

Preliminary Master Thesis

Systematic Risk and Secured Debt

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Table of contents

1. Introduction to research topic	1
1.1 Background.....	1
1.2 Motivation.....	2
1.3 Literature review.....	2
2. Research question and objectives of the thesis	7
2.1 Research question.....	7
2.2 Hypotheses.....	7
2.3 Objectives of the thesis.....	9
3. Plan for data selection and research methodology	11
3.1 Research design and methodology.....	11
3.2 Data selection.....	12
4. Plan for thesis progression	13
5. References	14

1. Introduction to research topic

1.1 Background

Modigliani and Miller (1958) state that debt and capital structure decisions of firms are irrelevant under perfect capital markets. However, this is not the case in practice. Firms use different types of debt in different situations. Therefore, access and usage of the different debt instruments may have a large impact on firms' corporate policy decisions in the presence of financial constraints. Investments undertaken by a firm are thus affected by the firm's choice of debt. As a result, it is reasonable to think that firms with lower costs of financing can invest more.

We are going to investigate the capital structure of U.S. public firms, with emphasis on aspects connected to a firm's debt and the impact on the firm's investment. Biguri (2015) analyzes how access to the unsecured debt market affect investments. She introduces the topic by stating that firms' access to external funding may be limited by financial constraints, which reduces the firm's investment capacity. These financial constraints can be in the form of asymmetric information or contract enforceability. A way to reduce such friction is by pledging collateral. Collateral can be defined as the assets the borrower pledges to the lender in case of default. A firm's debt capacity will therefore be increased by pledging collateral. In addition, collateral reduces the risk for debt providers since the collateral creates enforcement and protection against other creditors' claims.

The lender can liquidate the assets pledged as collateral if the borrower runs into default. A significant difference between secured and unsecured debt is that collateral is not applied when borrowing unsecured. Instead, when borrowing unsecured, factors such as creditworthiness of the firm is emphasized. Although it may sound counter-intuitive, unsecured debt is associated with less risky borrowers. Borrowers of secured debt are riskier and must pledge collateral to guarantee their repayments.

There is also a distinction in priority between the two debt forms in the event of default. As the lenders of secured debt have required collateral pledged, they will get their claims back first as they liquidate the assets used as collateral. Then, if

there are more assets left to liquidate, the unsecured lenders will get their claims. In other words, the unsecured creditors are not guaranteed a payback. Therefore, they are exposed to a higher risk when lending out unsecured.

Biguri (2015) build on existing work by Berger and Udell (1990) and Federal Reserve (1993) and argue that unsecured debt is cheaper than secured debt. Firms that borrow unsecured debt minimize their financing costs and are thus able to invest more. However, when access to unsecured debt becomes more restricted, firms substitute toward secured debt, and hence the investments are reduced.

1.2 Motivation

The traditional literature has focused on debt as homogenous, for example as secured debt, where collateral has made investment possible. We have research on the types of collateral and the effect on investments through a macroeconomic perspective. As Rauh and Sufi (2010) show that debt structure heterogeneity is relevant, there is an importance of differentiating between secured and unsecured debt. Credit quality is the main determinant of the firm's capital and debt structure. In terms of the debt structure, the credit quality will determine whether the firm will borrow secured or unsecured. However, there has been a missing field within the research area of debt structure. Biguri (2015) takes the next step and shows that debt structure affect investments. This leads us to some unexplored areas we do not know. First, we do not exactly know why debt structure affect investments. To reveal the debt structure's effect on investment, we will research the pricing of debt. Basically, we think that unsecured debt is cheaper than secured debt. Second, we do not know the role of collateral variety and the volatility of collateral. Our thesis will be to explain the mechanism of how secured and unsecured debt, through risk and debt spreads will affect investments. The risk will be in terms of the value and volatility of the collateral. The risk of the firm will impact the spread, or the cost of the debt, which in turn will affect how much the firm will be able to invest.

1.3 Literature review

Unsecured debt is a topic that has not gained much attention in the academic literature. The literature that exists today, considers all debt as being secured. However, it is shown that unsecured debt plays a major role in the debt market. By looking into firms' capital structures, researchers have explored the characteristics

of the firms' choices of debt. Rauh and Sufi (2010) investigate the capital structure of U.S. public firms, and tries to assess what determines corporate capital structure. The study provides new information concerning capital structure decisions by acknowledging that firms use various types, sources and priorities of debt. In the study, the authors use a dataset that contains the type, source, and priority of every balance-sheet debt instrument for a large representative of rated public firms. The authors show why differentiating between secured and unsecured debt is important, regarding all types of debt markets. An important conclusion of the studies is that spread in the debt priority structure is a result of a decreasing credit quality situation. This importance is evident in other studies and is further described in terms of magnitude. If the debt structure is relevant, then the debt structure should have an impact on the investment as shown in Biguri (2015). Unsecured debt occurs in a larger extent than secured and is evident in the U.S. markets of bank debt, private placements and bonds. The paper researches a firm's investment magnitude if it has access to the unsecured debt market. The author tries to answer this question by investigating how shocks to unsecured debt influence investment decisions in the presence of financial constraints. As the results showed, investments are larger when access to unsecured debt increases. However, when there is a lack of access to unsecured debt, firms substitute toward secured debt. Because of the cost-effectiveness of unsecured debt, investments decrease when this substitution takes place. Despite what has been claimed in the literature, the findings of Biguri (2015) suggests that creditworthiness is a more important element to investments than collateral.

Let us now get a glance of the existing knowledge on pricing of debt. We begin with the present knowledge within bank debt expressed by the relationship between collateral and credit risk. Berger and Udell (1990) once questioned if unsecured debt is cheaper than secured. They do so by looking at three types of risk. The three types of risk are distinguished by risk of the borrower, the loan and the bank. This resulted in an interesting finding in the relationship between collateral and the three types of risk. The relationship was positive, for all three. Firms that are riskier than the average, tend to have secured debt, while unsecured loans tend to be associated with less risky firms. Hence, the banks with a large fraction of secured loans, have risky portfolios. Additionally, banks are able to collect information about the risk of the borrowers and hence they make high-risk borrowers pledge collateral. Berger

and Udell (1990) therefore make evidence for that collateral is associated with riskier loans, borrowers and banks. Let's consider the situation for private placements. Federal Reserve (1993) examines the private placement market, a source of long-term funds. A private placement is a debt or equity security that is not under the regulation of the Securities and Exchange Commission. It is hard to find information about private placements as they are not publicly offered, hence the exemption from the regulation with the SEC. Federal Reserve (1993) investigates the function of privately placed debt in corporate finance, and determines its relation to other debt markets. There are two common misperceptions about the nature of the privately placed debt. The first misperception is that it is a substitute for the public bond market. The issuers try to avoid the fixed costs related to the registration with the SEC and lenders correspond to buyers of the bonds issued in public. However, the lenders must acquire information about the borrowers through the performance of extensive credit analysis. Information gathering is a necessity in order to lend to smaller, less well-known borrowers, which have no access to the public bond market. This market primarily serve large companies that can be monitored with publicly available information. Therefore, private market lenders show more resemblance to banks than buyers of publicly issued corporate debt. The second misperception is that the private placement market is indistinguishable to the bank loan market. One of the findings in Federal Reserve (1993) is that there are differences in information-intensive lending. An important determinant of the markets in which the company borrows and of the terms under which credit is available, is the intensity of the information problem that a borrower poses for lenders. In addition to bank debt and private placements, we can refer to the situation for bonds, researched in John, Lynch and Puri (2003). The paper provides insight on the relationship between the yield on a bond and its collateral. The relationship is revealed through a study where they look at the difference in the yields of secured and unsecured respectively, while taking credit rating into account. The conclusion of the study is that the yield is higher for the collateralized bonds than for those which are not secured. The yield in this context is a measure of risk which stems from factors like probability of default, volatility of the collateral and other factors connected to loans. As a conclusion for the pricing of debt, these papers show that unsecured debt is cheaper in both cases.

As we are interested in the mechanism of how the risks, such as value and volatility of the collateral impact the investment, this section will look at the collateral and the implication of macroeconomic forces. Banks estimate a recovery rate on their debt instruments and collateral pledged. Degryse, Loannidou, Liberti and Sturgess (2016) assess the effects of laws and institutions on the banks' expectations. They used data from sixteen non-U.S. countries, but their conclusion is that the recovery rates are higher, the higher the creditor rights are. In the cases where the collateral was exposed to agency problems, depreciated fast and was less redeployable, the recovery rates were lower and more sensitive to institutions and laws. To compensate for the low recovery rates in economies with low performance, the banks will charge higher interest rates. The demand for collateralizable assets is a central cost of financing in many models regarding financial constraints. Liberti and Mian (2010) investigate how the collateral cost of capital is impacted by the degree of financial development. In their studies, the authors use 15 different countries which varies widely in financial and institutional development. They find that more financially developed countries ease borrowing restrictions by lowering the collateral spread, and thus shift the composition of acceptable collateral towards firm-specific assets. Collateral spread is the difference in the collateralization rates between high-risk and low-risk borrowers. On the other side, with borrower risk the composition changes to non-specific assets. This change is smaller for more financially developed countries. Therefore, riskier firms in financially developed countries are able to borrow on different terms than riskier firms in less developed countries.

When looking at what the firms pledge as a collateral, we should also pay attention to how the availability of collateral affect investments. Chaney, Sraer and Thesmar (2012) investigate real estate as a pledgeable asset and how shocks in the real estate market impact corporate investments. Looking at real estate is important because this group of assets represents a huge fraction of companies' balance sheet. In order to measure the sensitivity of the value of the collateral, local variations in housing prices are used as shocks to the value of real estate. The result is that when the value appreciates, investments increase by a small portion and are financed by the issuance of more debt. However, this effect is more evident for small firms which are more constrained. It is apparent that the value of the liquidated assets has a distinct role when assessing a firm's debt capacity. Bernanke and Gertler (1989)

emphasizes the macroeconomic consequences of this relationship. Chaney et al. (2012) assume that all debt is secured and they do not mention the role of collateral volatility. One should look to Brunnermeier, Eisenbach and Sannikov (2012), who reason for why it is important to consider collateral volatility. Their article examines the effects of financial frictions in the macro economy. Financial frictions cause continuity and amplification effects when combined with illiquidity. Financial instability is a result of liquidity spirals and downturns are reinforced by further restricted credit. Therefore, a need for funding and liquid assets arises. Frictions can be reduced by financial institutions. The institutions will at the same time enhance financial fragility and price instability. When the collateral value decreases and margins rise, the markets of secured funding are subject to so called “collateral runs”. On the other side, unsecured debt is only subject to traditional bank runs. Other contributions to secured debt’s effect on the investment is shown through a model where the lenders can force payback from the borrowers, only if the debt is secured. The model is described in Kiyotaki and Moore (1997) and assumes that assets used as production factors in the economy are pledged as collateral. The theory presented is that shocks to technology or income distribution may cause fluctuations in output and asset prices. These fluctuations will then affect the extension of credit by the lenders.

Extensive research exists on the relationship between credit quality and investments in connection to business cycles. Bernanke, Gertler and Gilchrist (1996) describe this relationship by considering unsecured debt. The Financial Accelerator is an expression given to the idea that adverse shocks to the economy may be enlarged by worsening credit-market conditions. Theory states that borrowers meeting higher agency costs in credit markets should get lower proportions of extended credit in the times of a recession. These borrowers therefore account for a proportionally greater part of the decline in economic activity as they exacerbate the recessionary shocks’ effects. Further investigation of business cycles can be found in Bernanke and Gertler (1989). Their model states that the agency costs of real investment financing are reduced when the borrower’s net worth is high. Borrower’s net worth is connected to business upturns, hence the agency costs will decrease as the net worth increase with the economic upturn. Due to accelerator effects, the increase in investments will strengthen the good times. The opposite effect will be evident in economic downturns. The fluctuations are affected by

shocks, for example debt deflation, which affects the net worth. Moving on to the conclusion of their research, the authors show that the macroeconomic fluctuations are more influenced by the agency costs than the costs of monitoring. Deviations from the first and best outcome that are associated with the necessity of external funding, should be included in agency costs.

2. Research question and objectives of the thesis

2.1 Research question

The research question should guide us to contribute with valuable information on the difference between secured and unsecured debt. Given the background and motivation for our thesis, we have defined the following research question.

What are the sources of the collateral pledged, and how does the valuation and volatility of the collateral affect the firm's investments?

2.2 Hypotheses

The empirical part of our thesis will be twofold. First, we will argue that the aggregated risk of the firm and hence the eventual, assessed volatility of the collateral will be a key determinant for whether the company can borrow secured or unsecured debt. To the extent that risk, measured by betas, has something to do with debt spreads, our hypotheses allow us to test the implications in terms of unsecured and secured debt spreads. The risk will in this case determine the choice of secured or unsecured debt in terms of the debt spread. For the secured case, the testing will also reveal if firms pledge additional or even substitute real estate as collateral. In the light of the objectives of the thesis, we have defined the hypotheses below.

Hypothesis 1: *Secured debt is used by firms with high asset volatility.*

Hypothesis 2: *Collateralizable assets have a lower asset volatility. Therefore, spare collateral capacity is likely to have a high asset volatility if overall assets volatility is high.*

Hypothesis 3: Borrowing dynamics

- *High asset volatility and no collateral: low leverage and financially constrained*
- *High assets volatility and high collateral: issue secured debt*
- *Low asset volatility: borrow unsecured debt and keep collateral as a reserve for future debt capacity*

Hypothesis 4: *Asset volatility directly maps into interest rates on debt contracts. Thus, unsecured debt is cheaper as it is lent to low asset volatility firms.*

In the second part, we will start by using the database created by Biguri and text-search techniques to create a register of collateral used. We will derive empirical evidence on the sources and valuation of collateral. By analyzing the determinants of each source of collateral pledged, we will look into whether different types of debt instruments require specific types of collateral. In addition we will investigate to what extent firms rely on sources of collateral unrelated to real estate. We will measure the beta of the assets, which will function as a proxy for the volatility of the collateral availability of the firm. These betas will be estimated from the sources and the valuation of the collateral pledged by the firm. The betas will be estimated with the method described in Acharya, Almeida and Campello (2012). The method is based on several assumptions. The total value of a firm is calculated with the following formula:

$$\frac{dV}{V} = \mu dt + \sigma_V dW$$

Where V is the total value, μ is the expected continuously compounded return on V , σ_V is the volatility of firm value, and dW is a standard Wiener process. After rearranging and substituting, the beta of the asset is given by this final formula:

$$\beta_{Asset} = \beta_{Equity} \frac{E}{V} N(d_1)$$

$$\text{Where } d_1 = \frac{\ln(V/F) + (r + \frac{1}{2}\sigma_V^2)T}{\sigma_V \sqrt{T}}$$

We will study how debt structure is determined by two-way sorting the beta of assets, and the level of collateral or sources of collateral pledged. In addition, we will complement the descriptive evidence with cross-sectional regression estimation. Thus, we will show how debt structure varies with changes in the beta of assets and the level of collateral. In order to address concerns regarding reverse causality, omitted variables and measurement error, we will add a shock to systematic risk to show variation in the terms of debt structure. By adding this shock, we will be able to test our stated hypotheses.

2.3 Objectives of the thesis

By answering our research question we will contribute to the literature by showing that unsecured debt is indeed cheaper than secured debt. We will also provide and support our conclusions with empirical evidence and give arguments for why this is the case. In addition, we will explain the mechanism of how secured and unsecured debt through risk and debt spreads will affect investments. We have divided the objectives of our thesis into seven steps.

As the literature has considered all debt as secured, it has also been a common assumption that real estate have been used when pledging collateral. However, as a substitution, companies pledge other assets like receivables, inventories, intangible assets, cash and marketable securities. Thus, as our first step, we will show that there are other sources of collateral.

In the second step, we will provide descriptive evidence on valuation of collateral and volatility of collateral of debt holdings. We want to show three results. The first result is that firms with low collateral volatility borrow unsecured debt. The second tells us that firms with high collateral volatility and high valuation of collateral, borrow secured debt. The third result shows that firms with high collateral volatility and low valuation of collateral, borrow very little as they are financially constrained. The intuition behind these results is that if the volatility of the assets is low, creditors know that the likelihood of getting their money back is high if the firm should default. On the other side, if the volatility of the assets is high, there is a lower probability of being repaid if the borrower defaults. Thus, only firms that have high value of collateral or a lot of assets to pledge, will get secured financing.

Those that pledges collateral with low value, get very little or no access to debt at all.

In step three, descriptive analysis of creditworthiness and volatility of collateral of debt holdings will be provided. Here, the results are not straightforward. We could find that firms with low collateral volatility and high creditworthiness borrow unsecured debt. Another explanation could be that firms with high collateral volatility and high creditworthiness borrow unsecured debt. However, it could also be that firms with high collateral volatility and low creditworthiness borrow secured debt. As the answer will be evident later in our thesis, we can enlighten the reader that the intuition is that unsecured debt depends positively on a firm's creditworthiness, but negatively on collateral volatility.

In step four, we will outline the relationship between growth opportunities and volatility of collateral of debt holdings. There are several possible outcomes of this research. One possible outcome is that firms with low collateral volatility and high growth opportunities borrow unsecured debt. We could instead, find that firms with high collateral volatility and high growth opportunities borrow unsecured debt. Another possibility is that firms with high collateral volatility and low growth opportunities borrow secured debt or they are financially constrained. The intuition behind these explanations is to show that unsecured debt depends positively on firms' growth opportunities and negatively on collateral volatility.

In step five we will look at the determinants for the sources of collateral, the valuation of the collateral pledged and the volatility of it. For this analysis, we will run a linear regression on the mentioned dependent variables. In the linear regression model, we will use different explanatory variables as controls. There are many explanatory variables we can think of and use. Examples can be expenditures, research and development, growth opportunities, profitability, size or various others that might fit the model. The intuition behind the fifth step is to investigate the different firms which pledge different sources of collateral and how the firms' different characteristics will impact the valuation of the collateral. In addition, we will look into how the volatility of the collateral pledged is dependent on the firm's characteristics.

In the sixth step, we want to understand the relation between firms' debt structure and the volatility of collateral. We will therefore create a table with determinants of debt structure. We will run a linear regression on unsecured debt over total debt using the volatility of collateral and different explanatory variables as controls. The table is somewhat similar to the one we will provide in the second step. However, this table is more robust.

Finally, in the seventh step we will explore some aspects which are important for the intuition of this research. These aspects are the debt contracts' interest rates on secured and unsecured debt contracts, and the determinants for them. We will also run a linear regression in this step. More specifically, we will run the regression on interest rates of the unsecured and secured debt contracts, having the volatility of the collateral and other factors as explanatory variables. Because the risk of the assets is lower in the unsecured case, the intuition in this step is that unsecured debt is cheaper than secured debt. Reasonably and logically, lower risk will lead to lower interest rates on debt.

3. Plan of data selection and research methodology

3.1 Research design and methodology

The research design describes the type of study. Both descriptive and explanatory research designs are applicable for our master thesis. It is descriptive in the sense that we want to understand the sources of collateral. It is also explanatory as we want to know what determines each type of collateral pledged and how the different sources affect the interest rates on debt. In addition, the design of our research can be characterized as longitudinal. By examining the panel data, we will be able to see how collateral valuation and collateral volatility relate to debt structure and other firm characteristics. There are two types of research methodologies, the quantitative and the qualitative approaches. Quantitative research fits an explanatory research design, and qualitative a descriptive. We need to apply both, as our field is descriptive in the way that we want to understand the sources of collateral, and explanatory since we want to know what determines each type of collateral pledged and their importance on the interest rates.

3.2 Data Selection

In our master thesis, we will be working with different types of secondary data, gathered in the period of 1996-2012. This data concerns balance sheet characteristics of U.S. public firms, debt contract terms for bank debt, bond contract terms and data concerning collateral sources, valuation and volatility. The data can be found in different databases, such as Compustat, Capital IQ, Dealscan and Mergent-fixed income security database.

Regarding the data over collateral sources, valuation and volatility, the database is created by Biguri (2015) by using Edgar, a database with over two million different company reports for U.S. public firms. She has used a text-search algorithm, which is a code that looks for specific keywords within a text, to identify the sources of collateral that are pledged for the firms. We are looking for various sources of collateral, including tangible assets, inventories, cash, receivables, intangible assets and other type of assets. In order to construct a collateral absorption index, we multiply the dummy variables for each source of collateral by the collateral item. The collateral absorption index shows valuation of the collateral pledged. We also need to create two additional data requirements. We will construct data on the beta of the stock, which we will estimate by using linear regression. In addition, we will need data on the beta of the assets. The betas will be estimated by using the construction procedure mentioned in appendix B in Acharya et al. (2013). With all these data, we will be able to create the tables mentioned in the objectives of our thesis.

4. Plan for thesis progression

January – February

- Working on preliminary master thesis

March – April

- March 1st: Extended deadline for preliminary master thesis
- Get to know the data
- Analysis
- Descriptive analysis to see how collateral valuation and collateral volatility relates to debt structure and other firm characteristics
- OLS estimation of determinants of the debt structure.
- Regressions to test whether lower risk of assets means lower spreads on debt.

May

- Policy implications

June-August

- Finalizing the paper

September

- September 1st. Deadline for master thesis.

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