Asymmetry of Information, Wealth Appropriation, Bank Loan Covenants and the 
Signaling Role of Accounting Conservatism

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Abstract

This study analyzes both analytically and empirically the private debt contracting relationship between covenants and conservative accounting under asymmetric information. Instead of moral hazard, asymmetric information is characterized in this study by borrowers’ willingness to appropriate wealth from lenders to themselves. We find that conservatism and covenants act as complements to signal borrowers’ commitment not to appropriate wealth from lenders in the high information asymmetry regime. No such a relation obtains in the low information asymmetry regime. We further show that in the high information asymmetry regime, borrowers with high levels of conservatism and tight covenants generally enjoy lower interest rates by comparison to borrowers with low levels of conservatism and loose covenants. Consistent with our signaling theory, we document that borrowers with a high level of conservatism and tight covenants in the high information asymmetry regime are less likely to make future wealth transfers from creditors to equity holders. Our empirical results are robust to alternative measures of conservatism and covenant restrictiveness.

Keywords: Information asymmetry; accounting conservatism; debt covenants; signaling; wealth appropriation.
1. Introduction

This study analyzes both analytically and empirically the private debt contracting relationship between covenants and conservative accounting under asymmetric information. The model and the empirical work differ from prior literature on a number of important dimensions. First, unlike the moral hazard framework of Ahmed et al. (2002) and Watts (2003), information asymmetry in our study is characterized by lenders not being fully informed about debtor’s willingness to appropriate lenders’ wealth. More specifically, we presume that lenders are less well-informed than debtors about the latter’s potential wealth transferring proclivities and explore the implications of this adverse selection on the relation between conservative accounting and the efficiency of debt contracts. Second, ours is a signaling model. Borrowers signal their proclivity to appropriate lenders’ wealth via conservatism and covenants in order to maximize their payoffs. Third, along with more standard empirical approaches, we employ the switching regression methodology of Maddala (1983, 1986, 1991) to account for the endogenous nature of asymmetric information regimes while simultaneously estimating the relation between covenants and conservatism.

Our results differ from that of the current literature. Importantly, we show theoretically and find empirically that the relation between covenants and accounting conservatism is highly nuanced and is conditioned upon the degree of information asymmetry. In particular, we show that conservative accounting and covenants are complements in the high information asymmetry regime, but unrelated in the low information asymmetry regime. In contrast, conventional empirical studies either find no relation between covenants and conservatism or the relation is

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1 Clearly, this has important implications for how information asymmetry is measured empirically. Moreover, market based measures of information asymmetry, such as the PIN measure used by LaFond and Watts (2008) would appear to be irrelevant in our private debt contracting milieu (see Wittenberg-Moerman, 2008 on this issue).
presumed to hold independently of the degree of information asymmetry.\textsuperscript{2} Furthermore, our results regarding conservatism per se are in direct opposition to the current literature. The “conventional” view of conservatism based on moral hazard finds that debt holders demand more conservatism for firms with higher risk of agency conflicts between debt holders and equity holders (Ahmed et al., 2002). In contrast, our signaling framework predicts and finds the opposite result, namely that in an environment with high information asymmetry in which lenders are more uncertain about borrowers’ proclivity to appropriate their (lenders) wealth, “good” firms with lower agency conflicts are more likely to signal their type via conservatism (and covenants) to reduce the cost of debt relative to “bad” firms with higher agency conflicts.\textsuperscript{3}

Buttressed by theory, we obtain other interesting empirical results. We show that more conservative financial reporting, combined with more covenant restrictions, reduces the cost of debt in the high information asymmetry regime. In contrast, we fail to find value for adopting conservative accounting \textit{and} financial covenant restrictions when the firm is in the low information asymmetry regime. Finally, we pick excessive payouts to shareholders as one example of wealth appropriation by borrowers. Focusing on the high information asymmetry regime, we verify that firms that adopt stringent conservative accounting and restrictive covenants are less likely to make excessive payouts to shareholders.

It bears noting that our results are both statistically and economically significant and are fairly robust to alternative measures of conservatism and alternative measures of financial covenant restrictiveness. Overall, our signaling framework provides a nuanced view regarding the signaling effectiveness of debt contracts and accounting conservatism.

\textsuperscript{2} See Section 2.1 for the related literature.
\textsuperscript{3} By good (bad) firms we mean firms that are less (more) likely to appropriate lenders’ wealth.
The remainder of the paper is organized as follows. Section 2 motivates the wealth appropriation view of asymmetric information and develops the model-based testable hypotheses. Section 3 outlines the research design. Section 4 describes the data sources and the empirical constructs. Section 5 reports the empirical findings. Section 6 concludes. The appendix develops an analytical model of debt contracting under adverse selection that both motivates and supports the empirical analyses.

2. Motivation and Hypotheses Development

2.1 Wealth Appropriation

Debt covenants are generally understood to be contractual features that protect creditors from activities that transfer wealth from them to shareholders, activities such as excessive dividend payments and risk shifting investments (Smith and Warner, 1979). For example, a large number of studies in the accounting and finance literatures have focused on the size, costs, and consequences of wealth appropriation by borrowers through dividends and the effectiveness of contractual cures (e.g., Smith and Warner, 1979; Kalay, 1982; Healy and Palepu, 1990; Long, Malitz and Sefcik, 1994; Gjesdal and Antle, 2001; Douglas, 2003; Brockman and Unlu, 2009). The general tenor of these findings suggests that dividend policy significantly affects the agency cost of debt, and dividend covenants could mitigate this cost.

Given the nature of debt contracts, there are at least two countervailing considerations. First, covenants, by restricting managers’ choice set, may help to solve one problem but then act to exacerbate others. For example, restrictive general covenants, such as the obligation not to pay out dividends over certain thresholds (Healy and Palepu, 1990), offer the advantage of being easily verifiable. Nevertheless they bear a high opportunity cost insofar as they may negatively
affect firms’ external financing in the future and, therefore, inefficiently restrict firms’ production and investment policies (Smith and Warner, 1979; Berlin and Mester, 1992; Rajan and Winton, 1995; Kahan and Yermack, 1998; Triantis, 2001). Second, debt contracts are incomplete in practice due to the difficulty in prescribing all future contingencies in contract provisions (Christensen and Nikolaev, 2009; Li, 2010). The incomplete contracting literature predicts that the initial terms of a debt contract might have to be renegotiated upon future unforeseen contingencies (Aghion and Bolton, 1992; Hart, 1995). In fact, one major contingency ex post is borrowers’ need for more flexible dividend payout, which often prompts the renegotiation of debt contracts (Roberts and Sufi, 2009). In short, debt contract provisions alone may not fully resolve wealth appropriation problems. Furthermore, information asymmetry between lenders and borrowers likely exacerbates the difficulty of screening and monitoring borrowers by creditors (e.g., Bharath, Dahiya, Saunders and Srinivasan, 2009). As a result, on the one hand, when faced with the uncertainty of the borrowers’ type in terms of their ability to expropriate lenders’ wealth, creditors will likely pool firms into the same risk categories and price debt on the basis of the average risk profile within that category (i.e., a cross-subsidization problem). On the other hand, borrowers with differential proclivity for wealth appropriation may have an incentive to reveal their type through costly signaling mechanisms, including financial reporting.

We conjecture that the failure of extant empirical studies to explicitly consider the effect of information asymmetry regarding wealth appropriation on the debt contracting demand for conservatism may be driving the literature's inconclusive results regarding the relation between covenants and conservatism. The empirical literature is indeed inconclusive. Nikolaev (2010)

4 Also notable is Spier (1992), who demonstrates that, in the presence of transaction costs, contractual incompleteness may arise from adverse selection.
finds that the number of covenants is positively correlated with accounting conservatism in a sample of public debt contracts. Zhang (2008) reports that conservatism benefits lenders because it accelerates debt covenant violations and, consequently, provides a timelier signal of default risk. These studies suggest that debt covenants and conservatism are complements. In contrast, Vasvari (2006) finds that conservatism reduces the number of general and financial covenants. Frankel and Litov (2007) and Begley and Chamberlain (2009) fail to find a clear association between covenants and conservatism.

2.2 Model-Based Hypotheses Development

We presume that creditors are less well-informed than shareholder-oriented management about potential wealth transfers from debt to equity, and explore the implications of this adverse selection on conservative accounting and debt covenants. Intuitively, lacking information about future wealth transfers, creditors will form inferences about management’s intent based on the debt contract offered. In equilibrium, management will have to compensate creditors for the inferred amount of wealth appropriation activity. Managers are distinguished by those who do not have much wealth appropriation activity at their disposal (Good types) and those that do (Bad types).

When the information asymmetry about manager type is high (the high information asymmetry regime), creditors will price protect themselves by charging a relatively high interest rate. This provides an incentive for the good-type manager to distinguish herself from the bad-type and get a lower interest rate by offering a combination of costly conservative accounting and covenant signals. Both are costly in that higher conservatism increases the likelihood that a

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5 Both Ahmed et al. (2002) and Zhang (2008) document that creditors will reward debt contracting efficiency due to conservatism by lowering the cost of debt.
6 The intuition in this section is consistent with and motivated by the analytical model in the appendix.
restrictive covenant is violated and violation of the covenant could cause property rights to transfer from shareholders to creditors. Unlike shareholders who continue to invest in deteriorating projects because of limited liability, creditors may prefer to liquidate these projects when the conservative accounting signal indicates that the expected payoff from continuing the project falls below its liquidation value. This asymmetric payoff structure creates a tension between creditors and residual claimants, and a need for covenants that regulate property rights.

In this separating equilibrium, neither covenants nor conservative accounting alone are optimal. Intuitively, covenants specify conditions under which control rights transfer from shareholders to creditors, a role that accounting conservatism cannot play. Absent accounting conservatism, covenants will have to be very restrictive and, hence, costly in order for the good types to separate themselves from the bad types. When conservatism can also be used to signal type, covenants need not be overly restrictive, reducing overall signaling costs. The unique feature of our model is that in equilibrium (under the given parameter conditions), only a combination of covenants and conservative accounting optimally deters the bad type from mimicking the good type. In this sense, conservative accounting and covenants are complements in the high information asymmetry regime.

In contrast, when the information asymmetry about borrower type is low (the low information asymmetry regime), the good-type manager can either reveal her type through costly signaling of higher levels of conservatism and tighter covenants, thereby enjoying a lower interest rate, or choose to pool with the bad type and be charged the pooling rate. Which option is chosen depends on the initial (costless) signal about borrower type. If the lender receives an initial bad signal, then the lender will treat the borrower who generated this signal as a bad-type

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7 This result is consistent with Beatty, Weber and Yu (2008), who empirically challenge the conjecture by Guay and Verrecchia (2006) that firms can always undo the effect of conservatism by adjusting debt contracts to the optimal level.
borrower and charge a high interest rate. Although in this case too the good-type borrower finds it beneficial to use costly signals to distinguish her type, in a low information asymmetry environment the probability that a good-type borrower generates a bad signal is small. Generally, in a low information asymmetry environment, the good-type borrower will generate a good signal, in which case the lender will update his belief of the type and charge a low pooling rate. Since there will be a very small number of bad-type borrowers who generate good signals, this pooling rate will be relatively close to what a good-type borrower might receive when she decides to reveal her type through costly signaling. Thus, the good-type borrower will most often prefer being pooled with the bad-type in the low asymmetric information regime.\(^8\) In that case, accounting conservatism (beyond what is mandated by GAAP) is redundant and the borrower will use covenants alone to affect a transfer of control from shareholders to creditors, if that should prove necessary. Therefore, in a low asymmetric information environment, there is no necessary relation between covenants and conservative accounting.

In summary, in the high asymmetric information regime, good-type managers will have incentives to reveal their type through a combination of accounting conservatism and debt covenants, deterring bad-type managers from mimicking the good type. Contrariwise, in the low asymmetric information regime, a pooling equilibrium is likely to obtain and managers will utilize debt covenants but will have no demand for conservative accounting per se.\(^9\) This discussion leads to the following formal hypotheses concerning the relation between conservatism and covenants stated in the alternative form:

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\(^8\) In contrast, when information asymmetry is high, costless signals do not provide much information about borrower type. The relation between conservatism and covenants will be predominantly set by pooled borrowers with good signals and bad-type borrowers with bad signals. Because the pooling rate for good-type and bad-type borrowers is relatively high, good-type borrowers, with either a good or bad signal have an incentive to signal their type through a higher level of conservatism and tighter covenants.

\(^9\) To the extent that GAAP mandates conservative accounting, less restrictive covenants will be optimal for all firms.
**H1a:** Conservative accounting and debt covenants are complements in the high information asymmetry regime.

**H1b:** Conservative accounting and debt covenants are unrelated in the low information asymmetry regime.

In the absence of information asymmetry, the adoption of more conservative accounting and/or stringent covenants might not reduce interest rates. With high levels of asymmetric information, good-type management will reveal their type through costly signaling devices (more conservative accounting and more restrictive covenants) in order to obtain lower interest rates, yielding the following hypothesis expressed in the alternative.\(^{10}\)

**H2:** Conditioned on the high information asymmetry regime, borrowers with conservative accounting and tight covenants enjoy a lower loan spread.

Another implication of our analysis is that good-type managers in the high information asymmetry regime will not make excessive transfers to their shareholders at the expense of their debt holders. We formulate (and test) this hypothesis with reference to excess dividends and stock repurchases.\(^{11}\)

**H3:** Under the high information asymmetry regime, borrowers with conservative accounting and tight covenants are less likely to make future wealth transfers from debt holders to themselves.

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\(^{10}\) We do not have a directional prediction for borrowers in the low information asymmetry regime.

\(^{11}\) Again, we do not have a directional prediction for borrowers in the low information asymmetry regime.
3. Research Design

3.1 Testing H1: Does Conservatism Correlate with Covenants Under Alternative Information Asymmetry Regimes?

Hypothesis 1 predicts different relations between accounting conservatism and covenants depending on the degree of information asymmetry between borrowers and lenders.

We assume that there are two separate information asymmetry regimes, each presenting a different relation between conservatism and debt covenants. We estimate the following pooled cross-sectional time-series regression models separately for firms residing in the high information asymmetry regime (Regime I) and the low information asymmetry regime (Regime II):

\[
\text{FinCov}_{i,t} = \alpha_0 + \alpha_1\text{Cons}_{i,t-1} + \sum_{j=2}^{7} \alpha_j\text{LoanControls}_{i,t} + \sum_{k=8}^{12} \alpha_k\text{FirmControls}_{i,t-1} + \sum \delta_j\text{year} + \epsilon_{i,t} \quad (1)
\]

The dependent variable, \(\text{FinCov}_{i,t}\), measures the financial covenant restrictions undertaken by firm \(i\) at time \(t\). \(\text{Cons}_{i,t}\) is the conservatism metric for firm \(i\) at time \(t\). Following Beatty, Weber and Yu (2008), we control for loan and firm characteristics in Equation (1). Industry dummies are also included to control for industry fixed effects. Following Petersen (2008), we adjust standard errors by two-way clustering at the firm- and year-levels.

3.2 Testing H2: Do Conservatism and Covenants Affect Loan Spreads in the High Information Asymmetry Regime?

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\(^{12}\) We control for the potential endogeneity of these regimes using switching regressions in the robustness section below.

\(^{13}\) We follow the industry classifications of Barth, Hodder and Stubben (2008).
Hypothesis H2 is conditioned on being in the high information asymmetry regime. We estimate the effect of conservatism and covenants on loan spreads separately for each regime using the following OLS regression:

\[
\text{Spread}_{i,t} = \lambda_0 + \lambda_1 \text{Cons}_{i,t-1} + \lambda_2 \text{FinCov}_{i,t} + \lambda_3 \text{Cons}^* \text{FinCov}_{i,t} \\
+ \sum_{j=4}^{8} \lambda_j \text{LoanControl}_{i,t} + \sum_{j=9}^{14} \kappa_j \text{FirmControl}_{i,t-1} + \sum \delta_i \text{Industry} + \delta_{i,t} \tag{2}
\]

where \(\text{Spread}\) is the loan’s spread over LIBOR at issue date. Our main focus here is on the coefficient estimates for the interaction term \(\lambda_3\). Following Hypothesis 2, we expect \(\lambda_3\) to be negative in the high information asymmetry regime. We also control for loan-specific and firm-specific variables. Furthermore, we adjust standard errors by two-way clustering at the firm- and year-levels.

3.3 Testing H3: Are Borrowers who signal by Conservatism and Covenants Less Likely to Make Wealth Appropriation?

To assess the likelihood that borrowers with conservative accounting and tight covenants will make future wealth appropriation in the high asymmetry regime (Hypothesis 3), we estimate a Probit regression separately for each regime of the form:

\[
\text{Prob}(\text{Transfer}_{i,t} = 1) = F(\kappa_0 + \kappa_1 \text{Cons}_{i,t-1} + \kappa_2 \text{FinCov}_{i,t-1} + \kappa_3 \text{Cons}^* \text{FinCov}_{i,t-1} \\
+ \sum_{j=4}^{8} \kappa_j \text{LoanControl}_{i,t-1} + \sum_{j=9}^{14} \kappa_j \text{FirmControl}_{i,t-1} + \sum \delta_i \text{Industry} + \epsilon_{i,t}) \tag{3}
\]

The dependent variable, \(\text{Transfer}_{i,t}\), is a dummy variable that equals 1 if a firm involved in facility \(i\) in year \(t\) makes a wealth transfer to shareholders at the expense of debt holders, and 0 otherwise. In this study, we measure wealth appropriation activities by abnormal payouts. More specifically, following Boudoukh, Michaely, Richardson and Roberts (2007), we calculate the
total payout as dividends (COMPUSTAT #dvc) plus repurchases (total expenditure on the purchases of common and preferred stocks (COMPUSTAT #prstkc) plus any reduction in the value of the net number of preferred stocks outstanding (COMPUSTAT #pstkvr)). Following Grullon, Paye, Underwood and Weston (2007) and Banyi, Dyl and Kahle (2008), we choose the following determinants of total payouts: market capitalization (the percentile in which the firm falls on the distribution of equity market values for NYSE firms in year $t$), market-to-book ratio, return on assets, sales growth, the logarithm of firm age, the logarithm of stock return volatility, retained earnings, stock options outstanding, leverage, the logarithm of total assets, free cash flows, and stock returns. To come up with a prediction of total payouts, we use the entire COMPUSTAT population from 2000 to 2008 to estimate the Probit model of the determinants of total payouts with year and industry fixed effects. Firm-year observations predicted not to pay out but with an actual positive total payout are coded as abnormal payout observations.

Our main variable of interest is the interaction term $Cons^{*}FinCov$ in Equation (3). Hypothesis 3 predicts a negative coefficient $\kappa_3$ for $Cons^{*}FinCov$ in the high information asymmetry regime.

4. Data Sources and Empirical Constructs

4.1 Data Sources and Sample Construction

Loan data are obtained primarily from the Dealscan database supplemented by net worth covenants data from the SDC database. Accounting and stock returns data are obtained from the quarterly COMPUSTAT and Center for Research in Security Prices (CRSP) files. Institutional ownership data are obtained from Thompson Financial’s CDA/Spectrum database.
The Dealscan database is used for information on firms’ bank loan facilities, including spread over LIBOR, maturity structure, size, loan types (e.g., lines of credit, term loans, etc.), and covenants. The initial data consists of 33,590 deals (49,704 loan facilities) from 2000 to 2007. We carefully match each borrower’s and/or borrower’s parent name to CRSP/COMPUSTAT using both algorithmic matching and manual checking to obtain the GVKEY of borrowers. Matching reduces the sample to 8,698 loan deals (12,334 loan facilities) and 2,859 borrowers. We further require the availability of CRSP/COMPUSTAT firm data at the year-end, prior to the loan origination date, thereby further reducing the sample to 3,021 loan deals (4,228 loan facilities) and 1,433 borrowers. Dropping firms with negative book equity yields the final sample of 2,887 loan deals (4,007 loan facilities) and 1,262 borrowers. The resulting panel of loans is fairly evenly distributed across the sample period.

We also identify lenders’ equity voting stakes in each borrowing firm from the data provided by Thomson Financial (see Section 4.4 for determinants of information asymmetry regimes). We chose year 2000 as the beginning of our sample period because this was the first year when the data on institutional investors’ voting stakes became available. We further match the above sample with the Thomson Financial Form 13F database by lender name and by quarter of loan origination (using both algorithmic matching and manual checking) to obtain information on lenders’ holdings of borrower equity, if any.

4.2 Measures of Accounting Conservatism

We use four different metrics of conservatism.\(^{14}\) Recent studies, such as Givoly, Hayn and Natarajan (2007), advocate using multiple metrics to assess conservatism, both because of

\(^{14}\) We analyze two more conservatism measures in the robustness section.
potential measurement error in any given firm-level metric and because each metric may capture distinct aspects of conservatism.

These conservatism metrics are estimated for fiscal periods prior to the time that the firm enters into the debt contract. Although borrowers and lenders cannot normally contract on borrowers’ future level of accounting conservatism, the prior literature provides at least two reasons as to why managers are expected to commit to accounting conservatism after signing a debt contract. First, a lending relationship is not a one-shot game so a good reputation is crucial to a firm’s access to outside capital (Diamond, 1991). Second, failure to adhere to conservative accounting policies increases the firm’s litigation risk (Basu, 1997; Qiang, 2007) and exposes the firm’s auditor to such risk (Nikolaev, 2010).

Our first two metrics of conservatism are based on Givoly and Hayn (2000). The first metric, $\text{NonOppAccr}$, measures the extent to which earnings include negative non-operating accruals. For each sample firm, we calculate non-operating accruals as net income (#172) + Depreciation and Amortization (#14) – operating cash flow (#308) + decreases in accounts receivable (#302) + decreases in inventory (#303) + increases in accounts payable (#304) + increases in accrued income tax (#305), scaled by total assets (#6). $\text{NonOppAccr}$ is calculated as minus one times average non-operating accruals for the five years prior to the firm entering into the debt contract. Our second metric, $\text{Skewness}$, is defined as minus one times the ratio of the skewness in quarterly earnings (#69) scaled by total assets (#44) to the skewness in cash flows (#108) scaled by total assets.$^{15,16}$ We measure $\text{Skewness}$ using a maximum of 20 quarters and a minimum of 5 quarters of data prior to entering into the contract.

$^{15}$ Since the items in the statement of cash flows reflect year-to-date figures for each quarter, we adjust them by taking the increments.

$^{16}$ Zhang (2008) employs the same metric except that she uses annual rather than quarterly data.
We use the Basu (1997) differential timeliness metric for our third conservatism measure. We first group the firm-year data by 3-digit SIC industry codes, and then conduct annual pooled cross-sectional regressions to estimate the regression coefficients, for industries with at least 20 observations. Consistent with Basu (1997), we measure Earnings using earnings per share before extraordinary items (#58) scaled by market price at the end of the fiscal year (#199). We measure returns, Return, using the annual return over the 12-month period ending 3 months after the fiscal year-end. Return is also interacted with NegRet, an indicator variable that is one if Return is negative and zero otherwise. We label the interaction of NegRet with the Return variable as Basu. The latter is Basu’s (1997) measure of the extent to which firms are conservative. Thus, in each year and in each 3-digit SIC industry, all firms will have the same measure of conservatism.

Our fourth conservatism measure is based on the conservatism index (PZ_Cscore) from Penman and Zhang (2002), which measures the effect of conservative accounting on the balance sheet. It is calculated as the level of estimated reserves relative to net operating assets. Three sorts of reserves are estimated, i.e., inventory reserve, R&D reserve, and advertising reserve. Inventory reserve equals the LIFO reserve reported in the financial statement footnotes. R&D reserve is the unamortized portion of R&D assets generated by current and past R&D expenditures if these expenditures had been capitalized. A similar definition applies to the advertising reserve.

4.3 Measures of Debt Covenant Restrictiveness

Dealscan classifies debt covenants into two categories: financial covenants (e.g., current ratio) and general covenants (e.g., dividend restrictions, and asset sales sweep). We measure

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17 Bradley and Roberts (2004) report that 84% of private debt contracts, in the period from 1993 to 2001, include dividend restrictions. Since these covenants typically stipulate the maximum funds available for dividends in terms
the overall restrictiveness of covenants in two alternative ways. The first is measured as the number of financial covenants in a loan contract \((\text{FinCov})\). This variable is ranked within an industry on a scale from 0 to 1. The second measure reflects the overall tightness of financial covenants \((\text{SlackIndex})\) and, similar to Vasvari (2006), computed as the sum of the inverse ranks of slack across all financial covenants in the loan contract. Slack for covenants that require a maximum accounting number is computed as the percentage ratio, \(\frac{(\text{Required} - \text{Actual})}{\text{Required}}\), where \(\text{Required}\) is the accounting ratio or number that has to be maintained as per the bank loan and \(\text{Actual}\) is the accounting ratio or number computed using the current balance sheet or income statement information. For covenants that require a minimum accounting measure, we calculate the negative of the above ratio. Finally, slacks are inversely ranked within an industry on a scale from 0 to 1, so that the larger the number, the tighter the financial covenants.\(^\text{18}\) Due to the data limitations of COMPUSTAT for calculating the actual accounting ratio or number, covenant slacks at loan inception are available for 11 covenants only.

### 4.4 Determinants of Information Asymmetry Regimes

Our determinants for the degree of information asymmetry about future wealth transfers from lenders to borrowers are the following loan related variables: the lenders’ equity voting rights in the borrower firm \((\text{Voting})\), the existence of an historical borrower-lender relationship \((\text{Relation})\), the existence of a credit rating \((\text{Rating})\), and the age of the borrower \((\text{Age})\).

In our sample, lenders’ equity voting rights in the borrower firm come from two sources: (1) non-bank institutional investors who participate in the loan syndication; and (2) banks that have a trust investment in the borrower giving them (partial) control over the firm’s voting rights of the firm’s accounting numbers and equity raised since the time of the debt issue, the level of reported earnings is an important determinant of general covenants (Daniel, Denis and Naveen, 2008).\(^\text{18}\) Beatty and Weber (2006) also used the rank measure of covenant slacks.
In either case, equity voting rights provide lenders with the incentive, as well as the fiduciary capacity, to mitigate information asymmetry between borrowers and lenders (Ferreira and Matos, 2009). Moreover, voting stakes on borrowing firms provide lenders with the opportunity to learn firms’ proclivity for potential wealth appropriation. We calculate Voting as the lead lenders’ holdings of borrowing firms’ shares with voting rights scaled by total shares outstanding. Following Chava and Roberts (2008), we take the existence of an historical borrowing relationship with one of the current lenders as another determinant of information asymmetry. Lenders in such a relationship are more knowledgeable about the borrowers operations and risk taking proclivities, effectively reducing information asymmetry between the parties (e.g., Petersen and Rajan, 1994; Berger and Udell, 1995; Bharath et al., 2007, 2009).

In addition, Sufi (2007, 2009) argues that credit ratings (Rating) mitigate information asymmetry, acting effectively as a form of debt “certification” and leading rated firms to increase their use of debt. Hence, we expect that Rating is negatively related to information asymmetry. Finally, we include the variable Age since an old and established firm should have a long history of private and public debt financing. Its longer record of engagement with creditors should substantially mitigate the informational concern of a new creditor when she is asked for a loan (Diamond, 1991).

### 4.5 Controls for Loan and Firm Characteristics

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19 Banks are identified by the lenders’ primary four-digit SIC. SIC codes 6011-6082 and 6712 represent the banking sector.
We follow prior studies such as Beatty et al. (2008) and Bharath, Sunder and Sunder (2008) in controlling for loan and firm characteristics in Equations (1)-(3). Variables related to loan characteristics include loan maturity (*Maturity*, measured in the number of months), loan size (*LoanSize*, measured by the logarithm of the facility amount scaled by total assets), the performance pricing indicator (*PerfGrid*),\(^{21}\) the interest rate spread over LIBOR (*Spread*, measured as All-in-Drawn spread in basis points charged by the bank over LIBOR for the drawn portion of the loan facility), the existence of collateral (*Collateral*), and an indicator variable for whether the loan is of the revolving type (*Revolver*).

We also control for the following firm-level variables in Equation (1): a proxy for default risk (*DefRisk*, measured by the probability of bankruptcy following Hillegeist, Keating, Cram and Lundstedt (2004)), firm size (*LnAsset*, measure by the logarithm of total assets (#6)), return on assets (*ROA*, measured as income before extraordinary item (#18) / total assets (#6)), asset growth (*Growth*, measured as total assets (#6) / last year total assets (#6)), and cash flow volatility (*CFVol*, measured by the standard deviation over the past 5 years of quarterly operating cash flows (#108) / total assets (#44)).

Firm controls in the case of Equation (2) include market value (*MV*, measured as the logarithm of stock price (#199) \(\times\) share outstanding (#25)), a default risk proxy (*DefRisk*), cash flow volatility (*CFVol*), financial leverage (*Lev*, measured as (long-term debt (#9)+debt in current liabilities (#34)) / (stock price (#199) \(\times\) share outstanding (#25))), and the book-to-market ratio (*BM*, measured as common equity (#60) / (stock price (#199) \(\times\) share outstanding (#25))).

\(^{20}\) Beatty et al. (2008) interpret many of these characteristics as contract-level and firm-level measures of agency costs.

\(^{21}\) According to Asquith, Beatty and Weber (2005), the performance pricing feature is intended to reduce “adverse selection problems when asymmetric information between the borrower and lender results in a misclassification of credit risk” (p. 102). In addition, Manso, Strulovici and Tchistyi (2010) argue that performance pricing is used to screen borrowers with different investment opportunities. We treat performance pricing as a control variable since the nature of the information asymmetry problem in this study is specifically about the creditors’ information asymmetry regarding the borrower’s ability to appropriate wealth in the future from creditors.
In the case of Equation (3), because we use an extensive array of firm characteristics to derive abnormal payouts, we limit the explanatory variables to a parsimonious number of firm characteristics, namely; default risk \((DefRisk)\), return on assets \((ROA)\), tangible assets \((TangAsset)\),\(^{22}\) accounting losses \((Loss)\), asset growth \((Growth)\), and the book-to-market ratio \((BM)\). In addition, we control for the following loan characteristics: loan maturity \((Maturity)\), loan size \((LoanSize)\), the existence of dividend restriction covenants \((DivCov)\), the number of general covenants \((GenCov)\), and the existence of revolving loans \((Revolver)\).

It is important to note that there are likely other factors that affect the relation between covenants and conservatism. For example, when borrowers have severe default risk, it is probably a moot point to discuss how information asymmetry affects the relation between conservatism and covenants. Thus, we control for several other factors, including the firm’s default risk, the extent to which the firm has been historically conservative (which is also built into the measurement of our four empirical proxies of accounting conservatism), the inherent uncertainty surrounding the firm, and the extent to which the owner’s managers interests are aligned. (See our Additional Test section below.)

5. Empirical Results

5.1 Descriptive Statistics

Table 1, Panel A reports descriptive statistics for variables used in the multivariate regressions after winsorizing all continuous variables at the top and bottom 1%. The sample exhibits considerable variation in borrowing amounts and borrowers’ size. The mean (median) loan size is $286 ($125) million. The mean (median) market value of the borrowers in our

\(^{22}\) We follow Berger, Ofek and Swary (1996) and measure tangible assets as cash and short-term investments \((#1) + 0.715 \times \text{receivables} \((#2) + 0.547 \times \text{inventories} \((#3) + 0.535 \times \text{PPE Net} \((#8) / \text{total assets} \((#6).\)
sample is $3,877 ($667) million and the standard deviation is $10,677 million. Furthermore, around 23% of sample firms incurred accounting losses during the sample period, and the mean (median) ROA is 1.4% (4%).

Concerning the loan characteristics, we find an average loan maturity of about 50 months and an average loan spread of 194 basis points. In our sample, 58% of the loan facilities are revolving, and slightly more than half of the facilities in the sample require collateral. Each facility in the sample has an average of about 2 financial covenants and 9 general covenants, while about 60% of loan deals come with a dividend payout restriction. Turning to the information asymmetry proxies, we note that almost half of the loan facilities involve lenders and borrowers without prior borrowing-lending relationships. About 57% of borrowers have their debt rated prior to entering a loan contract.

We conduct a principal components analysis of the four information asymmetry proxies in order to create an index of information asymmetry. The principal factor loadings are presented in Panel B of Table 1. We obtain only one factor with an eigenvalue greater than one (1.120). The principal component is positively correlated with all four information asymmetry proxies, i.e., Voting, Relation, Rating and Age. Thus, the principal factor (InfoFactor) appears to be an inverse proxy for information asymmetry. In subsequent analyses, we separate our sample into two groups using the median value (0.500) of our newly-generated information asymmetry factor; observations with below-median principal values are classified to be in the high information asymmetry group (Regime I), whereas the remaining observations are classified to be in the low information asymmetry group (Regime II).

Table 2 provides a correlation matrix of variables of interest including the alternative conservatism measures, covenant restrictions, and loan-level and firm-level characteristics. We
note that the two alternative measures of covenant restrictiveness, $FinCov$ and $SlackIndex$, are highly correlated (Pearson correlation = 0.72). While $NonOppAccr$ and $Skewness$ are highly correlated (Pearson correlation = 0.30), they are not significantly correlated with $Basu$, suggesting that Basu’s measure reflects a different aspect of conservatism. Furthermore, the $Basu$ measure of accounting conservatism is negatively correlated with financial covenant restriction ($FinCov$). Not surprisingly, the variable $FinCov$ is positively and significantly correlated with both the general covenant intensity ($GenCov$) and the existence of a dividend payout restriction ($DivCov$).

The univariate analysis shows that loan spreads are positively and significantly correlated with $FinCov$ but not with $SlackIndex$. Also, loan spreads decrease significantly with the existence of performance pricing, but increase with both the general covenant intensity ($GenCov$) and the existence of a dividend payout restriction ($DivCov$). In addition, there are significantly negative correlations of loan spreads with firm-level variables such as borrower size ($LnAsset$) and profitability ($ROA$). The negative relationship between borrower size and the two measures of covenant restrictiveness ($FinCov$ and $SlackIndex$) indicate that the debt contracts of large firms have significantly fewer restrictive debt covenants than those of small firms. Consistent with Bradley and Roberts (2004), the significant positive correlations between various measures of covenant restrictions and $Spread$ suggest that restrictive covenants alone are not sufficient to reduce the cost of debt. Moreover, our measure of default risk is highly correlated with the book-to-market ratio, suggesting that both are proxies for distress risk. Consistent with Nikolaev (2010), the collateral requirement and various measures of covenant restrictions are positively correlated. Finally, our four information asymmetry proxies are all positively correlated to each
other, suggesting they all capture some degrees of information asymmetry between borrowers and lenders.

5.2 Conservatism and Covenants Under Alternative Information Asymmetry Regimes

Table 3 reports the results of the OLS regression estimation on the relation between covenant restrictiveness and alternative measures of conservatism. Covenant restrictiveness is defined as the number of financial covenants in the debt contract, ranked by industry and scaled between 0 and 1. Results in Table 3 confirm our Hypothesis 1. The relations between accounting conservatism and debt covenants are quite different in the two regimes. Covenant restrictions in the high information asymmetry regime are positively and statistically significantly related to the four conservatism metrics, indicating that conservative accounting and covenants are complements. By contrast, with one borderline exception, there are no statistically significant associations between covenant restrictions and the various conservatism measures in the low information asymmetry regime.

In general, the signs of the control variables are also in the expected direction. Financial covenant restrictions are positively associated with the loan spread, loan maturity, the presence of performance pricing, collateral, firm performance, and growth in firm assets, and negatively associated with loan amount, firm size and cash flow volatility. After controlling for default risk, loan spreads possibly capture agency costs (Beatty et al., 2008). Thus, the positive loadings on loan spreads suggest that some component of agency cost is captured by financial covenants.

5.3 Signaling and Loan Spreads in the High Information Asymmetry Regime
Table 4 shows the effect of conservatism and covenants on loan spreads under alternative information asymmetry regimes as in Equation (2). Consistent with Zhang (2008), we find that most of the coefficients on Cons are negative and significant in the high information asymmetry regime. Similar to Bradley and Roberts (2004), we find that more financial covenant restrictions are actually associated with higher cost of debt, as the coefficients on FinCov are positive and significant in most cases. The results are consistent with our paired correlations in Table 2, where Spread is shown to be positively and significantly correlated with covenant restrictions (FinCov).

Our primary focus is on the coefficient for Cons*FinCov. Consistent with H2, the estimated coefficients under the high information asymmetry regime are negative and significant for all conservatism metrics. The relations are economically significant as well. For example, by moving both the rank of financial covenants and non-operating accruals from one standard deviation below to one standard deviation above their respective means, the loan spread will incrementally drop by about 18.7 basis points under the high information asymmetry regime. We interpret this result as indicating that the combined adoption of conservative accounting and financial covenants has signaling value in the high information asymmetry regime. By contrast, the results in the low asymmetry regime are mixed, consistent with the absence of a directional prediction for borrowers in the low information asymmetry regime.

5.4 Signaling and Future Wealth Appropriation

We test Hypothesis 3 using the Probit regression specified in Equation (3). Table 5 presents the results for the four alternative conservatism measures. In the high information asymmetry regime, the coefficients on Cons*FinCov are negative and significant with
conservatism measured by NonOppAccr, Basu, and PZ_Cscore, but insignificant for Skewness. These results are fairly consistent with H3. By contrast, in the low information asymmetry regime, the coefficients on Cons*FinCov are either insignificant or have counterintuitive signs across all four measures of conservatism.

5.5 Results from an Alternative Measure of Covenant Restrictiveness

Up to this point, the primary measure of covenant restrictiveness was defined by the number of financial covenants in a debt contract (FinCov). While this measure has been used by other studies (Vasvari, 2006; Sunder, Sunder and Zhang, 2009), it fails to directly measure the restrictiveness of financial covenants. As a robustness check, Table 6 replicates our results for the measure of overall tightness of financial covenants (SlackIndex).

Panel A shows that all proxies of accounting conservatism are positively and significantly associated with SlackIndex in the high asymmetry regime. The relations between conservatism and covenant restrictiveness are either mixed or insignificant in the low asymmetry regime. These results are consistent with Hypothesis 1.

Panel B reports the estimation of the signaling role of conservatism and financial covenants on loan spreads. In the high asymmetry regime, the interaction term Cons*SlackIndex is negatively and significantly associated with the various proxies for accounting conservatism, expect on PZ_Cscore. Overall, these results appear to support Hypothesis 2.

Ahmed et al. (2002) find that firms facing more severe conflicts over dividend policy, as proxied by actual dividends, tend to use more conservative accounting. In contrast, we consider how accounting conservatism combined with restrictive covenants works as a signaling device for borrowers. Our variable of interest is the interaction term, Cons*FinCov.
The results from Panel C are consistent with Hypothesis 3. We find a significant negative relation in the high asymmetry regime between $Cons*SlackIndex$ and abnormal transfers for all four of our conservatism metrics.

5.6 Results from a Switching Regression Model Estimation

Although we fully expect that some firms face greater information asymmetry than others, the relative information asymmetry status of sample firms is not observable either cross-sectionally or over time. Furthermore, even if we were to know the information asymmetry regime, conditioning the dependent variable on the firm’s information environment will generally induce sample selectivity and biased OLS coefficients (Heckman, 1979; Maddala, 1983, 1986, 1991; Dietrich, Muller and Reidl, 2007). Instead, we implement a switching regression model (with unknown sample separation) to control for the potential endogeneity of the information asymmetry regimes and to assess the impact of information asymmetry on the signaling effectiveness of conservatism and covenants (e.g., Maddala, 1983 Ch. 9). We assume that there are two separate information asymmetry regimes, each presenting a different relation between conservatism and debt covenants. The switching regression model estimates separate regressions for each asymmetry information regime without $a priori$ classifying firms into a high information asymmetry regime or a low information asymmetry regime. Rather, the (unobservable) regime in which firms find themselves is determined by the data and a selection model. The selection equation controls for the determinants of the degree of information asymmetry between lenders and borrowers.

More formally, the switching regression model is composed of the following system of three equations that are estimated simultaneously:
Equations (4) and (5) are the structural equations that describe the relation between accounting conservatism and debt covenants for the high and low asymmetric information regimes, respectively. Financial covenant restrictions, $\text{FinCov}_{i,t}$, undertaken by firm $i$ at time $t$, are defined as:

$$\text{FinCov}_{i,t} = \text{FinCov}_{i,1,t} \text{ if } \text{Regime}^*_t > 0 \quad \text{FinCov}_{i,t} = \text{FinCov}_{2,i,t} \text{ if } \text{Regime}^*_t \leq 0.$$  

$\text{Regime}^*_t$ is a latent unobservable variable measuring the likelihood of being in the high information asymmetry regime (Regime I) versus the low information asymmetry regime (Regime II). Equation (6) is the selection equation that determines the firm’s “propensity” to be in one or the other information asymmetry regime. $Z_{i,t}$ denotes the vector of variables that determine the regime for firm $i$ at time $t$ and $\psi$ is a vector of parameters relating these variables to the specific (unobserved) regime.

The model parameters are estimated by the method of simultaneous Maximum Likelihood using numerical maximization techniques. Observations are classified as belonging to the high (low) asymmetry regime if the estimated probability of being in that regime from the switching regression analysis [Equations (4)-(6)] is greater than 0.5.

Table 7, Panel A shows the estimated switching regressions. The results are consistent with Hypothesis 1. In particular, covenant restrictions in the high information asymmetry regime are positively and statistically significantly related to the four conservatism metrics.
Panel B shows the estimated selection equation. The four selection characteristics play a significant and intuitive role in determining the likelihood of a firm being in a particular information asymmetry regime. Specifically, lenders with more voting equity in the borrower firm (Voting), an historical borrowing relation with the lender (Relation), more established borrowers (i.e., older firms), and borrowers with previous loan ratings (Rating), are more likely to be in the low information asymmetry regime.

5.7 Additional Empirical Tests

Tests using separate financial covenants: We compute covenant tightness for the current-ratio and net-worth covenants following the method of Dichev and Skinner (2002) and Frankel and Litov (2007). For example, for each facility, $f$, the measure of current-ratio-covenant-tightness is computed as

$$
-\ln \left( \frac{\text{Current Ratio}_{f,t-1}}{\text{Covenant-Current Ratio}_{f,t}} \right),
$$

where Current Ratio$_{f,t-1}$ is computed based on the firm’s end of year $t-1$ COMPUSTAT data, and covenant-current ratio$_{f,t}$ is the covenant-current-ratio benchmark for a loan facility originated in year $t$ obtained from Dealscan. The Net-worth-covenant slack for each facility is computed in a similar fashion. In untabulated results for tests using two financial covenants, all coefficient estimates in the high asymmetry regime have signs consistent with our hypotheses, although in a couple of cases the coefficient estimates are only marginally significant at the 10% level. Overall, these results add confidence to our previous findings.

Alternative measures of accounting conservatism: We conduct supplementary analyses exploring two alternative measures of conservative accounting, the conservatism ratio by Callen,
Segal and Hope (2010)\textsuperscript{24} and the C_Score measure of Khan and Watts (2009).\textsuperscript{25} We obtain consistent if weaker results for these two additional conservatism measures (untabulated).

*Tests using a contracting conservatism measure:* Our analytical model also applies to the relation between financial covenants and conservative contractual modifications of accounting information. Thus, we repeat all empirical tests using the contracting conservatism measure of Beatty et al. (2008). Specifically, the conservative adjustment of debt contracts through income escalator clauses also satisfies lenders’ demand for conservatism. Income escalators are adjustments to net worth covenants that exclude a percentage of positive net income from covenant calculations. We are able to identify the existence of income escalators in a sample of 1,215 private loan deals for the period 2000-2007 that contained net worth covenants.\textsuperscript{26} The results (untabulated) are similar to those obtained previously.

*Additional proxies of “information opacity”:* Our debt-contract related information variables are intended to capture the degree of information asymmetry between borrowers and lenders. Consistent with prior studies such as Bharath et al. (2009), we believe these variables conceptually differ from proxies for “information opacity” of the borrower, in which higher opacity reflects the lower amount of publicly available information. Nevertheless, in addition to the control variables in the main regressions that proxy for the borrower’s information opacity (e.g., borrower size), we further correlate four other “information opacity” proxies with our principal component measure of information asymmetry. These four proxies include the bid-ask spread (BidAsk) (from TAQ), the standard deviation of stock return residuals from a market

\textsuperscript{24} We thank the authors for access to the data.
\textsuperscript{25} The C_Score measure adds firm-specific characteristics, including size, market-to-book ratio, and leverage, into the annual cross-sectional regression of Basu (1997).
\textsuperscript{26} Specifically, we use the SDC database to identify a sample of 2,284 private debt contracts with net worth covenants during the period 2000-2007. Following Beatty et al. (2008), we cross-checked the information about income escalators for this sub-sample using SDC, Dealscan, and the firms’ SEC filings. After we match the data with accounting data from COMPUSTAT, we are left with 1,215 observations.
model (IdioRisk) (from CRSP), analyst forecast accuracy (Forecast), and analyst forecast dispersion (Disp) (from I/B/E/S). In contrast to the subsample with low information asymmetry, the subsample with high information asymmetry has significantly higher bid-ask spreads, more idiosyncratic risk, less analyst forecast accuracy and more forecast dispersion. Controlling for these additional “information opacity” proxies does not affect our results.

**Controls for managerial incentives:** Begley and Feltham (1999) argue that managerial incentives could affect the choice and structure of debt covenants. In particular, the reduction in interest rates and future wealth appropriation that we found could be due to the mitigation of moral hazard problems rather than signaling. However, if the compensation committee is aware of the potential impact of managerial incentives on covenants and adjusts managers’ compensation accordingly, controlling for managerial compensation incentives in Equations (1)-(3) should mitigate the impact of moral hazard on covenants. We use two compensation incentive measures: one is Core and Guay’s (2002) portfolio equity incentive (PEI) defined as the change in the dollar value of the CEO’s stock and option holdings for a 1% change in the stock price; the other is Guay’s (1999) convexity in the CEO’s incentive pay (Vega) defined as the change in the dollar value of the executive’s wealth for a 1% change in the annualized standard deviation of stock returns. We obtain the compensation data from ExecuComp. Our inferences remain unchanged with the inclusion of these managerial compensation variables in the regressions.

**Changes in accounting conservatism after entering into a debt contract:** Although we do not expect a change in the borrower’s financial reporting conservatism after entering into a debt contract on theoretical grounds, empirical verification is desideratum. Therefore, we separate firms into high and low information asymmetry regimes. For each group, we compare the change

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27 Since ExecuComp only covers S&P 1500 firms, our sample size was reduced to 2,186 observations.
in the borrower’s accounting conservatism after the borrower enters into the contract relative to her conservatism level before signing the contract. We find no evidence of a change in conservatism levels after a borrower enters into the contract. Results from our robustness checks are consistent with the related findings of Beatty et al. (2008) and Nikolaev (2010).

6. Conclusion

Watts (2003) argues cogently that there is a debt contracting demand for the accounting conservatism. Accounting researchers have investigated whether accounting conservatism enhances the efficiency of debt contracts by examining the relation between conservatism and debt covenants, with mixed results. We revisit this issue in a debt contracting context where private debt holders have varying degrees of information regarding borrowers’ tendency to appropriate wealth. In our setting, high information asymmetry between borrowers and lenders incentivizes borrowers to signal via conservative accounting and financial covenants. We show analytically and empirically that when there is a high degree of information asymmetry between borrowers and lenders, accounting conservatism and covenants are complements in restoring efficiency. Contrariwise, conservatism and covenants are predicted and confirmed to be unrelated to each other when there is a low degree of information asymmetry between borrowers and lenders. Furthermore, in direct contrast to the “conventional” view of conservatism based on moral hazard that debt holders demand more conservatism for firms with higher risk of agency conflicts, our signaling framework predicts and finds the opposite result; namely, in an environment with high information asymmetry in which lenders are more uncertain about borrowers proclivity to appropriate their (the lenders) wealth, “good” firms with lower agency conflicts are more likely to signal their type via conservatism (and covenants) to reduce the cost
of debt relative to “bad” firms with higher agency conflicts.

We further predict and show that under a high information asymmetry regime, borrowers with high levels of conservatism and tight covenants generally enjoy lower interest rates than borrowers with low levels of conservatism and loose covenants. Consistent with our signaling theory, we also document that borrowers with high levels of conservatism and tight covenants in the high information asymmetry regime are less likely to appropriate future wealth from their creditors.

Overall, the empirical evidence in this study supports our signaling story and is robust to alternative measures of conservatism and covenant restrictiveness.
Appendix: An Analytical Framework of Conservatism and Covenants

In this Appendix, we provide a stylized signaling framework of the impact of information asymmetry between lenders and borrowers on accounting conservatism, debt covenants, and debt spreads. Our framework extends Gigler, Kanodia, Sapra and Venugopalan (2009) by incorporating asymmetric information into the analysis. There are two types of borrowers, one with no ability to transfer future outcomes from creditors to shareholders (the good type) and one with the potential to effect such transfers (the bad type). The lender may or may not have the exact information about the borrower’s type. We maintain Gigler et al. (2009)’s notion of contracting efficiency, namely that debt covenants minimize the sum of expected costs associated with type I errors (when a viable project is liquidated because the accounting signal sends a false alarm) and type II errors (when the accounting signal fails to send an alarm when the project is not viable).

A firm has exclusive rights to a project financed by $K$ of debt at date 0. At date 1, the firm’s accounting system produces a noisy signal $y$ about the eventual outcome of the project. The firm then has the option to either continue the project, or liquidate the project and receive a known deterministic liquidation value of $M$. If the project is continued, it produces at date 2 an

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28 Levine and Hughes (2005) provide a signaling theory of conservatism, covenants and compensation in the presence of adverse selection and moral hazard. However, in contrast to this study, their focus is primarily on how compensation contracts that aim to resolve the adverse selection and moral hazard problems between internal parties (owners and managers), may also be used to resolve external adverse selection (firm and outside capital suppliers). They use compensation contracts as a signaling device, and show how debt covenants and conservative accounting may help to eliminate the need to rely on compensation for signaling purposes, and thus reduce signaling costs. We are interested in how the degree of information asymmetry affects the relation between conservatism and covenants when both of them are the source of signaling costs. Chen and Deng (2009) also explore the signaling role of accounting conservatism in debt contracting. In their setting the information asymmetry between borrowers and lenders is on the project outcome, as in Levine and Hughes, not on wealth appropriation of creditors.

29 This type of information asymmetry between borrowers and lenders is also in the model of Garleanu and Zwiebel (2009). However they do not address accounting conservatism. Unlike Garleanu and Zwiebel, we do not explicitly model renegotiation in our setting. Instead, we opt for tractability by assuming that the parties pre-commit to the contract so that levels of conservatism and covenants can be used as screening devices.

30 A firm’s demand for debt can be endogenized by assuming the existence of either a high tax incentive for debt financing or a severe adverse-selection cost from equity financing as in Myers and Majluf (1984).
uncertain cash flow $x$, which takes one of the two values, $x_H$ and $x_L$ ($x_H > x_L$), with equal probability. For simplicity, the risk-free return equals 0. We assume that $E(x) > K > M > x_L$, which ensures that at the time of initiation, the project has a positive net present value and neither the lender nor the residual claimant is interested in liquidating the project ex ante. With neutral accounting (defined below), the accounting signal $y$ follows a uniform distribution over $[0,1]$ ex ante and $\Pr(x_H \mid y) = \frac{1}{2} (y + \frac{1}{2})$. By the Bayesian rule, the density function of $y$ conditional on the realization of $x$ is given by $f(y \mid x_H) = y + \frac{1}{2}$ and $f(y \mid x_L) = -y + \frac{3}{2}$. Thus, a higher value of $y$ indicates a higher probability that the cash flow of the project takes the value of $x_H$ at date 2. This density function is depicted in Figure 1, Panel A. Let $D$ be the chosen face value of the loan (which implicitly determines the interest rate); so when the project continues at date 2, the lender receives the amount $D$ if $x_H$ is realized ($x_H > D$), or $x_L$ if $x_L$ is realized ($x_L < D$). $D$ cannot be less than $M$ in equilibrium.\footnote{See Gigler et al. (2009) for a proof.}

Accounting conservatism is defined by reference to the parameter $\delta$, which is related to the skewness of the distribution of $y$ conditional on the realization of $x$. Let $f(y \mid x_i; \delta)$ where $i \in \{H, L\}$ denote the probability density of the accounting signal conditional on the true future cash flow $x_i$, given the level of accounting conservatism $\delta$. In the following analysis, we assume that the density function $f$ takes the following form.\footnote{This density satisfies the conditions (A1)-(A4) in Gigler et al. (2009). Intuitively, regardless of the level of accounting conservatism, higher values of $y$ contain more favorable information in the sense that the probability of $x = x_H$ is higher; the information content of sufficiently high accounting signals relative to the information content of sufficiently low accounting signals is increasing in the level of conservatism; more conservative accounting shifts the distribution of accounting signals to the left so that, on average, the accounting signal is lower conditional on the value of the underlying state; and, when accounting is conservative, relaxing the level of conservatism shifts the}
\[
\begin{align*}
    f(y | x_H ; \delta) &= \delta(y - \frac{1}{2}) + 1; \\
    f(y | x_L ; \delta) &= (\delta - 2)(y - \frac{1}{2}) + 1
\end{align*}
\]
for \(y \in [0, 1]\), and 0 otherwise, where \(\delta \in [0, 1]\).\(^{33}\)

This density distribution is depicted in Figure 1 Panel B. Note the feature of this density: lower values of \(\delta\) mean higher levels of conservatism; and as the degree of conservatism increases (i.e., \(\delta\) decreases), \(f(y | x_H ; \delta)\) becomes flatter and \(f(y | x_L ; \delta)\) becomes steeper, yielding a higher probability that a lower signal will be generated, consistent with the notion of accounting conservatism.

There are two types of borrowers: the good type, who maintains the payoffs to each party when the project continues to date 2; and the bad type, who transfers a positive amount \(T\) from the lender to the residual claimants if the project continues beyond date 1, either through dividends or asset substitution. The borrower privately knows her own type. The lender does not know the borrower’s exact type but he knows that with probability \(p\), the borrower is of a good type, where \(p \in (0, 1)\) (one can also interpret \(p\) as the proportion of good types in the economy).

Before the borrower and the lender sign the loan contract, a signal \(S\) about the borrower’s type is generated and observed by both the lender and the borrower.\(^{34}\) The signal is stochastically related to the underlying type in the following way: when the underlying type is good (bad), the probability of a good signal, \(S_G\) (a bad signal, \(S_B\)), is \(q\), and the probability of a bad signal, \(S_B\)

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\(^{33}\) In light of GAAP, we impose the constraint that accounting is non-aggressive in nature, i.e., the accounting system is neutral, when \(\delta = 1\). The purpose of our model differs from that of Gigler et al. (2009). While the latter aims to establish whether accounting conservatism or liberalism is more efficient in debt contracts, we focus on whether the level of conservatism helps solve the information asymmetry between lenders and borrowers within the current conservative accounting framework.

\(^{34}\) We do not model the source of the signal here. One way to look at this is that the signal is generated through interaction between the borrower and the lender.
(a good signal, $S_g$), is thus $(1-q)$, where $q \in [\frac{1}{2},1]$.\(^{35}\) The parameter $q$ captures the degree of information asymmetry: a higher $q$ reflects less information asymmetry between the borrower and the lender.

Ideally, a lender will self-protect from possible transfers of wealth to residual claimants by charging a higher interest rate to the bad-type borrower and a lower interest rate to the good-type borrower. However, when the lender cannot perfectly distinguish the borrower types, he will charge a moderate pooling rate by taking into account the likelihood of interacting with both types of borrowers, given his knowledge about the distribution of types. A good-type borrower has two options. She can reveal her type through costly devices (i.e., higher levels of conservatism and/or tighter covenants), so that the bad type will not be able to mimic her and thus enjoy a lower interest rate. Alternatively, she can choose to pool with the bad type by employing the same levels of conservatism and covenants, and be charged the pooling rate. The bad-type borrower will be happy to pool with the good type and enjoy the pooling rate. But, in the event that the good type reveals (in a separating equilibrium), the bad type has to accept a contract with a higher interest rate, since mimicking the good type is overly costly.\(^{36}\)

Whether the good-type borrower has an incentive to reveal her type or not depends on the parameters $p$, $q$, $S$, and possibly $T$. We argue that absent the signal $S$, this incentive is strictly decreasing in $p$ and there exists a $p^* \in (0,1)$ such that when $p < p^*$, the good-type borrower will

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\(^{35}\) It can be easily verified that when $q = 1$, the signal $S$ perfectly reveals the borrower’s type and there is no information asymmetry; when $q = 0.5$, the signal $S$ tells nothing about the borrower type.

\(^{36}\) Borrowers with no ability to engage in wealth transfers (good type) would forego less when the project is terminated than borrowers with that ability (bad type). So the marginal cost of conservative accounting and/or covenants is lower for good-type borrowers. This sustains the single crossing property.
always choose to reveal her type. We restrict our analysis to this scenario.\(^3^7\) It can be shown that
the updated probability that a borrower is of a good type given a good (bad) signal \(S_G (S_B)\) is
strictly increasing (decreasing) in \(q\). This further implies that for any \(p\), there exists a \(q(p)\) such
that if \(q > q(p)\), only the good-type borrower with a bad signal has an incentive to signal her type,
while the good-type borrower with a good signal chooses to pool with a bad-type borrower with
a good signal. This is due to the fact that when \(q\) is high, the signal \(S\) is very informative about
the borrower’s type. With only a small probability \((1 - q)\), a good (bad) type borrower generates
a bad (good) signal. If the lender receives a bad signal, absent a credible revelation of type by
the borrower, with high probability, the lender will treat the borrower who generated this signal
as a bad type and charge a high pooling interest rate. However, if the signal is good, the lender
will update his belief about the type and charge a low pooling rate based on his updated belief.
Since there will be a very small number of bad-type borrowers who generate good signals, this
pooling rate is relatively close to what a good-type borrower might get when she decides to
reveal her type through costly signals. Thus, the good type with a good signal will prefer being
pooled with bad-type borrowers with good signals; however, the good-type borrower with a bad
signal will find it beneficial to use both a higher level of conservatism and tighter covenants to
distinguish herself from the bad-type borrowers with bad signals. In this scenario, good-type
borrowers with good signals and bad-type borrowers (with good or bad signals) implement the
lowest conservatism level mandated by GAAP\(^3^8\), and adjust covenants accordingly to maximize
the efficiency of debt contracts, while good-type borrowers with bad signals use both a high level

\(^{37}\) When \(p\) is very large, price protection by the lender is very small so that the signaling benefit is dominated by the
signaling cost. As a consequence, the good-type borrower always prefers pooling with the bad type borrower. We do
not further pursue this uninteresting case.

\(^{38}\) This is established in Gigler et al. (2009).
of conservatism and tight covenants to reveal their types.\(^{39}\) However, when the degree of information asymmetry is high, i.e., \(q\) is low, the signal \(S\) does not provide much information about the borrower’s type. The pooling rate for good and bad type borrowers is relatively high, so all good-type borrowers, with either good or bad signals, may have an incentive to signal their types through a higher level of conservatism and/or tighter covenants – depending on the magnitude of the transfer payment, \(T\). For intermediate levels of \(T\), good-type borrowers prefer revealing their type. But in order to deter the bad-type borrowers from mimicking, they have to choose very restrictive covenants, or very conservative accounting, or a combination of moderate levels of covenants and conservatism. In our setting, it turns out that a combination of moderate levels of covenants and conservatism leads to the smallest loss in economic efficiency. We make the following claims.

**Proposition:** (a) When the degree of information asymmetry is low, bad-type borrowers and good-type borrowers with good signals all implement low levels of conservatism and covenants, while good-type borrowers with bad signals implement high levels of conservatism and covenants;

(b) When the degree of information asymmetry is high, with intermediate levels of potential transfers, there exists a separating equilibrium where good (bad) type borrowers implement high (low) levels of conservatism and covenants;

(c) When the degree of information asymmetry is high, on average, borrowers with high levels of conservatism and covenants enjoy a lower interest rate than borrowers with low levels of conservatism and covenants.

**Proof:**

\(^{39}\) Three interest rates will be offered here: a high rate to borrowers with bad signals and implementing low levels of conservatism and covenants; a low rate to borrowers with bad signals, but implementing high levels of conservatism and covenants, and an intermediate rate to borrowers with good signals.
First we show that without the signal $S$, there exists a $p^* \in [0,1]$ such that the good-type borrower is indifferent between revealing her type through a higher level of conservatism and tighter covenants (and, thus, being charged a lower interest rate), and pooling with the bad-type borrower by taking the same level of conservatism and covenants (and, thus, being charged a higher interest rate).

The lender will protect himself from a possible transfer of wealth to the residual claimants. Let us focus first on the case where the lender has perfect knowledge of the borrower type. If the borrower is of a good type, having observed a signal $y$ at date 1, the value to the lender of continuing the project is given by:

$$V(D, y; \delta) = \text{Prob}(x_H | y; \delta) D + \text{Prob}(x_L | y; \delta) x_L$$  \hspace{1cm} (A1)

The value to the borrower of continuing the project is then

$$U(D, y; \delta) = \text{Prob}(x_H | y; \delta) (x_H - D)$$  \hspace{1cm} (A2)

Given the level of accounting conservatism, $\delta \in [0,1]$, a debt contract is a pair $\{D, y^c\}$, where $D$ represents the implicit interest rate, and $y^c$ denotes the covenant level, below which the project is liquidated. At date 0, given $\delta$ and debt covenant $y^c$, the expected payoff to the lender from the loan is

$$\hat{V}(D, y^c; \delta) = \int_{0}^{y^c} M f(y; \delta) dy + \int_{y^c}^{1} V(D, y; \delta) f(y; \delta) dy$$  \hspace{1cm} (A3)

The expected payoff to the good type borrower is then

$$\hat{U}(D, y^c; \delta) = \int_{y^c}^{1} U(D, y; \delta) f(y; \delta) dy$$  \hspace{1cm} (A4)

As Gigler et al. (2009) show, efficiency dictates that the borrower will choose the least conservative accounting, i.e., $\delta = 1$. The borrower then solves the following problem:
\[
\begin{align*}
\text{Max } \hat{U}(D, y^c; \delta = 1) \\
\text{s.t. } \hat{V}(D, y^c; \delta = 1) \geq K
\end{align*}
\]

so the optimal debt contract \( \{D^*, y^*\} \) is defined by the system of equations:

\[
\begin{aligned}
&\left\{ \begin{array}{l}
E[x | y^*; \delta^* = 1] = M \\
\hat{V}(D^*, y^*; \delta^* = 1) = K
\end{array} \right.
\end{aligned}
\] (A5)

If the borrower is of a bad-type, at date 0, given the level of accounting conservatism \( \delta \) and debt covenant \( y^c \), the expected payoff to the lender from the loan is

\[
\hat{V}(D, y^c; \delta) = \int_0^M M f(y; \delta)dy + \int_{y^c} [V(D, y; \delta) - T] f(y; \delta)dy
\] (A6)

As a consequence, the optimal debt contract \( \{D^{**}, y^{**}\} \) is defined by the system of equations:

\[
\begin{aligned}
&\left\{ \begin{array}{l}
E[x | y^{**}; \delta^{**} = 1] = M \\
\hat{V}(D^{**}, y^{**}; \delta^{**} = 1) = K
\end{array} \right.
\end{aligned}
\] (A7)

It can be easily verified that \( y^{**} = y^* \) and \( D^{**} > D^* \), so that the only difference between good and bad type borrowers in the optimal debt contract is that the lender charges the bad type a higher interest rate to compensate for future transfers. The expected total surplus from the investment is the same for both types. Since the lender always gets an expected payoff \( K \), the expected payoffs for the good type and bad type are identical.

Applying the functional form of \( f \), we solve for the optimal contract yielding:

\[\delta^* = \delta^{**} = 1, \text{ and } y^* = y^{**} = \frac{1}{2} + \frac{M - 0.5(x_H + x_L)}{0.5(x_H - x_L)} < \frac{1}{2}.\]

When the lender cannot tell the borrower’s type, he price protects himself from a pooling equilibrium. Therefore, at date 0, given the level of accounting conservatism \( \delta \) and debt covenant \( y^c \), the expected payoff to the lender from the loan is
\[
\hat{V}(D, y^c; \delta) = \int_0^x M f(y, \delta) dy + \int_x^y [V(D, y; \delta) - T(1 - p)] f(y, \delta) dy
\] 
(A8)

where \( p \) is the probability that the borrower is of a good type. In this case the optimal debt contract \( \{D_{pooling}, y_{pooling}\} \) is defined by the system of equations:

\[
\begin{align*}
\hat{V}(D_{pooling}, y_{pooling}; \delta = 1) &= M \\
E[x \mid y_{pooling}; \delta = 1] &= M \\
\end{align*}
\] 
(A9)

It can be verified that \( y_{pooling} = y^{**} = y^* \) and \( D^{**} > D_{pooling} > D^* \), so although there is no efficiency loss, the good-type borrowers cross-subsidize the bad-type borrowers. Given conservatism \( \delta \) and covenants \( y \), the expected payoff to the good-type borrower \( \hat{U}(D, y; \delta) \) is strictly decreasing in \( D \). From (A9), \( D_{pooling} \) is strictly decreasing in \( p \), so \( \hat{U}(D_{pooling}, y^*; \delta^* = 1) \) is strictly increasing in \( p \). As \( p \) approaches 1, \( \hat{U}(D_{pooling}, y^*; \delta^* = 1) \) approaches \( \hat{U}(D^*, y^*; \delta^* = 1) \), which is the good-type borrower’s payoff under the first best scenario; and as \( p \) approaches 0, \( \hat{U}(D_{pooling}, y^*; \delta^* = 1) \) approaches \( \hat{U}(D^{**}, y^{**}; \delta^{**} = 1) \), which is the bad-type borrower’s payoff under the first best scenario. Therefore, a lower \( p \) gives the good-type borrower a greater incentive to reveal her type through higher levels of both conservatism and covenants.

To obtain a separating equilibrium, we need to construct two sets of menus \( \{D^g, y^g, \delta^g\} \) and \( \{D^b, y^b, \delta^b\} \) for good and bad borrower types, respectively, so that (1) the sets of menus maximize the expected payoffs of each type and (2) neither type will find it beneficial to mimic the other type. This requires that \( \{D^g, y^g, \delta^g\} \) is the solution to the problem:

\[
\begin{align*}
\text{Max}_{D, y, \delta} & \int_y^x [E(x \mid y; \delta) - V(D, y; \delta)] f(y, \delta) dy \\
\text{s.t.} & \int_0^x M f(y, \delta) dy + \int_y^x V(D, y; \delta) f(y, \delta) dy \geq K
\end{align*}
\] (IR)
\[
\int_{y}^{1} [E(x | y; \delta^b) - V(D^b, y; \delta^b) + T] f(y; \delta^b) dy \leq \int_{y}^{1} [E(x | y; \delta^b) - V(D^b, y; \delta^b) + T] f(y; \delta^b) dy \quad \text{(IC)}
\]

The latter program says that the good type maximizes her expected payoff subject to two constraints. The individual rationality constraint (IR) ensures that the lender is willing to participate under the contract \{D^e, y^e, \delta^e\}; and the incentive compatibility constraint (IC) makes it undesirable for the bad type to pretend to be a good type. The solution to this problem leads to the Proposition stated.

In a separating equilibrium, the bad type will get the first best contract \{D^b, y^b, \delta^b\} = \{D^{**}, y^{**}, \delta^{**} = 1\}, so the expected payoff for the bad type is:

\[
\int_{y}^{1} [E(x | y; \delta^b) - V(D^b, y; \delta^b) + T] f(y; \delta^b) dy = \int_{y}^{1} [E(x | y; \delta) - V(D^{**}, y; \delta) + T] f(y; \delta) dy.
\]

Recall that absent information asymmetry, the expected payoffs from both types are the same, so

\[
\int_{y}^{1} [E(x | y; \delta^b) - V(D^b, y; \delta^b) + T] f(y; \delta^b) dy = \int_{y}^{1} [E(x | y; \delta) - V(D^*, y; \delta)] f(y; \delta) dy \equiv C.
\]

Since the bargaining power is on the borrower side, the (IR) constraint binds. From (IR),

\[
\int_{y}^{1} V(D^*, y; \delta^*) f(y; \delta^*) dy = K - \int_{0}^{y} M f(y; \delta) dy
\]

Substituting the latter into (IC) yields:

\[
\int_{y}^{1} [E(x | y; \delta^*) f(y; \delta^*) dy - K + \int_{0}^{y} M f(y; \delta^*) dy + \int_{y}^{1} T f(y; \delta) dy] \leq C
\]

(IC) also binds because otherwise the good type can always be better off without violating the separating equilibrium. Thus, we need to maximize \(A\) subject to \(A + B = C\).

Applying the functional form for \(f\), yields in equilibrium:
\[ y^g = \frac{1}{2} > y^b = y^*, \text{ and, } 0 < \delta^g = \frac{(4M - x_H - 3x_L)^2 + 4x_H + 6x_L - 10M - 6T}{x_H + x_L - 2M + 2T} < 1 = \delta^b = \delta^* \text{ if} \]

\[
\frac{16(E(x) - M)^2 + 3Mx_L}{8(x_H - x_L)} < T < \frac{16(E(x) - M)^2 + 2(x_H - x_L)[E(x) - M] + 12Mx_L}{6(x_H - x_L)} \quad 40, 41
\]

Now we introduce the signal \( S \) about type received by both lenders and borrowers. We show that for each \( p^* \), there exists a \( q^* (p^*) \) such that when \( q \) is larger than \( q^* (p^*) \), good-type borrowers with good signals are willing to be pooled with bad-type borrowers with good signals, while good-type borrowers with bad signals choose to reveal their type. In contrast, when \( q \) is smaller than \( q^* (p^*) \), all good-type borrowers choose to distinguish themselves from bad-type borrowers.

We conjecture that the borrower follows the following strategy: When \( q \) is larger than \( q^* \), if the signal is bad, she gets a chance to demonstrate that she is of a good type by adopting a higher level of conservatism and tighter covenants, and propose a lender-acceptable lower

---

40 Since we have too many free parameters here, it is difficult to discern the intuition underlying this condition. To get a better feel for this condition, let us normalize \( x_L \) to 0, so that the condition simplifies to

\[
(1 - \frac{2M}{x_H})[E(x) - M] < T < (1 - \frac{2M}{x_H})[E(x) - M] + \frac{1}{3} [2E(x) - M] ; \text{ that is, the potential transfer has to be at least a portion of the ex-ante option value of continuing the project, } E(x) - M. \text{ Imposing a further parameterization constraint, } M = \frac{1}{4} x_H, \text{ we have } \frac{1}{2} [E(x) - M] < T < [E(x) - M].
\]

41 The intuition is as follows. In a separating equilibrium, good-type borrowers choose the least costly device to reveal their type. This signaling device could be a higher level of conservatism, tighter covenants, or a combination of both. When \( T \) is small, it turns out that under our parametric specification, tighter covenants are the least costly device. So good-type borrowers implement the lowest level of conservatism mandated by GAAP, and adjust covenants accordingly. But, too large a \( T \) gives the bad-type borrowers a strong incentive to mimic the good type, and in order to distinguish themselves, good type borrowers have to use extremely conservative accounting and/or restrictive covenants, with a concomitant large loss in economic efficiency. The “if” condition provides us with a unique separating equilibrium in which the good-type borrowers use both more conservative reporting and tighter covenants to signal their type. When this condition is not satisfied, we may have a pooling equilibrium or a separating equilibrium where good-type borrowers only use covenants as a signaling device – in either case, we don’t have a prediction on the association between covenants and conservatism. Therefore, an intermediate value of \( T \) is required to empirically distinguish the two scenarios (high vs. low information asymmetry). Whether on average \( T \) satisfies this condition or not is an empirical question, and we let data speak for this.
interest rate (all three variables are endogenously determined), or she simply offers the same contract that would be offered by a known bad type. Alternatively, if the signal is good, the good and bad type borrowers pool together and offer a corresponding contract. When $q$ is smaller than $q^*$, all good-type borrowers (irrespective of good or bad signal) choose to reveal their types through (the same) higher level of conservatism and tighter covenants, and the lender accepts two contracts – one from the revealed good-type borrowers and the other from the bad-type borrowers in a separating equilibrium.

Having observed a bad signal, before the borrower reveals her true type, the lender updates his belief on the likelihood of being matched with a good-type borrower, namely,

$$Q = \text{prob(Goodtype|} S_b) = \frac{p(1-q)}{p(1-q) + (1-p)q} < p \text{ for } q \in (\frac{1}{2},1).$$

Because we focus on scenarios where ex ante separation is preferred by good-type borrowers, good-type borrowers with bad signals will reveal their type for all $q \in (\frac{1}{2},1)$. Having observed a good signal, $S_g$, the lender updates his belief about the likelihood of being matched with a good-type borrower, namely,

$$Q = \text{prob(Goodtype|} S_g) = \frac{pq}{pq + (1-p)(1-q)} > p \text{ for } q \in (\frac{1}{2},1).$$

Note that $Q$ is strictly increasing in both $p$ and $q$. As $q \to 1$, $Q \to 1$ and as $q \to \frac{1}{2}$, $Q \to p$. Let $Q^* = p^*$. Then for $Q > Q^*$, good-type borrowers will be willing to pool with the bad-type. However, for $Q < Q^*$, good types prefer to distinguish themselves from bad-types. Thus, $Q^*$ uniquely determines the indifference level of information asymmetry $q^*$ through $Q^* = \frac{pq^*}{pq^* + (1-p)(1-q^*)}$. This is consistent with the lender’s strategy.
The calculation of the exact contract terms in various scenarios resembles the procedure set forth in the no-signal case. In the low information asymmetry case \( q > q^* \), when the signal is good, a contract \( \{\hat{D}, y^*, \delta = 1\} \) will be offered, where \( y^* \) is defined as before and \( \hat{D} \) is derived in the same way as \( D^{pooling} \) with \( p \) replaced by \( Q \); when the signal is bad, two contracts \( \{D^{**}, y^*, \delta = 1\} \) and \( \{D^*, y^*, \delta^*\} \) will be offered by borrowers according to their true types. In the high information asymmetry case \( q < q^* \), two contracts \( \{D^{**}, y^*, \delta = 1\} \) and \( \{D^*, y^*, \delta^*\} \) will be offered by the borrowers according to their true types, regardless of which signal might have been observed.

This completes the proof.
References


Figure 1
Unconditional and Conditional PDFs of the Signal

A. Under Neutral Accounting

B. Under Conservative Accounting
Table 1
Descriptive Statistics

Table 1 presents descriptive statistics for the full sample of 4,007 observations over the period 2000-2007. Variables are defined as follows. FinCov is the number of financial covenants in the loan contract. SlackIndex is computed as the sum of the inverse ranks of slack across all financial covenants in the loan contract. Slack for covenants that require a maximum accounting number is computed as the percentage slack ratio, (Required − Actual) / Required, where Required is the accounting ratio or number that has to be maintained as per the loan contract and Actual is the accounting ratio or number computed using current balance sheet or income statement information. For covenants that require a minimum accounting measure, we substitute the negative of the above ratio. Each slack is inversely ranked within the industry on a scale from 0 to 1 so that the larger the number, the tighter the specific financial covenant. Due to COMPUSTAT data limitations, covenant slack at the loan inception is available for 11 covenants only as follows: Max. Debt to Cash Flow covenant is measured as Total Debt / Cash Flow; Max. Debt to Equity (Leverage) covenant is measured as Total Debt / Equity; Max. Debt to Tangible Net Worth covenant is measured as Total Debt / [Total Asset − Total Liabilities − Intangible Assets]; Min. Cash Interest Coverage covenant is measured as Operating Cash Flow / Interest Expenses; Min. Interest Coverage covenant is measured as EBITDA / Interest Expense; Min. Net Worth covenant is measured as Total Assets − Total Liabilities; Min. Tangible Net Worth covenant is measured as Total Assets − Total Liabilities − Intangible Assets; Min. Current Ratio covenant is measured as Current Assets / Current Liabilities; Min. Quick Ratio covenant is measured as (Cash and Short-term Investments + Receivables) / Current Liabilities; Max. Capital Expenditure covenant is measured as Capital Expenditures (#90); Min. EBITDA covenant is measured as EBITDA (#21). DivCov is a dummy variable that equals 1 if the debt contract contains the dividend payout covenant restriction and 0 otherwise. GenCov is the number of general covenants in a debt contract. Spread is All-in-Drawn spread in basis points charged by the bank over LIBOR for the drawn portion of the loan facility. Maturity is the maturity of the loan in months. LoanSize is the size of the loan divided by firm assets in the year prior to entering into the loan contract (unscaled amounts in millions of dollars are shown in Panel A). Revolver is a dummy variable taking the value 1 if the loan type is a revolver and 0 otherwise. PerfGrid is a dummy variable taking the value 1 if performance pricing is included in loan covenants and 0 otherwise. Collateral is a dummy variable taking the value 1 if there exists a collateral requirement, and 0 otherwise. NonOppAccr measures the extent to which a firm’s earnings include negative non-operating accruals, calculated as the average (COMPUSTAT #172 + #14 - #308 + #302 + #303 + #304 + #305) / #6 measured over a 5-year period. Skewness is the difference between the skewness in the firm’s cash flows and the firm’s earnings using 20 quarters of data prior to the firm entering into the loan contract. Basu is the conservatism measure following Basu’s (1997) specification, which is the coefficient associated with the interaction of NegRet (an indicator variable that is one if Return is negative) with Return (i.e., the annual return over the 12-month period ending 3 months after the fiscal year-end) estimated by year for each 3-digit SIC group. PZ_Cscore is the conservatism index from Penman and Zhang (2002), calculated as the level of estimated reserves relative to net operating assets. Three sorts of reserves are estimated, i.e., inventory reserve, R&D reserve, and advertising reserve. Inventory reserve equals the LIFO reserve reported in the financial statement footnotes. R&D reserve is the unamortized portion of R&D assets generated by current and past R&D expenditures if these expenditures were capitalized. R&D reserve is amortized using the coefficients reported in Lev and Sougiannis (1996). Advertising reserve is amortized using a sum-of-year digits method over two years. DefRisk is a market-based measure of a firm’s default probability developed by Hillegeist et al. (2004). Asset is a firm’s total assets in millions of dollars. MV is a firm’s market value of equity in millions of dollars. TangAsset is a firm’s tangible assets, measured as net PP&E divided by total assets (unscaled amounts in millions of dollars are shown in Panel A). Loss is a dummy variable that takes the value 1 if a firm reports accounting losses in a year and 0 otherwise. ROA is the return on total assets. CFVol is the standard deviation of cash flow over past five years. Lev is financial leverage, calculated as long-term debt divided by total assets. Growth is the growth rate in a firm’s total assets. BM is the book-to-market ratio. Voting is the lead lenders’ holdings of borrowing firms’ shares with voting rights scaled by total shares outstanding. Relation is a dummy variable that equals 1 if there is an historical borrower-lender relationship and 0 otherwise. Rating is a dummy variable that equals 1 if the firm has a credit rating prior to entering into the loan contract and 0 otherwise. Age is borrower’s age, measured as the difference between the current year and the year when the firm first appeared in the CRSP database.
Panel A: Descriptive Statistics of the Full Sample

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<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>p25</th>
<th>Median</th>
<th>p75</th>
<th>Std. Dev.</th>
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Panel B: Principal Factor Loadings

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**Table 2**

**Correlation Matrix**

Table 2 lists Pearson (Spearman) correlations below (above) the diagonal for the main variables defined in Table 1. Figures in bold indicate correlations that are significant at a 5% level or better.

|     | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    | 12    | 13    | 14    | 15    | 16    | 17    | 18    | 19    | 20    | 21    | 22    |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1   |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 2   | -0.24 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 3   | 0.04  | -0.06 | -0.05 | -0.13 | -0.38 | 0.14  | -0.22 | -0.46 | -0.15 | -0.03 | -0.41 | -0.30 | 0.08  | 1.00  | -0.21 | 0.35  | -0.28 | 0.26  | -0.11 | 0.08  | 0.11  | 0.07  |
| 4   | 0.06  | 0.14  | 0.05  | 0.03  | 0.20  | 0.00  | 0.09  | 0.04  | 0.03  | 0.00  | -0.24 | 0.25  | 0.03  | -0.03 | 1.00  | -0.04 | 0.15  | -0.12 | 0.43  | 0.07  | 0.12  | 0.07  |
| 5   | 0.03  | 0.04  | 0.04  | 0.00  | 0.02  | 0.00  | 0.03  | 0.00  | -0.03 | 0.00  | -0.03 | 0.00  | -0.03 | -0.15 | -0.01 | 0.12  | 0.05  | 1.00  | -0.34 | 0.12  | 0.08  | 0.16  |
| 6   | 0.09  | -0.03 | 0.10  | 0.09  | 0.31  | -0.04 | 0.20  | -0.06 | 0.06  | -0.13 | -0.44 | -0.12 | -0.17 | 0.04  | -0.16 | 1.00  | -0.20 | 0.14  | -0.21 | 0.14  | 0.09  |
| 7   | -0.07 | 0.04  | -0.06 | -0.05 | -0.16 | 0.04  | -0.10 | -0.04 | 0.03  | -0.02 | -0.05 | -0.07 | 0.08  | 0.11  | -0.04 | 0.01  | -0.07 | 1.00  | 0.32  | 0.41  | 0.23  | 0.22  |
| 8   | 0.13  | 0.05  | 0.09  | 0.13  | 0.23  | -0.02 | 0.18  | 0.10  | 0.02  | 0.02  | 0.08  | 0.07  | -0.18 | -0.13 | -0.07 | -0.01 | 0.12  | 0.13  | 1.00  | 0.28  | 0.16  | 0.20  |
| 9   | -0.13 | 0.10  | -0.09 | -0.15 | -0.21 | 0.06  | -0.17 | -0.15 | -0.01 | -0.00 | 0.18  | 0.00  | 0.34  | 0.17  | 0.35  | 0.04  | -0.13 | 0.11  | 0.27  | 1.00  | 0.19  | 0.27  |
| 10  | -0.18 | 0.05  | -0.22 | -0.24 | -0.34 | 0.02  | -0.30 | -0.20 | 0.02  | 0.00  | -0.04 | -0.07 | 0.40  | 0.16  | -0.02 | -0.14 | -0.04 | 0.19  | 0.15  | 0.28  | 1.00  | 0.99  |
| 11  | -0.14 | 0.03  | -0.16 | -0.19 | -0.31 | 0.05  | -0.26 | -0.21 | 0.01  | 0.03  | -0.07 | -0.06 | 0.35  | 0.18  | -0.03 | -0.14 | -0.05 | 0.16  | 0.17  | 0.31  | 0.88  | 1.00  |

49
Table 3  
An OLS Regression Model of the Relation between Conservatism and Financial Covenants

Table 3 shows the results of an OLS regression estimation for a sample of firms over the period 2000-2007. Regime I (II) refers to the high (low) information asymmetry regime. Regimes are classified based on the median value of the principal factor of information asymmetry, where observations in Regime I are below the median value, and observations in Regime II are above the median value. Variable definitions are given in Table 1. P-values are two-tailed and based on standard errors adjusted for two-way clustering at the firm- and year-level.

\[
FinCov_{it} = \alpha_i + \alpha_t Cons_{t-1} + \sum_{j=2}^{7} \alpha_j LoanControls_{it} + \sum_{j=8}^{12} \alpha_j FirmControls_{it} + \delta_t Year + \epsilon_{it}
\]

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<tr>
<th>Variables</th>
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<th>Conservatism measured by</th>
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<td>Basu</td>
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<td>Regime II</td>
<td>Regime I</td>
<td>Regime II</td>
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<th>p-value</th>
<th>Coef.</th>
<th>p-value</th>
<th>Coef.</th>
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<td>0.001</td>
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R² | 0.383 | 0.511 | 0.381 | 0.513 | 0.391 | 0.527 | 0.359 | 0.514 |
N  | 1,902 | 1,974 | 1,902 | 1,974 | 1,110 | 1,054 | 791  | 868  |

50
Table 4 presents the OLS regression results of the loan spread on conservatism and financial covenant restrictions for a sample of firms over the period 2000-2007. Regime I (II) refers to the high (low) information asymmetry regime. Regimes are classified based on the median value of the principal factor of information asymmetry, where observations in Regime I are below the median value, and observations in Regime II are above the median value. Variable definitions are given in Table 1. P-values are two-tailed and based on standard errors adjusted for two-way clustering at the firm- and year-level.

\[
\text{Spread}_{i,t} = \lambda_0 + \lambda_i \text{Cons}_{i,t-1} + \lambda_i \text{FinCov}_{i,t} + \lambda_i \text{Cons} \times \text{FinCov}_{i,t} + \sum_{j=4}^{8} \lambda_j \text{LoanControl}_{i,t} + \sum_{j=9}^{14} \kappa_j \text{FirmControl}_{i,t-1} + \sum \delta_j \text{Industry} + \delta_i
\]

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<tr>
<th>Variables</th>
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<th>PZ_Cscore</th>
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**Industry Dummies:**

- YES
- YES
- YES
- YES
- YES
- YES

**R²:** 0.547

**N:** 1,902
Table 5
The Signaling Role of Conservatism and Financial Covenants on Future Wealth Appropriation

Table 5 presents Probit regression results of abnormal payouts to shareholders on conservatism and financial covenant restrictions for a sample of firms over the period 2000-2007. Regime I (II) refers to the high (low) information asymmetry regime. Regimes are classified based on the median value of the principal factor of information asymmetry, where observations in Regime I are below the median value, and observations in Regime II are above the median value. Variable definitions are given in Table 1. P-values are two-tailed and based on standard errors adjusted for two-way clustering at the firm- and year-level.

\[
\text{Prob}(Transfer_{it} = 1) = F(\kappa_0 + \kappa_1 \text{Cons}_{i,t-1} + \kappa_2 \text{FinCov}_{i,t-1} + \kappa_3 \text{Cons}^* \text{FinCov}_{i,t-1} + \sum_{j=4}^{8} \kappa_j \text{LoanControl}_{i,t-1} + \sum_{j=9}^{14} \kappa_j \text{FirmControl}_{i,t-1} + \sum \delta_i \text{Industry}_i + \epsilon_{it})
\]

<table>
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<th>Conservatism measured by Skewness</th>
<th>Conservatism measured by Basu</th>
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<th>YES</th>
<th>YES</th>
<th>YES</th>
<th>YES</th>
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<td>Pseudo R²</td>
<td>0.098</td>
<td>0.085</td>
<td>0.078</td>
<td>0.112</td>
<td>0.083</td>
<td>0.155</td>
<td>0.092</td>
<td>0.094</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>1,902</td>
<td>1,914</td>
<td>1,902</td>
<td>1,914</td>
<td>1,083</td>
<td>1,018</td>
<td>785</td>
<td>726</td>
<td></td>
</tr>
</tbody>
</table>

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Table 6
The Signaling Role of Conservatism and Covenants – Covenants Measured by a Covenant Slack Index

Table 6 replicates the analyses in Tables 3 through 5 with covenant restrictiveness measured by a covenant slack index (SlackIndex). Panels A presents the results of the OLS regression of the covenant slack index on accounting conservatism. Panel B presents results of the OLS regression of the loan spread on conservatism and covenants. Panel C presents the Probit regression results for abnormal payouts to shareholders on conservatism and covenants. Variable definitions are given in Table 1. P-values are two-tailed and based on standard errors adjusted for two-way clustering at the firm- and year-level.

Panel A: An OLS Regression Model of the Relation between Conservatism and Financial Covenants (Equation (1))

<table>
<thead>
<tr>
<th>Variables</th>
<th>Conservatism measured by NonOppAccr</th>
<th>Conservatism measured by Skewness</th>
<th>Conservatism measured by Basu</th>
<th>Conservatism measured by PZ_Cscore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regime I</td>
<td>Regime II</td>
<td>Regime I</td>
<td>Regime II</td>
</tr>
<tr>
<td>Cons</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td>Control Variables</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Industry Dummies</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>R²</td>
<td>0.529</td>
<td>0.000</td>
<td>0.514</td>
<td>0.080</td>
</tr>
<tr>
<td>N</td>
<td>1,902</td>
<td>1,974</td>
<td>1,902</td>
<td>1,974</td>
</tr>
</tbody>
</table>
### Panel B: The Signaling Role of Conservatism and Financial Covenants on Loan Spreads (Equation (2))

<table>
<thead>
<tr>
<th>Variables</th>
<th>NonOppAccr</th>
<th>Skewness</th>
<th>Basu</th>
<th>PZ_Cscore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regime I</td>
<td>Regime II</td>
<td>Regime I</td>
<td>Regime II</td>
</tr>
<tr>
<td>Cons</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td>-415.0</td>
<td>0.623</td>
<td>-682.6</td>
<td>0.781</td>
</tr>
<tr>
<td>SlackIndex</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td>4.000</td>
<td>0.622</td>
<td>-11.44</td>
<td>0.032</td>
</tr>
<tr>
<td>Cons* SlackIndex</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td>-15.68</td>
<td>0.059</td>
<td>-12.2</td>
<td>0.107</td>
</tr>
<tr>
<td>Control Variables</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Industry Dummies</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>R²</td>
<td>0.065</td>
<td>0.076</td>
<td>0.055</td>
<td>0.075</td>
</tr>
<tr>
<td>N</td>
<td>1,902</td>
<td>1,974</td>
<td>1,902</td>
<td>1,974</td>
</tr>
</tbody>
</table>

### Panel C: The Signaling Role of Conservatism and Financial Covenants on Future Wealth Appropriation (Equation (3))

<table>
<thead>
<tr>
<th>Variables</th>
<th>NonOppAccr</th>
<th>Skewness</th>
<th>Basu</th>
<th>PZ_Cscore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regime I</td>
<td>Regime II</td>
<td>Regime I</td>
<td>Regime II</td>
</tr>
<tr>
<td>Cons</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td>5.879</td>
<td>0.616</td>
<td>19.70</td>
<td>0.243</td>
</tr>
<tr>
<td>SlackIndex</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td>-0.194</td>
<td>0.029</td>
<td>-0.109</td>
<td>0.468</td>
</tr>
<tr>
<td>Cons* SlackIndex</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td></td>
<td>-1.637</td>
<td>0.085</td>
<td>-0.716</td>
<td>0.276</td>
</tr>
<tr>
<td>Control Variables</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Industry Dummies</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Psedo R²</td>
<td>0.063</td>
<td>0.137</td>
<td>0.088</td>
<td>0.164</td>
</tr>
<tr>
<td>N</td>
<td>1,902</td>
<td>1,914</td>
<td>1,902</td>
<td>1,914</td>
</tr>
</tbody>
</table>
Table 7
A Switching Regression Model of the Relation between Conservatism and Covenants

Table 7 shows the results of the switching regression estimation with unknown sample separation for a sample of firms over the period 2000-2007. Parameters are estimated by simultaneous Maximum Likelihood. Regime I (II) refers to the high (low) information asymmetry regime. Variable definitions are given in Table 1. Panel A presents the two switching regime equations. Panel B presents the regime selection equation. P-values are two-tailed.

Panel A: The Switching Regime Regressions (Equations (4) and (5))

\[ FinCov_{1i,t} = \alpha_i + \alpha_i Cons_{i,t-1} + \sum_{j=2}^{7} \alpha_j LoanControls_{i,j} + \sum_{j=8}^{12} \alpha_j FirmControls_{i,j-1} + \sum \delta_i Year + \varepsilon_{1i,t} \]

\[ FinCov_{2i,t} = \beta_i + \beta_i Cons_{i,t-1} + \sum_{j=2}^{7} \beta_j LoanControls_{i,j} + \sum_{j=8}^{12} \beta_j FirmControls_{i,j-1} + \sum \delta_i Year + \varepsilon_{2i,t} \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cons</th>
<th>NonOppAccr</th>
<th>Skewness</th>
<th>Basu</th>
<th>PZ_Cscore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regime I</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
</tr>
<tr>
<td>Regime II</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
</tr>
<tr>
<td>( Cons )</td>
<td>0.061</td>
<td>0.086</td>
<td>-0.082</td>
<td>0.207</td>
<td>0.006</td>
</tr>
<tr>
<td>Control Variables</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Industry Dummies</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.623</td>
<td>0.373</td>
<td>0.625</td>
<td>0.382</td>
<td>0.621</td>
</tr>
<tr>
<td>( N )</td>
<td>3,876</td>
<td>3,876</td>
<td>2,164</td>
<td>1,659</td>
<td></td>
</tr>
</tbody>
</table>
Panel B: The Regime Selection Equations (Equation (6))

\[ \text{Regime}_{i,t}^* = \phi_0 + \phi_1 \text{Voting}_{i,t} + \phi_2 \text{Relation}_{i,t} + \phi_3 \text{Rating}_{i,t} + \phi_4 \text{Age}_{i,t} + \mu_{i,t} \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cons. measured by NonOppAccr</th>
<th>Cons. measured by Skewness</th>
<th>Cons. measured by Basu</th>
<th>Cons. measured by PZ_Cscore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>p-value</td>
<td>Coef.</td>
<td>p-value</td>
</tr>
<tr>
<td>Voting</td>
<td>-7.219</td>
<td>0.000</td>
<td>-7.840</td>
<td>0.000</td>
</tr>
<tr>
<td>Relation</td>
<td>-0.162</td>
<td>0.000</td>
<td>-0.164</td>
<td>0.000</td>
</tr>
<tr>
<td>Rating</td>
<td>-0.013</td>
<td>0.000</td>
<td>-0.013</td>
<td>0.000</td>
</tr>
<tr>
<td>Age</td>
<td>-0.105</td>
<td>0.000</td>
<td>-0.123</td>
<td>0.000</td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R²: 0.185 0.191 0.247 0.229
N: 3,876 3,876 2,164 1,659