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Hedge Commitments and Agency Costs of Debt: Evidence from Interest Rate Protection Covenants and Accounting Conservatism

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ABSTRACT

We provide large sample evidence that credible hedge commitments reduce the agency costs of debt and that accounting conservatism enhances hedge commitments. We examine 2,338 bank loans entered into by 263 mandatory derivative users that are contractually obligated by interest rate protection covenants, 709 voluntary derivative users, and 1,366 non-users. We show that loan contracts are more likely to include interest rate protection covenants when borrowers are less likely to maintain the hedge position once the financing is completed. We find that borrowers who credibly commit to hedge using the covenants significantly reduce their interest rates. While we do not find an average interest savings for voluntary derivative users, we do find a reduction in their loan rates when they practice conservative financial reporting. Our results suggest that accounting conservatism helps borrowers resolve shareholder-creditor conflicts by committing to maintain their hedge positions after completing debt financing.

1. Introduction

We investigate whether borrowers can reduce the agency costs of debt by credibly committing to hedge interest rate risk using derivatives that fix the interest rates on their floating-rate syndicated loans. Hedging reduces debt costs by decreasing default probabilities (Mayers and Smith, 1982; Smith and Stulz, 1985) and by generating more stable internal cash flows that alleviate underinvestment problems arising from reliance on costly external financing (Froot et al. 1993). Although hedging increases total firm value, it redistributes wealth from equity holders to debt holders making it difficult for borrowers to convince lenders that they will maintain the hedge position once the financing is completed (Smith and Stultz, 1985). Risky borrowers have incentives to increase risk after debt issuance because of shareholders' limited liability (Jensen and Meckling, 1976). Doherty (2000) argues that the ability to obtain external financing may critically depend on whether firms can credibly commit to hedge.

We examine two hedge commitment mechanisms available to borrowers. Specifically, we consider interest rate protection covenants, which contractually obligate borrowers to use derivatives to fix the rates on their variable rate debt, and borrower accounting conservatism as commitment devices. Interest rate protection covenants provide a straightforward hedge commitment, since unwinding the required derivative contracts would result in a covenant violation that allows lenders to call the debt. Accounting conservatism provides a more indirect hedge commitment, but we argue that there is more than one reason why accounting conservatism helps borrowers commit to hedge.

In some circumstances, the desire to increase reported earnings could provide borrowers with incentives to unwind their hedge positions. The incentive will be the strongest when lenders are most concerned with the borrower's interest rate exposure, which occurs during rising

interest rate environments, since an increase in interest rates leads to an unrecognized gain on variable-to-fixed rate swap hedges.[1] Chen et al. (2007) show that firms with conservative accounting are less likely to engage in upward earnings management. Conservative accounting may also provide a hedging commitment by facilitating timely debt covenant violations that transfer control rights to creditors in the event of economic losses (Watts, 2003; Zhang, 2008; Beatty et al., 2008; Nicolaev, 2010). This suggests that the benefit to shareholders of increasing risk decreases with accounting conservatism (Loktionov, 2009). We expect that the relatively higher costs of altering accounting conservatism compared to derivative holdings will allow accounting conservatism to enhance the ability to commit to hedge positions.

We investigate the importance of commitment in reducing agency costs of debt by examining how derivate use affects syndicated loan interest rate spreads for two types of derivative users: those required by interest rate protection covenants to fix the rates on their syndicated loans (hereafter mandatory users), and those who voluntarily fix their debt rates in the absence of these covenants (hereafter voluntary users). We also consider whether derivative users' interest rate savings vary cross-sectionally with their accounting conservatism. Since borrowers can choose to use derivatives and to use interest rate protection covenants, we first model borrowers' choice of each of these possibilities versus the choice not to use derivatives. We control for these choices in our interest rate spread analyses. We examine borrowers' derivative use choice using a bivariate probit model that accounts for the interdependence between derivative use and the inclusion of interest rate protection covenants in the loan contracts. We adopt an instrumental variables approach and incorporate the estimates from these models in our analysis of whether a hedge commitment affects borrowing rates.

[1] Since virtually all syndicated loans charge variable-rates, banks are more concerned about borrowers' ability to fulfill interests payment obligations when interest rates increase.

To account for the endogeneity in the derivative use choices, we identify two plausible instruments that are related to firms' hedging decisions, but are unlikely related to loan pricing. Our first instrument for derivative use is the before-financing marginal tax rate. Consistent with previous research, we argue that the before-financing tax rate will be unrelated to the interest rates charged on the new loans. Our second instrument related to the choice of fixed versus floating rate debt is the proportion of existing debt maturing in more than one year. A syndicated loan with an interest rate swap is equivalent to fixed rate debt with a call option. Previous research shows that the maturity of existing debt predicts both the choice of fixed rate debt over floating rate debt (Denis and Mihov 2003) and the choice to issue fixed rate debt that is callable for reasons other than interest rate changes (Thatcher 1985).

Consistent with previous research, we find larger firms with higher marginal tax rates and higher leverage ratios are more likely to use derivatives, suggesting that the decision to use derivatives is affected by scale economies, expected tax liabilities, and agency conflicts of debt. We extend the previous hedging literature by examining factors related to hedge commitments. Our bivariate probit model explicitly examines why some loan contracts include interest rate protection covenants while others do not. We find that firms with a natural exposure to interest risk, captured by a negative correlation between sales and interest rate changes, are more likely to be mandatory users. We also examine the role of accounting conservatism in the derivative use decision and find that, consistent with what would be expected if conservatism serves as a commitment mechanism, this association is dependent on the extent of accounting conservatism for voluntary users but not for mandatory users. We also predict that distressed firms will need a credible commitment mechanism to convince lenders that they will continue to hedge after they enter the loan. Consistent with this prediction, we find that interest rate protection covenants are

more likely for high default risk borrowers. In particular, mandatory users are smaller, less profitable firms with lower credit ratings. They also have stricter contract terms including a greater number of other covenants and a higher likelihood of a collateral requirement. Specifically, 91% of loans with interest rate protection covenants also require collateral, compared with 60% for non-users and 51% for voluntary users. Overall, these results suggest that hedging determinants and incentives are very different for borrowers who hedge voluntarily compared to those with covenants requiring them to hedge.

If commitment is important in mitigating agency conflicts and the interest rate protection covenant serves as an effective commitment mechanism, then we expect to find reduced costs of debt for mandatory users. For voluntary users we expect any interest rate reduction will likely depend on the extent of their commitment to hedge as reflected in their accounting conservatism. Using different measures of accounting conservatism, we find empirical results consistent with these predictions. Overall, we find that interest rates are lower for loans with interest rate protection covenants relative to both non-users and voluntary users. In contrast, we do not find evidence that voluntary users reduce their loan rates on average, despite their derivative use. Consistent with the argument that accounting conservatism enhances the hedge commitment, we find the interest rate reduction for voluntary users increases with their accounting conservatism. In contrast, we do not find this effect for mandatory users. Finding that the costs of debt are reduced only for derivative users that can commit to hedge demonstrates that commitment is an important factor in solving conflicts between shareholders and debt holders.

Our study makes three contributions. First, by examining a setting where firms are contractually obligated to use derivatives, we provide large-sample evidence of the importance of a credible hedge commitment in reducing agency costs of debt. Previous research emphasizes

the importance of hedge commitment and acknowledges that debt covenants might provide a credible commitment mechanism (Smith and Stulz, 1995; Campbell and Kracaw, 1990; Bessembinder, 1991; Doherty, 2000). However, explicit study of how a hedge commitment affects firms' financing activities has been limited to Chidambaran et al. (2001) who examine a single gold mining firm's pre-commit to hedge using commodity-linked bonds. We complement their study by investigating a broader setting that allows firms to achieve a similar commitment by including hedging covenants in their loan contracts.

Second, by separately studying firms that are contractually obligated to hedge and firms that hedge voluntarily, we extend previous corporate risk management research that implicitly assumes that all derivative use is voluntary.[2]

Third, we contribute to the literature on the role of accounting conservatism in facilitating efficient debt contracting by identifying a new channel through which accounting conservatism reduces costs of debt by enhancing hedge commitment for voluntary users.

The paper proceeds as follows. Section 2 provides a background and brief literature review. We develop our hypotheses in Section 3. Section 4 describes our sample selection and research design. We present the empirical results in Section 5 and conclude in Section 6.

2. Background and Literature Review

2.1 Background

2.1.1 Syndicated Loan Floating Interest Rates

[2] An exception is Geczy et al. (1997), who recognize that lenders may require borrowers to follow certain hedging strategies. They note that at least four of their sample firms have interest rate hedge covenants. However, Geczy et al. (1997) do not specifically investigate these mandatory derivative users.

Most syndicated loans charge floating interest rates. In the Handbook of Loan Syndications and Trading, Taylor and Sansone (2006) summarize the characteristics of syndicated loans as follows:

> *Floating Interest Rate: The market convention today is a rate that is quoted as a spread over a floating-rate index. That index is the three- or six- month LIBOR (London Interbank Offered Rate). In the past, other indexes have been used, such as the prime rate, banker's acceptance rates, or even the fed funds rate. …*
>
> *Prepayment without penalty: Since the loans are floating rate, they carry the "free option" of being "called". In other words, the loans can be repaid at any time without penalty. Those prepayments generally occur at interest payment dates to avoid the breakage cost of the index rate setting.*

The handbook suggests that syndicated loans charge floating rates to facilitate prepayment without penalty. Public debt typically charges fixed rates and requires a call premium.

Vickery (2008) provides two alternative rationales for why banks might prefer to lend at floating rates. First, he argues that in periods of rising rates there is an outflow of deposits from the banking system, which banks cannot costlessly replace with other sources of finance. Lending at a floating rate would at least partially hedge this funding risk. Second, he argues that floating rate business loans can be used to hedge the maturity mismatch between deposits and long-term mortgage loans. We do not explore these alternative explanations for why banks virtually always lend at floating rates, but instead take this as a given in the market we study.

2.1.2 Interest Rate Protection Covenants

Interest rate protection covenants are affirmative covenants requiring borrowers to use derivative contracts to effectively convert their floating-rate debt into fixed-rate debt. Therefore, when a bank loan contract includes an interest rate protection covenant, the borrower is in essence borrowing at a fixed rate and is no longer subject to interest rate fluctuation risk. The following is an example of a bank loan contract that requires interest rate protection. Lecroy's

2004 Credit Agreement states that:

> *The Borrower will, within 90 days from the Funding Date, enter into one or more Interest Rate Protection Agreements covering the interest payable with respect to at least 50 percent of the outstanding principal amount of the Term Loan for a period of at least three years.*

Where an

> "*Interest Rate Protection Agreement" shall mean any interest rate swap agreement, interest rate cap agreement, interest rate collar agreement, interest rate hedging agreement or other similar agreement or arrangement.*

This interest rate protection covenant only applies to the new borrowing. In other cases, the covenant may apply to the firm's entire outstanding debt. For example, GCI Holdings 1997 Credit Agreement requires that:

> *By no later than 60 days after the Closing Date, the Borrower or GCII will enter into an Interest Hedge Agreement on terms acceptable to the Administrative Agent providing for interest rate protection for not less than three years for 50% of Total Debt on such date.*

A covenant that requires interest rate protection for all outstanding debt eliminates interest rate fluctuation risk, not only for the current borrowing, but also for all the debt on the balance sheet.

2.1.3 Accounting for Pay-fixed Swaps

Hedge accounting for pay-fixed receive-variable interest rate swaps recognizes the current period cash flows from the swaps as an adjustment to the interest expense associated with the hedged debt. Changes in the fair value of future swap payments are generally not recognized in income. Under certain circumstances, borrowers could recognize gains on these contracts in the income statement. Specifically, a gain can be recorded in income when the swap is settled if the borrower can argue that it is probable that the forecasted variable interest payments on the debt will not occur. In an increasing interest rate environment, this accounting treatment provides an incentive for borrowers who want to increase reported earnings to settle the hedge position before maturity.

The incentives to undo hedge positions provided by hedge accounting occur in periods of rising interest rates when banks are the most concerned about the borrowers' ability to make their interest payments. Banks are less likely to be concerned with borrowers' incentives to unwind hedge positions in a declining rate environment because the risk that borrowers cannot make their interest payments is lower when rates decline.[3]

In short, the accounting treatment for interest rate derivatives related to a floating rate loan may exacerbate borrowers' risk shifting incentives. Borrowers interested in managing earnings upward have greater incentives to unwind their hedge positions in a rising interest rate environment, a time when they need interest rate protection the most.

2.2 Literature Review

2.2.1 Hedging, Commitment, and Agency Costs of Debt

The hedging literature includes several theories of how hedging can increase firm value by reducing creditor-shareholder conflicts. Smith and Stulz (1985) argue that hedging reduces the probability and cost of financial distress by reducing cash flow volatility. However, they point out that it is difficult for firms to convince creditors that they will maintain the hedge after the debt issuance because hedging also redistributes wealth from shareholders to debt holders, Froot et al. (1993) propose that the more stable cash flows created by hedging can mitigate underinvestment problems that arise when firms with investment opportunities face financial constraints. Doherty (2000) argues that the ability to obtain external financing may depend on whether firms can credibly commit to hedge.

The theoretical research on hedging suggests a positive association between firms' financial constraints and hedging activities. However, the empirical evidence is mixed. For example, Nance et al. (1993) find that derivative users are larger and face more convex tax

[3] For example, borrowers may want to smooth the earnings.

functions, but find no evidence of higher leverage ratios that might suggest greater financial constraints. In contrast, Haushalter (2000) finds the leverage ratio to be the most significant factor explaining the hedge ratio for 100 oil and gas producers. In summarizing the findings for non-financial firms' incentives to use derivatives, Bartram et al. (2009) note that "as a whole, the findings of empirical studies remain controversial because the conclusions are largely sample specific." They argue that lack of power produces the mixed findings.

By focusing on debt covenants that obligate firms to hedge interest rate risk and the potential reduction in borrowing rates, our paper provides a more powerful setting to examine whether hedging reduces the agency costs of debt. Prior conflicting findings could also reflect the fact that theses studies have largely ignored the commitment issue, which Smith and Stulz (1985) argue to be important given firms' strong incentives to unwind hedges once financing is obtained. Creditors who know this ex ante will not factor the credit enhancement into the debt pricing unless the firm is able to credibly commit to maintain the hedge. Interest rate protection covenants provide us the setting to address the commitment issue.

One study that recognizes the importance of commitment is Chidambaran et al. (2001). They study Freeport McMoran's (a gold mining company) gold-linked depository shares issued in 1993 and 1994. The gold-linked bonds essentially bundle financing and hedging together to address the commitment problem. Despite being financially constrained, Freeport McMoran successfully raised $359 million at a favorable rate through the gold-denominated bonds. Chidambaran et al. (2001) focus on a special case that allows a commodity company to pre-commit to hedge through commodity-linked bonds. We complement their study by investigating a more widespread mechanism that allows firms to achieve the same commitment by accepting hedging covenants in their loans.

2.2.2 Accounting Conservatism and Debt

Watts (2003a, b) argue that one of the most important economic rationales for accounting conservatism is to improve the efficiency of debt contracts. Consistent with this argument, Chen et al. (2007) theorize that, when accounting numbers serve both an equity valuation role and a stewardship role, managers have incentives to engage in earnings management and such manipulation leads to inferior risk sharing. They show that when the accounting regime is unbiased and there is uncertainty about the future payoff of the firm, managers have incentives to manage the accounting earnings upward to induce more favorable investors' belief about the firm's prospects. However, the degree of earnings manipulation is lower in the conservative accounting regime because observing a low accounting earnings number does not necessarily mean that the true economic earnings are as low. The reduction in earnings management improves risk sharing, and hence contract efficiency.

Under hedge accounting, gains or losses arising from price fluctuations on pay-fixed swaps are not recognized in income. Kangeretnam et al. (2009) find that hedge gains and losses that are not recorded in income are not priced by the equity market. This suggests that managers may have an incentive to use hedge settlement to produce an immediate accounting gain that will be included in net income.

Empirical research has identified several channels through which accounting conservatism mitigates agency costs of debt. For example, Ahmed et al. (2002) find that accounting conservatism mitigates bondholder-shareholder conflicts over dividend policy. Beatty et al. (2008) find that accounting conservatism complements conservative contract modifications in loan contracts, suggesting that contract modifications alone do not fulfill the contracting demand. Loktionov (2009) shows that conservative reporting reduces risk shifting in distressed

firms. Zhang (2008) documents that in the event of economic losses, conservative accounting produces more timely transfers of control rights to banks through covenant violations. Her findings suggest that by recognizing bad news more quickly, conservative financial reports facilitate the role of covenants and thus, reduce creditors' risk. Nikolaev (2010) provides consistent evidence in the bond markets that firms with more covenants in their public debt exhibit higher level of accounting conservatism.

Our study adds to the literature by identifying a new channel through which conservative financial reporting enhances debt contracting. In contrast to previous studies, we examine the interaction between accounting conservatism and commitment to risk management in alleviating shareholder-creditor conflicts. We show that accounting conservatism enhances a borrower's ability to commit to hedge and therefore reduces their costs of debt.[4]

3. Hypotheses Development

We examine the role of a commitment to hedge in reducing agency costs of debt. Hedging reduces cash flow variability, resulting in lower default risk and higher debt capacity. However, economic theories suggest that firms with higher default risk tend to engage in risk-shifting activities after the debt financing is completed. Specifically, risky borrowers have incentives to unwind hedge positions ex-post. Both borrowers and creditors acknowledge this tendency and design mechanisms to address this issue. An interest rate protection covenant provides one such mechanism. By ensuring borrowers' commitments to maintain hedge positions ex-post, interest rate protection covenants mitigate agency conflicts between creditors and

[4] Biddle et al. (2011) document that accounting conservatism reduces the downside risk of operating cash flows through increased cash holdings, reduced customer bargaining power, and increased hedge usage. We differ from Biddle et al. (2011) by separately analyzing mandatory users and voluntary users and by examining how accounting conservatism serves as a commitment mechanism.

shareholders and therefore should reduce agency costs of debt. We hypothesize that by accepting the covenants, mandatory users credibly commit to hedge and enjoy lower funding costs.

> *H1: Ceteris paribus, borrowers that commit to maintain hedge positions through interest rate protection covenants enjoy lower interest rates relative to both non-users and voluntary users.*

For voluntary users, we examine whether accounting conservatism enhances their ability to commit to hedge. Without covenant restrictions, the use of derivatives to reduce cash flow volatility is not credible because of borrowers incentives to unwind their positions once debt financing is completed. Lenders recognize this and will not factor the hedging activities into debt pricing. However, accounting conservatism increases the likelihood that earnings will reflect the economic losses resulting from increases in the volatility of cash flows. Lower earnings and financial numbers will trigger covenant violations, allowing lenders to intervene and take remedial actions. Therefore, the cost of risk-shifting activities increases in the level of accounting conservatism. Consistent with this argument, Loktionov (2009) find that distressed firms with more conservative accounting system are less likely to engage in risk-shifting activities. In addition to the risk-taking incentive, borrowers may also unwind their hedge positions to recognize gains in the income statement when interest rates increase. Chen et al. (2007) show that firms with conservative accounting reporting are less likely to engage in income increasing earning management. Therefore, we expect borrowers with conservative accounting are less likely to unwind their hedge positions after they complete their financing.

For accounting conservatism to serve as a hedge commitment mechanism, it requires that conservatism cannot be changed ex-post. Previous research suggests that changing financial reporting conservatism is costly, at least relative to the cost of changing derivative positions. For contracting purposes change conservatism may not be possible under "fixed GAAP" where the

impact of changes in accounting methods on financial numbers are excluded when calculating covenant violations (Mohrman 1996; Beatty et al. 2002). In addition, litigation risk may increase when firms accounting practice becomes more aggressive, especially when default risk is high. Finally, the finding that accounting conservatism reduces ex-ante debt costs implicitly support the argument that borrowers can pre-commit to certain conservatism levels. Consistent with these arguments, Beatty et al. (2008) do not find that firms reduce their conservatism level after entering loan contracts. In summary, we expect voluntary users with more conservative accounting system to have higher ability to commit to hedge and enjoy reduced costs of debt.

H2: Ceteris paribus, the interest savings for voluntary users relative to non-users are positively associated with accounting conservatism.

Note that we do not have a directional prediction comparing the interest savings between mandatory users and voluntary users who also engage in conservative reporting. Both derivative users commit to hedge – one uses interest rate protection covenant, and the other uses conservative accounting practices. If by being conservative, voluntary users achieve the same commitment level as mandatory users, we would expect these two groups of borrowers to have the same magnitude of interest savings. In contrast, if conservatism is not as strong of a commitment mechanism as interest protection covenants, we would expect mandatory users to achieve bigger interest savings than voluntary uses who employ conservative accounting.

4. Data and Research Design

4.1 Sample Selection

We use Loan Pricing Corporation's Dealscan and SEC's EDGAR databases to construct our sample. The Dealscan "Tear Sheets" provide extensive covenant information for a sub-sample of loans in the database. We identify interest rate protection covenants in 445 of the

2,188 Tear Sheets from 1995 to 2005. We supplement the Tear Sheets sample by conducting a search of all credit agreements included as material contract exhibits in 10-K and 8-K filings during the same time period. Our search identifies 10,059 credit agreements, of which 1,188 have interest rate protection covenants. We manually verify the accuracy of the search results by reading the covenant section of the 1,188 credit agreements. We further require our sample firms to be non-financial firms covered by LPC and COMPUSTAT. Using these selection criteria, we obtain a sample of 4,018 loans, of which 415 include interest rate protection covenants (i.e., mandatory users).

For the 3,603 loans without an interest rate protection covenant, we read the companies' 10-K filings both in the year immediately before the borrowing and in the year of the borrowing to identify voluntary users. First, we identify firms that already have interest rate derivative instruments outstanding at the time of the loan contract. We expect that if commitment is not an issue, banks will factor the borrower's existing derivative positions into the loan pricing. Second, we consider the possibility that companies may hedge after the loan origination and identify firms that enter new variable to fixed rate derivative instruments (including swaps, caps, and collars) to hedge the new loan.[5] We include both types of voluntary users in our analysis.

After requiring data for constructing at least one accounting conservatism measure and other non-missing information on firm and loan characteristics used in the regression analysis, we have in total 2,338 bank loans consisting of 263 mandatory users, 709 voluntary users, and 1,366 non-users. Table 1 Panel A reports the sample selection process. All the loans in the sample are based on floating rates that vary with the LIBOR. Table 1 Panel B reports the

[5] We can clearly identify voluntary users when firms explicitly disclose the purpose of the new derivative contracts in their 10-K filings. When firms do not disclose the purpose of their derivative contracts, we examine the change in the notional amount of the variable-to-fixed derivative instruments (swaps, caps, and collars) between the fiscal year of loan origination and the fiscal year prior to loan origination. If the change in the notional amount is positive, we consider the loan to have been (at least partially) swapped to fixed-rate.

industry distribution for mandatory users, voluntary users, and non-users, respectively. Mandatory users represent a smaller percentage of firms in the mining and construction industry (5.32%) relative to voluntary users (9.73%) and non-users (11.56%). Transportation, communication, and utilities include more mandatory users (19.39%) and voluntary users (15.79%) than non-users (13.47%). Finally, the personal and business services industry is comprised of more mandatory users (14.45%) than voluntary users (8.60%) and non-users (12.66%). Overall, all three groups consist of firms across various industries and exhibit similar industry representation.

4.2 Research Design

4.2.1 Determinants of Derivative Use and Mandatory Derivative Use

To test our main hypothesis that hedge commitments reduce interest rates, we adopt an instrumental variables approach to alleviate concerns that the loan rate outcomes and firms' choices to hedge are endogenously determined. We build a bivariate probit model to first examine the incentives to use derivatives and the incentives to include interest rate protection covenants in the syndicated loan contracts.

$$USE = \beta_0 Intercept + A*Instruments + \beta_1 NATURAL\_P + \beta_2 NATURAL\_N + \beta_3 CONSERV + \beta_4 CONSERV*NATURAL\_P + \beta_5 CONSERV*NATURAL\_N + C*Firm\ Characteristics + D*Loan\ Characteristics + u \quad (1)$$

$$MAND = \gamma_0 Intercept + A'*Instruments + \gamma_1 NATURAL\_P + \gamma_2 NATURAL\_N + \gamma_3 CONSERV + \gamma_4 CONSERV*NATURAL\_P + \gamma_5 CONSERV*NATURAL\_N + C'*Firm\ Characteristics + D'*Loan\ Characteristics + v \quad (2)$$

USE equals 1 if the borrower is a mandatory user or a voluntary user, 0 if the borrower is a non-user. MAND equals 1 if the borrower is a mandatory user, 0 if the borrower is a voluntary user or non-user.

We identify two instruments that are related to the borrower's propensity to use derivatives but are not directly related to the interest rates charged on the syndicated loans. The first instrument is the marginal tax rate before financing activities (MTR) constructed following Graham and Mills (2007) for the loan initiation year. Economic theory on hedging suggests firms hedge to reduce tax liabilities. Prior empirical studies find firms hedge more when the marginal tax rate is high (Graham and Rogers, 2002; Barton 2001). Consistent with previous research, we argue that the before-financing tax rate will be unrelated to the rates charged on the new loan. Our second instrument is the proportion of existing debt maturing in more than one year (PROP) measured at the fiscal year end prior to loan initiation. Thatcher (1985) shows that the maturity of existing debt predicts firms' choice to issue fixed rate debt that is callable for reasons other than interest rate changes. Denis and Mihov (2003) show that the maturity of existing debt predicts the choice of fixed rate debt over floating rate debt. Since syndicated loans with variable-to-fixed rate swaps incorporate both the fixed-rate and the callable features, we expect the maturity of existing debt to be positively associated with the propensity of derivative use. Barclay and Smith (1995) find little evidence that firms use maturity structure to signal credit quality. Thus, we do not expect the existing debt maturity to be directly related to loan interest rates.

We include firms' natural hedge positions in the bivariate probit model. Similar to Vickery (2008), we measure natural hedge positions (NATURAL) as the sum of the coefficients on current and one period lagged 12-month treasury rates from a regression of sales scaled by total assets on these variables, as well as a constant, time trend, and log time trend. The regression is estimated at the 2-digit SIC industry-year level. We expect firms to be less likely to hedge interest rate risk if they have a natural hedge against such risk (i.e., a negative coefficient

on NATURAL). We allow separate coefficients for negative natural hedge positions (NATURAL_N), when sales revenue decreases with increases in interest rates, and for positive natural hedge positions (NATURAL_P), when sales revenue increases with increases in interest rates. If banks are primarily concerned with borrowers ability to fulfill interest payments in an increasing interest rate environment, we expect the negative association between derivative use and the natural hedge position to be stronger for firms with negative natural hedge positions.

We include accounting conservatism in the first stage bivariate probit model to examine the role of conservatism in enhancing the hedge commitment. We follow prior literature and employ multiple accounting conservatism measures in our tests. Our first measure, CONSERV_KW, follows Khan and Watts (2009) and is constructed for each firm-year based on size, leverage ratio and book-to-market ratio. Our second measure, CONSERV_SK, is the difference between the skewness in operating cash flows and earnings before extraordinary items (Givoly and Hayn 2000; Beatty et al. 2008). We measure skewness using cash flows and earnings information from the previous 12 quarters requiring at least 5 quarters of data prior to entering into the loan. CONSERV_AC is our third measure of accounting conservatism and is the average non-operating accruals scaled by total assets over the 3-year period prior to loan origination (Givoly and Hayn 2000). Finally, we extract the principal component of the above three measures as our fourth measure of accounting conservatism (CONSERV). We rank all these conservatism measures into deciles with higher levels indicating more conservative reporting. We also interact accounting conservatism with firms' natural hedge positions to allow for the possibility that not all voluntary users are hedging. Previous research finds firms may use derivatives to speculate (Faulkender 2005; Geczy et al. 2007). If this is the case, accounting conservatism may not be directly related to derivative use. Firms with negative natural hedge

positions are more subject to interest rate fluctuation risk and may be less likely to speculate. Therefore, these firms are more likely to use conservative accounting to commit to hedge.

Previous literature suggests that firm size, leverage, profitability, and growth options affect derivative use (Mian 1996; Haushalter 2000; Geczy et al. 1997). We include the following controls: the natural log of sale revenue (SIZE), the ratio of total debt to total assets (LEV), profit margin (PM), and research and development expense scaled by sales (RD). We also control for whether the borrower is rated (RATE) and its S&P credit ratings (SPRATE), which ranges from 1 for AAA to 22 for D for firms with ratings and equal 0 for firms without ratings. All these firm characteristics are measured at the fiscal year end before loan contract initiation. Since the derivative use is associated with the new borrowing, we also include a set of loan characteristics: collateral requirements (SECURE), maturity (MATURE), loan type (TERM), secondary sales (SECOND), loan purpose (TAKEOVER), the number of financial covenants (NCOV), the number of lenders (NLENDER), and performance pricing (PERFORM). All these firm and loan controls are also expected to affect the loan rates in the second stage. We provide detailed variable definitions in Appendix I.

4.2.2 Interest Rate Spread Model

We estimate the following model to test our first hypothesis that a commitment to hedge through interest rate protection covenants reduces costs of debt.

$$AISD = \alpha_0 Intercept + \alpha_1 USE + \alpha_2 MAND + E*Firm\ Characteristics + F*Loan\ Characteristics + \varepsilon \quad (3)$$

AISD is the loan spread above LIBOR for each deal. If one deal consists of multiple facilities, *AISD* is measured as the average across all facilities. We conduct the analysis at the deal level because the interest rate protection covenants apply to all facilities in a deal. Same as in equation (1) and (2), *USE* equals 1 if the borrower is a mandatory user or a voluntary user, 0 if the

borrower is a non-user. MAND equals 1 if the borrower is a mandatory user, 0 if the borrower is a voluntary user or non-user. Since the derivative use decision is likely to be endogenously determined, we replace *USE* in model (3) with the predicted probability of *USE* from the first stage bivariate probit model. To account for the fact that mandatory users are a subgroup of users, we replace *MAND* in model (3) with the predicted joint probability of both USE = 1 and MAND=1 from the first stage bivariate probit model.

In model (3), α_1 captures the difference in interest rates between voluntary users and non-users; and α_2 captures the difference in interest rates between mandatory users and voluntary users. If commitment to hedge is important in reducing agency costs of debt and interest rate protection covenants serve as a credible commitment mechanism, we expect mandatory users to enjoy lower interest rates relative to both voluntary users and non-users (i.e., $\alpha_2 < 0$ and $\alpha_1 + \alpha_2 < 0$). In addition, we do not expect voluntary users to receive lower interest rates (i.e., $\alpha_1 = 0$).

To test our second hypothesis that accounting conservatism facilitates voluntary users' hedge commitment, we estimate the following regression.

$$\begin{aligned} AISD_{i,t} = \; & \delta_0 Intercept + \delta_1 USE + \delta_2 MAND + \\ & \delta_3 CONSERV + \delta_4 USE*CONSERV + \delta_5 MAND*CONSERV + \\ & E'*Firm\ Characteristics + F'*Loan\ Characteristics + \varepsilon \end{aligned} \qquad (4)$$

δ_4 captures how interest savings for voluntary users vary with accounting conservatism. If accounting conservatism enhances voluntary users' ability to commit and a credible hedge commitment reduces interest rate, we expect δ_4 to be negative. $(\delta_4 + \delta_5)$ captures how interest savings for mandatory users vary with accounting conservatism. Since mandatory users already have committed to hedge positions through the interest rate protection covenants, they do not need conservatism as a commitment mechanism. Therefore, we expect $(\delta_4 + \delta_5)$ to be

insignificant. Since δ_5 captures the differential impact of the accounting conservatism on loan rates between voluntary users and mandatory users, we expect it to be positive.

In equation (4) since *USE* and *MAND* are endogenous, their interaction terms *USE*CONSERV* and *MAND*CONSERV* are endogenous as well. As pointed out in Beaver et al. (2010), the extant accounting and finance literature usually instruments a function of the endogenous variable, not through building a separate first-stage, but via directly plugging in the predicted value of the endogenous variable in the function. This approach is referred to as a "forbidden regression" in Wooldridge (2002), which may result in biased coefficient estimates. Following Wooldridge (2002) and Beaver et al. (2010), we build the following separate first-stage models for USE*CONSERV and MAND*CONSERV.

$$\text{USE*CONSERV} = \alpha\ \widehat{USE}\text{*CONSERV} + \Psi X + \mathcal{E} \qquad (5)$$

$$\text{MAND*CONSERV} = \beta\ \widehat{MAND}\text{*CONSERV} + \Theta X + \mathcal{E} \qquad (6)$$

$\widehat{USE}$ is the predicted probability of USE =1 from the bivariate probit model and $\widehat{MAND}$ is the predicted joint probability of both USE = 1 and MAND = 1 from the bivariate probit model. X is the set of exogenous variables including the constant, two instruments (MTR and PROP), and all firm and loan characteristics. We then use the fitted values from equations (5) and (6) to instrument for USE*CONSERV and MAND*CONSERV in equation (4).

5. Results

5.1 Descriptive Analysis

Table 2 reports Pearson correlations between the main variables. We find that larger firms are more likely to be rated and have higher before-financing marginal tax rate. Consistent with prior research, we find that derivative use is positively correlated with firm size and

leverage ratios. However, mandatory derivative use is negatively correlated with firm size, suggesting mandatory users and voluntary users might be very different. We find firms with higher accounting conservatism are smaller, less profitable, have higher leverage ratios, and are less likely to be rated. We also find that higher interest rates are imposed on borrowers that are smaller, less profitable, and have higher leverage. These borrowers are also more likely to be required to provide collateral. We find before-financing MTR is negatively correlated with the interest charged on the loan, likely because firms with high marginal tax rates also have lower leverage and better credit ratings. Overall, these correlations are consistent with the prior literature.

Table 3 Panel A reports univariate analyses of firm characteristics and loan attributes for mandatory users, non-users, and voluntary users. We report the mean value of each variable; results based on the median values yield similar inferences and are not reported. Comparisons of before-financing marginal tax rates indicate that voluntary users have the highest marginal tax rates among the three groups of borrowers, consistent with the argument that voluntary users have strong incentive to hedge for tax purpose. We find both mandatory users and voluntary users have higher proportion of existing debt maturing after one year relative to non-users, suggesting that these firms may prefer fixed rate callable debt. Inconsistent with the argument that firms with natural hedge positions are less likely to hedge, we find the natural hedge position for voluntary users is significantly higher than both mandatory users and non-users. We do not find the natural hedge position to be different between mandatory users and non-users.

We find that mandatory users have higher default risk measured at both firm and loan levels. Specifically, at the firm level mandatory users are smaller, less profitable, and have higher leverage ratios and lower credit ratings relative to either non-users or voluntary users.

Using the existence of a rating as a proxy for access to bond markets (Faulkender and Petersen, 2006), we find that mandatory users are the least likely to have access to bond markets (36%) compared to non-users (44%) and to voluntary users (64%). At the loan level, mandatory users are charged much higher interest rates and endure more restrictive covenant conditions than both voluntary users and non-users. The average interest rate charged for mandatory users is 78.3 basis points higher than the rate for non-users and 103 basis points higher than the rate for voluntary users. Mandatory users are also more likely to be required to provide collateral and to have a higher number of covenants in their contracts. Finally, we find that bank loans with interest rate protection covenants are more likely to be repackaged and sold on the secondary loan market (48% compared with 9% of non-users and 14% of voluntary users).

Table 3 Panel B reports the distribution of the main variables. On average, borrowers have 34% leverage ratio with 81% existing debt maturing after 1 year. Half of the borrowers have credit ratings. Collateral is required for 61% of the loans and 59% of the loans have performance pricing provisions. Loan contracts have on average 4 financial covenants and 10 participating lenders.

Overall Table 3 suggests that loan contracts are more likely to include interest rate protection covenants when borrowers exhibit higher default risk. These borrowers are charged a higher interest rate on the loan and are subject to more restrictive covenant conditions. The difference in various characteristics between mandatory and voluntary users suggests that the two groups are likely to have very different incentives for entering derivative contracts.

5.2 Incentives for Derivatives Use and Mandatory Derivative Use.

Table 4 Panel A presents the first-stage bivariate probit model estimation results where accounting conservatism is measured as the principal component of the Khan and Watts (2009)

measure, the earnings skewness measure, and the non-operating accruals measure. We present the results under three different specifications. Consistent with the tax incentive to hedge, we find users have higher pre-financing marginal tax rate for two out of three model specifications. We do not find the marginal tax rate to be significant for mandatory users, suggesting the tax incentive to hedge is not associated with the probability of including interest rate protection covenants in the loan contracts. Consistent with the argument that syndicated loans swapped to fixed rate reflect borrowers' preference for fixed rate callable debt, we find the proportion of existing debt maturing after one year predicts both derivative use and mandatory derivative use.

For mandatory derivative use, we do not find an association between firms' natural hedge positions and the propensity of using derivatives if sales revenue increases in a rising interest rate environment (positive natural hedge position as indicated by NATURAL_P). However, we find a significantly negative association between the natural hedge position and mandatory derivative use when borrowers' sales revenue decreases in a rising interest rate environment (negative natural hedge position as indicated by NATURAL_N) for all three specifications. Borrowers with negative natural hedge positions and variable rate debt suffer the most from the mismatch of the interest rate exposure from the assets side and the liability side. The asymmetric association between mandatory derivative use and borrowers' natural hedge positions suggests that the borrower's natural hedge position is important in determining interest rate protection covenant use. In contrast to mandatory derivative use, we find no association between derivative use and natural hedge positions, suggesting that some voluntary users may use derivatives to speculate.[6]

In specification (2), we do not find conservative financial reporting to be associated with derivative use. However, this result could be due to the fact that some borrowers use derivatives to speculate. To further examine how conservative financial reporting affects firms' hedging

[6] Faulkender (2005) also finds no association between derivative use and the firm's natural hedge positions.

decisions, we include the interaction term between conservatism and firms natural hedge positions in specification (3).[7] For mandatory users, the estimated coefficients on CONSERV*NATURAL_P and CONSERV*NATURAL_N are not significant, suggesting the role of accounting conservatism in enhancing hedge commitment is minimal given the existence of interest rate protection covenants. For derivative use in general, we find significantly a negative coefficient on CONSERV*NATURAL_N (z = -2.827). Thus, the association between derivative use and firms' natural hedge positions is more negative for firms with conservative financial reporting, suggesting conservatism may be important only for borrowers with negative hedge positions.

Our results on conservatism and hedging are different from Biddle et al. (2011) in that we do not find an overall positive association between conservative reporting and hedging activities. Instead, we find that conservative financial reporting increases borrowers propensity to hedge only when firms have negative natural hedge positions. This asymmetric association is consistent with the interpretation that, in an interest-rising environment, firms with negative natural hedge positions have stronger incentives to manage earnings upwards because their sales revenue decreases with higher interest rates. Conservatism enhances hedge commitment by reducing their incentive to unwind their hedge positions to recognize gains in the income statement.

For other control variables, we find larger firms are more likely to use interest rate derivatives, consistent with prior studies that find derivative use exhibits economies of scale (Geczy et al., 1997; Mian, 1996). We find firms with higher leverage ratios and better credit

[7] Ai and Norton (2003) point out that it can be difficult to interpret the interaction term in non-linear models if the research objective is to assess the marginal effect of an independent variable at a point other than the center of the distribution. Since our purpose of including the interaction term in the bivariate probit model is to examine whether the impact of the natural hedge position on derivative use varies with conservatism, not to assess the absolute marginal effect of conservatism, it is correct to just rely on the interaction terms to draw inferences (Kolasinski and Siegel 2010).

ratings are more likely to use derivatives. The coefficients on most of the loan specific variables are significant and consistent with the univariate results in Table 3. We find borrowers are more likely to swap to fixed rates for loans that have longer maturity, higher number of lenders, more financial covenants, as well as for term loans and those sold on the secondary market. Compared with the incentives for derivative use in general, we find the incentives for mandatory derivative use are very different. For example, we find that mandatory users are smaller, less likely to be rated and have lower credit ratings when they are rated. These characteristics indicate mandatory users tend to be higher risk borrowers. Loans with interest rate protection covenants are also more likely to require collateral.

Table 4 Panel B reports the bivariate probit model estimation results using alternative conservatism measures. The results are largely consistent with the results reported in Panel A. Overall, the results in Table 4 suggest that our instruments (i.e., MTR and PROP) are valid because they are associated with borrowers' hedge decisions and inclusion of interest rate protection covenants in the loan contracts. In addition, banks especially care about borrowers' commitment to hedge when the borrowers' sales revenue negatively co-moves with interest rates. Such borrowers are most subject to interest rate fluctuation risk. The commitment mechanism can be either the interest rate protection covenants or conservative financial reporting. In the next section, we explore whether hedge commitments reduce firms' funding costs.

5.3. Effect of Hedge Commitments on Interest Rates

If the commitment to maintain the hedge position is important in enhancing a borrower's credit quality, the borrower should enjoy a reduction in its funding costs after it credibly commits to hedge. We investigate this issue using an instrumental variables approach. We use the

predicted probability of *USE* and the predicted joint probability of both USE = 1 and MAND=1 from the first stage bivariate probit model and estimate OLS regressions with all the explanatory variables from the first stage, except for the two instrumental variables, MTR and PROP.

Table 5 Column (1) reports the second stage OLS regression results without considering accounting conservatism. Consistent with our first hypothesis, we find that borrowers who use derivatives voluntarily do not enjoy reduced interest rates on average. The estimated coefficient on USE is -52.292 but is statistically insignificant (t = -1.118). Consistent with our first hypothesis, we find that borrowers who credibly commit to hedge by accepting the interest rate protection covenants in their loan contracts enjoy significant reductions in interest rates of 63.5 basis points (t = -2.276) relative to voluntary users and reductions of 115.8 basis points (F = 5.26) relative to non-users. These results highlight the importance of a credible commitment to hedge in reducing funding costs. The results also show that an interest rate protection covenant serves as a credible commitment mechanism.

Table 5 Columns (2) through (5) report test results of our second hypothesis on whether accounting conservatism enhances hedge commitment for voluntary users. We find significantly negative coefficients on the interaction terms between accounting conservatism and voluntary derivative use for all four conservatism measures. This result suggests that conservatism enhances voluntary users' ability to commit, resulting in lower costs of debt. Voluntary users who practice conservative reporting are less likely to engage in risk-shifting activities, such as unwinding the hedge positions in rising interest rate environments. Creditors recognize this and thus, factor the credit improvement into debt pricing.

The interaction terms between accounting conservatism and mandatory derivative use are mostly positive and significant (except for Column (5)), offsetting the negative coefficients on

CONSERV*USE. We conduct F-tests on the sum of the coefficients on CONVSERV*USE and CONSERV*MAND, which indicates whether mandatory users save interests by practicing conservative reporting. The bottom of Table 5 reports the results. We find that being conservative does not reduce interest rates for mandatory users (except for Column (5)). This result is not surprising because mandatory users do not need to depend on conservative reporting to commit to hedge.

The coefficient on CONSERV is in general positive and significant, consistent with the interpretation that firms with higher default risk are more likely to have conservative financial reporting due to debt contracting demands.[8] The results for other control variables are consistent with those found in previous research. Specifically, smaller borrowers and borrowers that have high leverage, low profitability, and low credit ratings are charged a higher rate. We find larger spreads for loans that require collateral, for term loans, for loans later sold in the secondary market, and for loans used for takeovers. We also find that loans with a longer maturity are charged a lower interest rate.

In summary, Table 5 shows that voluntarily taking hedge positions without a credible commitment to maintain the hedge does not reduce the borrower' funding costs. An interest rate protection covenant serves as a credible commitment mechanism and so does conservative reporting. Accounting conservatism enhances voluntary users' hedge commitment but is not important for mandatory users.

5.4 Sensitivity Tests

The inclusion of interest rate protection covenants could arise from certain lead arrangers' preferences rather than borrowers' characteristics. We consider this possibility by

[8] Zhang (2008) documents a negative association between loan spreads and accounting conservatism. However, this negative association only applies to a sub-sample of loans without performance pricing.

examining whether mandatory users share the same lead arrangers. We identify 219 unique banks serving as lead arrangers for the entire sample of 2,338 loans. The 263 deals with interest rate protection agreements are arranged by 75 banks, and the 2,075 deals without interest rate protection agreements are arranged by all 219 banks. There is no lead arranger that only arranges deals with interest rate protection covenants. This result suggests that the requirement for borrowers to enter an interest rate protection program does not merely reflect a specific lead arranger's preference.

6. Conclusion

We study how credible hedge commitments affect agency costs of debt by examining three types of borrowers: those required to hedge interest rate risk due to interest rate protection covenants, those who voluntarily hedge interest rate risk, and those who do not hedge interest rate risk. We find that loan contracts are more likely to require borrowers to hedge interest rate risk when borrowers exhibit high default risk and when borrowers' sales revenues decrease in a rising interest rate environment. We find hedge commitment through interest rate protection covenants reduces interest rates charges on the syndicated loans. In contrast, we do not find interest savings on average for voluntary users. However, we find accounting conservatism enhances voluntary users' ability to commit to hedge and thus results in lower loan rates.

Our finding provides large sample evidence on the importance of credible hedge commitments in reducing agency costs of debt. The finding is consistent with Smith and Stulz's (1985) conjecture that, due to conflicts between creditors and shareholders, the benefits of hedging are only realizable when borrowers can credibly commit to maintain the hedge positions once the financing is completed. The study also extends the literature on corporate risk

management. We show that the assumption that derivative use is a voluntary firms choice is not always valid. Many bank loan agreements explicitly include interest rate protection covenants requiring borrowers to use derivatives to hedge interest rate risk. Reasons for mandatory derivative use can be very different from reasons for voluntarily derivative use. It is thus important for researchers to consider whether the derivative use is out of contractual obligations when conducting risk management research.

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Appendix I: Variable Definitions

AISD	Loan spreads over LIBOR calculated for each deal. If one deal consists of multiple facilities, AISD is measured as the average spreads across all the facilities.
COMPRATE	S&P rating ranging from 1 for AAA to 22 for D for firms with ratings. Set to missing value for firms without ratings.
CONSERV_KW	Decile ranking of the accounting conservatism constructed for each firm-year based on Khan and Watts (2009).
CONSERV_AC	Decile ranking of the accounting conservatism measured as the average non-operating accruals scaled by total assets over the 3-year period before the loan origination.
CONSERV_SK	Decile ranking of the accounting conservatism measured as the difference between the skewness of operating cash flows scaled by total assets and the skewness of income before extraordinary items scaled by total assets. The skewness of earnings and cash flows are calculated for the firm-year before the loan origination using information from the previous 12 quarters with minimum 5 quarters data.
CONSERV	Decile ranking of the principal component of the three accounting conservatism measures based on non-operating accruals, difference in the skewness of cash flows and earnings, and Khan and Watts (2009).
NATURAL	Firms' natural hedge position measured as the sum of the coefficients on current and one period lagged 12-month treasury rates from a regression of sales scaled by total assets on these variables, as well as a constant, time trend, and log time trend. The regression is estimated at 2-digit SIC industry-year level. This measure is similar to the natural hedge position measured in Vickery (2008).
NATURAL_P	Equals NATURAL if NATURAL > 0 and set to 0 otherwise.
NATURAL_N	Equals NATURAL if NATURAL < 0 and set to 0 otherwise.
LEV	Book leverage measured as the sum of the long-term debt and debt in current liabilities divided by total assets.
MAND	Indicator variable that equals 1 if a bank loan includes an interest rate protection covenant (i.e., mandatory users), 0 for non-users and for voluntary users.
MATURE	Natural log of number of months between the loan start and end date.
MTR	Before-financing simulated marginal tax rate. We calculate the variable using the coefficients estimated in Graham and Mills (2007) for predicting pre-financing marginal tax rate.

PM	Gross profits scaled by sales revenue.
PROP	Proportion of debt maturing after one year.
PERFORM	Indicator variable that equals 1 if the loan includes performance pricing, 0 otherwise.
RATE	Indicator variable that equals 1 if a borrower has S&P credit ratings prior to loan origination, 0 otherwise.
RD	Research and development expense scaled by sales. Set to 0 when research and development expense data is missing.
NCOV	Number of financial covenants.
NLENDER	Number of lenders involved in the syndicated loans.
SECOND	Indicator variable that equals 1 if a "Term Loan" is followed by letter A-H, 0 otherwise.
SECURE	Indicator variable that equals 1 if the loan is secured, 0 otherwise.
SIZE	Natural log of sales revenue.
SPRATE	S&P rating ranging from 1 for AAA to 22 for D for firms with ratings and equal to 0 for firms without ratings.
TAKEOVER	Indicator variable that equals 1 if the loan is used for takeover purpose, 0 otherwise.
TERM	Indicator variable that equals 1 if any facility is a term loan, 0 otherwise.
USE	Indicator variable that equals 1 if a borrower uses derivative contracts to fix the borrowing rate (both voluntary users and mandatory users), 0 for non-users.

All accounting variables are measured at the end of the fiscal year prior to loan origination, except for MTR. Before-financing marginal tax rate (MTR) is measured at the end of the fiscal year of the loan origination.

Table 1
Sample Description

Panel A: Sample selection

Total credit agreements identified with 10-K wizard and Tear Sheets from 1995 to 2005	10,059
Credit agreements with COMPUSTAT coverage	4,018
Credit agreements with at least one accounting conservatism measure and other non-missing variables	2,338
Number of loans (firms) with interest rate protection covenant (mandatory users)	263 (229)
Number of loans (firms) without interest rate protection covenant but with interest rate derivatives in place at time of loan initiation (voluntary users)	709 (491)
Number of loans (firms) without interest rate protection covenant or interest rate derivatives at time of loan initiation (non-users)	1,366 (958)

Panel B: Industry distribution of mandatory users, voluntary users and non-users

	Mandatory Users (%)	Voluntary Users (%)	Non-Users (%)
01-09 Agriculture	0.00	0.14	0.15
10-19 Mining and Construction	5.32	9.73	11.56
20-27 Food, paper, and finished goods	12.16	11.28	10.83
28-29 Chemicals and pharmaceuticals	3.80	6.34	5.34
30-34 Rubber, leather, and metal works	7.22	9.73	6.44
35-36 Machinery & electronics	11.02	11.86	10.86
37-39 Other equipment and machinery	7.98	8.46	7.54
40-49 Transportation, telecom & utilities	19.39	15.79	13.47
50-51 Wholesalers	3.42	5.41	4.83
52-59 Retailers	9.50	9.87	10.54
70-79 Personal and business services	14.45	8.60	12.66
80-99 Other services	5.70	3.95	5.85
Total	100	100	100

Table 2
Pearson Correlation Coefficients

This table presents Pearson correlation coefficients among the main variables. All variables are defined in Appendix I. Numbers in bold indicate 1% or less level of significance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
USE (1)	1.00																				
MAND (2)	**0.42**	1.00																			
AISD (3)	0.00	**0.24**	1.00																		
MTR (4)	0.04	**-0.07**	**-0.37**	1.00																	
PROP (5)	**0.10**	0.05	**-0.09**	0.03	1.00																
NATURAL_P (6)	0.03	-0.04	**-0.07**	**0.08**	**0.07**	1.00															
NATURAL_N (7)	**0.06**	-0.04	**-0.09**	**0.16**	0.04	**0.46**	1.00														
CONSERV (8)	**-0.06**	**0.07**	**0.42**	**-0.33**	**-0.12**	**-0.12**	-0.04	1.00													
SIZE (9)	**0.17**	**-0.14**	**-0.40**	**0.24**	**0.11**	**0.13**	**0.24**	**-0.33**	1.00												
LEV (10)	**0.13**	**0.11**	**0.30**	**-0.28**	**0.16**	0.06	-0.01	**0.24**	-0.05	1.00											
PM (11)	0.02	**-0.06**	**-0.19**	**0.09**	**0.16**	0.02	**-0.20**	**-0.23**	**-0.07**	0.04	1.00										
RATE (12)	**0.13**	**-0.08**	**-0.17**	-0.02	**0.24**	**0.12**	**0.08**	**-0.18**	**0.57**	**0.25**	**0.12**	1.00									
SPRATE (13)	**0.10**	-0.01	0.04	**-0.15**	**0.25**	**0.07**	0.03	-0.03	**0.39**	**0.37**	**0.07**	**0.92**	1.00								
RD (14)	-0.05	-0.04	-0.03	-0.02	**-0.15**	**-0.09**	0.01	0.01	-0.03	**-0.18**	**-0.10**	-0.06	**-0.08**	1.00							
SECURE (15)	0.00	**0.22**	**0.66**	**-0.25**	-0.04	**-0.10**	**-0.06**	**0.36**	**-0.44**	**0.21**	**-0.11**	**-0.22**	-0.02	-0.04	1.00						
MATURE (16)	**0.15**	**0.20**	-0.01	-0.01	**0.16**	-0.01	**0.06**	-0.03	**-0.10**	0.06	**0.08**	-0.03	0.04	**-0.13**	**0.14**	1.00					
SECOND (17)	**0.18**	**0.32**	**0.41**	**-0.15**	**0.06**	0.02	0.04	**0.10**	-0.03	**0.17**	-0.05	0.06	**0.15**	-0.05	**0.32**	**0.29**	1.00				
TERM (18)	**0.17**	**0.34**	**0.44**	**-0.16**	0.03	0.00	0.00	**0.13**	**-0.19**	**0.19**	-0.03	**-0.07**	0.04	-0.03	**0.40**	**0.33**	**0.58**	1.00			
NCOV (19)	0.05	**0.25**	**0.18**	**-0.06**	**0.08**	**-0.07**	0.01	**0.17**	**-0.28**	**0.07**	-0.04	**-0.20**	**-0.09**	**-0.07**	**0.27**	**0.28**	**0.24**	**0.31**	1.00		
NLENDER (20)	**0.23**	0.04	**-0.31**	**0.09**	**0.15**	**0.11**	**0.09**	**-0.24**	**0.51**	**0.10**	**0.12**	**0.41**	**0.30**	**-0.07**	**-0.25**	**0.13**	0.04	-0.02	-0.02	1.00	
TAKEOVER (21)	**0.06**	**0.14**	**0.11**	0.00	0.03	-0.02	0.01	0.00	-0.01	0.03	0.01	0.01	0.01	-0.04	**0.08**	**0.10**	**0.22**	**0.13**	**0.09**	0.00	1.00
PERFORM (22)	**0.08**	-0.01	**-0.23**	**0.15**	**0.09**	-0.01	**0.06**	**-0.13**	**0.08**	**-0.08**	**0.14**	0.05	0.02	-0.03	**-0.15**	**0.19**	**-0.06**	**-0.07**	-0.04	**0.08**	-0.04

Table 3
Descriptive Statistics

Panel A presents descriptive statistics [means and differences in means] for three types of borrowers. Mandatory users are borrowers whose loan contracts contain interest rate protection covenants and are required to hedge interest rate risk. Voluntary users are borrowers who freely choose to hedge interest rate risk related to the borrowing. Non-users are borrowers who do not hedge the new borrowing's interest rate risk. Panel B presents distribution of main variables. All variables are defined in Appendix I. ***,** and * represent 1%, 5% and 10% level of significance, respectively.

Panel A: Descriptive statistics for bank loan borrowers by derivative use

Variables	Means for Mandatory Users	Means for Voluntary Users	Means for Non-Users	*Mandatory users versus voluntary users*	*Mandatory users versus non-users*	*Voluntary users versus non-users*
Instrumental Variables						
MTR	0.3023	0.3231	0.3142	***	***	***
PROP	0.8542	0.8379	0.7852		***	***
Firm Characteristics						
SIZE	5.874	7.211	6.2955	***	***	***
LEV	0.4244	0.3625	0.3058	***	***	***
PM	0.1281	0.1803	0.1611	***	***	***
RATE	0.3650	0.6417	0.4399	***	**	***
COMPRATE	13.000	9.683	10.604	***	***	***
RD	0.0084	0.0116	0.0141	*	**	
CONSERV	6.056	5.013	5.645	**	***	***
NATURAL_P	0.0064	0.0090	0.0077	***		**
NATURAL_N	-0.0087	-0.0064	-0.0082	***		***
Loan characteristics						
AISD	242.3	139.3	164.0	***	***	***
SECURE	0.9087	0.5077	0.6032	***	***	***
MATURE	4.043	3.732	3.639	***	***	***
TERM	0.8060	0.3074	0.2738	***	***	*
SECOND	0.4753	0.1382	0.0915	***	***	***
NLENDER	11.283	13.119	8.744	***	***	***
NCOV	5.182	3.689	3.908	***	***	***
TAKEOVER	0.0837	0.0183	0.0168	***	***	
PERFORM	0.5779	0.6657	0.5571	**		***

Panel B: Distribution of main variables

Variables	N	Mean	STD	1%	25%	50%	75%	99%
MTR	2338	0.3156	0.0584	0.171	0.290	0.345	0.345	0.371
PROP	2338	0.8090	0.2604	0	0.7407	0.9255	0.9849	1
NATURAL_P	2338	0.0079	0.0123	0	0	0	0.0132	0.0418
NATURAL_N	2338	-0.0077	0.0108	-0.0328	-0.0270	-0.0026	0	0
SIZE	2338	6.526	1.649	2.184	5.459	6.455	7.798	10.280
LEV	2338	0.3363	0.2506	0.0022	0.1789	0.3081	0.4411	1.0964
PM	2338	0.1632	0.1619	-0.3934	0.0849	0.1397	0.2187	0.6697
RATE	2338	0.4927	0.5001	0	0	0	1	1
SPRATE	2338	5.144	5.669	0	0	0	10	16
RD	2338	0.0127	0.0327	0	0	0	0.0088	0.1700
AISD	2338	165.3	112.8	20	75	150	250	555
SECURE	2338	0.6086	0.4881	0	0	1	1	1
MATURE	2338	3.712	0.568	1.792	3.584	3.871	4.094	4.331
TERM	2338	0.3438	0.4751	0	0	0	1	1
SECOND	2338	0.1488	0.3560	0	0	0	0	1
NLENDER	2338	10.356	9.147	1	3	8	14	44
NCOV	2338	3.984	1.740	1	3	4	5	7
TAKEOVER	2338	0.0248	0.1556	0	0	0	0	1
PERFORM	2338	0.5923	0.4914	0	0	1	1	1

Table 4
Bivariate Probit Models for Derivative Users and Mandatory Users

Table 4 reports bivariate probit model regression results. Panel A presents estimation results when accounting conservatism is measured as the principal component of the three accounting conservatism measures: Khan and Watts (2009), differences in skewness of earnings and cash flows, and non-operating accruals. Panel B presents estimation results using alternative conservatism measures. Estimated coefficients on firm and loan characteristics are omitted in Panel B for presentation purpose. z-stats are in brackets. All variables are defined in Appendix I. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

Panel A: Bivariate probit model regression results where accounting conservatism is measured as the principal component of CONSERV_KW, CONSERV_AC, and CONSERV_SK.

	(1)		(2)		(3)	
	USE	MAND	USE	MAND	USE	MAND
MTR	0.894	0.309	1.089*	0.041	1.094*	0.214
	[1.632]	[0.431]	[1.824]	[0.051]	[1.704]	[0.255]
PROP	0.300**	0.353**	0.254**	0.310*	0.255*	0.263
	[2.549]	[2.130]	[2.077]	[1.882]	[1.793]	[1.217]
NATURAL_P	0.222	0.875	-0.567	-1.310	-10.752	13.942
	[0.070]	[0.196]	[-0.157]	[-0.282]	[-1.356]	[0.917]
NATURAL_N	-2.950	-10.130*	-2.595	-12.104**	17.561	-21.489*
	[-0.691]	[-1.691]	[-0.586]	[-2.036]	[1.642]	[-1.762]
CONSERV			0.001	-0.008	-0.039*	0.016
			[0.049]	[-0.474]	[-1.921]	[0.492]
CONSERV* NATURAL_P					1.765	-2.169
					[1.269]	[-0.827]
CONSERV* NATURAL_N					-3.343***	0.976
					[-2.827]	[0.636]
Firm Characteristics						
SIZE	0.103***	-0.080**	0.092***	-0.102***	0.093***	-0.100***
	[3.762]	[-2.278]	[3.061]	[-2.692]	[3.423]	[-3.629]
LEV	0.805***	0.396**	0.726***	0.207	0.735***	0.161
	[4.355]	[2.062]	[5.352]	[1.135]	[5.070]	[1.137]
PM	-0.194	-0.343	-0.074	-0.173	-0.008	-0.153
	[-0.956]	[-1.508]	[-0.322]	[-0.637]	[-0.037]	[-0.521]
RATE	0.646***	-0.913***	0.682***	-0.814*	0.666***	-0.838***
	[3.332]	[-2.889]	[3.295]	[-1.860]	[3.511]	[-2.769]
SPRATE	-0.065***	0.048*	-0.066***	0.046	-0.065***	0.049**
	[-3.963]	[1.947]	[-3.930]	[1.387]	[-4.218]	[2.361]
RD	-1.218	-0.594	-1.057	-0.437	-1.081	-0.812
	[-1.236]	[-0.512]	[-0.958]	[-0.260]	[-0.962]	[-0.490]

Loan Characteristics						
SECURE	0.098	0.296**	0.088	0.356***	0.090	0.370**
	[1.323]	[2.517]	[1.123]	[2.807]	[1.341]	[2.499]
MATURE	0.198***	0.210*	0.182***	0.241**	0.174*	0.224
	[3.260]	[1.902]	[2.822]	[2.030]	[1.825]	[1.391]
SECOND	0.243**	0.402***	0.167	0.359***	0.188**	0.357***
	[2.454]	[3.551]	[1.644]	[3.139]	[2.028]	[3.597]
TERM	0.334***	0.521***	0.372***	0.545***	0.371***	0.558***
	[4.395]	[4.929]	[4.673]	[4.813]	[3.816]	[5.823]
NCOV	0.053***	0.143***	0.057***	0.154***	0.056**	0.154***
	[2.661]	[5.220]	[2.643]	[5.023]	[2.367]	[5.381]
NLENDER	0.016***	0.017***	0.020***	0.019***	0.020***	0.019***
	[4.077]	[3.198]	[5.027]	[3.951]	[5.116]	[3.488]
TAKEOVER	0.110	0.382*	0.162	0.415*	0.203	0.414
	[0.580]	[1.911]	[0.830]	[1.915]	[0.758]	[0.975]
PERFORM	0.163***	0.026	0.137**	0.028	0.137***	0.033
	[2.734]	[0.322]	[2.169]	[0.320]	[3.051]	[0.689]
INTERCEPT	-2.401***	-2.902***	-2.540***	-2.856***	-2.309***	-3.065***
	[-4.361]	[-4.360]	[-3.852]	[-3.034]	[-2.843]	[-4.847]
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2338	2338	2,125	2,125	2,125	2,125

Panel B: Bivariate probit model regression results based on alternative conservatism measures

	CONSERV_KW				CONSERV_SK				CONSERV_AC			
	USE	MAND	USE	MAND	USE	MAND	USE	MAND	USE	MAND	USE	MAND
MTR	1.018*	0.397	1.050*	0.644	0.823	0.212	0.892*	0.092	0.907	-0.128	0.932	-0.098
	[1.807]	[0.537]	[1.802]	[0.846]	[1.459]	[0.290]	[1.671]	[0.097]	[1.595]	[-0.183]	[1.593]	[-0.128]
PROP	0.291**	0.316**	0.314**	0.332	0.278**	0.346**	0.273*	0.322	0.255**	0.308**	0.254*	0.305
	[2.456]	[1.961]	[2.187]	[1.588]	[2.303]	[1.983]	[1.843]	[1.466]	[2.145]	[2.157]	[1.777]	[1.482]
NATURAL_P	-0.694	-0.551	-3.568	16.479**	0.668	1.186	-13.713*	-5.852	-1.241	-0.386	-0.107	8.593
	[-0.211]	[-0.118]	[-0.463]	[2.014]	[0.191]	[0.250]	[-1.666]	[-0.507]	[-0.367]	[-0.082]	[-0.021]	[1.124]
NATURAL_N	-3.960	-11.314**	22.911**	-0.687	-2.339	-8.993	14.388	-10.716	-2.745	-13.704**	-0.645	-14.300
	[-0.919]	[-1.984]	[2.251]	[-0.046]	[-0.546]	[-1.594]	[1.325]	[-0.695]	[-0.625]	[-2.293]	[-0.080]	[-1.128]
CONSERV	0.023	0.027	-0.015	0.028	-0.008	-0.018	-0.050***	-0.024	-0.007	-0.020	-0.008	-0.008
	[1.458]	[1.257]	[-0.507]	[1.140]	[-0.774]	[-1.256]	[-2.635]	[-0.995]	[-0.632]	[-1.429]	[-0.650]	[-0.343]
NATURAL_P *CONSERV			0.372	-2.622*			2.576**	1.358			-0.260	-1.805
			[0.323]	[-1.861]			[2.001]	[0.730]			[-0.477]	[-1.067]
NATRUAL_N *CONSERV			-4.856***	-2.435			-2.841**	0.099			-0.369	0.166
			[-5.292]	[-1.588]			[-2.385]	[0.049]			[-0.674]	[0.105]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2292	2292	2292	2292	2243	2243	2243	2243	2216	2216	2216	2216

Table 5
Effects of Interest Rate Protection Covenants and Accounting Conservatism on the Interest Rates of Syndicated Loans

Table 5 reports analysis of the impact of interest rate protection covenants and accounting conservatism on loan interest rates (as a spread over LIBOR). The dependent variable is loan spread. We use an instrumental variables approach to address the endogeneity problem. We employ two instruments, marginal tax rate (MTR) and proportion of debt maturing after one year (PROP). See Table 4 for the first stage results. All variables are defined in Appendix I. Reported in brackets are t-statistics calculated based on White heteroskedastic consistent standard errors and adjusted for clustering by company. ***, ** and * represent 1%, 5% and 10% level of significance, respectively.

Variables		CONSERV	CONSERV _KW	CONSERV _SK	CONSERV _AC
	(1)	(2)	(3)	(4)	(5)
USE	-52.292	-51.375	-67.968	-36.049	-68.397
	[-1.118]	[-0.942]	[-1.289]	[-0.635]	[-1.232]
MAND	-63.522**	-102.114***	-76.759**	-100.960***	-58.862*
	[-2.276]	[-2.787]	[-2.070]	[-3.047]	[-1.693]
USE * CONSERVE		-14.704***	-14.956***	-12.101***	-8.551**
		[-3.545]	[-3.293]	[-3.271]	[-2.182]
MAND * CONSERVE		10.789***	8.785**	7.197**	1.624
		[2.624]	[1.962]	[2.062]	[0.417]
CONSERVE		8.020***	12.825***	5.869***	2.301
		[4.609]	[6.592]	[3.640]	[1.452]
Firm Characteristics					
SIZE	-8.434***	-4.428	1.695	-7.106***	-5.803*
	[-3.336]	[-1.560]	[0.547]	[-2.602]	[-1.944]
LEV	77.382***	87.568***	80.577***	88.542***	94.551***
	[5.130]	[5.321]	[5.205]	[5.036]	[5.479]
PM	-93.545***	-74.482***	-71.712***	-90.963***	-94.100***
	[-6.747]	[-4.838]	[-5.348]	[-6.130]	[-6.043]
RATE	-74.145***	-54.510***	-43.961***	-59.450***	-61.906***
	[-4.842]	[-3.172]	[-2.634]	[-3.397]	[-3.751]
SPRATE	6.149***	4.334***	3.551**	4.797***	4.823***
	[4.355]	[2.734]	[2.282]	[2.971]	[3.066]
RD	-87.865	-109.715*	-35.497	-103.475*	-102.542*
	[-1.541]	[-1.893]	[-0.602]	[-1.800]	[-1.711]
NATURAL_P	-35.175	42.487	-254.864	107.303	-171.103
	[-0.198]	[0.216]	[-1.399]	[0.556]	[-0.924]
NATURAL_N	-97.047	68.047	-120.595	16.294	127.925
	[-0.387]	[0.245]	[-0.458]	[0.064]	[0.450]

Loan characteristics					
SECURE	83.517***	82.685***	78.064***	85.644***	84.850***
	[20.359]	[19.089]	[18.324]	[19.677]	[19.804]
MATURE	-21.226***	-17.483***	-14.178***	-17.392***	-17.626***
	[-4.426]	[-3.459]	[-2.892]	[-3.453]	[-3.350]
SECOND	64.443***	62.883***	67.977***	66.303***	65.109***
	[7.724]	[7.741]	[8.162]	[7.872]	[7.594]
TERM	42.246***	53.611***	50.040***	49.045***	51.835***
	[5.731]	[6.042]	[6.360]	[5.867]	[5.934]
NCOV	3.487**	4.758***	4.960***	4.260**	4.703***
	[2.346]	[2.913]	[3.314]	[2.573]	[2.851]
NLENDER	-0.380	0.203	0.277	0.016	0.087
	[-1.081]	[0.442]	[0.700]	[0.036]	[0.204]
TAKEOVER	37.046***	43.406***	38.197***	40.206***	44.391***
	[4.209]	[4.360]	[4.035]	[4.497]	[4.540]
PERFORM	-18.230***	-12.268***	-9.517**	-14.679***	-14.173***
	[-4.328]	[-2.765]	[-2.092]	[-3.217]	[-3.151]
INTERCEPT	266.478***	244.936***	169.428***	275.715***	296.402***
	[9.752]	[7.908]	[4.740]	[9.656]	[9.781]
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.637	0.649	0.652	0.648	0.642
Observations	2,338	2,125	2,292	2,243	2,216
F-test of USE*CONSERV + MAND*CONSERV		F=0.72	F=2.07	F=1.85	F=3.72*