significant, suggesting differences in measurement of the variable, making it difficult to interpret these values

Table 3: Sample comparison - credit sentiment index

Using the narrow description of the leverage ratio, market capitalization as the log of market value (end-of-year stock price multiplied by number of shares outstanding) and interest coverage is EBIT over interest expenses. Expected default frequency, following the simplified distance to default method and Age as the number of years a stock price was available on CRSP.
*Data gathered from Greenwood & Hanson (2013).

	Sample used for construction CSE			Sample Greenwood and Hanson 2013*		
	Mean	Median	Std. dev.	Mean	Median	Std. dev.
Leverage ratio	0.23	0.18	0.22	0.23	0.20	0.19
Net debt issues	0.09	0.03	1.38	0.09	0.04	0.40
Market capitalization	19.23	19.17	2.24	1,166.39	8,367.79	0.11
Interest coverage	15.92	3.07	170.30	23.72	5.44	223.97
Expected default frequency	0.06	0.00	0.18	0.06	0.00	0.18
Age	16.30	12	15.10	13.25	8.42	14.17

4.4 Other variables

In order to answer the different hypotheses, additional variables are included in the analysis. A short and long-term leverage ratio is calculated to evaluate if credit sentiment affects these variables differently. Furthermore, I try to make a distinction between public and private debt, where public debt consists of corporate bonds and the rest of liabilities is considered as private debt. Even though, this information is not available in Compustat files, the Federal Reserve publishes in its Fund of Flow tables (Table L.102), aggregate data on these different categories for the US economy. In similar spirit to Faulkender and Petersen (2006), this aggregate data can be used to deduce the level of public debt as a sum for all firms in the sample, assuming this sample is representative of all nonfinancial businesses in the US economy. Specifically, the public debt ratio, attained by dividing Aggregate Total Liabilities over Aggregate Total Debt Securities (consisting of corporate bonds and commercial paper) of Nonfinancial Businesses in the US (formula 4) is assumed to be similar for the sample.

$$Public\ debt\ ratio_t = \frac{Public\ debt_t^{FOF}}{Total\ debt_t^{FOF}} = \frac{Public\ debt_t^{sample}}{Total\ debt_t^{sample}} \tag{4}$$

Using this equation, the level of $Public\ debt$ held by the $sample$ analyzed in this paper at time t can be calculated, with FOF representing the data published by the Federal Reserve. This time-series can then be evaluated with credit sentiment. An alternative method to acquire information on public debt was performed through the Mergent FISD database. This method allows the analysis to maintain a panel data structure, which is beneficial for the explanatory power of the model. An approximation of outstanding bonds is constructed per firm year by adding up all the principal values of the bonds for the years the bond is outstanding (from the offering date up to the maturity date). This data however is very dependent on the completeness of the Mergent FISD database, which is not guaranteed. Furthermore, information on bond issuance was only available for a small subset of the sample. In order to evaluate if this subsample is representative of the sample applied in this paper, summary statistics are compared of both groups in table 4.

Table 4: Sample comparison - public debt

This table presents an overview of summary statistics of firm characteristics, in the first column for the subsample for which data on public bonds is available and in the second column for the total sample. The sample period consists of the years 1987 to 2018.

	Subsample			Total sample		
	Mean	Median	St. dev.	Mean	Median	St. dev.
Book Leverage	0.57	0.58	0.21	0.48	0.48	0.23
Market leverage	0.40	0.37	0.24	0.35	0.31	0.24
Net debt issues	0.11	0.03	0.32	0.09	0.02	0.32
Firm size	7.03	6.98	1.09	5.02	4.91	2.22
Market to book	1.97	1.48	1.66	2.05	1.44	1.97
Tangibility	0.32	0.27	0.23	0.27	0.20	0.23
Profitability	0.12	0.14	0.33	0.06	0.11	0.31
Age	19.14	14	18.19	15.42	11	13.73
Public	0.95	1	0.22	0.96	1	0.20
Cash-dividend	0.00	0	0.00	0.00	0	0.01
Credit rating	0.35	0	0.48	0.10	0	0.30
Investment grade	0.15	0	0.36	0.05	0	0.21
N	3,081			128,525		

Apart from a higher percentage of firms that possess a credit rating (35% compared to 10%) and also a higher percentage of firms with an investment grade rating (15% compared to 5%) for the subsample, there are no large differences visible in the summary statistics of the firm characteristics of the two samples. Both book and market leverage, and net debt issues of the subsample are slightly higher on average, but this is not expected to lead to significant biases in the analysis. The difference found for credit ratings and investment grade is in line with expectations since credit ratings and bond issues are gathered from the same database (Mergent FISD). In addition, when evaluating the share of firms with a credit rating that have an investment grade rating the percentages of the two samples do not differ a lot (47% compared to 45%). Nonetheless, the overrepresentation of firms with a credit rating, and consequently, when considering findings of Faulkender and Petersen (2006), of firms with easier access to the public debt market needs to be considered when making inferences.

In their 2006 paper, Whited and Wu (2006) developed through analysis of multiple variables, an alternative to the Kaplan and Zingales (1997) index. Notwithstanding two overlapping variables, the two indices show very low and insignificant correlation. As both Whited and Wu (2006) and Hadlock and Pierce (2010) find evidence allocating less explanatory power to the KZ-index, only the WW-index (formula 5) is evaluated in this paper.

$$WW\ index_{it} = -0.091 \times CF_{it} - 0.062 \times DIV_{it} + 0.021 \times Leverage_{it} - 0.44 \times Size_{it} + 0.102 \times ISG_{it} - 0.035 \times SG_{it} \quad (5)$$

Where CF reflects cash flow, calculated as operating income before depreciation over lagged total assets, for firm i in year t. DIV is a dummy equal to 1 if the firm pays cash dividends, $Leverage$ denotes the ratio of long-term liabilities over total assets and $size$ is measured as the natural logarithm of total assets. SG is defined as sales growth[8] and ISG as the industries sales growth, based on firm's industry classification as depicted in table 5.

Table 5: Industry distribution

This table present the distribution of the firms in the sample over the industry sectors, based on SIC codes. Firms from category 8 and 10, and a selection from category 5 are excluded from the sample.

Nr.	Industry	SIC code	Number of firms
1.	Agriculture, Forestry and Fishing	0100-0999	672
2.	Mining	1000-1499	7,312
3.	Construction	1500-1799	1,268
4.	Manufacturing	2000-3999	66,209
5.	Transportation, Communications, Electric, Gas and service	4000-4999	8,494
6.	Wholesale Trade	5000-5199	6,368
7.	Retail Trade	5200-5999	10,571
8.	Finance, Insurance and Real Estate	6000-6799	-
9.	Services	7000-8999	27,621
10.	Public Administration	9100-9729	-

Though in agreement with Whited and Wu (2006) on the shortcomings of the widely used KZ-index, Hadlock and Pierce (2010) considered only the firm size and age variables fit for inclusion in their index (formula 6). Specifically, because of the endogenous nature of the variables leverage and cash flow.

[8] Calculated as the change in total sales divided by lagged total sales multiplied by 100%.

$$SA\ index_{it} = -0.737 \times Size_{it} + 0.043 \times Size_{it}^{2} - 0.040 \times Age_{it} \quad (6)$$

With $size$ measured by the natural logarithm of total assets, for firm i and year t, and age measured as the number of preceding years the specific firm had available information on total assets in Compustat. For the composition of this index in this paper, $size$ and age were not capped at 4.65 billion and 37 years, respectively, as performed for the original index as this only resulted in a minor change in the outcome.

Contrary to the two indices mentioned above, which are mostly focused on listed firms, the index by Schauer et al (2019) (formula 7) was initially constructed for private firms. But it has also shown consistent results for listed firms in the USA. As both private and listed firms are included in the sample, also this index is added to the analysis.

$$FCP_{i,t} = -0.123 \times Size_{i,t-1} - 0.024 \times ICov_{i,t-1} - 4.404 \times ROA_{i,t-1} - 1.716 \times Cash_{i,t-1} \quad (7)$$

Where $Size$ is the natural logarithm of total assets, $ICov$ denotes the interest coverage ratio, calculated as EBIT over interest expenses, ROA is net income over total assets and $Cash$ denotes the cash holdings of the firm, divided by lagged total assets. For all variables one-year lagged levels are used.

Table 6: Credit rating assignments

This table illustrates the assignment process of credit ratings. The assigned rating (column 2) is based on an average of a rating classification based on EU Credit Quality Step classification. In addition, the ratings included in the range belonging to a Rating group are given, as well as the number of firms assigned to this rating class. For only 12,809 firm-years credit ratings were available from Mergent FISD.

Nr.	Rating	Range of average classification	Ratings included (from a.o. Moody's, S&P and Finch)	Number of firm-years
1.	AA*	0 – 1.00	AAA, AA, AA+, AA-, Aaa, Aa3, Aa2, Aa1	496
2.	A*	1.00 - 2.00	A, A+, A-, A3, A2, A1	1,955
3.	BBB*	2.00-3.00	BBB, BBB+, BBB-, Baa1, Baa2, Baa3	3,531
4.	BB	3.00-4.00	BB+, BB, BB-, Ba1, Ba2, Ba3	2,012
5.	B	4.00-5.00	B, B+, B-, B1, B2, B3	3,821
6.	C	5.00-6.00	CCC, CCC+, CCC-, CC, C, Caa, Caa1, Caa2, Caa3, Ca	942
7.	D	6.00-7.00	DDD, DD, D	52

*Ratings included in Investment grade variable

Finally, the presence of a credit rating, as a proxy for the level of financial constraints that a firm faces is evaluated with a dummy variable based on the data from Mergent FISD. As the credit ratings in the database were assigned to specific issues, the ratings were regrouped into numerical categories[9] and averaged if multiple issues were rated for 1 firm at a time. Finally, the ratings were divided into 9 categories, as depicted in table 6. In 10% of the firm years there is information on the debt rating. When creating an alternative credit rating dummy which is equal to 1 if a firm has held a rating at any point in time (within the sample time period), the percentage rises to 19%. For the analysis of the two subsamples, firms with and without a credit rating, summary statistics of firm characteristics are compared in table 7. Firms in the possession of a credit rating (for both credit rating variables) are found to have on average a significantly higher leverage ratio, however net debt issues do not differ across the groups. Furthermore, firms with a rating are of larger size and age, on average. Due to the limited information available on credit ratings, the hypothesis concerning the effect of an investment-grade rating will only be run for a subset of the data, approximately 10% of the full sample. Therefore, the disparities found for the subsamples in table 7 will need to be considered when evaluating the effect of an investment-grade rating.

Table 7: Sample comparison - credit rating

This table presents an overview of summary statistics of firm characteristics for the subsamples of the variables Credit rating 1 and 2. In the first, only firm year observations are equal to 1 if a credit rating is available. Credit rating 2 is equal to 1 for firms for which a credit rating was available at any point in time, within the sample period. The sample period consists of the years 1987 to 2018.

	Credit rating 1				Credit rating 2			
	Without		With		Without		With	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Book Leverage	0.46	0.23	0.62	0.16	0.46	0.24	0.57	0.19
Market leverage	0.34	0.24	0.44	0.21	0.33	0.25	0.41	0.22
Net debt issues	0.09	0.32	0.09	0.27	0.09	0.32	0.10	0.30
Firm size	4.69	2.04	7.96	1.46	4.48	1.97	7.36	1.65
Market to book	2.09	2.04	1.73	1.04	2.11	2.08	1.84	1.36
Tangibility	0.26	0.23	0.34	0.24	0.25	0.23	0.34	0.14
Profitability	0.05	0.33	0.15	0.10	0.04	0.34	0.16	0.14
Age	12.50	12.68	27.87	22.42	11.74	11.63	23.60	21.02
Public	0.96	0.20	0.99	0.09	0.95	0.21	0.99	0.09
Cash-dividend	0.00	0.01	0.00	0	0.00	0.01	0.00	0.00
Investment grade	-	-	0.47	0.50	-	-	0.47	0.50
N	115,716		12,809		104,231		24,202	

Multiple additional control variables are included in the analysis, consisting of both firm specific controls and macroeconomic controls. Firm specific controls include a firm's tangibility, measured as the net value of property plants and assets scaled by assets, the higher the tangibility

[9] Based on the categories of the EU Credit Quality Steps (Joint Committee of the European Supervisory Authorities), which bring together the rating systems of different rating agencies.

of the firm, the higher the leverage ratio is expected to be.[10] Second, market to book ratio, the market value of assets over the book value of assets, is included as a proxy for growth. Firms with higher market to book ratios are expected to have higher growth opportunities, and thereby lower leverage. As a measure for firm size, the log of assets is included as control variable, where a larger firm is expected to have a higher leverage ratio. Finally, a measure for profitability is included, operating income before depreciation (OIBDP) over lagged assets, with the expectation that firms with higher profits have more internal funds and therefore lower leverage ratios. In addition, the median industry leverage ratio, with industries based on 4-digit SIC codes, is expected to have a positive relation with leverage. Furthermore, dummy variables indicating if a firm is public and if it is paying cash dividends will be included. Descriptive statistics on the different controls are presented in panel B of table 2, and the distribution of firms over industry in table 5. Notable is the high average market-to-book ratio and a relatively skewed age distribution. Moreover, almost all firms are public (96%), less than 0.1% of firms pays their shareholders cash dividend and approximately half of the firms with a credit rating hold on average investment grade debt.

Table 8: Correlation table: credit sentiment index and macro-economic variables

This table presents correlations of macro-economic variables on the credit sentiment index (CSE).

	CSE
GDP growth (%)	0.427
Inlation expectation (%)	0.008
Moody's spread (%)	-0.400
BW Sentiment index	-0.215
Aggregate debt	0.152

Macroeconomic controls added to the analysis are gathered from the Federal Reserve Bank of St. Louis (FRED) and include annual percentage GDP growth and expected inflation, as measured by the University of Michigan.[11] In addition, Moody's Baa corporate bond yield relative to 10-year treasury yield, as a measure of credit spread and the Baker and Wurgler (2006) Investor Sentiment Index are included. Descriptive statistics on these variables can be found in panel C of table 2, and their correlations with Credit Sentiment are depicted in table 8. GDP growth, which is on average 5%, and Aggregate debt are positively correlated with the credit sentiment measure. Whereas, credit spread, as measured by Moody's and the investment sentiment index are negatively correlated and expectations of inflation shows almost no correlation with credit sentiment.

[10] Following the information of Frank and Goyal (2008) on which firms characteristics are found to affect capital structure.

[11] Median expected price change in the next 12 months, Surveys of Consumers.

4.5 Methodology

This paper aims to examine whether part of the unobserved heterogeneity in capital structure, which cannot be explained by the explanatory variables identified in earlier literature, can be explained by the credit sentiment measure employed in the analysis as described above. Specifically, the objective is to identify the changes in capital structure per firm over time regarding the changes in credit sentiment, thereby focusing on within firm variation. For this analysis a fixed effects model, which specifically measures within panel variation by including firm fixed effects through a set of dummy variables of the group variable (in this case firm-id), is deemed most suitable. Assuming the unique errors of the firms and the regressors are correlated, the fixed effects model removes time-invariant characteristics in order to assess the net effect of the variables on the dependent variable.

$$Leverage_{it+1} = \propto \ + \beta CSE_t + \gamma FC_{it} + \delta MC_t + \eta_i + \varepsilon_{it} \qquad (8)$$

In formula 8 the standard format of the regression is presented, with $Leverage$ indicating one of the variables measuring capital structure for firm i and time $t+1$ as it is leading 1 year. CSE indicates the index used as credit sentiment measure, FC a set of firm specific controls and MC a set of macro-economic time-series controls. In addition, η denotes firm fixed effects, $\propto$ the intersect and ε random error.

Additional evidence supporting the choice for this model include two statistical tests. A rejection of the null hypothesis that the error term across all groups, i.e. firms, is equal indicates a fixed effects model is preferred over a pooled OLS (F-statistic 11.16, p-value 0.00). And the Hausman test (officially Durbin-Wu-Hausman test) which evaluates the presence of correlation between the unique errors and the regressors in the model, recommends the use of the fixed effects model over the random effects model (chi-statistic 1318.85, p-values 0.00).

This model is however less fit for investigating the effect of time-invariant variables on the dependent variable, even leading to perfect collinearity of time invariant characteristics, resulting in an exclusion from the regression. In this analysis the dummy variable Listed, indicating whether a firm is listed on a stock exchange and credit rating 2 which is equal to 1 if a firm had a credit rating at any point within the sample period, don't change for a firm over time and are therefore excluded from all regressions. In addition, the variable Age could also experience problems of multicollinearity. Although the absolute age of every firm increases every year, relatively the age between the firms do not change over the time period. This could possibly explain the non-significant results found for the age coefficients therefore the variable is excluded as a precaution. As in further evaluation different regression specifications are run and additional control variables are included, and there will be more focus on between firm variation, a random effects regression could be more appropriate. However, for multiple specifications the Hausman test and error term F-test indicate a preference for the fixed effects model. The random effects model has been tested in multiple cases, but as its results were either of less significance or did not lead to different interpretations, these results are not included in the paper.

For the final hypothesis long term effects on the dependent variables are evaluated. The regression formula used for this regression is based on Jordá's (2005) local projection method, as displayed in formula 9, where k ranges from 1 to 5.

$$Leverage_{it+k} = \propto \, + \beta_k CSE_t + \gamma FC_{it} + \delta MC_t + \varphi \sum_{k=1}^{k} Leverage_{it+k-1} + \eta_i + \varepsilon_{it+k} \tag{9}$$

Where β_k, representing the impulse response function, will be the coefficient of interest in the evaluation. In addition, lags of the dependent variables are included in the regression, as k moves up 1 period an addition lag is included, thereby creating a dynamic panel model.

I include adjusted (clustered) standard errors, at the firm level, as a precaution for the potential influence of heteroskedasticity. Moreover, all regression coefficients in the following tables are scaled by their variable's standard deviation. Specifically, the dependent variables are divided by their average and the independent variables by their standard deviation. The coefficients can therefore be interpreted as the percentage change in the leverage measure corresponding to a one-standard deviation change in the independent variable.

5. Results

5.1 Leverage and debt issuance

The analysis performed in this paper is focused on investigating the effect of credit sentiment, measured by the credit sentiment index (CSE), on firm's capital structure decisions, measured by the leverage ratio and net debt issues. The results in table 9 indicate for all three regression specifications a positive association of CSE on book leverage, with an increase of 1% per one-standard deviation of the index in the third specification. Whereas, for market leverage only negative relations are displayed. The R squared of both regressions in the first specification (including only CSE) is however very low, indicating that only little of the variation in leverage is explained by the credit sentiment measure. Yet this is also expected as the independent variable is firm-invariant and is not able to explain any of the variation between firms. In the second specification several firm-specific control factors are included, which are deemed by Frank and Goyal (2009) to be important determinants for capital structure. The coefficients of these control variables are significant and indicate relations with the leverage ratios that are in accordance with expectations. Opinions on the relation between a firm paying cash dividends and its leverage level differ greatly. Results in panel A indicate firms paying cash dividends have on average higher leverage, although this effect is only very small. The coefficients of the macro-economic control factors are mostly significant, apart from GDP growth for book leverage, and suggest that the variables have only a relatively small influence on the dependent variables. In addition, overall adding these variables to the regression model barely increases (and sometimes even decreases) the explanatory power of the model.

Table 9: Regressions of leverage and debt issuance on credit sentiment

This table presents coefficient estimates from regressing multiple measures of leverage on the credit sentiment index, using different sets of controls. In panel A Book and Market Leverage are evaluated and in panel B Net Debt Issues and Net Equity Issues. The full sample is used in these regressions and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In every first specification of a dependent variable no controls are added (column 1 and 4), in the second firm controls are included (column 2 and 4) and for the third macroeconomic control variables are added to the regression (column 3 and 6). Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.

[a] [b] [c] Denote statistical significance at the 1%, 5%, and 10% levels.

Panel A: Leverage ratio

	Book Leverage			Market Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	0.004[a]	0.009[a]	0.010[a]	-0.020[a]	-0.013[a]	-0.025[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

	(1)	(2)	(3)	(4)	(5)	(6)
Firm size		0.088[a]	0.086[a]		0.217[a]	0.253[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Market to book ratio		-0.035[a]	-0.036[a]		-0.134[a]	-0.134[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Tangibility		0.074[a]	0.074[a]		0.127[a]	0.120[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Profitability		-0.275[a]	-0.273[a]		-0.523[a]	-0.536[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Median Industry		0.097[a]	0.098[a]		0.101[a]	0.101[a]
leverage		(0.00)	(0.00)		(0.00)	(0.00)
Dividend Payer		0.008[a]	0.009[a]		0.009[a]	0.009[a]
		(0.00)	(0.00)		(0.00)	(0.00)
GDP growth			-0.003			0.018[a]
			(0.19)			(0.00)
Expected inflation			-0.007[a]			0.017[a]
			(0.00)			(0.00)
Credit spread			-0.002			-0.011[a]
			(0.34)			(0.00)
Investment sentiment			0.003[b]			0.025[a]
			(0.04)			(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	113.284	106,016	106,016	108,302	105,610	105,610
R^2	0.000	0.213	0.214	0.003	0.224	0.220

Panel B: Debt and equity issuance

	Net debt issues			Net equity issues		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	0.178[a]	0.183[a]	0.206[a]	0.032[a]	0.018[a]	0.062[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm size		-1.303[a]	-1.396[a]		-0.877[a]	-1.009[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Market to book ratio		0.482[a]	0.471[a]		0.873[a]	0.876[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Tangibility		-0.071[c]	-0.063[c]		0.114[a]	0.142[a]
		(0.05)	(0.08)		(0.00)	(0.00)
Profitability		0.714[a]	0.750[a]		-1.924[a]	-1.870[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Median Industry		-0.201[a]	-0.188[a]		0.049[a]	0.047[a]
leverage		(0.00)	(0.00)		(0.00)	(0.00)
Dividend Payer		-0.007[a]	-0.006[a]		0.003[a]	0.005[a]
		(0.00)	(0.00)		(0.00)	(0.00)
GDP growth			-0.093[a]			-0.019[c]
			(0.00)			(0.05)
Expected inflation			-0.123[a]			-0.050[a]
			(0.00)			(0.00)
Credit spread			-0.051[a]			0.094[a]
			(0.00)			(0.00)
Investment sentiment			-0.055[a]			-0.086[a]
			(0.00)			(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	113.284	106,016	106,016	113,283	106,016	106,016
R^2	0.005	0.007	0.007	0.001	0.193	0.187

In panel B of table 9 the results for the dependent variables net debt issues and net equity issues are presented. The CSE coefficients suggest a positive association of credit sentiment with both dependent variables, however a one-standard deviation change of CSE leads to a higher increase in net debt issues compared to net equity issues (20.6% compared to 6.2% for specification 3). The explanatory power of the regressions for net debt issues is however lower than for net equity issues and, furthermore, lower than for both the leverage ratios in panel A. Moreover, the R squared for net debt issues barely increases when control variables are added to the analysis (from 0.5% to 0.7%), which might indicate that the specific control variables used are not helpful in explaining net debt issues. The coefficients of the firm control variables display the opposite relation with net debt issues compared to the leverage ratios, whereas they show the same direction for net equity issues. Similar to Ma (2018), a negative effect on net debt issues is found in association with an increase in firm size and credit spread.

5.2 Short- and long-term debt

For the second hypothesis I examine whether credit sentiment has a different effect for short and long-term debt. The regressions using short- and long-term leverage as dependent variables are presented in table 10. Apart from the first specification, the CSE coefficient implies a positive relation with short-term leverage, suggesting on average an increase of 1.2% in the short-term leverage ratio at a one-standard deviation increase of CSE (for specification 3). For long-term leverage, the coefficient of CSE indicates at first a positive association (specification 1 and 2), but switches to a negative association when macro-economic controls are included. Although the explanatory power of the model does not increase due to this addition of variables, the coefficients of the controls are significant suggesting the positive relation found in the first two specifications might just be the result of an omitted variable bias. Specifically, the variables GDP growth and credit spread, which also have the highest coefficients cause this change in coefficient.

Table 10: Short- and Long-term leverage regressions

This table presents coefficient estimates from regressing short and long-term leverage ratios on the credit sentiment index, using different sets of controls. The full sample is used, and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In every first specification of a dependent variable no controls are added (column 1 and 4), in the second firm controls are included (column 2 and 4) and for the third macroeconomic control variables are added to the regression (column 3 and 6). Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels

	Short-term Leverage			Long-term Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	-0.004[a]	0.006[a]	0.012[a]	0.012[a]	0.014[a]	-0.021[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm size		-0.131[a]	-0.140[a]		0.338[a]	0.387[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Market to book ratio		-0.041[a]	-0.041[a]		-0.021[a]	-0.027[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Tangibility		0.025[a]	0.026[a]		0.185[a]	0.171[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Profitability		-0.317[a]	-0.313[a]		-0.200[a]	-0.211[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Median Industry		0.054[a]	0.055[a]		0.169[a]	0.169[a]
leverage		(0.00)	(0.00)		(0.00)	(0.00)
Dividend Payer		0.012[a]	0.012[a]		-0.001[a]	0.001[a]
		(0.00)	(0.00)		(0.00)	(0.01)
GDP growth			-0.006			0.033[a]
			(0.17)			(0.00)
Expected inflation			-0.006[a]			-0.019[a]
			(0.00)			(0.00)
Credit spread			0.003			-0.038[a]
			(0.30)			(0.00)
Investment sentiment			0.002[a]			0.006[a]
			(0.10)			(0.01)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	113.284	106,016	106,016	113,284	106,016	106,016
R^2 overall	0.001	0.038	0.037	0.000	0.235	0.234

A second analysis is performed to evaluate if the maturity of debt affects the credit sentiment effect on leverage ratios. In table 11 regressions of debt ratios consisting of debt maturing in 1 up to 5 years, on credit sentiment are presented. The CSE coefficients indicate a higher effect of credit sentiment on debt with a higher maturity, compared to low maturity debt. When comparing these results to the findings in table 10, they appear to lead to the same conclusion, except for the negative results found in specification 3. The regressions described in table 11 were also performed including macro-economic variables, but as they resulted in the same interpretations, they were not included in the table.

Table 11: Regressions of debt with different maturities

This table presents in panel A coefficient estimates from regressing debt levels of different maturities on credit sentiment, using different sets of controls. The dependent variables are calculated as the level of debt maturity at the year stated in the column divided by total assets. The full sample is used in these regressions and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. Only firm-specific controls are included in the regression specifications. Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

Debt maturity (years)	1	2	3	4	5
Credit sentiment	-0.026[a]	-0.048[a]	-0.025[a]	0.025[a]	0.054[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	103,698	91,607	91,583	91.925	90,741
R^2	0.011	0.031	0.034	0.046	0.126
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Macro controls	No	No	No	No	No

Additionally, with the second hypothesis I set out to evaluate whether a different reaction to a change in credit sentiment occurs for public debt and bank debt. Using fund of flow data, an aggregate time series of public debt is constructed. At first, a linear regression is run, as the main variables, CSE and public debt are time-series variables. However, most likely due to the small sample size, this regression does not result in significant coefficients. In addition, the panel data regression did not yield any valid results either, because of the firm-invariance of the dependent variable. A second method used to gather information on public debt is a corporate bond ratio constructed with data from Mergent FISD. The influence of possible biases needs to be considered when making inferences, because this data is only available for a subgroup of the full sample. Table 12 presents the coefficients of the constructed dependent variable public debt ratio and the leverage ratio for the sub-sample. No significant coefficients of CSE are found in any of the regression models for the sub-sample. This could either be explained by the small sample size, or because the collected data is not complete or incorrect. However, considering the availability of data sources, it is not within the scope of this paper to be able to adjust for this.

Table 12: Regressions of public debt

This table presents coefficient estimates from regressing the public debt ratio and the normal leverage ratio, using different sets of controls. Only a sub- sample of the data is used in the analysis due to limitations in data availability. The public debt ratio is the level of bonds outstanding, constructed from Mergent FISD data, divided by total assets. Coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In every first specification of a dependent variable no controls are added (column 1 and 4), in the second firm controls are included (column 2 and 4) and for the third macroeconomic control variables are added to the regression (column 3 and 6). Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels

	Public debt ratio			Total debt ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	0.046	0.039	0.029	-0.003	-0.001	-0.008
	(0.18)	(0.29)	(0.69)	(0.66)	(0.91)	(0.32)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	No	Yes	Yes
Macro control	No	No	Yes	No	No	Yes
N	2.785	2,610	2,610	2,840	2,664	2,664
R^2	0.000	0.006	0.007	0.001	0.226	0.221

5.3 Financial Constraints

In hypothesis 3, I evaluate whether the effect of credit sentiment on firms leverage and net debt issues is affected by the level of restrictions on acquiring capital that firms experience (table 13). With an interaction term I examine if the CSE coefficient is significantly affected by the proxies for financial constraints and if, in accordance with expectations, the positive association of CSE on the firm's leverage is enhanced. In panel A, the coefficients of the three indices indicate a negative effect on the CSE coefficient for leverage, with significance at the 1% level. This contradicts the hypothesis, suggesting higher financial constraints lead to a smaller (or even negative) effect of credit sentiment on leverage. Moreover, the FCP and partly the SA indices are found to positively affect the leverage ratio, indicating higher financial constraints are associated with on average a higher leverage ratio. Contrary to the indices, the credit rating measure is negatively related to financial constraints, because the presence of a credit rating (when the dummy variable is equal to 1) is assumed to decrease the difficulty of acquiring capital. Therefore, its interaction term is expected to be negative, which is confirmed by the results implying that on average the absence of a debt rating leads to an increase in the CSE coefficient for leverage of 0.6%. In panel B, where the dependent variable net debt issues is evaluated, coefficients of the interaction terms for SA and FCP indicate a positive effect on CSE, whereas the WW index suggests a negative effect. In addition, all three indices show a negative relation to net debt issues, although not all coefficients are significant. The credit rating measure, similar to leverage ratio, is found to indicate the results suggested by the third hypothesis, the absence of a credit rating is associated with a higher credit sentiment effect. Furthermore, the presence of a debt rating shows a positive association with the leverage ratio, of approximately 7.5% on average, whereas it has a negative effect on the issuance of debt, with approximately 40%. Thus, while the evidence on financial constraints influencing the credit sentiment effect for leverage ratio is limited to the credit rating measure, and significant findings disproving the hypothesis are found for the indices, the credit sentiment effect on net debt issues indicates slightly stronger results as only the WW index's findings are contradicting the hypothesis.

Table 13: Sensitivity of credit sentiment to financial constraints

This table presents coefficient estimates from regressing multiple measures of leverage on the credit sentiment index, using multiple proxies for financial constraints and different sets of controls. In panel A Book Leverage ratio and in panel B Net Debt Issues are evaluated. The full sample is used in these regressions and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In every first specification of a dependent variable firm controls are included (column 1, 3 and 5) and for the second specification macroeconomic control variables are added to the regression (column 2, 4 and 6). CSI denotes the credit sentiment index, WW the index of Whited and Wu (2006), SA the index developed by Hadlock and Pierce (2010), and FCP the index of Schauer et al (2019). Credit rating is the dummy variable equal to 1 for firms in the possession of a credit rating. while CSI x variable denotes the interaction effect between the credit sentiment index and the specific financial constraint proxy. Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

Panel A: Leverage ratio	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit sentiment	0.010[a]	0.011[a]	-0.002	-0.003	0.008[a]	0.007[a]	0.009[a]	0.010[a]
	(0.00)	(0.00)	(0.53)	(0.43)	(0.00)	(0.00)	(0.00)	(0.00)
CSI x WW	-0.060[a]	-0.048[a]						
	(0.00)	(0.00)						
WW	-0.008[b]	-0.007[c]						
	(0.03)	(0.06)						
CSI x SA			-0.041[a]	-0.004[a]				
			(0.00)	(0.00)				
SA			0.083[a]	-0.042[a]				
			(0.00)	(0.00)				
CSI x FCP					-0.111[a]	-0.104[a]		
					(0.00)	(0.00)		
FCP					0.314[a]	0.320[a]		
					(0.00)	(0.00)		
CSI x credit rating							-0.006[b]	-0.005[b]
							(0.02)	(0.03)
Credit Rating							0.076[a]	0.075[a]
							(0.00)	(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	No	Yes	No	Yes	No	Yes	No	Yes
N	105,816	105,815	105,902	105,902	81,864	81,864	106,016	106,016
R^2	0.213	0.214	0.209	0.210	0.202	0.204	0.218	0.219

Panel B: Net debt issues								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit sentiment	0.186[a]	0.208[a]	0.348[a]	0.331[a]	0.184[a]	0.198[a]	0.196[a]	0.220[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CSI x WW	-0.197[b]	-0.263[a]						
	(0.03)	(0.01)						
WW	-0.011	-0.011						
	(0.79)	(0.78)						
CSI x SA			0.059[a]	0.057[a]				
			(0.00)	(0.00)				
SA			-0.615[a]	-0.540[a]				
			(0.00)	(0.00)				
CSI x FCP					0.350	0.362		
					(0.18)	(0.17)		
FCP					-0.662	-0.902[c]		
					(0.17)	(0.07)		
CSI x credit							-0.115[a]	-0.104[a]
rating							(0.00)	(0.00)
Credit Rating							-0.415[a]	-0.457[a]
							(0.00)	(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	No	Yes	No	Yes	No	Yes	No	Yes
N	105,815	105,816	105,902	105,902	81,864	81,864	106,016	106,016
R^2	0.007	0.007	0.004	0.005	0.007	0.007	0.007	0.007

Next to the influence of a credit rating on the credit sentiment effect, there might also be an effect of the rating itself. Specifically, the dummy variable whether the credit rating is investment grade is included in the analysis, of which the results are reported in table 14. This evaluation however only consists of the firm years in which information on a credit rating is available. The possible influence of the use of this subsample has already been discussed in the Data section and should be considered when examining these results.

The coefficients for leverage ratio are not significant, moreover the interaction coefficient illustrates a different effect than the CSE coefficients of the two groups. The regressions for net debt issues indicate a decreasing effect of an investment grade rating on the credit sentiment association with debt issuance, for both the interaction effect and the CSE coefficients of the two groups. However, these coefficients are also not significance at the 10% level. Regression models including macroeconomic variables were considered but because they also resulted in insignificant coefficients and did not lead to different interpretations, they were not included in the table. In the comparison of the subsample with the full sample, on average a higher leverage ratio and firm size were found. This divergence might have resulted in a bias, specifically because the difference was larger for leverage ratio compared to net debt issues and the results of leverage ratio were least significant.

Table 14: The effect of an investment grade rating on credit sentiment

This table presents coefficient estimates from regressing Leverage ratio and Net debt issues on the credit sentiment index, using different sets of controls. In the first two columns for both dependent variables, the sample is split into firms with a credit rating that is below investment grade and firms with an investment grade credit rating. In the third column for both dependent variables, both groups are included in the regression and the effect of an interaction term is investigated. Only firm years for which a credit rating is available are included in the regressions of this table. The coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

	Leverage ratio			Net Debt Issues		
	Sample not investment grade	Sample investment grade	Interaction	Sample not investment grade	Sample investment grade	Interaction
Credit sentiment	0.004	-0.001	-0.001	0.111	0.030	0.099[a]
	(0.28)	(0.95)	(0.80)	(0.00)	(0.11)	(0.00)
CSI x Inv. grade			0.005			-0.051
			(0.27)			(0.11)
Investment grade			-0.012			0.366[a]
			(0.45)			(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	No	No	No	No	No	No
N	5,870	5,685	11,555	5,870	5,685	11,555
R^2	0.181	0.172	0.204	0.014	0.009	0.009

5.4 Long-term effects

In the last hypothesis, the focus of the evaluation shifts from examining effects over 1 year to effects over multiple years. In table 15, the CSE coefficients of different regression models with up to 5 years leading dependent variables are displayed. The first regression specification only includes firm controls, in the second row lags of the dependent variables are included and in the third row macroeconomic controls. In panel A, no reversal in leverage ratio is visible, a credit sentiment increase appears to increase leverage over multiple years. However, when the leverage ratio is leading more than 5 years, a reversal becomes apparent in Year 7 and 8. In panel B a distinct declining trend is visible in all three regression specifications, even suggesting a reversal for net debt issuance in year 4 and 5 (for the regression specifications not including macro-economic controls). Furthermore, in panel A CSE coefficients for regression model 2 are significantly lower than model 1, whereas this is not visible for net debt issues. This might indicate that the value of the previous year is of higher importance in explaining variation in the dependent variable for leverage ratio compared to net debt issues.

Table 15: Long-term effects of credit sentiment

This table presents coefficient estimates from regressing up to 5 years leading dependent variables on the credit sentiment index, using different sets of controls. In panel A book leverage ratio and in panel B net debt issues are evaluated. The full sample is used in these regressions and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In the first row (1) the regression specification includes only firm controls, in the second row (2) lagged values of the dependent variables are included and in the last row (3) the regression specification also includes macroeconomic controls. Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

Panel A: Leverage ratio

	Year 1	Year 2	Year 3	Year 4	Year 5
(1) Firm-specific controls					
Credit sentiment	0.009[a]	0.011[a]	0.010[a]	0.013[a]	0.009[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R^2	0.213	0.196	0.179	0.168	0.153
N	106,016	94,410	84,633	76,136	68,690
(2) Including Lags					
Credit sentiment		0.005[a]	0.003[a]	0.006[a]	0.002[a]
		(0.00)	(0.00)	(0.00)	(0.00)
R^2		0.741	0.751	0.762	0.773
N		93,384	82,646	73,362	65,267
(3) Including Macro-economic controls					
Credit sentiment	0.010[a]	0.002[b]	0.003[a]	0.008[a]	0.005[a]
	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)
R^2	0.214	0.740	0.752	0.762	0.771
N	106,016	93,384	82,646	73,362	65,267
Firm fixed effects	Yes	Yes	Yes	Yes	Yes

Panel B: Net debt issues

	Year 1	Year 2	Year 3	Year 4	Year 5
(1) Firm-specific controls					
Credit sentiment	0.183[a]	0.085[a]	0.007	-0.029[a]	-0.088[a]
	(0.00)	(0.00)	(0.44)	(0.00)	(0.00)
R^2	0.007	0.002	0.002	0.002	0.002
N	106,016	94,410	84,633	76,136	68,690
(2) Including Lags					
Credit sentiment		0.094[a]	0.024[a]	-0.002	-0.062[a]
		(0.00)	(0.00)	(0.84)	(0.00)
R^2		0.001	0.001	0.001	0.001
N		93,384	82,646	73,362	65,267

(3) Including Macro-economic controls					
Credit sentiment	0.206[a]	0.208[a]	0.168[a]	0.112[a]	0.035[b]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
R^2	0.007	0.001	0.001	0.001	0.001
N	106,016	93,384	82,646	73,362	65,267
Firm fixed effects	Yes	Yes	Yes	Yes	Yes

5.5 Robustness checks

Several additional analyses have been run to test whether the results as described above are robust to changes in the specifications of the regression models. First, to check whether the results are not dependent on the specific construction of the dependent variables, alternative measures of leverage ratio and net debt issues are tested. The regressions evaluating the 'narrow' variables which do not include non-bond or non-loan liabilities, are presented in table 16. The CSE coefficients for the narrow leverage ratio indicate at first a positive relation, however in the third regression specification a negative relation is suggested. This might indicate the effect found for leverage ratio of the credit sentiment effect is not valid or is not significant enough. Moreover, clustering standard errors on year level instead of firm level results in less significant results for the leverage ratio, whereas the CSE coefficients for net debt issues remain significant at the 1% level (see table 17). The results of narrow net debt issues are more in line with the original variable, the coefficients even indicate a slightly higher effect of credit sentiment. However, the explanatory power of these regression is even lower than for net debt issues in table 9.

Table 16: Regressions of 'narrow' alternatives

This table presents coefficient estimates from regressing alternative measures of leverage on the credit sentiment index, narrow book leverage and narrow net debt issues, using different sets of controls. The full sample is used in these regressions and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In every first specification of a dependent variable no controls are added (column 1 and 4), in the second firm controls are included (column 2 and 4) and for the third macroeconomic control variables are added to the regression (column 3 and 6). Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

	Narrow Leverage			Narrow Net Debt Issues		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	0.001	0.007[a]	-0.030[a]	0.284[a]	0.280[a]	0.309[a]
	(0.67)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm size		0.237[a]	0.292[a]		-1.269[a]	-1.307[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Market to book ratio		-0.034[a]	-0.040[a]		0.442[a]	0.424[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Tangibility		0.189[a]	0.175[a]		-0.257[b]	-0.267[a]
		(0.00)	(0.00)		(0.02)	(0.00)
Profitability		-0.260[a]	-0.273[a]		1.038[a]	1.035[a]
		(0.00)	(0.00)		(0.00)	(0.00)
Median Industry		0.159[a]	0.158[a]		-0.231[a]	-0.198
leverage		(0.00)	(0.00)		(0.00)	(0.00)
Dividend Payer		0.001[a]	0.001[a]		0.001	0.001
		(0.00)	(0.00)		(0.50)	(0.45)
GDP growth			0.041[a]			-0.216[a]
			(0.00)			(0.00)
Expected inflation			-0.012[a]			-0.131[a]
			(0.00)			(0.00)
Credit spread			-0.035[a]			-0.210[a]
			(0.00)			(0.00)
Investment sentiment			0.006[a]			0.036[c]
			(0.00)			(0.08)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	113.284	106,016	106,016	113,284	106,016	106,016
R^2	0.000	0.188	0.188	0.003	0.000	0.000

Table 17: Standard errors clustered at year-level

This table presents coefficient estimates from regressing multiple measures of leverage on the credit sentiment index, with standard errors clustered at year-level. In panel A Book and Market Leverage are evaluated and in panel B Net Debt Issues and Net Equity Issues. The full sample is used in these regressions and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In every first specification of a dependent variable no controls are added (column 1 and 4), in the second firm controls are included (column 2 and 4) and for the third macroeconomic control variables are added to the regression (column 3 and 6). All specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

Panel A: Leverage ratio						
	Book Leverage			Market Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	0.004	0.009[b]	0.010[b]	-0.020	-0.013	-0.025
	(0.44)	(0.02)	(0.02)	(0.34)	(0.49)	(0.26)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	113.284	106,016	106,016	108,302	105,610	105,610
R^2	0.000	0.213	0.214	0.003	0.224	0.220

Panel B: Debt and equity issuance						
	Net debt issues			Net equity issues		
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	0.178[a]	0.183[a]	0.206[a]	0.032	0.018	0.062[a]
	(0.00)	(0.00)	(0.00)	(0.46)	(0.54)	(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	113.284	106,016	106,016	113,283	106,016	106,016
R^2	0.005	0.007	0.007	0.001	0.193	0.187

Adjusting the clustering of standard errors has also resulted in a change of the t-statistics for market leverage, indicating the coefficients are not significant. With this information the inference could be made that instead of an increase in credit sentiment leading to a decrease in market leverage, as has been suggested by the results in table 9, there is no significant result found for market leverage. Moreover, as has been suggested in the data section, this could also be the result of the mismeasurement of the market equity variable and thereby the market value of total assets.

In the data section, some ambiguity existed on the validity of the credit sentiment index. To further test whether the index employed in this paper measures the appropriate effect, a regression analysis performed by Gulen et al (2018) using the same credit sentiment index is replicated. In specific, following their sample selection process, investment variables are constructed and regressed on this paper's credit sentiment index. In agreement with Gulen et al (2018), the results presented in table 18 suggest a positive association between credit sentiment and investment. Furthermore, apart from cash flow to assets, the coefficients of the control variables indicate the same relations as found in the original work. Thus, even though there is a difference in time period (1963-2016 compared to 1987-2018) these findings further support the validity of the credit sentiment index constructed for this paper.

Table 18: Regressions on investment

This table presents coefficient estimates from regressing measures of investment on the credit sentiment index, using multiple controls. Total investment is the percentage change in total capital, which includes physical capital (gross PPE) and intangible capital (goodwill, capitalized R&D and SG&A). Physical and intangible investment is calculated as the one year change in physical or intangible capital scaled by lagged total capital. Tobin's q is calculated as the market equity value plus book leverage divided by total capital and ROA indicates operation income before depreciation divided by total assets. The sample is based on the sample selection process of Gulen et al (2018) excluding financial (SIC 6000-6999), utility firms (SIC 4900-4999) and firms not incorporated in the US, but for the time frame 1987 to 2018. All variables are winsorized at the 1 and 99th percentile. Coefficients are scaled and can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In line with the specifications of Gulen et al (2018), in every first specification of a dependent variable the controls Tobin's q and cash flow to assets are included (column 1, 3 and 5) and in the second specification the other firm controls are included (column 2, 4 and 6). Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
a b c Denote statistical significance at the 1%, 5%, and 10% levels.

	Total investment		Physical investment		Intangible investment	
	(1)	(2)	(3)	(4)	(5)	(6)
Credit sentiment	0.053[a]	0.072[a]	0.044[a]	0.069[a]	0.056[a]	0.070[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Tobin's q	1.290[a]	1.167[a]	0.895[a]	0.827[a]	1.500[a]	1.345[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Cash flow to assets	-0.030[c]	-0.153[a]	-0.007	-0.097[a]	-0.028	-0.207[a]
	(0.10)	(0.00)	(0.70)	(0.00)	(0.28)	(0.00)
Log total assets		-0.804[a]		-0.910[a]		-0.709[a]
		(0.00)		(0.00)		(0.00)
Cash to assets		0.277[a]		0.251[a]		0.296[a]
		(0.00)		(0.00)		(0.00)
Book leverage		-0.028[b]		-0.116[a]		0.026[c]
		(0.03)		(0.00)		(0.06)
Sales growth		0.039[a]		0.075[a]		0.051[a]
		(0.01)		(0.00)		(0.00)
ROA		0.297[a]		0.269[a]		0.368[a]
		(0.00)		(0.00)		(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	111.377	107,071	111.377	107,071	111,932	107,546
R^2	0.147	0.104	0.050	0.026	0.142	0.115

Furthermore, regressions using a categorical variable instead of a continuous measure as firm size proxy have been run. This is an often used method for estimating size (Gulen et al, 2018) which might provide different results. Only for the long-term debt ratio a significant different CSE coefficient has been found (table 19). These results indicate higher CSE coefficients than in the original regression in table 10, and the negative effect of CSE found in the third specification has disappeared. Moreover, they suggest that long-term debt is more affected by changes in credit sentiment, than short-term debt (1.8% compared to 1.2% per one-standard deviation of CSE).

Table 19: Categorical firm size variable

This table presents coefficient estimates from regressing long-term leverage ratio on the credit sentiment index, using different sets of controls including the categorical size variable. The firm size variable is a categorical variable of deciles based on the logarithm of total assets. The full sample is used in these regressions and coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In the first specification firm controls are included (column 1) and for the second specification macroeconomic control variables are added to the regression (column 2). Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

	Long-term Leverage	
	(1)	(2)
Credit sentiment	0.023[a]	0.018[a]
	(0.00)	(0.00)
Firm size	0.066[a]	0.065[a]
	(0.00)	(0.00)
	0.138[a]	0.137[a]
	(0.00)	(0.00)
	0.226[a]	0.224[a]
	(0.00)	(0.00)
	0.325[a]	0.322[a]
	(0.00)	(0.00)
	0.486[a]	0.482[a]
	(0.00)	(0.00)
	0.672[a]	0.666[a]
	(0.00)	(0.00)
	0.854[a]	0.846[a]
	(0.00)	(0.00)
	0.975[a]	0.963[a]
	(0.00)	(0.00)
	0.978[a]	0.963[a]
	(0.00)	(0.00)
Market to book ratio	-0.034[a]	-0.037[a]
	(0.00)	(0.00)
Tangibility	0.140[a]	0.137[a]
	(0.00)	(0.00)
Profitability	-0.246[a]	-0.238[a]
	(0.00)	(0.00)
Median Industry	0.165[a]	0.167[a]
leverage	(0.00)	(0.00)
Dividend Payer	-0.002[a]	-0.002[a]
	(0.00)	(0.00)
GDP growth		0.011[b]
		(0.01)
Expected inflation		-0.023[a]
		(0.00)
Credit spread		0.001
		(0.86)
Investment sentiment		-0.004
		(0.15)
Firm fixed effects	Yes	Yes
N	106,016	106,016
R^2	0.245	0.246

For hypotheses 3, the presence of a credit rating is examined, as one of the proxies for financial constraints. An alternative construction method of this credit rating dummy, which has already been mentioned in the data section and is employed by among others Gulen et al (2018), is equal to 1 if a firm has had a credit rating at any point in time (within the sample period). Because this alternative credit rating measure does not vary for firms over time, it cannot be included in a fixed effects regression. Therefore, the sample is divided in two groups based on the credit rating dummy, for which separate regressions are run (table 20). For leverage ratio, the results found by the original dummy variable are confirmed by the second credit rating dummy, with more significant coefficients. The regression model results for net debt issues including macro-economic controls using the second credit rating dummy variable are not in line with the original variable's results. However, the CSE coefficient of firms with a rating is only slightly higher (20.8% compared to 20.2%). Overall, these findings suggest the results found for table 13 are robust to a change in the credit rating dummy variable.

Table 20: Regressions of credit rating subsamples

This table presents coefficient estimates from regressing Leverage ratio and Net debt issues on the credit sentiment index, using different sets of controls and different samples. When the sample is divided based on the dummy variable Credit rating 1, only firm years for which a credit rating is available are included in the group "With rating". Whereas for Credit rating 2, a firm is included in the group "With rating" if at any time within the sample period a credit rating was available. The coefficients can be interpreted as the percentage change in the leverage measure associated with a one-standard deviation change in the regressor. In every first specification of a dependent variable firm controls are included (column 1, 3 and 5) and for the second specification macroeconomic control variables are added to the regression (column 2, 4 and 6). Standard errors are clustered at the firm level, and all specifications include firm fixed effects. P-values are in parentheses. The overall R squared is displayed, indicating the variance of the dependent variable that is explained by the specific model.
[a b c] Denote statistical significance at the 1%, 5%, and 10% levels.

	Credit rating 1				Credit rating 2			
	Without rating		With rating		Without rating		With rating	
Leverage ratio								
Credit sentiment	0.009[a] (0.00)	0.011[a] (0.00)	0.002 (0.44)	0.005 (0.20)	0.009[a] (0.00)	0.011[a] (0.00)	0.007[a] (0.00)	0.007[b] (0.02)
R^2	0.179	0.179	0.199	0.200	0.165	0.165	0.232	0.240
Net debt issues								
Credit sentiment	0.195[a] (0.00)	0.222[a] (0.00)	0.072[a] (0.00)	0.074[a] (0.00)	0.186[a] (0.00)	0.202[a] (0.00)	0.165[a] (0.00)	0.208[a] (0.00)
R^2	0.007	0.007	0.009	0.010	0.008	0.008	0.052	0.055
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	No	Yes	No	Yes	No	Yes	No	Yes
N	94,461	94,461	11,555	11,555	83,919	83,919	22,097	22,097

6. Conclusion

6.1 Summary of conclusions

This paper set out the investigate if there is an association of moving along the credit cycle with firm's capital structure. In specific, an index is used as proxy for the stage of the behavioral credit cycle of which the relation with leverage and debt issuance is evaluated. In agreement with the first hypothesis, an increase in credit sentiment is followed by an increase in leverage and debt issuance. However, the small R squared, to a certain extent caused by the firm-invariance of the explanatory variable, indicates that the credit sentiment measure itself only explains a small part of the variation in leverage and debt issuance. Furthermore, this paper found evidence suggesting long-term debt is affected more by credit sentiment than short-term debt. Additionally, literature suggested different effects for public and bank debt could be found. However, no significant results were discovered, most likely caused by the data limitations of this paper.

Multiple proxies for financial constraints were tested. The three indices indicated overall a negative effect on CSE for leverage ratio. However, for net debt issues two out of the three suggested a positive relation, which is in accordance with the third hypothesis. An additional proxy for financial constraints, specifically not having access to public debt, indicates for both dependent variables that the absence of a credit rating increases the effect of credit sentiment. Furthermore, a credit rating suggests on average an increase in leverage, in line with findings of Faulkender and Petersen (2006), which supports the validity of the data and specifically the credit rating dummy variable. Moreover, when a firm is in possession of a credit rating, there could also be an effect of the rating itself on the restrictions a firm faces when acquiring capital. No evidence was found for the credit sentiment effect on leverage ratio. Results for net debt issues suggest a decreasing effect of an investment grade rating on the credit sentiment effect but the coefficients are not significant enough.

Finally, long-term effects of credit sentiment were evaluated, in order to investigate if a reversal in the effect of credit sentiment was visible. For net debt issues a reversal is visible in Year 4 and 5, leverage ratio, however, only decreases in Year 7 and 8. To a small extent, these results are in accordance with the fifth hypothesis and results found by Gulen et al (2018). Yet for Gulen et al (2018) this reversal was already visible from the second year onwards and lasted multiple years, therefore it is not certain if this delayed decrease in the credit sentiment effect can be interpreted as a reversal effect.

6.2 Discussion

Even though the first results indicate findings in accordance with the main research question, there are some contradictory findings that ask for caution when drawing conclusions. Findings of an evaluation of an alternative 'narrow' leverage ratio and the clustering of standard errors on firm level, imply that the results found for leverage ratio might not be robust to changes in the specification of the regression model. Furthermore, for market leverage, which is expected to display the same relation, the positive credit sentiment effect was not found. In the data section, the examination of the summary statistics of both leverage ratios already indicated a larger divergence than expected, which could explain these results.

As already mentioned, the explanatory power of the credit sentiment measure is relatively low, however at the inclusion of control variables the net debt issues regressions do not indicate an increase in explanatory power. This might indicate the chosen control variables are not a good fit for debt issuance, which could be expected when considering that the firm-specific controls were chosen because of evidence in literature on their explanatory power of leverage ratio, and not specifically debt issuance. Moreover, the macro-economic control variables also add only very little explanation of the variance of both dependent variables, suggesting for further research to assess control variables more extensively in advance.

Since multiple hypotheses, on the difference in public and bank debt, and the effect of credit ratings, where limited in their investigative power by limited data sources, further research would be recommended in order to draw well-founded conclusions on these effects.

Furthermore, results in this paper are dependent on the use of one specific credit sentiment measure. Whereas Greenwood and Hanson (2013) have illustrated other methods that, according to them, also capture the credit sentiment effect, for example the high yield share. Using multiple measures for behavioral credit cycles would give more information on the validity of the credit sentiment effect on capital structure that is suggested by the findings in this paper.

This paper set out, first, to support evidence of the effect of supply factors on firm's capital structure. Since effects of credit sentiment on both leverage ratio and net debt issues have been found, this analysis has contributed to increasing the awareness of this supply factor. However, as the validity and magnitude of this effect, specifically for leverage, are not completely established, improvement of the regression models and control variables could possibly aid to further identify this credit sentiment effect. In addition, other supply factors including the presence of a credit rating and financial constraints are found to affect both the capital structure variables and in some cases the effect of credit sentiment on them. Second, this paper aimed to contribute to the research on behavioral credit cycles, specifically by focusing on the leverage ratio variable which has not been frequently used in this analysis. The findings in this paper suggest there is an effect, also for leverage, inviting further research into this variable and possibly others.

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