Lending an Ear to the Market -
The Credit Spread to Duration as a
Measure of Financial Constraints

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Abstract

I introduce a new market-based approach to quantify a firm’s exposure to financial constraints. The resulting measure that I call Credit Spread to Duration is a firm-specific, time-varying, continuous variable that captures the financial market’s evaluation of the respective firm’s soundness. To my knowledge this is the first measure of financial constraints that is independent of any ex ante judgment on the respective firm’s ability to raise external capital. I contribute to the empirical finance literature by providing an objective method to verify the consistency of measures of financial constraints most commonly used in the literature. On the one hand I compare my empirical results to cash-flow sensitivity related measures that are based upon the seminal paper by Fazzari et al. (1988) and used by e.g. Almeida et al. (2004) and Erel et al. (2015). On the other hand I evaluate the measures of financial constraints proposed by Kaplan and Zingales (1997), Lamont et al. (2001), Whited and Wu (2006) and Hadlock and Pierce (2010).
1 Motivation

Over the last two decades, scholars of various economic disciplines have contributed to a thriving body of empirical and theoretical literature delving into the impacts that financial constraints have on firm behavior. Several empirical studies such as Almeida and Campello (2007), and Denis and Sibilkov (2010) ascertain that financial frictions decisively affect firms’ investment behavior. Beck et al. (2005) and Bottazzi et al. (2014) find that financial constraints hinder firm growth. Greenaway et al. (2007), Berman and Héricourt (2010), and Muûls (2015) among others analyze financial constraints as an additional determinant of firms’ export market participation, while Manova (2013) incorporates financial constraints in the “new-new trade theory” framework on heterogeneous firms based upon Melitz (2003). Marquez and Yavuz (2013) deal with location choice and specialization as possible strategies for firms to mitigate against financial constraints while Desai et al. (2008) shed light on advantages multinational firms’ affiliates enjoy in contrast to their financially constrained competitors in foreign markets. Lamont et al. (2001) and Li (2011) even argue that financial constraints may predict a firm’s subsequent stock returns.

In the light of the findings that are provided by these and a lot more top level research papers it seems that the identification of financially constrained firms and the measurement of their exposure to financial frictions is plain sailing. Nevertheless a cutting edge paper by Farre-Mensa and Ljungqvist (2016) is titled “Do Measures of Financial Constraints Measure Financial Constraints?” and renders the crushing verdict that they do “not well”. The key problem is that a firm’s actual exposure to financial constraints is not directly observable. Consequently the approaches to dealing with this topic empirically are very heterogeneous. A wide variety of indirect measures are used and it remains ambiguous whether they provide a reliable identification of a firm’s extent of exposure to financial constraints.¹ Does this imply that all the research work that has been done so far must be revised? Or even worse, that a firm’s actual exposure to financial constraints cannot be measured at all?

Actually the difficulties begin with finding an objective definition of the term Financial Constraints. Everyone will agree that a firm is financially constrained if it has difficulties to raise external capital. External capital may be bank loans or credit lines, debt capital raised by issuance of fixed income securities or equity capital collected by public offerings. The basic idea of my approach is that capital costs of debt financing provide a suitable measure for a firm’s ability to raise external financing. Capital costs are approximated by a yield to maturity related key figure constructed from publicly observable information of the respective firm’s bonds traded in the market. For each firm all

¹Carreira and Silva (2010) provide a survey of empirical studies on financial constraints and their effects on firms.
non-callable straight bonds that are outstanding at a certain point in time are pooled in a portfolio. Each of these portfolios is matched to a portfolio of risk-free government bonds of the same present value and interest rate sensitivity to obtain the *Credit Spread to Duration*, which captures the market’s willingness to lend debt capital to the respective firm. The *Credit Spread to Duration* is a firm-specific, time-varying, continuous variable that captures the financial market’s evaluation of the respective firm’s soundness. To my knowledge this is the first measure of financial constraints that is independent of any *ex ante* judgment on the respective firm’s ability to raise external capital. I contribute to the empirical finance literature by providing an objective method to verify the consistency of measures of financial constraints most commonly used in the literature. On the one hand I compare my empirical results to cash-flow sensitivity related measures that are based upon the seminal paper by Fazzari et al. (1988) and used by e.g. Almeida et al. (2004) and Erel et al. (2015). On the other hand I evaluate the measures of financial constraints proposed by Kaplan and Zingales (1997), Lamont et al. (2001), Whited and Wu (2006) and Hadlock and Pierce (2010).

The remainder of the paper is structured as follows. In Section 2 I present an overview of relevant literature. The subsequent Section 3 illustrates the basic rationale behind the *Credit Spread to Duration*, while Section 4 provides details on its implementation to real data. Section 5 starts with a description of the data and provides summary statistics. Finally in Section 6 I compare the performance of the *Credit Spread to Duration* with some approaches currently used in the literature and present a way to transfer my approach to other datasets. There is a brief conclusion.
2 Literature

Despite the remarkable academic interest in the effects financial constraints have upon firms, there is no common methodology to determine whether a firm is financially constrained. Silva and Carreira (2012) provide a comprehensive overview of the approaches used to measure financial constraints. They claim that the perfect measure of financial constraints should be firm-specific, time-varying, objective and continuous and show that none of the measures presented in their study satisfies the four criteria simultaneously.

Most commonly cash-flow sensitivity related measures based upon the seminal work by Fazzari et al. (1988) are used. The rationale behind the method presented in Fazzari et al. (1988) is that firms that are financially constrained cannot obtain external debt finance or can do so only at prohibitively high costs and thus must rely on internal cash flows to fund their investment activities. According to their dividend policy firms are assigned to three classes of exposure to financial constraints such that firms that steadily pay a relatively low dividend are considered to be most constrained. Fazzari et al. (1988) find that applying this ordering the severeness of financial constraints increases as the investment to cash-flow sensitivity increases. Based on this result numerous empirical studies investigate the effect of financial constraints upon firm dynamics using cash-flow related variables as proxies for financial constraints. Regardless of whether the original investment to cash-flow sensitivity is applied or extensions like the growth to cash-flow sensitivity (e.g. Oliveira and Fortunato (2006)) or the cash to cash-flow sensitivities (Almeida et al. (2004)) are utilized, the need of an *ex ante* classification of the firms is the main point of criticism associated with these methods.

Comprising the method of Fazzari et al. (1988) rests on an *a priori* clustering of firms in subsamples labeled with e.g. “unconstrained”, “medium constrained” and “constrained” according to a segmenting variable that is assumed to provide information on a firm’s extent of exposure to financial constraints. Thus the validity of the cash-flow related proxies that are so widely used in the literature depends on the unobservable correlation of the segmenting variable with the firms’ actual exposure to financial constraints. Harsh criticism of cash-flow sensitivity related measures is leveled by Kaplan and Zingales (2000) and the ignited debate on the validity of this method is ongoing. The alternative approach proposed by Kaplan and Zingales (1997) comprises the careful reading of annual reports that are assumed to reveal the firms’ subsistent financial situation. The method involves an assignment of levels of financial constraints to the respective firms according to some predefined sets of keywords. Eventually the qualitative information obtained from the corporate reports is combined with quantitative information from annual financial statements to create a score of financial constraints. The richness of information a researcher may glean from analyzing company reports comes at the costs of a tremendous amount of effort and time. Even if abstracting from problems that may arise
due to managerial misreporting the analysis of a large sample of firms is plainly unfeasible to most researchers. The sample analyzed in Kaplan and Zingales (1997) consists of merely 49 firms over the time span from 1970 to 1984.

The results of Kaplan and Zingales (1997) can be used to assign levels of financial constraints to firms within other datasets without performing their qualitative analysis. Lamont et al. (2001) use the coefficients of a re-estimated version of the ordered logit regression performed in Kaplan and Zingales (1997) to construct the so called KZ index. Applying the index results in a continuous, firm-specific and time-varying variable that describes the level of a firm’s exposure to financial constraints. Two major drawbacks are associated with the KZ index. First, it is constructed under the assumption that the qualitative dependent variable used in Kaplan and Zingales (1997) provides an objective evaluation of financial constraints. Due to the high degree of subjective judgment associated with the manual screening of a large amount of firm reports the objectivity of the resulting score is questionable. Second, the small sample size examined in Kaplan and Zingales (1997) raises doubts on the representativeness of their results and hence on the universal applicability of the KZ index. Nonetheless the KZ index is widely used in the literature due to its intriguing simplicity of construction.

An attempt to overcome the drawbacks associated with the need of a qualitative dependent variable is presented in Whited and Wu (2006). Like Lamont et al. (2001) they construct an index of financial constraints typically referred to as WW index in the literature. Instead of relying on a qualitative segmenting variable they use a structural parameter of the Whited (1992) model.
3 Basic Rationale

Suppose that two firms $A$ and $B$ compete for a large-scale order that will yield a certain payoff $R$ a year hence in return for a payment $C$ today. Both firms rely on external finance to realize the project and approach the capital market to raise debt capital offering to redeem it by the amount $R$ in a year’s time. If the amount $C_B$ firm $B$ is able to acquire is smaller than $C_A$, obviously the market participants prefer to lend capital to firm $A$ over lending it to firm $B$. The amounts $C_A$ and $C_B$ are the result of each potential lender’s complex considerations on the respective firm’s properties and prospects. To decide whether or not to lend money to one of the firms numerous questions must be answered. What is the firm’s default probability in the lent term? How high will be the lender’s loss in case of default? How will the value of the debt change if interest rates change? How easy will it be to sell the firm’s debt? What investment alternatives are feasible? Although the answers to these and a lot more relevant questions remain the respective lender’s private information, their aggregate impact on the firm’s financial situation is apparent. Since $C_B$ is smaller than $C_A$ firm $B$ can be considered as financially constrained relatively to firm $A$.

The firms’ lending in the present example can be understood as the issuance of zero coupon bonds. For $i \in \{A,B\}$ the $i$-th zero coupon bond is characterized by its market value $C_i$, its redemption value $R$ and its term to maturity $T$. The internal rate of return $r_i$ that fulfills the price equation (1) is hence the $i$-th zero coupon bond’s yield to maturity.

$$C_i = \frac{R}{(1 + r_i)^T}$$  \(1\)

Assuming that a risk free rate $r_f$ captures the relevant market interest rate I define the $i$-th firm’s exposure to financial constraints as the normalized credit spread

$$CS_i = \frac{r_i - r_f}{1 + r_f}. \tag{2}$$

Given that $C_A > C_B$ simple algebra results in $CS_B > CS_A$. The higher the credit spread $CS_i$ the higher is the firm’s exposure to financial constraints.

The simplicity of the current example disguises several complex obstacles that must be overcome to construct the corresponding measure of financial constraints for real data. First and most obvious there are most probably no points in time at which all firms of interest have zero bond issues of the same redemption value and the same term to maturity outstanding simultaneously. I encounter this issue by means of portfolio theory. For every point in time I construct portfolios that have the same characteristics as the zero coupon bonds presented in the humble example above.
A second challenge becomes apparent as one carefully examines the corporate bonds market. It transpires that there is a vast variety of fixed income instruments that firms issue to meet their financing needs and often several issues of a single firm are traded contemporaneously. The corporate bonds differ not just in present values, interest rates and terms to maturity but in a lot more technical aspects, like the number of coupon payments per year, the interest accrual method, the presence of odd coupon periods, the presence of embedded options, just to list a few. The specific characteristics of corporate fixed income securities that I deal with impose a high degree of technical complexity to the analysis. To avoid unnecessary complexity in the valuation of the instruments I restrict the fixed income instruments to non-callable straight fixed-coupon securities. Moreover the restriction ensures comparability to US Treasury notes and bonds that I use to obtain the risk free rates for the study.

The basic idea is to transform each firm’s outstanding bond issues at a certain point in time to a portfolio that has the same properties as a zero coupon bond. The result of this procedure for firm \( i \) is a portfolio that has the present value \( C_i \), the redemption value \( R_i \) and the term to maturity \( T_i \). For each firm a corresponding portfolio of US Treasuries is constructed that has the present value \( C_{f,i} = C_i \), the redemption value \( R_{f,i} \neq R_i \) and the term to maturity \( T_{f,i} = T_i \). Using the pair of price equations

\[
C_i = \frac{R_i}{(1 + r_i)^{T_i}} \quad (3)
\]

and

\[
C_{f,i} = \frac{R_{f,i}}{(1 + r_{f,i})^{T_{f,i}}} \quad (4)
\]

simple algebra yields

\[
CS_i = \frac{1 + r_i}{1 + r_{f,i}} - 1 \quad (5)
\]

and

\[
CS_i = \left( \frac{R_i}{R_{f,i}} \right)^{\frac{1}{T_i}} - 1. \quad (6)
\]

The resulting credit spread \( CS_i \) is an adequate measure of a firm’s exposure to financial constraints at the considered point in time. However it is inappropriate to compare the firms in terms of this spread because the constructed portfolios differ in their times to maturity \( T_i \). To ensure comparability of the measure \( CS_i \) across all firms at a certain point in time, I introduce a benchmark point in time \( B \) and use an appropriate term structure of interest rates to discount the redemption values \( R_i \) and \( R_{f,i} \) to this point in time. With \( r_{T_i,B} \)
and \( r_{T, i} \) and \( r_{f, i} \) representing the appropriate discount rates from the term structure and \( r_{ad j, i} \) and \( r_{f, i} \) being the respective yields to maturity of the portfolios, the adjusted price equations are:

\[
C_i = \frac{R_i (1 + r_{T, i})^{B - T_i}}{(1 + r_{ad j, i})^B} \tag{7}
\]

\[
C_{f, i} = \frac{R_{f, i} (1 + r_{f, i})^{B - T_{f, i}}}{(1 + r_{ad j, f, i})^B} \tag{8}
\]

Assuming that \( C_i = C_{f, i} \), \( T_i = T_{f, i} \) and hence \( r_{T, i} = r_{f, i} \), corollary 1 provides a measure of financial constraints that is comparable across all firms at a certain point in time.

**Corollary 1** The adjusted credit spread \( CS_{i}^{adj} \) for each firm \( i \) is a positive monotonic transformation of the credit spread \( CS_i \) and is given by the equation

\[
CS_{i}^{adj} = (CS_i + 1) \cdot \left( \frac{R_i}{R_{f, i}} \right)^{\frac{T_i - B}{T_i \cdot B}} - 1. \tag{9}
\]

**Derivation.**

i) Rearranging (7) and (8) yields

\[
1 + r_{ad j, i} = \left( \frac{R_i}{C_i} \right)^{\frac{1}{B}} \cdot (1 + r_{T, i}^{B - T_i}) \tag{10}
\]

\[
1 + r_{ad j, f, i} = \left( \frac{R_{f, i}}{C_{f, i}} \right)^{\frac{1}{B}} \cdot (1 + r_{f, i}^{B - T_{f, i}}) \tag{11}
\]

ii) Let \( B = T_i + a_i \) with \( a_i \in \mathbb{R} \). Then it holds

\[
\frac{1}{B} = \frac{1}{T_i} + \frac{T_i - B}{T_i \cdot B}. \tag{12}
\]
iii) Plugging (12) in (10) and using the identity (3) results in

\[ 1 + r_i^{adj} = (1 + r_i) \cdot \left( \frac{R_i}{C_i} \right)^{T_i-B_{T_i-B}} \cdot (1 + r_{T_i B})^{B-T_i_B}. \] (13)

iv) Plugging (12) in (11) and using the identities (4), \( C_i = C_{f,i}, T_i = T_{f,i} \) and \( r_{T_i B} = r_{T_f B} \) results in

\[ 1 + r_{f,i}^{adj} = (1 + r_{f,i}) \cdot \left( \frac{R_{f,i}}{C_i} \right)^{T_i-B_{T_i-B}} \cdot (1 + r_{T_i B})^{B-T_i_B}. \] (14)

v) Plugging (13) and (14) in the definition (2) results in

\[ CS_i^{adj} = \frac{1 + r_i}{1 + r_{f,i}} \cdot \left( \frac{R_i}{R_{f,i}} \right)^{T_i-B_{T_i-B}} - 1. \] (15)

vi) Applying identity (5) to (14) results in corollary 1.

Corollary 1 shows that the adjusted measure of financial constraints \( CS_i^{adj} \) is independent of the term structure of interest rates that was introduced in equations (7) and (8). It can be constructed from the individual firm’s measure \( CS_i \) given a benchmark point in time \( B \).
4 Modelling Financial Constraints with Real Data

Consider a firm that has \( n \) non-callable straight bond issues circulating in the market at a certain point in time \( t_0 \). The amount of debt capital raised by the \( i \)-th issue is denoted by \( C_i \) with \( i \in [1,n] \) and the present value of one bond of the \( i \)-th issue including accrued interest is denoted by \( DP_i \). The firm’s capital-weighted bond portfolio at \( t_0 \) has the present value:

\[
DP_{PF} = \sum_{i=1}^{n} \frac{C_i}{\sum_{i=1}^{n} C_i} DP_i
\]  

Each bond in the portfolio has a specific coupon payment schedule characterized by a vector of constant interest payments \( CF_i \) and a redemption value \( RV_i \) that are due on points in time \( \{t'_{i1}, t'_{i2}, \ldots, t'_{im}\} \). Hence the portfolio’s present value at \( t_0 \) is

\[
DP_{PF} = \sum_{i=1}^{n} \frac{C_i}{\sum_{i=1}^{n} C_i} \sum_{j=1}^{m} \frac{CF_i}{(1+y_i)^{t'_{ij}-t_0}} + \frac{RV_i}{(1+y_i)^{t'_{im}-t_0}}
\]

where \( y_i \) represents the yield to maturity of the \( i \)-th issue. To find the yield to maturity of the portfolio, \( y_{PF} \) is substituted by \( y_{PF} \) and the equation is solved for \( y_{PF} \).

To evaluate the portfolio’s sensitivity to changes in interest rates the function \( DP_{PF}(y_{PF}) \) is approximated by a 3-rd order Taylor polynomial:

\[
\widehat{DP_{PF}}(y_{PF}) = DP_{PF}(y_0) + \frac{dDP_{PF}(y_0)}{dy_0}(y_{PF} - y_0)
\]

\[
+ \frac{1}{2} \frac{d^2DP_{PF}(y_0)}{dy_0^2}(y_{PF} - y_0)^2 + \frac{1}{6} \frac{d^3DP_{PF}(y_0)}{dy_0^3}(y_{PF} - y_0)^3
\]

The absolute change of the portfolio value \( \Delta \widehat{DP_{PF}} = DP_{PF}(y_{PF}) - DP_{PF}(y_0) \) due to a change of \( \Delta y = y_{PF} - y_0 \) in interest rates is hence:

\[
\Delta \widehat{DP_{PF}} = \frac{dDP_{PF}(y_0)}{dy_0} (\Delta y) + \frac{1}{2} \frac{d^2DP_{PF}(y_0)}{dy_0^2} (\Delta y)^2 + \frac{1}{6} \frac{d^3DP_{PF}(y_0)}{dy_0^3} (\Delta y)^3
\]

Dividing the equation above by the portfolio value at \( y_0 \) yields the approximate percentage change in the present value of the portfolio due to an increase in interest rates by \( \Delta y \) percentage points:

\[
\% \Delta \widehat{DP_{PF}} = \frac{DP_{PF}(y_0)}{DP_{PF}(y_0)} (\Delta y) + \frac{1}{2} \frac{DP_{PF}(y_0)}{DP_{PF}(y_0)} (\Delta y)^2 + \frac{1}{6} \frac{DP_{PF}(y_0)}{DP_{PF}(y_0)} (\Delta y)^3
\]

The three summands of the approximation formula incorporate the bond portfolio’s price.
elasticities modified Duration ($D_{\text{mod}}$), Convexity ($\kappa$) and Theta ($\Theta$) the so-called twist parameter. According to the usual practice in fixed income analysis these bond portfolio’s price elasticities are defined as

$$D_{\text{mod}}^{PF} = -\frac{DP_{PF}'(y_0)}{DP_{PF}(y_0)}$$

$$\kappa^{PF} = \frac{DP_{PF}''(y_0)}{DP_{PF}(y_0)}$$

$$\Theta^{PF} = -\frac{DP_{PF}'''(y_0)}{DP_{PF}(y_0)}$$

Using equation (1) the $k$-th derivative of $DP_{PF}$ with respect to the portfolio yield to maturity $y_0$ at $t_0$ is

$$\frac{d^k(DP_{PF}(y_0))}{dy_0^{(k)}} = \sum_{i=1}^{n} \frac{C_i}{\sum_{i=1}^{n} C_i} \cdot \frac{d^k(DP_i)}{dy_0^{(k)}}$$

Hence equations (6) to (8) can be rewritten to

$$D_{\text{mod}}^{PF} = \frac{\sum_{i=1}^{n} \frac{C_i}{\sum_{i=1}^{n} C_i} \cdot D_{\text{mod}}^{i,y_0} \cdot DP_i}{DP_{PF}(y_0)}$$

$$\kappa^{PF} = \frac{\sum_{i=1}^{n} \frac{C_i}{\sum_{i=1}^{n} C_i} \cdot \kappa^{i,y_0} \cdot DP_i}{DP_{PF}(y_0)}$$

$$\Theta^{PF} = \frac{\sum_{i=1}^{n} \frac{C_i}{\sum_{i=1}^{n} C_i} \cdot \Theta^{i,y_0} \cdot DP_i}{DP_{PF}(y_0)}$$

where $D_{\text{mod}}^{i,y_0}$, $\kappa^{i,y_0}$ and $\Theta^{i,y_0}$ are the $i$-th bond’s respective price elasticities calculated at the bond portfolio’s yield to maturity $y_0$. The individual bond’s price elasticities are computed according to the generalized reduction formulas provided by Kuipers (2006), which consider the case of odd first coupon periods. Since Kuipers (2006) develops the formulas for US Treasury Notes and Bonds only, they are generalized for application to fixed income instruments that pay interest more or less than twice per year and follow other interest accrual methods than Actual/Actual.

To identify the excess return the market demands from an investment in the particular firm’s debt each portfolio of corporate bonds is matched with a portfolio of on-the-run US Treasury securities. The US Treasury portfolio is constructed such that in $t_0$ it has the
same present value, modified Duration, Convexity and Theta as the portfolio of corporate bonds.

Since the portfolios have different maturity dates it is inappropriate to compare them in terms of yield to maturity. Instead we introduce the yield to duration as the correct measure of return for this purpose. Following the interpretation of duration provided by Fabozzi (2007) a portfolio of non-callable straight bonds with duration $DUR$ has the price sensitivity to rate changes of a zero coupon bond with $DUR$ years remaining to maturity. The yield to duration is constructed such that it is the yield to maturity of this hypothetical zero coupon bond. Particularly this hypothetical zero coupon bond has the portfolio’s present value and duration such that the yield to duration $ytd$ satisfies the equation

$$DP_{PF} = \frac{X_{PF}}{(1 + ytd)^{D_{mod} - t_0}}$$  \hspace{1cm} (28)

To demonstrate the calculation of the yield to duration let’s consider a single non-callable straight bond with the present value including accrued interest $DP$ and modified duration $D_{mod}$ at the valuation date $t_0$. The bond’s interest rate per period is $r$, its redemption value is $RV$ and its redemption schedule is $\{t_1, t_2, ..., t_k, t_{l}, ..., t_m\}$ with $t_k < D_{mod} < t_l$. The yield to duration of this bond is the internal rate of return $ytd$ that fulfills the equation

$$DP = \frac{X}{(1 + ytd)^{D_{mod} - t_0}}$$  \hspace{1cm} (29)

with

$$X = \sum_{i=1}^{k} r \cdot RV \cdot (1 + r)^{D_{mod} - t_i} + \sum_{l=t}^{m} \frac{r \cdot RV}{(1 + r)^l - D_{mod}} + \frac{RV}{(1 + r)^{D_{mod} - D_{mod}}}$$  \hspace{1cm} (30)

Now turning back to the portfolios of corporate bonds and credit risk free US Treasury securities it holds

$$\frac{X_{PF}}{(1 + ytd_{PF})^{D_{mod} - t_0}} = \frac{X_{US}}{(1 + ytd_{US})^{D_{mod} - t_0}}$$  \hspace{1cm} (31)

Defining the credit spread to duration $CS$ as

$$CS = \frac{ytd_{PF} - ytd_{US}}{1 + ytd_{US}}$$  \hspace{1cm} (32)
after some algebraic remodeling we get:

\[ CS = \left( \frac{X_{PF}}{X_{US}} \right)^{t_0-D_{mod}} - 1 \]  

(33)

The credit spread to duration shall be comparable across all firms that have bond issues outstanding at the point in time \( t_0 \).

Here corollary 1 is used and \( B \) is chosen ...
5 Data

In the subsequent empirical analysis I use a unique dataset of matched firm-bond data that spans the period from 2006 to 2015 and consists of about 700 US firms, about 7,500 corresponding corporate bonds and about 1,000 US Treasury Notes and Bonds. The required bond data is obtained from the Thomson Reuters Datastream database and combined with information on firm characteristics retrieved from Bureau van Dijk’s Orbis company database.

6 Comparison to other Measures of Financial Constraints

I contribute to the empirical finance literature by providing an objective method to verify the consistency of measures of financial constraints most commonly used in the literature. On the one hand I compare my empirical results to cash-flow sensitivity related measures that are based upon the seminal paper by Fazzari et al. (1988) and used by e.g. Almeida et al. (2004) and Erel et al. (2015). On the other hand I evaluate the measures of financial constraints proposed by Kaplan and Zingales (1997), Lamont et al. (2001), Whited and Wu (2006) and Hadlock and Pierce (2010).

7 Conclusion
References


