Financial Ratios and Credit Risk:
The Selection of Financial Ratio Covenants in Debt Contracts

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Abstract

This study examines the selection of financial ratio covenants in debt contracts. Expanding on existing theory and evidence, I predict that loan contracts will include covenants with ratios that are informative of credit risk based on borrower or contract characteristics. The results support this prediction. I find that contracts of borrowers with positive earnings, high profitability, and low volatility earnings are likely to include covenants measured with earnings, such as coverage or debt to cash flow. Debt contracts of borrowers with losses, low profitability, and highly volatile earnings are likely to include covenants measured with shareholders' equity, such as net worth. Additionally, deals with revolving lines of credit are likely to contain leverage covenants, and those for borrowers with high levels of working capital are likely to contain current ratio covenants. In total, the evidence is consistent with contracts using ratios in covenants that are most informative of borrower credit risk.

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1. Introduction

This study examines the selection of financial ratio covenants in debt contracts. Financial ratio covenants, where the borrower is required to maintain threshold levels of specified accounting ratios, are common provisions of debt contracts. In this study's sample of 16,364 syndicated loan agreements, 78% of the deals include at least one financial ratio covenant. Additionally, five different types of ratios—coverage, current, debt to cash flow, leverage, and net worth—are commonly used in covenants. Despite widespread and varied use, there is little evidence documenting how financial ratios are selected for inclusion as covenants. This paper is the first to examine the research question: what drives the selection of financial ratio covenants in debt contracts?

The predictions on the selection of financial ratio covenants draw on evidence linking financial ratios and credit risk. This relation is well known in the practitioner and academic literature. Textbooks note the role of ratios in evaluating credit quality (Lundholm and Sloan 2004), while academic studies find that financial ratios serve to provide signals about borrower credit risk when used as covenants (Smith and Warner 1979, Dichev and Skinner 2002). The existing evidence suggests that financial ratios are informative of borrower credit risk, and that this informativeness drives their inclusion in debt contracts. I use this general view—informativeness driving inclusion—to make predictions on the variation in financial ratio covenant use. I identify how each covenant ratio is linked to credit risk. The commonly used covenant ratios capture three aspects of credit risk: profitability and operating performance (coverage, debt to cash flow, and net worth), total indebtedness (leverage), and short-term liquidity (current). I then identify borrower or contract characteristics that make each ratio more or less informative of credit risk based on its link. This is followed by predictions on cases when

a specific covenant is likely to be included in a debt contract. For example, the earnings of loss firms are relatively uninformative of future firm performance (Hayn 1995, Burgstahler and Dichev 1997). Given the link between operating performance and credit risk, ratios measured with earnings, such as coverage and debt to cash flow, are relatively uninformative of credit risk for loss firms. The corresponding prediction is that loans for loss firms are unlikely to include coverage and debt to cash flow covenants. Based on a variety of factors that make specific ratios more or less informative, I develop predictions on the inclusion of each covenant type.

The results are consistent with the predictions. Borrowers with positive earnings, high profitability, and low volatility earnings are relatively likely to have interest coverage and debt to cash flow covenants in their loan contracts. These ratios, measured with earnings from the income statement, are informative for stable, profitable firms. In contrast, borrowers with negative earnings, low profitability, and high volatility earnings are likely to have net worth covenants. Shareholders' equity is informative relative to earnings for poorly performing, volatile firms, making net worth informative of credit risk for these borrowers. These findings support the prediction that the inclusion of coverage, debt to cash flow, and net worth covenants is driven by the ratio's informativeness of credit risk related to operating performance and profitability. The evidence also shows that leverage covenants are more likely to be included in contracts of borrowers with revolving lines of credit. Leverage, which measures overall indebtedness, is particularly relevant to the credit risk profile of borrowers with revolvers because they can draw down additional debt more easily than borrowers without lines of credit. Finally, loans for borrowers with high levels of working capital are likely to include current ratio covenants. Current ratio measures short-term liquidity, and is more informative of credit risk

when current accounts are high. These empirical results support the prediction that contracts include financial ratio covenants that are most informative of borrower credit risk.

This paper builds on the research on debt covenants. Existing studies examining the inclusion of covenants focus primarily on the determinants of restrictive (or negative) covenants, where specific borrower actions are limited or prohibited in the contract.[1] Negative and financial ratio covenants differ in a fundamental way. Negative covenants require an action by the borrower to be violated, while financial ratio covenants are often violated due to poor operating performance. Existing research has treated these two covenant types as substitutes that serve the same purpose.[2] By focusing on credit risk generally rather than actions that explicitly transfer wealth from creditors to firm owners, the results in this study suggest a complementary role for these two types of provisions: negative covenants prevent borrower actions that explicitly decrease the value to lenders, while financial ratio covenants limit the costs of a) adverse actions that are not controlled by negative covenants and b) increases in credit risk unrelated to borrower action (e.g. poor operating performance driven by economy or industry shocks).

The results of this study also contribute to the literature examining reporting choices for firms subject to debt covenants. Two streams of literature examine the implications of having debt covenants. The debt covenant hypothesis predicts that firms make income-increasing accounting decisions when close to covenant thresholds. Originally termed the "debt/equity hypothesis" by Watts and Zimmerman (1986), studies examine accounting choices (Sweeney 1994), accruals (DeFond and Jiambalvo 1994), and the distribution of covenant financial ratios (Dichev and Skinner 2002). In another stream of research, theory posits that debt covenants

[1] Jensen and Meckling (1976) and Smith and Warner (1979) describe the role of negative covenants in limiting the agency cost of debt. Empirical studies examine limitations on dividends (Kalay 1982, Healy and Palepu 1990) and restriction on the issuance of debt (Begley and Feltham 1999, Nash et al. 2003).

[2] For example, Bradley and Roberts (2004) examine the influence of debt covenant inclusion on the pricing of debt. An index of contractual provisions, including financial ratio and other covenants, is used as an explanatory variable.

motivate the demand for conservative accounting (Watts 2003). Empirical studies have examined the benefit of conservatism for debt contract pricing (Zhang 2004) and the association between covenants and conservatism (Beatty et al. 2006). The consistent assumption for papers investigating both the debt covenant hypothesis and accounting conservatism is 'covenants in place'; that is, predictions are made given the covenants included in the contract. However, there is no modeling of how the covenants are put in place or what determines their inclusion. This paper fills this void in the literature. In this sense, the results in this study form a foundation for studies examining the implications of having debt covenants on borrower behavior.

The next section develops predictions. Section 3 describes the sample and empirical data. Section 4 presents the empirical tests and results, while Section 5 concludes.

2. Background and Predictions

2.1 Credit Risk, Errors in Detection, and Informativeness

Credit risk is the probability that a borrower will fail to make required payments of principal and interest over the life of the loan. Risk plays an important role in debt contracting. At loan inception, the lender estimates the expected credit risk that the borrower presents over the life of the loan. Absent provisions to control increases in credit risk, the lender prices the expected outcome in the interest rate of the loan. Both lender and borrower suffer when the expected credit risk of the borrower is high: the lender with increased risk over the life of the loan, and the borrower with a high interest rate. This suggests that both contracting parties benefit when provisions are included in the debt contract to control increases in credit risk. These provisions are one type of debt covenant. A covenant that allows action by the lender when credit risk increases above a specified level is valuable to the lender because they will no

longer be left bearing the full cost of the risk increase. The borrower should be compensated with a lower interest rate for consenting to a covenant in the contract.

The practical problem that presents itself is measurement. Credit risk is unobservable, so its measure cannot be directly used in the covenant. Rather, a covenant must use a proxy to measure credit risk. The optimal proxy is perfectly correlated with changes in credit risk. A covenant measured with an optimal proxy allows the lender to take action when credit risk is perceived (by the lender) to have increased, but does not allow action if the increase in credit risk is sufficiently low (or negative). Any departure from this optimal measurement results in an error-in-detection of a change in credit risk. Errors-in-detection are illustrated using the following framework.

Define r as the level of borrower credit risk. Further, define r* as the "too risky" level of credit risk. In other words, if borrower credit risk increases above r* during any period the lender will want to take action to reclaim the principal of the loan. Assume that r and r* cannot be used in the contract. The contract instead uses a covenant ratio, c, set to a threshold level c*. That is, if c goes above c* the lender can take action. The optimal case is when c is perfectly correlated with r: when r is greater than r*, c is greater than c*, and when r is less than r*, c is less than c*. Less than perfect correlation between underlying credit risk and the covenant ratio yields four possible cases, summarized in Figure 1.

Type I errors take place when the ratio exceeds the threshold but there has been little increase in credit risk. Type II errors are missed detection of increased risk: the lender would prefer to take action, but the ratio has not crossed the threshold, leaving the lender with no recourse. Assuming each error is costly, it is beneficial to use a covenant ratio that accurately

reflects changes in credit risk.[3] The informativeness of a ratio is defined as how accurately it measures the credit risk of the borrower. Based on the framework and Figure 1, informative covenant ratios minimize the incidence of Type I and Type II errors. Since informative covenants minimize costs, they are likely to be included in debt contracts.

2.2 Financial Ratio Covenants

Financial ratio covenants require the borrower to maintain a threshold level of a specified accounting ratio. If the borrower fails to maintain the threshold, the contract enters technical default and the lender has the option to take action. This option is valuable to the lender, who can evaluate the credit condition of the borrower and act accordingly.[4] There are five types of financial ratio covenants commonly used in contracts:

1. Minimum Coverage (earnings / periodic debt-related expense)
2. Maximum Debt to Cash Flow (total debt / earnings)
3. Minimum Net Worth (assets – liabilities = shareholders' equity)
4. Maximum Leverage (total debt / total assets)
5. Minimum Current (current assets / current liabilities)

Each of these has a link to borrower credit risk. The first three each use a measure of operating performance. Coverage and debt to cash flow each are measured using earnings from the income statement, while net worth captures shareholders' equity. Operating performance is an important element of credit risk. Debt payments are made out of firm cash flows. Evidence shows that earnings are a good predictor of future cash flows (Dechow et al. 1998, Barth et al. 2001). This

[3] Dichev and Skinner (2002) find that financial ratio covenants in private debt agreements are generally set to a tight level and frequently violated, suggesting a high cost to Type II errors relative to Type I. The majority of violations are waived, suggesting little if any direct cost to Type I errors for private debt (though this is not the case for public debt, see Beneish and Press 1993). However, as suggested in recent press articles, one cost of Type I errors may be that the borrower is left vulnerable to aggressive investors who purchase the debt in technical default and try to force immediate payment (Lattman and Richardson 2006).

[4] Gopalakrishnan and Parkash (1995) find six common actions following technical default, ranging from a waiver of the violation to a full call on the outstanding principal of the loan. Chen and Wei (1993) model the lender decision given technical default.

suggests, all other things equal, that firms with strong earnings performance are less likely to default on their debt obligations. Firms with high (low) levels of coverage and net worth (debt to cash flow) have lower credit risk. Leverage provides a measure of overall indebtedness of the firm. Leverage is often considered when evaluating credit quality, with high leverage firms having higher credit risk than those with relatively less debt. Current ratio captures the short-term liquidity of the firm. Since debt payments are ultimately made from cash, the current ratio measures the extent to which current assets are available to make payments. Current ratio is negatively associated with credit risk.

Anecdotal evidence supports the view of financial ratios as informative of credit risk. Lundholm and Sloan (2004) note that financial ratio covenants are useful because "… if the company starts to look sufficiently sick, the bank can rush back and grab assets before they are all gone." Moreover, rating agencies use financial ratios in evaluating credit quality.[5] The academic literature also supports this view of financial ratios. Smith and Warner (1979) note that violation of covenants provides a signal to the lender. Dichev and Skinner (2002) find that financial ratio covenants are used as "trip wires" in debt contracts. To further document and confirm this relation, the Appendix provides descriptive evidence examining the association between financial ratios and measures of credit quality.

2.3 Predictions

While each ratio described in Section 2.2 has a link to credit risk, this link is made stronger or weaker by features of the borrower or the debt contract. I identify borrower and contract features that strengthen or weaken the ability of specific ratios to reflect borrower credit

[5] A credit upgrade for Staples, Inc. described improvement in debt to cash flow and coverage ratios (Standard & Poor's 2006). Similarly, a ratings affirmation for Limited Brands, Inc., noted that deterioration or stabilization of coverage and debt to cash flow would impact future rating changes (Moody's 2006).

risk. The predictions link variation in these features with the inclusion of each financial ratio covenant.

Operating performance is a major driver of borrower credit risk. All other things equal, a borrower with strong operating performance is less likely to default than a borrower with weak operations, because debt payments are ultimately made from earnings. Earnings from the income statement generally provide an informative signal of borrower performance. Studies have shown that current earnings are associated with future earnings (Finger 1994, Nissim and Penman 2001), future cash flows (Dechow et al. 1998, Barth et al. 2001), and equity performance (Dechow 1994). As such, coverage and debt to cash flow provide a clear signal of the borrower's ability to make future debt payments. In contrast, shareholders' equity is relatively uninformative as a measure of operating performance, as it includes net accumulated earnings, contributed capital, and other non-operating items that do not articulate through the income statement. This suggests that net worth is relatively less informative of credit risk, and less useful as a covenant.

Certain borrower features make earnings (relative to shareholders' equity) less informative of the future prospects of the firm. Hayn (1995) shows that the earnings of loss and low profit firms are less informative than those of firms with higher profitability. Similarly, Burgstahler and Dichev (1997) find that earnings are less informative than shareholders' equity when firm earnings are low. Both studies use option-style models to measure the relative informativeness of earnings versus equity. When earnings are low, the firm is less likely to continue operations that result in this poor performance; they may opt to liquidate the firm (Hayn 1995) or adapt firm assets to a more profitable purpose (Burgstahler and Dichev 1997). In either case, low earnings make equity relatively more informative of the future operating prospects of

the firm. Since credit risk is closely tied to the operating performance of the borrower, these findings can be applied to the informativeness of ratios used in debt covenants. This leads to predictions for borrowers with negative earnings and low profitability.

P1: Debt contracts of borrowers with negative earnings are less likely to include covenants measured with earnings (coverage and debt to cash flow) than contracts of borrowers with positive earnings. Debt contracts of borrowers with negative earnings are more likely to include covenants measured with shareholders' equity (net worth) than contracts of borrowers with positive earnings.

P2: Debt contracts of borrowers with high profitability are more likely to include covenants measured with earnings (coverage and debt to cash flow) than contracts of borrowers with low profitability. Debt contracts of borrowers with high profitability are less likely to include covenants measured with shareholders' equity (net worth) than contracts of borrowers with low profitability.

Beyond the level of earnings, the volatility of earnings also plays a role in ratio informativeness. Highly volatile earnings are less persistent than those with lower volatility, making accurate projections of future earnings more difficult. Additionally, evidence has shown that earnings volatility makes accounting accruals more difficult to estimate (Dechow and Dichev 2002). If accruals are used by managers to convey private information about the condition of the firm, volatility will decrease the informativeness of earnings. Finally, in the model of Burgstahler and Dichev (1997), volatility decreases the value of current earnings relative to equity.[6] These findings yield the third prediction.

P3: Debt contracts of borrowers with high earnings volatility are less likely to include covenants measured with earnings (coverage and debt to cash flow) than contracts of borrowers with low earnings volatility. Debt contracts of borrowers with high earnings volatility are more likely to include covenants measured with shareholders' equity (net worth) than contracts with low earnings volatility.

To summarize these predictions, borrowers with non-negative earnings, high profitability, and low volatility earnings are predicted to have coverage and debt to cash flow covenants in their

[6] Burgstahler and Dichev (1997) measure the recursion value of earnings as expected future earnings times a capitalization factor. Volatility lowers the expected future value of earnings through lower persistence.

loan contracts. Borrowers with negative earnings, low profitability, and high volatility earnings are predicted to have net worth covenants in their contracts.

Leverage measures the overall indebtedness of the borrower. As with earnings-based ratios, there are certain cases where leverage will be more or less informative of borrower credit risk. One case is when the loan package includes a revolving line of credit. There are two main types of facilities in private loans: term loans and revolving lines of credit. With term loans, the full amount of the loan is drawn on deal inception and subject to repayment at specified intervals. Revolving lines of credit require neither full drawdown of the principal nor fixed repayment. Rather, the borrower is free to draw upon the line as needed, up to the limit, and pay down the balance when they choose. Borrowers of revolving lines of credit have easier and quicker access to credit than firms without credit lines. For this reason, total indebtedness is a relatively important signal of overall credit risk for borrowers with revolving lines of credit. A leverage covenant limits the borrower's ability to draw upon a revolving line of credit, particularly when operating performance is poor and the borrower's assets have dwindled. This suggests leverage covenants are most useful in contracts with revolving lines of credit.

P4: Contracts with revolving lines of credit are more likely to include leverage covenants than contracts without revolving lines of credit.

The final commonly used ratio is current. Current ratio measures the short-term liquidity of the borrower. Liquidity is more informative of credit risk for firms with high levels of short-term assets and liabilities. For example, the current ratio should be informative for firms in inventory-intensive industries, since the operations and cash flows of firms in these industries are driven by short-term accounts. This gives the final prediction.

P5: Contracts of borrowers with high levels of current assets, current liabilities, and working capital are more likely to include current ratio covenants than contracts of borrowers with low levels of current assets, current liabilities, and working capital.

The predictions are summarized in Figure 2.

3. Data and Sample

3.1 Setting and Sample

The sample consists of 16,364 syndicated private loan agreements from US firms on the LPC/Dealscan database. Syndicated private debt is a powerful setting to examine debt covenants. Private debt agreements are more likely to include covenants than public debt as less dispersed ownership makes violation and renegotiation less costly. Additionally, while public debt is more likely to contain a set of standard provisions, it is easier and less costly to customize private debt contracts to the features of the borrower. Predictions on the selection of covenants should yield particularly sharp results in this setting.

Data on Dealscan are classified on two levels: facilities and deals. Facilities are individual loan agreements. Deals often contain multiple facilities from a single lender or lending group. For example, it is common for a borrower to have a term loan and a line of credit packaged in a single deal. The analysis in this paper is made on the deal level, because all the facilities in a deal use the same covenants.

Accounting data are collected from quarterly Compustat. Loan data from Dealscan is collected as follows:

1. The Dealscan record must have a deal effective date and financial ratio covenant data available.
2. Dealscan and Compustat data are matched by ticker symbol. Matching names are confirmed for all ticker matches.
3. Any Dealscan record not matched by ticker is matched by name.
4. Dealscan records are matched to the most recent fiscal quarter-end data from Compustat. If the Compustat data is over one year old, the observation is deleted.
5. Deals missing total assets from Compustat (data item #44) are deleted.

The sample draws from 22,185 Dealscan deals totaling 34,043 facilities. The final sample consists of 16,364 deals that satisfy the matching requirements. Table 1 presents data on the sample. Panel A presents deal-level data by year. Loan size (New Debt) increased over the sample period, and on average is $254 million, suggesting that private debt is a large and increasingly substantial means of raising capital. Materiality is the amount of the loan as a percentage of firm assets, and Maturity is the loan term in months. Panel B presents accounting data for the sample firms. Each of these variables is truncated at the top and bottom 1% of observations. The firms are on average large, with total assets of over $6 billion, and profitable. With 16,364 deals representing over $4 trillion in total financing, this sample captures a large portion of private debt financing.

3.2 Financial Ratio Covenants

Financial ratio covenants are defined as in Dealscan. Dealscan provides information on twelve different types of ratios.[7] I group these twelve ratios into the following five classes:

1. **Coverage**: interest coverage (earnings / interest expense), debt service coverage (earnings / interest expense plus principal payments), fixed charge coverage (earnings / interest expense, principal, and other expenses such as rent, taxes and capital expenditures), cash interest coverage (earning / cash basis interest expense).
2. **Current**: current assets / current liabilities.
3. **Debt to Cash Flow**: total debt / earnings, total senior debt / earnings.
4. **Leverage**: total debt / total assets, senior debt / total assets, total debt / total equity.
5. **Net Worth**: total capitalization (assets – liabilities), total tangible capitalization (tangible assets – tangible liabilities).

The classifications are based on commonality in the ratios; for example, all coverage ratios have earnings in the numerator and some debt-based expense or payment in the denominator. The predictions are made on the inclusion of covenants from a particular class, rather than on

[7] Dealscan includes a thirteenth ratio, loan-to-value. However, this is included in only five deals, so I exclude this from the analysis.

inclusion of a specific covenant (e.g. the inclusion of a coverage covenant versus the inclusion of fixed charge coverage specifically). This decision has costs and benefits. By grouping certain covenants into a single class, some information will be lost. At the same time, it is likely that covenants within a class are used for similar purposes. Leftwich (1983) shows that covenants are set using GAAP accounting as a starting point and then customized to the specific needs of the contract. The same logic applies for covenant selection; for example, a contract may use senior debt to cash flow rather than general debt to cash flow when there are multiple classes of long-term debt. While it is clear that the covenants within a class are not identical, their use is likely similar enough to justify this grouping. Table 2 presents the incidence of financial ratio covenants by year for sample firms.

4. Empirical Results

4.1 Earnings-Based Covenants

I examine each prediction using three tests. In univariate analysis, I compare differences in predicted determinants between borrowers that use a specific covenant and those that do not. Marginal analysis is similar to the univariate tests, but uses finer partitions of borrowers to assess the selection of covenants. I measure the economic significance of the hypothesized determinants using probit regressions. I describe these tests while discussing the results for the first prediction.

The first prediction is that the earnings of loss firms are uninformative of future firm prospects relative to shareholders' equity, making earnings-measured ratios less likely to be used in covenants and equity-measured ratios more likely to be used. The univariate analysis examines the proportion of firms having losses, conditioned on inclusion of each specific

covenant. Firms are divided into two portfolios: those deals that include a particular covenant and those that do not. This is shown in Table 3, Panel A. The top row presents results for coverage covenants. There are 6,456 deals with a coverage covenant and 2,082 without.[8] Negative earnings is an indicator variable taking on a value of 1 when the sum of quarterly earnings (data item #21) for the trailing four quarters prior to deal inception is negative and 0 otherwise. The mean value of the indicator is measured for each portfolio; this captures the proportion of firms from each group that have negative earnings. The next column shows the predicted sign of the difference between portfolios, followed by the proportion for each portfolio. Prediction 1 says that firms with negative earnings are relatively unlikely to have a coverage covenant in their debt contracts, yielding a negative predicted sign. A total of 3.4% of borrowers with a coverage covenant have negative earnings, compared with 9.4% for borrowers without coverage. The difference of 6.0% is in the predicted direction and statistically significant with a t-value of -8.37. This provides support for Prediction 1 for coverage. The results for debt to cash flow and net worth covenants are similar: the differences are in the predicted direction and statistically significant, consistent with Prediction 1.

One problem with the univariate analysis is that debt contracts often contain multiple covenants. This can lead to inference problems. For example, a deal for a borrower with positive earnings includes both coverage and debt to cash flow covenants. The evidence in Panel A suggests that non-negative earnings drive inclusion of both of these types of covenants, so it is not clear which one's use is driven by earnings. To alleviate this problem, I complete a marginal analysis. Marginal analysis is similar to univariate analysis in that deals are sorted into two

[8] This analysis excludes deals that use no covenants. Unreported analysis suggests that these borrowers are different from others, either being large and financially strong (so that covenant protection is not needed) or having experienced very poor financial performance (so that no ratios are informative). In either case, including these deals in the analysis is likely to cloud the inference on informativeness.

portfolios based on inclusion of each covenant. In the marginal analysis, the firms are further sorted into pair-groups that differ by a single covenant. Panel B of Table 3 illustrates the sorting. The first two columns present the combined covenant class, a 5-digit number reflecting inclusion of covenants from each individual class. The order of the digits is {coverage, current, debt to cash flow, leverage, net worth}. For example, {01010} includes deals that contain current and leverage covenants. In Panel B, all the combined classes in the first column include coverage while those in the second column do not. Additionally, the pairs in each row differ only by inclusion of coverage. For example, the first row of Panel B contrasts deals with coverage and net worth {10001} against those with net worth only {00001}. Fifteen pairs are examined, including every possible ratio combination not including coverage. In this way, the role of negative earnings in determining the inclusion of coverage covenants can be evaluated independent of the presence of other ratio covenants.

The other columns in Table 3, Panel B are similar to univariate analysis, showing the number of deals for each group, the predicted sign, the mean value by group, the difference, and the t-statistic. Differences for 12 of 15 pairs are in the predicted direction, with 3 statistically significant. The t-statistics from the individual pairs are aggregated into a Z-statistic:

$$Z = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \frac{t_j}{\sqrt{k_j / k_j - 2}}$$

N is the number of pairs, k_j is the degrees of freedom for each pair j (adjusted for unequal variances), and t_j is the t-statistic for the difference in pair j. Assuming independence of t-statistics across pairs, the Z-statistic has a standard normal distribution. The value of -4.30 indicates that on the marginal level deals including coverage covenants are less likely for borrowers with negative earnings, consistent with Prediction 1.

For the sake of parsimony, I present summary marginal results for debt to cash flow and net worth covenants. These results are shown in Table 3, Panel C. Differences for 12 and 7 pairs are in the predicted direction for debt to cash flow and net worth. The Z-statistic is statistically significant for debt to cash flow. Coupled with the results in Panel A, these findings provide further evidence supporting Prediction 1.

Neither the univariate nor marginal analysis takes into account the impact of other variables that have been shown to influence the decision to use covenants. To estimate the impact of negative earnings on covenant selection given other variables, I run multivariate probit regressions with control variables. These variables are:

- **Asset Market to Book**: This measures the growth opportunities of the firm (Smith and Watts 1992), with a higher value indicating greater growth opportunities. Skinner (1993) shows that firms with low growth opportunities are more likely to use accounting-based debt covenants. The coefficient is predicted to be negative.
- **Maturity**: This measures loan term in months. Longer-term loans are relatively risky, so the demand for covenants is predicted to be increasing in deal maturity.
- **Materiality**: This is the amount of the new debt scaled by the total assets of the borrower. More material debt is more risky, so demand for covenants should be increasing. Both months to maturity and materiality are examined in El-Gazzar and Pastena (1991) and are predicted to have positive coefficients.
- **Performance Pricing**: Performance pricing is a contractual provision that allows the loan spread to vary based on borrower performance. Performance is often linked to debt to cash flow or an agency credit rating. The impact of performance pricing on financial ratio covenant use is ambiguous. Performance pricing may be a substitute for these covenants by limiting borrower performance risk. However, Dichev et al. (2002) show that performance pricing and financial ratio covenants can be complementary, with performance pricing rewarding good performance and covenants limiting the effects of poor performance. Therefore, there is no predicted sign for the coefficient.
- **Leverage**: Leverage is a proxy for monitoring costs and closeness to covenant violation (Holthausen and Leftwich 1983, Press and Weintrop 1990). High leverage suggests higher risk, increasing the demand for covenants. Moreover, high leverage is associated with low growth opportunities, suggesting greater use of accounting-based covenants.
- **Merton Distance to Default**: This measure (based on Merton 1974) captures firm distress. Higher values indicate a borrower further from default, so a negative coefficient is predicted.

Each probit regression also includes indicator variables for industry (based on Fama and French 1997) and year. Responses are coded to 1 when the covenant is used and 0 otherwise. The results of the probit estimation are shown in Panel D of Table 3. Each regression includes the indicator for negative earnings as the main effect under study. For all three covenants, the coefficient on negative earnings is in the predicted direction and statistically significant. To assess the economic significance of these results, I calculate the marginal effect. This is measured using the formula:

$$\phi(x_i\beta)\beta_j$$

where ϕ is the standard normal density function, x_i is the vector of explanatory variables for observation *i*, β is the vector of coefficients, and β_j is the coefficient estimate for variable *j*. The marginal effect measures the difference in likelihood of using the covenant (response of '1') for a one unit difference in variable *j*, holding all other variables at their mean values. Negative earnings is an indicator variable, so the economic significance reported in the table measures the difference in likelihood of including a coverage covenant for borrowers with negative earnings versus those with non-negative earnings. The economic significance is substantial for each covenant type. Firms with negative earnings are 26.98% and 28.31% less likely to use coverage and debt to cash flow covenants, respectively, but 10.21% more likely to use a net worth covenant. These results confirm the economically important role negative earnings play in determining earnings-based covenant selection.

Prediction 2 states that borrowers with high profitability are likely to have coverage and debt to cash flow covenants in their debt contracts, while those with low profitability will have net worth covenants. Profitability is return on assets (ROA), measured as the sum of trailing four quarter earnings (data item #21) scaled by average total assets (data item #44). Univariate,

summary marginal, and probit analyses are presented in Table 4. Panel A shows univariate results. For each covenant, the difference in ROA is in the predicted direction and between (in absolute terms) 1.0% and 3.1%. These results are statistically significant. Panel B presents summary marginal analysis. The results for debt to cash flow are statistically significant, with 13 pairs in the predicted direction and a Z-statistic of 10.15. However, coverage has 8 pairs with the predicted sign, and net worth only 7, and the Z-statistic is not significantly different from zero for either. Probit analysis is presented in Panel C. The coefficient on ROA is significant in the coverage and debt to cash flow regressions, but insignificant for net worth. As with negative earnings, I assess the economic significance of the results by measuring the marginal effect. Since ROA is a continuous variable, the reported significance is the interquartile difference in ROA. This is the difference in likelihood of including a covenant for borrowers at the 3rd quartile versus the 1st quartile. ROA plays a significant role in the determination of coverage and debt to cash flow covenants, with contracts of high ROA firms 4.82% and 8.78% more likely to include these than low. The statistical and economic significance in the net worth regression is low. The findings are consistent with Prediction 2 for coverage and debt to cash flow, suggesting ROA plays a role in their selection. The weak results for net worth (coupled with the results of Prediction 1) suggest that borrowers with negative earnings are more likely to have net worth covenants, but that variation beyond this (e.g. non-negative but low earnings versus non-negative and high earnings) has little explanatory power.

The third prediction examines earnings volatility. Earnings volatility is measured as the standard deviation of the borrower's four quarter ROA for the five years preceding loan

inception.[9] Univariate and marginal results are presented in Table 5, Panels A and B. In the univariate tests, the differences are small (ranging in absolute terms from 0.2% to 0.8%), but in the predicted direction and significant for coverage and net worth. The marginal results in Panel B are also of the predicted sign and significant for each ratio. In the probit analysis in Panel C, the coefficient on volatility is significant for coverage and debt to cash flow, but insignificant for net worth. The economic significance, measured as the marginal effect times the interquartile difference, is small relative to the other determinants, at -1.58%, -0.35%, and 0.34% for the three respectively. The results show that there may be statistically significant differences in earnings volatility between borrowers with contracts including and not including covenants, but these are not economically strong. This suggests that any effect volatility has on the selection of earnings-based covenants is secondary to negative earnings and profitability.

4.2 Leverage Covenants

The fourth prediction is that a leverage covenant is more likely to be used when a deal contains a revolving line of credit. Deals often comprise multiple facilities. The most common combination is one or more term loans with a revolving line of credit. Since Dealscan has data at the facility level, I am able to identify all deals that include revolving lines of credit. I create an indicator variable, Revolver, which receives a value of 1 for deals including a revolving line of credit and 0 otherwise. In total, 22% of sample deals have a revolving line of credit.

Table 6, Panel A shows the univariate analysis. Over 30% of deals with a leverage covenant have a revolving line of credit, in contrast to only 17% of deals not including a leverage covenant. This difference is large and statistically significant with a t-statistic of 17.23. This

[9] ROA is calculated for the trailing four quarters using quarterly data. Five years of data at four quarter intervals (i.e. for quarters t-3 to t, t-7 to t-4, etc.) are used to calculate standard deviation. This method of calculation limits the influence of seasonality on earnings.

result is supported by the marginal analysis in Panel B, with 10 pairs in the predicted direction and a Z-statistic of 4.70. The probit regression in Panel C shows that deals including revolvers are 12.63% more likely to include a leverage covenant than those not having a revolving line of credit. This finding is particularly strong as the regression includes the maturity of the contract as a control variable: revolvers are short-term facilities, so on average deals with a revolver will have shorter terms. The evidence in Table 6 provides evidence supporting Prediction 4 that revolving credit lines drive the inclusion of leverage covenants.

4.3 Current Ratio Covenants

The fifth prediction is that borrowers with more current accounts are likely to have a current ratio covenant in their debt contracts. This section examines three measures of current accounts. The first is current assets (data item #40) and the second is current liabilities (data item #49). The third, working capital, combines the two into a net current accounts figure. This is defined as cash and equivalents (data item #36) plus current receivables (data item #37) plus inventory (data item #38) plus other current assets (data item #39) less accounts payable (data item #46) less other current liabilities (data item #48). Each of these variables is scaled by average total assets.

Univariate results are presented in Table 7, Panel A. The predicted sign on each variable is positive, as higher levels are predicted to drive current ratio covenant use. Each difference is positive as predicted, but only current assets and working capital are statistically significant. These results are confirmed by the marginal analysis in Panel B, where current assets and working capital are again positive and significant but current liabilities is insignificant. The results in these panels suggest that the amount of current liabilities do not drive the use of the

current ratio. Additionally, current assets and working capital are highly correlated. Given this correlation, the probit analysis is run using only working capital.[10] The coefficient on working capital is positive and significant. The economic significance shows that borrowers with high working capital are 14.27% more likely to have a current ratio covenant than those with low working capital. These results support Prediction 5.

4.4 Robustness Checks

Alternative Univariate Tests: The univariate tests evaluate the difference between groups with and without specific covenants using t-tests. As a robustness test, I perform similar analysis using two non-parametric methods. I use Wilcoxon tests to compare the medians of each portfolio. The difference is statistically significant at the 1% level for all but two tests (standard deviation of ROA for coverage, p=0.0519 and standard deviation of ROA for debt to cash flow, p=0.0906). The second robustness check evaluates the significance of the differences between portfolios using bootstrap standard errors. I draw 100 bootstrap samples of 500 observations from each portfolio. The standard deviation for each variable is measured for each sample draw, and the mean value of the standard deviation across the 100 draws is calculated. The bootstrap standard deviation is used to measure the statistical significance of the actual differences. The univariate results are robust to use of this alternative measure.

Use of Quarterly Figures: The tests measuring income statement variables (negative earnings, ROA, ROA volatility) use the trailing four quarters to measure the variables. Additional analysis using only the most recent quarter's data yields similar results.

[10] Unreported analysis shows a correlation of 0.65 between current assets and working capital. Probit analysis using current assets instead of working capital yields qualitatively similar results.

Additional Controls: The probit regressions use a variety of control variables that have theoretical links to the decision to use covenants. In additional analysis, I include several other variables that may be associated with covenant use. These include firm size (measured as the natural log of total assets) as well as indicator variables for the use of collateral, restrictions on dividends, restrictions on new debt, and restrictions on asset sales. The results are robust to the inclusion of these variables.[11]

Correlation between Earnings Variables: The variables used to test the first three predictions—negative earnings, ROA, and the standard deviation of ROA—are correlated, with negative correlation between ROA and the other two variables. This makes inferences on the individual determinants difficult without measuring the impact of this correlation. I use two additional tests to assess the influence, if any, of this correlation. First, I run probit regressions including all three variables. These results are given in Table 8. The coefficients and calculated economic significance for negative earnings and ROA are smaller (in absolute terms), but inferences are similar: negative earnings is still a significant determinant for all three covenants, and ROA is significant for coverage and debt to cash flow. The results for ROA volatility are also diminished, though this is consistent with the generally weak results in Table 5. As a second robustness check, I run OLS regressions to calculate the variance inflation factors. The regressions include the three earnings variables and controls. The variance inflation factors in each regression are under two for each of the variables, confirming that multicollinearity is not a serious problem.

[11] An additional explanatory variable, seniority, was excluded from any tests because 98.9% of sample deals are classified as senior.

5. Conclusion

This study examines the selection of financial ratios for covenants in debt contracts. The results show that financial ratio covenant inclusion is related to borrower or contract features that make the ratio more or less informative of borrower credit risk. Borrowers with positive earnings, high profitability, and low volatility earnings tend to have coverage and debt to cash flow covenants in their debt contracts, while borrowers with negative earnings, low profitability, and high volatility earnings have net worth covenants. Deals using revolving lines of credit are relatively likely to contain leverage covenants. Finally, borrowers with high working capital and current assets are likely to have current ratio covenants. The evidence is consistent with the view that contracts will include covenants whose ratios are informative of the underlying credit risk of the borrower.

These results form a foundation for considerable further research on the selection and role of financial ratio covenants. While the tests in this paper examine the inclusion of individual covenants, contracts frequently include multiple covenants. To this time, there has been little theory or evidence on the role of multiple ratio covenants. Preliminary evidence shows that certain financial ratio covenants are often used together, such as coverage and debt to cash flow, or not used together, such as debt to cash flow and leverage. Further study could assess complementarity or redundancy in ratio measures and how this affects the selection of multiple covenants in contracts.

Another important element of financial ratio covenants is the tightness. Tightness is defined as the distance between the threshold and the initial value of the ratio. Existing research shows that covenants in private debt agreements are set to tight levels (Dichev and Skinner 2002)

and that tight covenants are more valuable in contracts (El-Gazzar and Pastena 1991). An interesting extension of this study could examine the joint role of covenant ratio selection and tightness in contracts.

Finally, existing studies have examined the implications of having covenants on the cost of debt. Theory and evidence show that the initial interest rate of debt is decreasing in the number of covenants included in the contract; this suggests, holding other things equal, that more covenants provide greater protection to the lender (El-Gazzar and Pastena 1991, Bradley and Roberts 2004). The results in this study could be extended to investigate the pricing implications of informative covenants. If the expected results obtain, and the informativeness of financial ratios in covenants is priced into the interest rate, this has important implications for the writing of efficient debt contracts.

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Appendix

A necessary condition for financial ratios to be useful in covenants is an association with credit risk. Though it is widely accepted that ratios provide information on borrower credit quality, there is little documentation of this relation. In this section, I provide evidence on the relation between financial ratios and credit risk by examining two measures of credit quality: the Merton (1974) distance to default and agency bond rating changes.[12]

I measure distance to default, based on Merton (1974) using the following formula:

$$DD = \frac{\ln(V_A / X) + (\mu - \delta - (\sigma_A^2 / 2))T}{\sigma_A \sqrt{T}}$$

The calculation of distance to default uses the variables and SAS code from Hillegeist et al. (2004), adapted to quarterly measurement. T is time to maturity of the debt. X is the face value of liabilities, calculated as the debt in current liabilities (#45) plus half the value of long-term debt (#51). V_A is the market value of assets, calculated as X plus the market value of equity (#14*#61). δ is the continuously compounded dividend rate, calculated using preferred dividends (#24) plus cash dividends (#89). μ is the continuously compounded expected return on assets: V_A plus δ less the lagged value of V_A scaled by lagged V_A. σ_A is asset volatility. This is calculated by measuring the standard deviation of daily stock return for one year to capture the volatility of equity. This value is multiplied it by the market value of equity (V_E) divided by the face value of assets ($X + V_E$).

The first term is the ratio of asset value to debt value. The higher this measure the lower the distance to default, as there are more assets to cover the value of debt. The second term captures the expected return on assets. Positive expected return increases the distance to default. The denominator scales by asset volatility. Higher volatility increases the likelihood of default, all other things equal.

This measure has wide use among practitioners. For example, the KMV model expands the Merton framework to accommodate multiple classes of debt with differing priority and maturity.[13] However, there is disagreement in the academic literature about the measure's merits. Hillegeist et al. (2004) find the model to be superior in predicting bankruptcy relative to the Z-Score and the O-Score. In contrast, Bharath and Shumway (2004) find that the Merton/KMV model is outperformed in bankruptcy prediction by relatively simpler models.

Distance to default is calculated for each quarter for all Compustat firms with available data. I measure the quarterly change to capture the shift in credit risk, and sort firms into quartile

[12] I complete similar analysis for four aggregate measures of financial distress: Altman's (1968) Z-Score, Ohlson (1980) O-Score, the Begley et al. (1996) re-estimation of Altman's Z and the Shumway (2001) measure. The results are in the predicted direction and statistically significant Each of these scores is an aggregation of financial ratios (and other variables). Since these measures are to some extent mechanically related to the financial ratios under study, I exclude the results. Distance to default is mechanically correlated with leverage but not to other ratios.

[13] See Bohn et al. (2005) for a discussion of KMV model.

portfolios based on the change. Distance to default is increasing in financial strength; therefore, the first change quartile represents the most negative (adverse) change in distance to default while the fourth quartile comprises the most positive changes. Panel A of the Appendix Table shows the quartiles, the number of observations, and the mean level, and change for each quartile. The following columns present the mean value of changes in five financial ratios: interest coverage, current, debt to cash flow, leverage, and net worth.[14] The mean values for the all ratios except net worth are monotonic and in the predicted direction across quartiles, indicating the predicted association. This relation is tested in the bottom rows, which measure the difference between the top and bottom quartiles. The difference for each ratio is statistically significant.

The second measure of credit risk is bond rating changes. I use S&P long-term debt ratings from Compustat Quarterly (SPDRC). Compustat yields a sample of approximately 12,000 rating changes. If financial ratios capture changes in credit risk, I expect that firms receiving upgrades should have stronger ratio performance than those receiving downgrades. These results are shown in Panel B of the Appendix Table. For each ratio but current, the difference in changes between upgrades and downgrades is in the predicted direction and significant. Unreported results also show that ratios for both upgrades and downgrades differ from the ratios of firms with no rating action (again, except for current ratio). The same results also obtain using a smaller sample of rating changes from Moody's. In total, these findings confirm the relation between financial ratios and credit risk.

[14] The distribution of debt to cash flow (measured as total debt / earnings) is discontinuous around earnings = 0. To accommodate this discontinuity, I use the inverse of the ratio and exclude firms with no debt. This reverses the predicted sign in tests, as the inverted ratio is increasing in financial strength.

Appendix Table: Financial Ratios and Performance

Panel A: Merton Distance to Default

Merton-Score Change Quartile	Observations	Merton-Score Level	Change in Merton-Score	Interest Coverage	Current Ratio	Debt to Cash Flow	Leverage	Net Worth
1 (worst)	92,837	10.512	-2.253	0.331	-0.242	-0.001	0.014	5.584
2	92,838	6.886	-0.361	0.830	-0.079	0.029	0.006	5.286
3	92,838	6.779	0.252	0.960	0.010	0.053	0.001	7.328
4 (best)	92,838	9.048	1.761	2.484	0.136	0.119	-0.005	13.539
Predicted Sign				+	+	+	-	+
Quartile Difference (4-1)				2.153	0.378	0.120	-0.019	7.955
t-statistic				6.91	59.43	6.49	-42.56	34.31

Panel B: Financial Ratio Changes preceding Bond Upgrades and Downgrades

Rating Action	Observations	Interest Coverage	Current Ratio	Debt to Cash Flow	Leverage	Net Worth
Upgrade	2,913	0.569	0.066	0.019	-0.013	42.008
Downgrade	9,149	-1.194	0.075	-0.078	0.040	7.888
Predicted Sign		+	+	+	-	+
Difference (up-down)		1.763	-0.009	0.097	-0.053	34.120
t-statistic		4.97	-0.54	3.09	-18.67	16.02

This table presents evidence on the relation between borrower credit risk and financial ratios. Panel A presents the association between changes in financial distress measures and changes in financial ratios. Financial ratios are defined as follows. **Interest Coverage** is EBITDA/interest expense (data item #21/data item #22). **Current Ratio** is current assets/current liabilities (data item #40/data item #49). **Debt to Cash Flow** is inverted from its normal measure (see footnote in the text): EBITDA/total debt (data item #21/data item #51). **Leverage** is debt/debt plus equity (data item #51/data item #51+data item #59). **Net Worth** is assets-liabilities (data item #44-data item #54). **Merton Distance to Default** is defined in the Appendix. Each distress measure is sorted into quartiles based on changes, and the mean changes in each financial ratio are presented in the Table. Panel B presents the association between bond rating changes and changes in financial ratios. Rating changes are Standard & Poor's long-term debt ratings from Compustat (SPDRC).

Figure 1: Errors in Detection

		Credit Risk	
		Low increase in risk (r<r*)	High increase in risk (r>r*)
Covenant Ratio	Ratio below threshold (c<c*)	Correct non-detection	False negative: **Type II error**
	Ratio above threshold (c>c*)	False positive: **Type I error**	Correct detection

Figure 2: Predictions

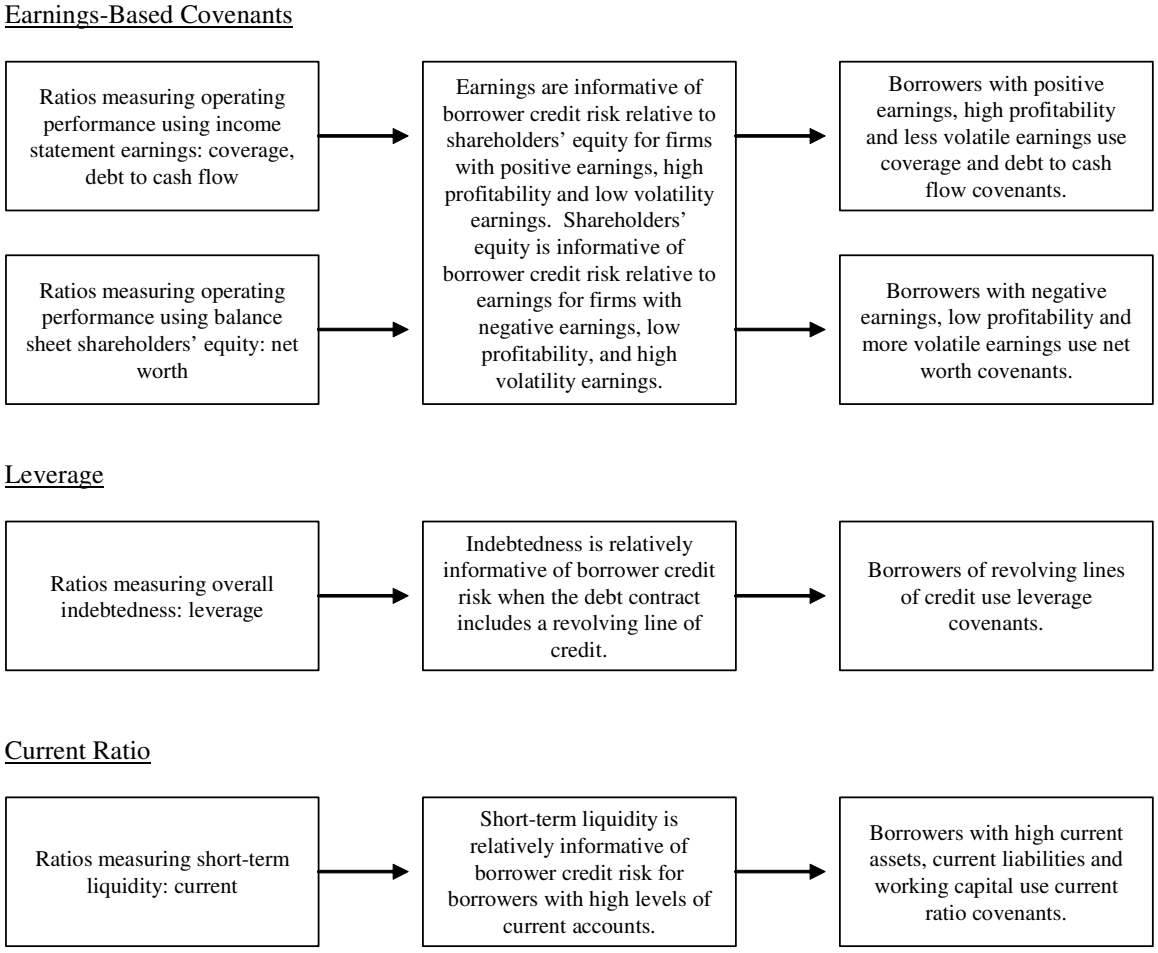

Table 1: Descriptive Statistics

Panel A: Deal Characteristics by Year

Year	Observations	New Debt	Materiality	Maturity
1987	1	200.00	5.0%	93.20
1989	4	77.25	3.5%	96.25
1990	8	38.38	2.1%	61.62
1991	5	96.83	3.3%	44.43
1992	12	77.20	1.4%	53.06
1993	34	108.50	4.3%	52.33
1994	144	358.68	38.3%	51.70
1995	626	134.59	8.6%	47.86
1996	1342	162.31	6.9%	46.41
1997	1554	170.63	10.3%	46.80
1998	1370	148.78	8.4%	44.36
1999	1234	178.52	4.3%	41.18
2000	1275	273.58	5.4%	36.16
2001	1378	262.54	3.5%	32.90
2002	1573	245.63	5.7%	34.31
2003	1633	249.56	4.5%	38.65
2004	1895	327.69	4.9%	48.30
2005	1601	407.27	5.9%	53.37
2006	675	494.66	6.4%	53.25
Total	16,364	254.24	6.35%	43.32

Panel B: Borrower Accounting Data

Variable	Mean	Median	Standard Deviation	First Quartile	Third Quartile
Sales	3,056.536	505.148	5,582.400	130.008	1,483.293
EBITDA	522.563	90.086	1,969.090	19.962	336.315
Return on Assets	0.131	0.132	0.123	0.083	0.186
STD of ROA	0.047	0.029	0.065	0.016	0.056
Total Assets	6050.010	636.379	36980.380	156.137	2596.080
Long-Term Debt	1453.540	150.533	8799.450	11.528	684.488
Common Equity	1341.880	212.572	6378.320	49.707	831.429
Market Value of Equity	3502.900	530.431	14295.390	120.731	2023.620
Altman's Z	2.543	1.695	5.147	0.884	2.992
Shumway Score	0.013	0.002	0.062	0.001	0.005
Merton DD	0.025	0.000	0.089	0.000	0.003

This table presents descriptive data on the sample. Panel A presents data on the sample loans. All deals are collected from the LPC/Dealscan database. **New Debt** is the average amount of debt (in millions) per deal from Dealscan. **Materiality** is the ratio of new debt to the total assets of the borrower (Compustat quarterly data item #44). **Maturity** is the duration of the loan from inception to maturity in months. Panel B presents accounting data for borrowers. Data from Dealscan is matched to Compustat for the quarter most recently preceding deal inception date. Income statement variables are calculated as the trailing four quarters. **Sales** is data item #12. **EBITDA** is operating income (data item #21). **Return on Assets** is EBITDA scaled by average total assets. **STD of ROA** is the standard deviation of ROA, calculated for the five years preceding deal inception date. **Total Assets** is data item #44. **Long-Term Debt** is data item #51. **Common Equity** is data item #59. **Market Value of Equity** is the quarter-end closing price (data item #14) times the shares outstanding (data item #61). **Altman's Z** is based on Altman (1968). **Shumway Score** is based on Shumway (2001). **Merton DD** (distance to default) is defined in the Appendix. Each of these variables is truncated at the top and bottom 1% of observations.

Table 2: Use of Financial Ratio Covenants

		Profitability and Operating Performance			Total Indebtedness	Short-term Liquidity	
Year	**Deals**	**Coverage**	**Current**	**Debt to Cash Flow**	**Leverage**	**Net Worth**	**Covenants per Deal**
1987	1	0	0	0	0	0	0.00
1988	0	0	0	0	0	0	0.00
1989	4	0	0	0	0	2	0.50
1990	8	2	3	2	2	1	1.25
1991	5	1	1	0	2	0	0.80
1992	12	4	3	1	6	5	1.58
1993	34	15	6	4	11	17	1.56
1994	144	87	23	37	63	63	1.90
1995	626	456	143	196	310	385	2.38
1996	1342	986	304	456	655	845	2.42
1997	1554	1,120	272	625	708	930	2.35
1998	1370	1,007	184	660	501	707	2.23
1999	1234	857	137	597	390	571	2.07
2000	1275	748	110	481	371	549	1.77
2001	1378	770	84	523	346	510	1.62
2002	1573	888	96	579	393	594	1.62
2003	1633	969	72	668	349	473	1.55
2004	1895	1,018	68	742	375	385	1.37
2005	1601	869	50	681	319	308	1.39
2006	675	320	22	244	114	117	1.21
Total	**16,364**	**10,117**	**1,578**	**6,496**	**4,915**	**6,462**	**1.81**
%		**61.82%**	**9.64%**	**39.70%**	**30.04%**	**39.49%**	

This table presents financial ratio covenant use by year, based on LPC/Dealscan. **Coverage** covenants include interest coverage, debt service coverage, fixed charge coverage, and cash interest coverage. **Current** covenants include current ratio. **Debt to Cash Flow** covenants include debt to cashflow and senior debt to cashflow. **Leverage** covenants include debt to total capitalization, debt to tangible capitalization, and debt to equity. **Net Worth** covenants include total capitalization and tangible capitalization.

Table 3: Negative Earnings

Panel A: Differences by Financial Ratio Covenant Class

Financial Ratio Covenant Class	Observations With Covenant	Observations Without Covenant	Predicted Sign	Mean Negative Earnings with	Mean Negative Earnings without	Difference	T-statistic	
Coverage	6,456	2,082	-	0.034	0.094	-0.060	-8.37	***
Debt to Cash Flow	4,424	4,114	-	0.025	0.074	-0.049	-10.52	***
Net Worth	3,917	4,621	+	0.067	0.033	0.034	7.12	***

Panel B: Marginal Analysis Example- Coverage

Class (With Coverage Covenant)	Class (Without Coverage Covenant)	Number of Deals with Coverage	Number of Deals without Coverage	Predicted Sign	Mean Negative Earnings with Coverage	Mean Negative Earnings without Coverage	Difference	T-statistic	
10001	00001	302	480	-	0.093	0.190	-0.097	-3.95	***
10010	00010	626	434	-	0.021	0.025	-0.004	-0.48	
10011	00011	687	431	-	0.034	0.093	-0.059	-3.81	***
10100	00100	2,159	224	-	0.018	0.036	-0.019	-1.50	
10101	00101	1,121	125	-	0.025	0.048	-0.023	-1.17	
10110	00110	212	58	-	0.047	0.035	0.013	0.45	
10111	00111	138	34	-	0.015	0.029	-0.015	-0.48	
11000	01000	55	34	-	0.073	0.206	-0.133	-1.69	*
11001	01001	90	64	-	0.056	0.125	-0.069	-1.44	
11010	01010	74	38	-	0.041	0.132	-0.091	-1.51	
11011	01011	173	96	-	0.075	0.135	-0.060	-1.49	
11100	01100	107	29	-	0.065	0.103	-0.038	-0.61	
11101	01101	114	17	-	0.026	0.059	-0.033	-0.54	
11110	01110	37	4	-	0.054	0.000	0.054	1.43	
11111	01111	31	14	-	0.000	0.000	0.000	0.00	
							Proportion with Predicted Sign	12	
							Z-Statistic	**-4.30**	***

Panel C: Summary Marginal Analysis

Financial Ratio Covenant Class	Predicted Sign of Relation	Number of Pairs with Predicted Sign (of 15)	Z-Statistic	
Coverage	-	12	-4.30	***
Debt to Cash Flow	-	12	-7.25	***
Net Worth	+	7	0.79	

Panel D: Probit Analysis

Covenant		Intercept	Negative Earnings	Asset Market to Book	Maturity	Materiality	Leverage	Performance Pricing	Distance to Default
Coverage N=5,517 R^2=12.17%	Estimate	-0.2967	**-0.5110**	0.0160	0.0141	0.0016	0.3783	0.2996	-0.0256
	p-value	0.0129	**0.0001**	0.3883	0.0001	0.6352	0.0001	0.0001	0.0001
	Predicted sign		**-**	-	+	+	+	?	-
	Significance		**-26.98%**						
Debt to Cash Flow N=5,517 R^2=18.94%	Estimate	-1.0501	**-0.7099**	0.0757	0.0115	0.0213	0.2690	0.4307	-0.0087
	p-value	0.0001	**0.0001**	0.0001	0.0001	0.0117	0.0005	0.0001	0.0520
	Predicted sign		**-**	-	+	+	+	?	-
	Significance		**-28.31%**						
Net Worth N=5,517 R^2=15.06%	Estimate	0.4889	**0.2516**	-0.0450	-0.0057	-0.0032	-0.6109	-0.0654	-0.0183
	p-value	0.0001	**0.0118**	0.0107	0.0001	0.3228	0.0001	0.0866	0.0001
	Predicted sign		**+**	-	+	+	+	?	-
	Significance		**10.21%**						

This table presents differences in negative earnings for borrowers with contracts that include specific financial ratio covenants and those that do not. **Negative Earnings** is an indicator variable taking a value of 1 if EBITDA (data item #21) is negative in the trailing four quarters prior to deal inception and 0 otherwise. Panel A presents the univariate differences. The predicted sign is on the expected value of the difference between firms with the covenant and without it. Panel B presents marginal analysis. Each row compares two groups of firms. The first two columns present the combinations of covenants compared. The compound covenant class has the form {coverage, current, debt to cash flow, leverage, net worth}, with each receiving a value of 1 when used and 0 when not. The first column features all covenant combinations that include coverage; the second is identical in all other covenants, but excludes coverage. For example, the third row compares borrowers having coverage, leverage, and net worth covenants {10011} with borrowers having leverage and net worth {00011}. The Z-statistic aggregates the individual pair t-statistics in the form: $Z = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \frac{t_j}{\sqrt{k_j / k_j - 2}}$. Panel C summarizes marginal analysis for all covenant types. Panel D presents multivariate probit regression results. Responses are coded 1 if the covenant is used and 0 otherwise. All variables are defined as in prior tables. **Asset Market to Book** is defined as in Smith and Watts (1992) with Compustat quarterly data items: ((#14*#61)-#59+#44)/#44. **Performance Pricing** is an indicator variable taking the value 1 when performance pricing is present in the contract and 0 otherwise. The economic significance of results is calculated as the marginal difference between the 3rd quartile and 1st quartile (for continuous variables) or the difference between 1 and 0 (for indicator variables) holding all other variables at their means. **R^2** is the pseudo-R^2 of the regression. *** and * denote significance at the 1% and 10% levels.

Table 4: Return on Assets

Panel A: Differences by Financial Ratio Covenant Class

Financial Ratio Covenant Class	Observations With Covenant	Observations Without Covenant	Predicted Sign	Mean ROA with	Mean ROA without	Difference	T-statistic	
Coverage	6,050	1,953	+	0.143	0.118	0.025	6.95	***
Debt to Cash Flow	4,131	3,872	+	0.152	0.121	0.031	12.21	***
Net Worth	3,668	4,563	-	0.132	0.142	-0.010	-3.70	***

Panel B: Summary Marginal Analysis

Financial Ratio Covenant Class	Predicted Sign of Relation	Number of Pairs with Predicted Sign (of 15)	Z-Statistic	
Coverage	+	8	1.30	
Debt to Cash Flow	+	13	10.15	***
Net Worth	-	9	-0.27	

Panel C: Probit Analysis

Covenant		Intercept	ROA	Asset Market to Book	Maturity	Materiality	Leverage	Performance Pricing	Distance to Default
Coverage N=5,379 R^2=11.98%	Estimate	-0.3992	**0.8937**	0.0021	0.0142	0.0013	0.4024	0.3165	-0.0271
	p-value	0.0012	**0.0001**	0.9163	0.0001	0.7068	0.0001	0.0001	0.0001
	Predicted sign		**+**	-	+	+	+	?	-
	Significance		**4.82%**						
Debt to Cash Flow N=5,379 R^2=19.83%	Estimate	-1.1170	**2.1682**	0.0150	0.0114	0.0226	0.3033	0.4192	-0.0154
	p-value	0.0001	**0.0001**	0.4595	0.0001	0.0126	0.0001	0.0001	0.0007
	Predicted sign		**+**	-	+	+	+	?	-
	Significance		**8.78%**						
Net Worth N=5,379 R^2=15.05%	Estimate	0.5485	**-0.1183**	-0.0285	-0.0058	-0.0022	-0.6200	-0.0654	-0.0221
	p-value	0.0001	**0.5529**	0.1341	0.0001	0.4903	0.0001	0.0905	0.0001
	Predicted sign		**-**	-	+	+	+	?	-
	Significance		**-0.49%**						

This table presents differences in return on assets (ROA) for borrowers with contracts that include specific financial ratio covenants and those that do not. **ROA** is defined as EBITDA for the trailing four quarters scaled by average total assets (data item #44). Panel A presents the univariate differences. The predicted sign is on the expected value of the difference between firms with the covenant and without it. Panel B summarizes marginal analysis for all covenant types. The Z-statistic aggregates the individual pair t-statistics in the form: $Z = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \frac{t_j}{\sqrt{k_j / k_j - 2}}$.

Panel C presents multivariate probit regression results. Responses are coded 1 if the covenant is used and 0 otherwise. All variables are defined as in prior tables. **Asset Market to Book** is defined as in Smith and Watts (1992) with Compustat quarterly data items: ((#14*#61)-#59+#44)/#44. **Performance Pricing** is an indicator variable taking the value 1 when performance pricing is present in the contract and 0 otherwise. The economic significance of results is calculated as the marginal difference between the 3rd quartile and 1st quartile (for continuous variables) or the difference between 1 and 0 (for indicator variables) holding all other variables at their means. $\mathbf{R^2}$ is the pseudo-R^2 of the regression. *** denotes significance at the 1% level.

Table 5: Volatility of Earnings

Panel A: Differences by Financial Ratio Covenant Class

Financial Ratio Covenant Class	Observations With Covenant	Observations Without Covenant	Predicted Sign	Mean STD-ROA with	Mean STD-ROA without	Difference	T-statistic	
Coverage	6,357	2,054	-	0.044	0.052	-0.008	-3.99	***
Debt to Cash Flow	4,264	4,147	-	0.045	0.047	-0.002	-1.57	
Net Worth	3,848	4,563	+	0.050	0.043	0.007	4.55	***

Panel B: Summary Marginal Analysis

Financial Ratio Covenant Class	Predicted Sign of Relation	Number of Pairs with Predicted Sign (of 15)	Z-Statistic	
Coverage	-	7	-1.91	*
Debt to Cash Flow	-	8	-2.55	***
Net Worth	+	8	1.97	**

Panel C: Probit Analysis

Covenant		Intercept	STD of ROA	Asset Market to Book	Maturity	Materiality	Leverage	Performance Pricing	Distance to Default
Coverage N=5,642 R^2=11.44%	Estimate	-0.2842	**-0.7459**	0.0033	0.0139	0.0121	0.3661	0.3112	-0.0204
	p-value	0.0151	**0.0275**	0.8549	0.0001	0.1927	0.0001	0.0001	0.0001
	Predicted sign		**-**	-	+	+	+	?	-
	Significance		**-1.58%**						
Debt to Cash Flow N=5,642 R^2=18.06%	Estimate	-1.1692	**-0.2219**	0.0685	0.0114	0.0169	0.2807	0.4302	-0.0076
	p-value	0.0001	**0.5041**	0.0003	0.0001	0.0298	0.0002	0.0001	0.0723
	Predicted sign		**-**	-	+	+	+	?	-
	Significance		**-0.35%**						
Net Worth N=5,642 R^2=15.05%	Estimate	0.5918	**0.2136**	-0.0417	-0.0058	-0.0028	-0.6438	-0.0715	-0.0207
	p-value	0.0001	**0.5137**	0.0208	0.0001	0.3987	0.0001	0.0576	0.0001
	Predicted sign		**+**	-	+	+	+	?	-
	Significance		**0.34%**						

This table presents differences in the standard deviation of return on assets (STD of ROA) for borrowers with contracts that include specific financial ratio covenants and those that do not. **STD of ROA** is defined as the standard deviation of ROA calculated as in Table 4. ROA is measured using the trailing four quarters; the standard deviation of the five trailing years is used to calculate volatility (e.g. quarter t-3 to quarter t, quarter t-7 to quarter t-4, etc.). Panel A presents the univariate differences. The predicted sign is on the expected value of the difference between firms with the covenant and without it. Panel B summarizes marginal analysis for all covenant types. The Z-statistic aggregates the individual pair t-statistics in the form: $Z = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \frac{t_j}{\sqrt{k_j / k_j - 2}}$. Panel C presents multivariate probit regression results. Responses are coded 1 if the covenant is used and 0 otherwise. All variables are defined as in prior tables. **Asset Market to Book** is defined as in Smith and Watts (1992) with Compustat quarterly data items: ((#14*#61)-#59+#44)/#44. **Performance Pricing** is an indicator variable taking the value 1 when performance pricing is present in the contract and 0 otherwise. The economic significance of results is calculated as the marginal difference between the 3rd quartile and 1st quartile (for continuous variables) or the difference between 1 and 0 (for indicator variables) holding all other variables at their means. $\mathbf{R^2}$ is the pseudo-R^2 of the regression. *** , **, and * denote significance at the 1%, 5%, and 10% levels.

Table 6: Leverage

Panel A: Differences by Financial Ratio Covenant Class

Variable	Observations With Leverage	Observations Without Leverage	Predicted Sign	Mean Value with	Mean Value without	Difference	T-statistic	
Revolver	4,915	8,405	+	0.302	0.169	0.133	17.23	***

Panel B: Summary Marginal Analysis

Variable	Predicted Sign of Relation	Number of Pairs with Predicted Sign (of 15)	Z-Statistic	
Revolver	+	10	4.70	***

Panel C: Probit Analysis

Covenant		Intercept	Revolver	Asset Market to Book	Maturity	Materiality	Leverage	Performance Pricing	Distance to Default
Leverage N=6,815 R^2=13.21%	Estimate	0.1840	**0.2932**	-0.0349	-0.0060	-0.0152	-0.4986	0.0446	0.0060
	p-value	0.0684	**0.0001**	0.0245	0.0001	0.0522	0.0001	0.2001	0.0998
	Predicted sign		**+**	-	+	+	+	?	-
	Significance		**12.63%**						

This table presents differences between firms using leverage covenants and those that do not. **Revolver** is an indicator variable taking a value of 1 if the deal includes a revolving line of credit and 0 otherwise. Panel A presents the univariate differences. The predicted sign is on the expected value of the difference between firms using the covenant and not using it. Panel B summarizes marginal analysis for all covenant types. The Z-statistic aggregates the individual pair t-statistics in the form: $Z = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \frac{t_j}{\sqrt{k_j / k_j - 2}}$. Table C presents multivariate probit regression results.

Responses are coded 1 if the covenant is used and 0 otherwise. All variables are defined as in prior tables. **Asset Market to Book** is defined as in Smith and Watts (1992) with Compustat quarterly data items: ((#14*#61)-#59+#44)/#44. **Performance Pricing** is an indicator variable taking the value 1 when performance pricing is present in the contract and 0 otherwise. The economic significance of results is calculated as the marginal difference between the 3rd quartile and 1st quartile (for continuous variables) or the difference between 1 and 0 (for indicator variables) holding all other variables at their means. **R^2** is the pseudo-R^2 of the regression. *** denotes significance at the 1% level.

Table 7: Current Ratio

Panel A: Differences by Financial Ratio Covenant Class

Variable	Observations With Current Ratio Covenant	Observations Without Current Ratio Covenant	Predicted Sign	Mean Value with	Mean Value without	Difference	T-value	
Current Assets	1,057	7,718	+	0.476	0.416	0.060	7.07	***
Current Liabilities	1,062	7,756	+	0.256	0.250	0.006	1.02	
Working Capital	1,053	8,586	+	0.290	0.228	0.062	8.57	***

Panel B: Summary Marginal Analysis

Variable	Predicted Sign of Relation	Number of Pairs with Predicted Sign (of 15)	Z-Statistic	
Current Assets	+	11	3.94	***
Current Liabilities	+	9	-0.54	
Working Capital	+	11	6.12	***

Panel C: Probit Analysis

Covenant		Intercept	Working Capital	Asset Market to Book	Maturity	Materiality	Leverage	Performance Pricing	Distance to Default
Current N=6,387 R^2=9.58%	Estimate	-1.4578	**0.3490**	0.0328	-0.0021	-0.0781	-0.5973	-0.2105	-0.0316
	p-value	0.0001	**0.0117**	0.0796	0.0322	0.0026	0.0001	0.0001	0.0001
	Predicted sign		**+**	-	+	+	+	?	-
	Significance		**14.27%**						

This table presents differences in current assets, current liabilities and working capital for borrowers with contracts that include a current ratio covenant and those that do not. **Current assets** is data item #40. **Current Liabilities** is data item #49. **Working capital** is receivables plus inventory plus other current assets minus payables minus other current liabilities (data items: #37+#38+#39-#46-#48). Each variable is scaled by average total assets. Panel A presents the univariate differences. The predicted sign is on the expected value of the difference between firms with the covenant and without it. Panel B summarizes marginal analysis for all covenant types. The Z-statistic aggregates the individual pair t-statistics in the form: $Z = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \frac{t_j}{\sqrt{k_j / k_j - 2}}$. Panel C presents multivariate probit regression results. Responses are coded 1 if the covenant is used and 0 otherwise. All variables are defined as in prior tables. **Asset Market to Book** is defined as in Smith and Watts (1992) with Compustat quarterly data items: ((#14*#61)-#59+#44)/#44. **Performance Pricing** is an indicator variable taking the value 1 when performance pricing is present in the contract and 0 otherwise. The economic significance of results is calculated as the marginal difference between the 3rd quartile and 1st quartile (for continuous variables) or the difference between 1 and 0 (for indicator variables) holding all other variables at their means. **R^2** is the pseudo-R^2 of the regression. *** denotes significance at the 1% level.

Table 8: Earnings-Based Variables

Covenant		Intercept	Negative Earnings	ROA	STD of ROA	Asset Market to Book	Maturity	Materiality	Leverage	Performance Pricing	Distance to Default
Coverage N=5,065 R^2=12.31%	Estimate	-0.3166	**-0.3393**	**0.5546**	**-0.2767**	0.0085	0.0141	0.0172	0.3438	0.2950	-0.0286
	p-value	0.0151	**0.0104**	**0.0379**	**0.4674**	0.7013	0.0001	0.1322	0.0002	0.0001	0.0001
	Predicted sign		**-**	**+**	**-**	-	+	+	+	?	-
	Significance		**-17.95%**	**2.98%**	**-0.58%**						
Debt to Cash Flow N=5,065 R^2=19.65%	Estimate	-1.1078	**-0.2367**	**2.0102**	**0.3793**	0.0165	0.0114	0.0217	0.3185	0.3924	-0.0149
	p-value	0.0001	**0.0923**	**0.0001**	**0.3020**	0.4496	0.0001	0.0188	0.0001	0.0001	0.0017
	Predicted sign		**-**	**+**	**-**	-	+	+	+	?	-
	Significance		**-9.44%**	**8.14%**	**0.60%**						
Net Worth N=5,065 R^2=15.37%	Estimate	0.5942	**0.2763**	**0.1246**	**-0.0129**	-0.0446	-0.0058	-0.0025	-0.6330	-0.0477	-0.0226
	p-value	0.0001	**0.0339**	**0.6157**	**0.9710**	0.0331	0.0001	0.4543	0.0001	0.2347	0.0001
	Predicted sign		**+**	**-**	**+**	-	+	+	+	?	-
	Significance		**14.79%**	**0.51%**	**-0.02%**						

This table presents probit regression results for coverage, debt to cash flow, and net worth covenants using three earnings-based variables. Variables and marginal significance are defined as in prior tables.