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Tying loan interest rates to borrowers' CDS spreads

Ivan T. Ivanov, Joao A. C. Santos, and Thu Vo

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The transformation of banking: Tying loan interest rates to borrowers' CDS spreads*

Ivan T. Ivanov† João A. C. Santos‡ Thu Vo§

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JEL classification: G1, G21, G30
Key Words: Market-based pricing, loan spreads, loan covenants, CDS spreads

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†Federal Reserve Board, 20th Street and Constitution Avenue NW, Washington, DC 20551; 202-452-2987; ivan.t.ivanov@frb.gov.

‡Federal Reserve Bank of New York and Nova School of Business and Economics, 33 Liberty Street, New York, NY 10045; 212-720-5583; joao.santos@ny.frb.org.

§Amherst Securities Group, 5001 Plaza On The Lake, Austin, TX 78746; 512-342-3108; tvo@amherst.com.

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Abstract

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1 Introduction

A large strand of literature in finance, including the seminal work of Ramakrishnan and Thakor (1984), Diamond (1984), and Holmström and Tirole (1993), shows that banks are valuable when there are information asymmetries because they have a comparative advantage in monitoring borrowers. Monitoring involves screening borrowers ex ante in order to identify good credits and measure their risk; and following borrowers during the realization of their investment in order to both prevent them from undertaking opportunistic behavior, and penalize them when they fail to meet contractual obligations.[1] Since these activities are costly, banks find themselves under constant pressure from competition to find new, more economical, ways to extend loans to corporations.

The development of the CDS market has provided banks with observable information on borrowers' default risk at minimal cost. While banks do not seem to use the CDS market extensively to lay off credit risk, it appears that they are relying on information from the CDS market in their lending business.[2] Since 2008 banks have increasingly extended loans to corporations with interest rate spreads tied to the borrower's CDS spread over the life of the loan, a practice referred to as market-based pricing. This innovation has the potential to lower the cost of bank financing because it gives banks an opportunity to save on both monitoring and hedging costs. In this paper, we investigate whether market-based pricing has led to a reduction in the cost of bank credit to corporations. We also attempt to explain why banks are able to lower the cost of bank debt when they used market-based pricing.

We first analyze whether interest rate spreads at the time of the loan origination differ between standard loans and loans priced off borrower CDS spreads. The results suggest that banks lower interest rates at origination when they tie loan spreads to borrower CDS spreads. This finding is robust to the inclusion of borrower- and loan-specific factors, and macroeconomic controls. It is also robust to firm- and bank-fixed effects, which has the potential to

[1] We use the term monitoring to refer to both ex ante screening and ex post monitoring of loans.

[2] See Minton, Stulz, and Williamson (2009) for evidence on banks' use of the CDS market to hedge their credit risk exposures.

account for unobservables that are correlated with underlying firm and bank quality. Further, our results do not appear to be driven by the endogenous determination of banks' decision to rely on the CDS market to set loan spreads and borrower credit quality. Our findings remain the same when we use different matched sample methods commonly employed in the literature, and when we account for potential endogeneity of selecting market-based pricing using the Lewbel (2012) GMM estimator.

Our finding that market-based pricing loans have lower interest spreads at origination than otherwise similar standard loans does not necessarily guarantee that this new form of loan pricing is associated with a reduced interest cost of bank financing. This is because loan spreads can now vary during the life of the loan. To address this issue, we compare the interest costs firms incur during the life of their loans when interest rate spreads are tied to credit default swaps with the hypothetical payments firms would have owed had banks opted for using the standard pricing model.

We find that the difference between the actual and the hypothetical fixed-rate spread over the life of the loan is always negative for loans priced off the CDS market. On average, CDS-priced loans allow firms to pay an annualized monthly interest rate spread of approximately 40 basis points lower than with standard loan contracts. This difference is larger for one- and three-year loans (an annualized monthly gap of approximately 60 and 30 basis points) than for five-year loans (an annualized monthly gap of between 6 and 10 basis points). These results confirm that market-based pricing has allowed borrowers to enjoy substantial cost savings in terms of interest rate spreads and that these effects are concentrated in short-term contracts.

There are two main channels through which market-based pricing could lead to a decline in the cost of bank credit: allowing banks to save on monitoring costs and offering banks protection against future changes in borrowers' default risk. Disentangling the relative importance of these explanations could not only help us understand why banks are able to lower the cost of credit to corporations when they use market-based pricing, but it could

also be useful in identifying some potential implications of this innovation.

We measure banks' monitoring costs with the number of covenants banks include in a loan contract and investigate whether CDS-priced loans carry fewer covenants than similar loans not linked to CDS spreads. Using both matched samples and a Lewbel (2012) GMM estimation, we find that loans with market-based pricing have fewer covenants than otherwise similar fixed interest rate spread contracts. In contrast, we do not find supporting evidence for the hypothesis that the decline in the cost of bank credit has resulted from market-based pricing offering banks protection against changes in borrowers' risk of default. More specifically, we do not find that such cost decline is higher for borrowers with greater default risk. These findings suggest that the reduction in the cost of bank credit induced by market-based pricing is due to the savings banks enjoy by substituting costly monitoring with borrower-specific information from CDS markets.

Banks mostly use market-based pricing to set interest rate spreads on revolving credit lines. Since the pricing structure of a credit line also includes commitment fees (all-in-undrawn fees), this gives us an additional opportunity to test our hypotheses.[3] The results of our investigation of undrawn fees, though not as strong as those on interest rate spreads, suggest that market-based pricing has also led to a reduction in undrawn fees. This finding runs counter to the hedging hypothesis and adds support to the monitoring explanation because as pointed out in the theoretical literature (see, Holmstrom and Tirole, 2000) and documented empirically (see, Bord and Santos, 2013), the all-in-undrawn fee compensates banks for the liquidity risk that arises with the provision of credit lines.

The transformation of lending arising from banks' pricing loans off borrowers' CDS spreads has several potential implications. Since market-based pricing makes bank loans

[3]The all-in-drawn spread, which is defined in excess of LIBOR and equals to the annual cost to a borrower for drawn funds, compensates the bank for the credit risk it bears when the borrower draws down on its credit line. The undrawn fee, which a borrower must pay its bank for funds committed under the credit line but not taken down, compensates the bank for the liquidity risk it bears by guaranteeing the firm access to funding at its discretion over the life of the credit line and up to the total commitment amount. Dealscan uses the wording all-in-undrawn spread when referring to the prices firms pay on undrawn commitments, but in reality these prices are not markups over market interest rates.

less relationship-based and more transactional-based, it might reduce the benefits emanating from the complementarity between relationship and transactional lending.[4] It might also make it more difficult for borrowers to benefit from relationship lending, which has been a distinct feature of bank lending. For instance, Petersen and Rajan (1995) show an important benefit of relationship borrowing is firms' ability to enjoy some intertemporal interest rate smoothing, which is not present in transactional borrowing.[5]

In addition, information obtained from the CDS market is unlikely to be a perfect substitute for bank monitoring because banks have better access to borrower information and possibly greater monitoring incentives than other claimholders. As a result, the adoption of market-based pricing, by reducing banks' monitoring incentives, might have a negative effect on investors that free ride on bank monitoring, and consequently on the cost of non-bank funding sources.[6]

The decline in bank monitoring could also adversely affect the information content of CDS prices, jeopardizing the viability of market-based pricing for corporate loans. There is ample evidence that CDSs' spreads are a valuable source of firm-specific information and that the CDS market leads the stock market.[7] Although it is difficult to determine the extent to which the information content of CDS spreads varies with bank monitoring, it is conceivable that bank monitoring forces firms to disclose information that they otherwise would not release. Under these circumstances, the decline of bank monitoring that comes with market-based pricing will adversely affect the information content of borrowers' CDS spreads, with negative effects for contractual arrangements that rely on the CDS market.

Last, market-based pricing has the potential for creating liquidity spirals in the cost of bank credit. For instance, adverse shocks to the CDS market could lead to an increase in the

[4]See Song and Thakor (2010) for a model in which banks and financial markets complement each other.

[5]See Boot (2000) for a review of the benefits of relationship lending.

[6]See Holmström and Tirole (1997) for a model in which bank monitoring allows borrowers to raise funding from bondholders who would not be willing to lend otherwise, and Longhofer and Santos (2000) for a model in which trade creditors are willing to extend funding under better terms because there is also a bank that monitors the borrower.

[7]See Hull, Predescu, and White (2004), Longstaff, Mithal, and Neis (2005), Norden and Weber (2004), Blanco, Brennan, and Marsh (2005), and Acharya and Johnson (2007).

cost of bank credit, putting pressure on borrowers' financial condition. This could in turn lead to further increases in their CDS spreads and another wave of increases in the cost of bank credit.

Our paper is related to the literature investigating how the development of the CDS market has affected the cost of bank financing. This literature, thus far, has found mixed results. Ashcraft and Santos (2009) find that the onset of firm-specific CDS trading has not lowered the cost of bank debt for the average borrower. In addition, these authors identify an adverse effect on the cost of bank financing for risky and informationally opaque firms, which they suggest could derive from the CDS market weakening the ability of lead banks to commit to monitoring. Bolton and Oehmke (2011) and Campello and Matta (2012), in turn, present models showing that the CDS market could also have a negative effect on borrowers by virtue of the "empty creditor" problem.[8]

In contrast, Hirtle (2009) and Norden, Buston, and Wagner (2012) claim that the CDS market has lowered the cost of bank credit, by allowing intermediaries to hedge their risk exposures. Minton, Stulz, and Williamson (2009), however, report that few banks disclose using credit derivatives to hedge lending activity and that few banks are net buyers of credit protection based on a sample of U.S. bank holding companies from 1999 to 2003.[9] Unlike our paper, none of these studies considers the effects of banks substituting standard pricing models with market-based pricing.

Our study also contributes to the incomplete contracts literature. Contractual provisions could either anticipate future states of the world so that less renegotiation is necessary ex post (see, e.g., Dewatripont, 1988, 1989) or they could be designed to force renegotiation (see, e.g., Berlin and Mester 1992; Garleanu and Zwiebel 2009; Aghion and Bolton 1992; Grossman and Hart 1986). Our finding that CDS loans have fewer financial covenants indi-

[8]Researchers have also investigated the effect of the emergence of the CDS market on the availability of bank credit (see, e.g., Hirtle, 2009; Norden, Buston and Wagner, 2012) and borrowers' leverage and debt maturity (Saretto and Tookes, 2012).

[9]Duffie (2007) discusses ways in which banks can use derivatives to hedge their credit exposures, and Duffie and Zhou (2001) and Parlour and Plantin (2005) present models of bank's use of credit derivatives.

cates that market-based pricing makes bank loans more contractually complete by including more provisions that pre-specify future states with respect to borrower financial health[10] and fewer provisions that force renegotiation such as financial covenants.

The remainder of this paper is organized as follows. We first describe the institutional specifics of market-based pricing. We then discuss the data, empirical strategy and sample characteristics in section 3. In section 4, we investigate whether CDS-based loans are associated with lower interest rates at the time of origination. In section 5, we analyze if it is beneficial to borrowers to have loans priced off CDS, by considering interest costs borrowers incur throughout the life of their loans. In section 6, we attempt to explain why market-based pricing has led to a reduction in the cost of bank credit. Section 7 concludes the paper.

2 Institutional background

Market-based pricing ties loan interest rate spreads to borrowers CDS spreads or to a CDX index. CDS/CDX-priced loans first appeared in the second quarter of 2008.[11] Market-based pricing was advertised in the popular press as a valuable arrangement to ease banks' resistance to lend at fixed interest rates given the highly uncertain economic conditions at the time. A July 1^{st} article in the DJ Newswire stated, while referring to banks' granting of credit lines: "The borrower is ensured continued access to capital through market cycles, and the lender, if and when the facility is drawn upon, gets a market-based price..."

Market-based pricing contracts, in addition to tying the loan interest rate spread to the borrower's CDS spread, often specify either an interest rate cap or a floor, or both, that are usually kept constant throughout the life of the loan. If the CDS/CDX stays within the floor-cap range, the borrower pays an interest rate spread on its loan that varies with the

[10] Market-based pricing specifies interest rate spreads as a function of credit default swap spread as compared to standard loans in which interest rate spreads are fixed and not contingent on credit quality.

[11] See the following articles "Banks Get Tougher on Credit Line Provisions" *WSJ May 4^{th} 2009* or "Markit Offers Benchmarks for Pricing Investment Grade Loans" DJ Newswires July 1^{st}

CDS/CDX. If the CDS/CDX spread exceeds the cap, the borrower pays the interest rate cap, and whenever the CDS/CDX spread is below the interest rate floor the borrower pays the interest rate floor.

Some loan contracts tied to CDS/CDX allow the interest rate floor and/or cap to vary throughout the life of the loan. These contracts almost always tie the interest rate floor and cap to the credit rating of the borrower. Figure 1 presents an example of one of these contracts. According to it, if the borrower retains a rating above AA-, the floor is 20 basis points, while the cap is 87.5 basis points. As long as the borrower's CDS spread stays within the 20–87.5 bps interval, the borrower pays an interest rate spread linked to the CDS spread according to a formula specified in the contract. If the borrower's financial condition deteriorates and it is downgraded to say A or A+, then the floor goes up to 25 bps and the cap increases to 100 bps. Again, after the downgrade as long as the borrower's CDS spread stays within the 25–100 bps interval, the borrower pays an interest rate that evolves with the CDS spread according to the formula specified in the loan agreement.

Figure 2 shows that banks use the market-based pricing innovation mainly in the loans to investment-grade borrowers. Figure 3, in turn, shows that these contracts became popular very quickly. Since their inception in the second quarter of 2008, CDS/CDX-based loans account for up to one third to a half of total investment-grade bank lending in the syndicated loan market.

Last, Figure 4 shows that banks use market-based pricing to extend loans predominantly to large corporations. Even though, the number of CDS/CDX-price based loans issued per quarter rarely exceeds 20, the amount of total debt issued under these contracts has been as high as $95 billion per quarter. The focus on large corporations is to be expected since the CDS market is still dominated by large firms.

3 Data, methodology, and sample characterization

3.1 Data

The data for this project come from several sources, including the DEALSCAN database (from LPC), COMPUSTAT, the Center for Research on Securities Prices (CRSP), Merrill Lynch's bond yield indices, and Markit.

We use the DEALSCAN database to identify corporate loans with spreads linked to borrowers' CDS spreads, and to gather information on the nature of the link between loan spreads and borrowers' CDS spreads. We use this database to collect additional information on each loan, including interest rate spread over LIBOR, amount, maturity, purpose, type of contract (credit line vs. term loan), performance pricing grids, loan covenants (financial, net worth, and sweep), dividend restrictions, seniority status, and security provisions. We also use Dealscan to gather information about the borrower, including its identity, industry affiliation, and legal status (private or public); and information on the lending syndicate, including the identity and role of the banks in the loan syndicate.

We use COMPUSTAT to obtain data on borrowers' balance sheets. Even though DEALSCAN contains loans to both privately-held and publicly-listed firms, we exclude loans to private companies because COMPUSTAT only has information on public firms.

We use CRSP to gather data on firms' stock prices. We also use the CRSP database to link parent companies and their subsidiaries and to link companies that went through mergers/acquisitions or name changes over time. We then use these links to merge the LPC and Compustat databases. This allows us to identify the financial condition of firms both at loan origination and during the life of their loans.

We use Merrill Lynch's indices on yields of triple-A and triple-B rated new long-term corporate bonds to construct a measure of the risk premium in the bond market, which we use to proxy for the cost to access funding in that market.

Finally, we use Markit to identify which borrowers in our sample have a CDS contract at

the time of the loan origination, and to obtain information on the number of dealer quotes on these contracts, which we use as a measure of the liquidity of the borrower's CDS. We also use this data source to gather information on CDS spreads for borrowers with loans tied to firm-specific CDS, and information on CDS indices. These indices are important because there is a small number of loans in the sample with interest rate spreads linked to CDS indices rather than to the borrower-specific CDS.

3.2 Methodology

Our analysis has two parts. Part I investigates the effect of market-based pricing on the cost of bank credit to corporations. Part II analyzes whether monitoring cost savings and/or credit risk hedging benefits drive the reduction in the interest cost of bank credit associated with market-based pricing. We next describe the tests we conduct in each part of our analysis.

3.2.1 Market-based pricing and the cost of bank credit

We first investigate whether interest rate spreads at origination differ between market-based pricing and standard contracts. Next, since market-based pricing spreads can change during the life of the loan while spreads in standard contracts remain constant, we compare the interest expenses borrowers incur under each arrangement.

Market-based pricing and spreads at origination

We estimate the following model of loan spreads to determine whether the spreads banks set at origination differ between market-based pricing and standard contracts:

$$SPREAD_{ijt} = c + \alpha MBP_{ijt} + X'_{it-1}\psi + Y'_{jt}\nu + M'_t\delta + \epsilon_{ijt} \quad (1)$$

$SPREAD_{ijt}$ is the all-in-drawn credit spread (at the origination date) over LIBOR on loan j of firm i at date t. According to DEALSCAN, the all-in-drawn spread is a measure of the overall cost of the loan, expressed as a spread over LIBOR, because it takes into account both one-time and recurring fees. This definition applies to traditionally-priced loans that have fixed spreads, but it is not accurate for market-based priced loans since the all-in-drawn spread at origination will no longer capture the overall cost of the loan.

MBP_{ijt} is a binary variable which takes a value of one if the loan spread is linked to the borrower's CDS spread or to a CDX index, and 0 otherwise. In some specifications, we replace MBP_{ijt} with CDS_{ijt} and CDX_{ijt}. These are binary variables which take the value of one if the loan spread is linked to the borrower's CDS spread or to a CDX index, respectively, and 0 otherwise. The coefficient estimates of these variables will indicate whether there is any spread difference between market-based pricing and standard loans. We attempt to identify this difference while controlling for a set of borrower- and loan-specific factors, X and Y, and a set of macroeconomic factors, M, that other studies find to affect loan spreads.[12]

We use $LN\,SALES$ (the natural log of the firm's sales) to control for firm's size. Larger firms are usually better diversified across customers, suppliers, and regions, so we expect $LN\,SALES$ to be negatively associated with loan spreads. $PROF\,MARGIN$ is the firm's profit margin (net income divided by sales). $LN\,INTCOV$ is the firm's interest coverage, which we measure as the log of one plus the interest coverage ratio (i.e., earnings before interest, taxes, depreciation, and amortization (EBITDA) divided by interest expense). More profitable firms as well as firms with higher interest coverage ratios have a greater cushion for servicing debt and should therefore pay lower spreads on their loans. $LEVERAGE$ is the firm's leverage ratio (total liabilities divided by total assets); higher leverage usually translates into a greater likelihood of default, implying a positive relation between $LEVERAGE$ and spreads.

[12]See Santos and Winton (2008), Hale and Santos (2009), and Santos (2011) for studies of loan interest rates.

Another aspect of credit risk is the magnitude of losses to debt holders in the event of default. To capture this dimension, we include several variables that measure the size and quality of the asset base that debt holders can draw on given default. $TANGIBLES$ is the firm's tangible assets – inventories plus plant, property, and equipment – as a fraction of total assets. Tangible assets lose less of their value in default than do intangible assets such as brand equity, so we expect this variable to be negatively correlated with spreads. $ADVERTISING$, the firm's advertising expense divided by sales, is a measure of the firm's brand equity, so we expect it to be positively associated with spreads. Similarly, $R\&D$, the firm's research and development expense divided by sales, is a proxy for intellectual capital, we also expect it to be positively correlated with interest spreads.[13] $MKTOBOOK$ is the firm's market to book ratio, which measures the proportion of firm value that is expected to be converted from growth opportunities into tangible assets. Although growth opportunities are vulnerable to financial distress, we already have controls for the tangibility of the book value of assets. Thus, this variable could be negatively associated with spreads if it represents additional tangible assets that debt holders can potentially access in the event of default.

We include two stock price-based measures of risk: $STOCK\,VOL$ (the implied volatility of the firm's stock return), and $STOCK\,RET$ (the firm's excess stock return relative to the overall market over the previous twelve months). Firms with more volatile stock returns have a higher chance of failure – we expect them to pay higher interest spreads. In contrast, companies that outperform the market on a risk-adjusted basis should have more of a cushion against default and thus pay lower bank loan spreads.

In addition, we include a set of binary variables to control for the credit rating and the single-digit SIC industry group of the borrower. Credit rating agencies claim that they have access to private information on firms that is not contained in publicly available data (such

[13]Firms are required to report advertising expenses only when they exceed a certain value. For this reason, this variable is sometimes missing in COMPUSTAT. The same is true of research and development expenses. We set all missing values in $ADVERTISING$ and $R\&D$ to zero. Dropping these variables from our analysis does not affect our findings in any meaningful way.

as COMPUSTAT). Likewise, a given industry may face additional risk factors that are not captured by our controls, so this set of indicators allows us to control for such risk at a very broad level.

We include $LN\ AMOUNT$ (the natural log of facility amount) to control for the size of the loan. Larger loans may represent greater credit risk, implying higher loan rates. On the other hand, larger loans may also allow for economies of scale in loan processing and monitoring. As a result, the sign of the association between this variable and loan spreads is ambiguous. We include $LN\,MATURITY$ (the natural log of facility maturity in months) to control for the maturity of the loan. Loans with longer maturities may have greater credit risk, but they are also more likely to be granted to more creditworthy firms. This suggests the sign of the correlation between $LN\ MATURITY$ and spreads could be either positive or negative.

Since the loan type may contain information about the risk of the loan, we include indicator variables to distinguish lines of credit ($CREDITLINE$) from term loans ($TERMLOAN$). Similarly, we include a binary variable to distinguish loans that have a performance pricing grid. In contrast with market-based pricing, which ties spreads to credit default swaps, performance pricing grids usually link loan interest rates to issuer credit rating. We include $COVENANTS$ (the total number of financial, net worth and sweep covenants as well as dividend restriction in the loan contract), $SENIOR$ (an indicator variable for whether the loan is senior), and $SECURED$ (an indicator variable for whether the loan is secured with collateral) to control for the covenant structure of the loan contract. All else equal, loans that have a greater number of covenants, seniority, and security provisions are safer, and should have lower interest spreads. However, lenders usually impose more (restrictive) covenants and require loans to be senior and secured more frequently when they lend to riskier borrowers (see Berger and Udell (1990) for the case of collateral), so the empirical relation between these variables and spreads may be reversed.

Our last set of controls, M, captures macroeconomic factors and the condition of credit

markets that may also affect bank loan spreads at the time of loan origination. To this end, we control for $LIBOR$, the 3-month LIBOR, and for the $BBBSPREAD$, the difference between BBB and AAA bond yields. In addition, we include a set of calendar year indicators.

We estimate all loan-spread models with heteroskedasticity-consistent standard errors clustered at the firm level. We present the estimates from models with bank fixed effects, firm fixed effects, and both bank and firm fixed effects to reduce concerns about unobserved heterogeneity at the firm and bank level that may affect loan pricing policies.

To alleviate concerns with the endogeneity of banks' decision to set loan spreads off the borrower's CDS spread, we use different matched sample methodologies commonly employed in the literature. In addition, we employ the Lewbel (2012) GMM estimator.

Does market-based pricing lower the cost of bank debt?

Since market-based pricing spreads can vary during the life of the loan, we cannot infer from our analysis of loan spreads at origination whether choosing CDS/CDX-priced loans is advantageous to borrowers.

To address this issue, we calculate the counterfactual of interest rate spreads that borrowers would have paid had banks opted for standard loan contracts. To this end, we set CDS= 0 and CDX= 0 in our model of loan spreads and calculate the predicted value of interest rate spreads for all market-based priced contracts. Next, holding the counterfactual spread constant, we study the difference between the actual CDS/CDX-based and the hypothetical spreads over time. The actual spreads take into account the cap, the floor, and performance pricing grids (if any) at each point in time. The difference between the actual and the hypothetical spreads tells us whether the interest costs borrowers pay over the life of loans are lower as compared to the costs they would have paid under standard loan pricing.

3.2.2 Why does market-based pricing lower the cost of bank credit?

In our last set of tests we investigate two potential explanations for the interest cost savings associated with market-based pricing that we identify in the first part of our analysis. The first hypothesis is that market-based pricing allows banks to save on monitoring costs. To the extent that the bank lending market for large corporate borrowers is competitive, savings in monitoring costs is passed on to borrowers in the form of lower interest rate spreads. The second hypothesis is that the reduction in the cost of bank credit derives from the additional credit-risk protection that market-based pricing offers banks.

To ascertain the validity of these hypotheses, we first investigate whether market-based pricing is associated with a reduction in the number of covenants in the loan contracts, our measure of bank's monitoring intensity of the borrower. We next compare the reduction in the cost of bank lending induced by market based pricing across borrowers of different risk. If the credit-risk protection hypothesis is supported by the data then we should observe a larger decline in the interest rate spreads of riskier borrowers.

Finally, since banks mostly use market-based pricing to set rates on credit lines, we investigate whether this financial innovation is also associated with a reduction in the all-in-undrawn fees. These are the fees borrowers pay for the option to draw on their credit lines, subject to the credit line limit. These fees compensate banks for the liquidity risk that arises with the provision of credit lines. If the monitoring hypothesis holds true in the data then we expect the use of market-based pricing to be associated with lower all-in-undrawn fees, as well. In contrast, the credit-risk protection hypothesis predicts that we will not observe a decline in the all-in-undrawn fees since these fees compensate the bank only for the liquidity risk associated with the credit line. We next describe our tests.

Market-based pricing and banks' monitoring incentives

To investigate the monitoring-cost hypothesis, we measure banks' monitoring costs with the number of covenants in the loan contract and consider the following model to investigate

whether market-based pricing is associated with fewer covenants:

$$COVENANTS_{ijt} = c + \alpha MBP_{ijt} + X'_{it-1}\psi + Y'_{jt}\nu + M'_t\delta + \epsilon_{ijt} \quad (2)$$

where $COVENANTS_{ijt}$ is equal to the total number of covenants in loan j that firm i took out at time t. The number of covenants is defined as the sum of the number of financial, net worth, and sweep covenants, as well as dividend restrictions. The set of independent variables is the same as in Model (1). Since market-based pricing allows banks to rely on the market as opposed to their own monitoring efforts, we expect banks to impose fewer covenants in loans they price off CDS markets. As a result we expect α to be negative.

We test Model (2) using various matched sample methodologies commonly employed in the literature. As with our spread models we estimate the covenant models with heteroskedasticity consistent standard errors clustered at the firm level. Last, we employ the Lewbel (2012) GMM estimator.

Market-based pricing and banks' credit risk hedging

The second hypothesis we consider is that market-based pricing lowers the cost of bank credit because it offers banks protection against future changes in borrowers' risk of default. If that is the case, then we would expect the decline in the cost of bank credit to be larger for riskier borrowers. To investigate this possibility, we extend our model of loan spreads to include an interaction term between CDS_{ijt} and measures of borrowers' default risk, including leverage, credit rating, and stock volatility.

Monitoring vs. risk hedging: Additional test based on all-in-undrawn fees

Since banks use market-based pricing predominantly on credit lines, we undertake a third test which is based on the undrawn-fee they demand when they extend credit lines. To investigate whether market-based pricing has also resulted in a reduction in all-in-undrawn

fees, we consider the following model:

$$UNDRAWN\ FEE_{ijt} = c + \alpha MBP_{ijt} + X'_{it-1}\psi + Y'_{jt}\nu + M'_t\delta + \epsilon_{ijt} \tag{3}$$

where $UNDRAWN\ FEE_{ijt}$ is the undrawn fee on credit line j of firm i at issue date t. According to DEALSCAN, the undrawn fee, which usually includes both a one-time commitment fee and an annual component, is a measure of the cost the bank charges the borrower for granting it access to liquidity via a credit line. The undrawn fee, therefore, compensates the bank for the liquidity risk it incurs by guaranteeing the borrower access to liquidity at its discretion and up to the total commitment amount. The set of independent variables is the same as those in Model (1).

If monitoring costs savings associated with market-based pricing explain the decline in credit spreads, then we also expect a reduction in the all-in-undrawn fees on market-based pricing loans. In this case, we expect α to be negative. In contrast, if the decline in credit spreads derives from the additional credit-risk protection that banks enjoy with market-based pricing then we should not observe a decline in undrawn fees since these fees compensate banks only for the liquidity risk associated with the credit line. In this case we do not expect α to be significantly different from zero.

As with our previous tests, we test Model (3) using various matched sample methodologies commonly employed in the literature. In addition, we estimate the undrawn-fee models with heteroskedasticity-consistent standard errors clustered at the firm level. Last, we employ the Lewbel (2012) GMM estimator.

3.3 Sample characterization

Our loan sample starts in 2005 because the CDS market was not very liquid before then and ends in December of 2012. We restrict the analysis to publicly traded corporations. We further exclude loans to financial and foreign firms as market-based pricing loans are

arranged only by US banks.

Table I provides descriptive statistics. Our test sample consists of 7860 unique loans taken out by 2204 corporations from 139 banks. Of these loans, 117 are CDS-tied and 28 are CDX-tied. The CDS-based loans are taken out by 51 corporations from 18 banks and the CDX-based loans were taken out by 11 corporations from 8 banks.

Table I indicates that the average loan spread is 84 basis points for market-based pricing loans and 214 basis points for standard contracts, a difference of 131 basis points that is statistically significant at the 1% level. The low average interest rate spreads in the market-based pricing subsample suggests these loans belong to high credit quality borrowers. The average facility amount and the average maturity are approximately $2.37 billion and 29 months for CDS/CDX-based loans and $523 million and 52 months for standard contracts, respectively. 95.86% of market-based pricing loans are credit lines, while only 68.28% of standard contracts are revolvers.

The average number of covenants per loan facility is 0.70 for MBP loans, which is significantly lower than the average of 3.03 covenants per loan facility for non-MBP loans. The average number of covenants in the entire sample is 2.98, which is similar to the numbers reported in Demiroglu and James (2010). About 0.7% of the MBP loans and 52.97% of non-MBP loans are secured, indicating that MBP borrowers are less likely to pledge their assets as collateral for the loan. Approximately 46.9% of the MBP loans and 51.59% of the non-MBP loans in our sample have a performance pricing grid, that is their spreads, are linked to a measure of credit quality such as leverage ratios or credit ratings. All performance pricing grids in our sample are based on senior debt credit ratings. Asquith, Beatty, and Weber (2005) report a similar proportion of loans including performance pricing provisions in the entire DEALSCAN universe. MBP borrowers tend to be much larger than non-MBP borrowers (a difference of $54 billion in average sales). MBP firms also have statistically lower leverage, net working capital, tangibles, and stock volatility; and higher market-to-book ratio and interest coverage than non-MBP firms.

4 Spreads at Origination

We first investigate whether market-based pricing loans have lower interest rate spreads than non-CDS loans at loan origination, holding all else fixed. To that end, we regress the interest rate spread (over LIBOR) of a given loan on the dummy variable MBP, which indicates whether the loan was priced off the CDS market, controlling for variables that account for borrowers' risk, the structure of the loan contract, and the macroeconomic conditions at the time of loan origination. Given that for a small number of loans, banks use a CDS index as opposed to the borrower-specific CDS, in some specifications we account for this difference by including the following two dummy variables: CDS, which takes the value one for loans with spreads tied to the firm-specific CDS and 0 otherwise; and CDX, which takes the value one for loans with spreads tied to a CDS index and 0 otherwise.

Table II reports coefficient estimates for our first set of tests. Columns (1) through (3) include a single indicator variable for market-based pricing loans, MBP. The specification in column (1) is estimated with bank fixed effects to account for potential unobservables that are not captured by the bank-specific control variables. The coefficient estimate of MBP is highly statistically negative (1% level significance) and economically important. Market-based pricing loans have interest rate spreads that are approximately 32 basis points lower than those on similar standard loans. This difference is at the time of loan origination and does not reflect any changes in loan spreads resulting from changes in CDS spreads during the life of the loan, which may increase or decrease the cost of credit to the borrower.

The coefficient estimates of the statistically significant control variables are consistent with existing studies of loan spreads.[14] Larger borrowers as well as borrowers with more growth opportunities pay lower spreads on their loans. In contrast, firms with higher stock volatility pay higher loan spreads. Larger loans are likely associated with lower spreads because they are usually taken out by larger (and less risky) borrowers. Our findings also indicate that loans with pricing grids have lower average spreads, while those with more

[14] See Santos and Winton (2008), Hale and Santos (2009), and Santos (2011).

covenants have higher average spreads. The latter result may appear counter-intuitive, but as explained in the methodology section banks are more likely to impose a larger number of covenants on loans to riskier borrowers.

Although column (1) includes a comprehensive list of firm-specific variables to control for firm quality, one may argue that market-based pricing loans have lower spreads at origination than non-MBP loans because they belong to higher quality firms. To alleviate these concerns, we estimate our model of loan spreads with firm fixed effects to account for potential unobservables that are correlated with underlying firm quality. The results of this investigation, reported in column (2), confirm our earlier finding. The MBP coefficient continues to be highly statistically and economically significant. Average spreads on market-based pricing loans are now 44 basis points lower than those on similar standard loans.

In column (3), we go a step further and estimate our model of loan spreads with both bank and firm fixed effects to control for both bank and firm unobservables. Our results are robust to such modification and, if anything, the coefficient estimate on the MBP variable becomes larger, indicating an interest rate discount of approximately 45 bps for market-based pricing loans.

In columns (4) through (6) of Table II, we repeat the analysis we report in columns (1) through (3), but we now decompose MBP into two variables to distinguish between loans with spreads linked to borrower CDS and loans with spreads linked to a CDS index. The results in specifications (4) through (6) suggest that our previous findings on market-based pricing are driven by loans tied to borrower-specific CDS. The coefficient of CDS is negative and statistically significant across all three models, indicating that loans tied to borrower-specific CDS contracts enjoy a discount of 39 to 56 bps on interest rate spreads at origination.

In contrast, borrowers with loans linked to a CDS index do not enjoy any interest-rate discount. The estimate of the CDX variable is not statistically different from zero in any of our models. The difference between loans linked to borrowers CDS and those linked to a CDS index may be due to the latter contracts not offering banks the same level of credit

protection against changes in borrower risk during the life of the loan as the former do. Such a difference may also result from the small number of CDX-based loans (N=28) in the sample. In addition, since CDS indices do not contain sufficient borrower-specific information, CDX-tied loans do not represent a suitable empirical setting to test our hypotheses. As a result, we drop all CDX-based loans from the sample in all subsequent tests and only report the effect of CDS-tied pricing on loan contracting terms.

The results we have reported thus far indicate that borrowers that have their loans linked to borrower-specific CDS spreads enjoy an interest rate discount at the time of loan origination. A concern that remains here is that the choice of market-based pricing might be endogenous and might depend on such factors as the risk of the borrower and the liquidity of its CDS. We next investigate the extent to which this endogeneity affects our findings.

4.1 Accounting for the endogenous choice of market-based pricing

We employ matched samples, propensity score matching techniques, as well as the Lewbel (2012) GMM estimator to address endogeneity concerns. In our first specification, we only include borrowers that have at least one CDS-based loan during the sample period. This test allows us to compare how the pricing of CDS-based and standard loans differs for the same set of borrowers. The results of this test are reported in column (1) of Table III, indicating that CDS-linked loans have spreads that are 49 bps lower at origination than standard-priced loans for the same set of borrowers.

In column (2) of Table III, we require not only that a borrower has both a CDS-based and a standard loan contract, but we also impose the restriction that these loans are similar in structure. We construct the matched sample as follows: for each CDS-based loan facility we include a non-CDS facility with the same maturity and type (revolver/term loan) belonging to the same borrower. These conditions are put in place to ensure that the purpose of both loans by the same borrower is similar. This condition represents a more precise match than in our first matching specification. As we can see from Table III, we obtain similar

results in terms of the magnitude of the coefficient estimate of the CDS variable. The CDS coefficients are significant at the 5% level and are economically large, thus confirming our original findings.

We employ a propensity score matching procedure commonly used in the literature. We first estimate annual logit regressions of CDS on our entire set of firm controls, X and loan controls, L. Then, for each facility that belongs to a firm that has CDS contracts traded, we calculate the fitted probability of having CDS-based pricing in the contract. All CDS facilities are then matched to non-CDS facilities with similar fitted probability. The empirical results when using the propensity score matched sample are reported in column (3) of Table III. These results show that our main finding continues to hold both in terms of statistical and economic significance.

To further alleviate concerns that our findings could be attributed to differential firm quality between CDS and non-CDS borrowers, we employ the Lewbel (2012) GMM estimator that uses additional information contained in higher order moments to construct instruments. Our goal here is to account for the relevant differences between CDS-based and standard contracts that might be driving our earlier results rather than to explain how firms/banks select CDS-based contracts. In this test, we only include loans that are originated in or after April of 2008, when the first CDS-based contracts were originated. We also exclude firms without CDS contracts as the debt of these firms will not be eligible for firm-specific market-based pricing.

The Lewbel GMM estimator is constructed as follows: we first regress the endogenous variable, in this case the CDS indicator, on firm-specific factors, macroeconomic controls, credit rating indicators, and quarter dummies. We then collect the estimated residuals and multiply them by the demeaned values of a subset of the independent variables that is exogenous to the second-stage loan interest rates residuals conditional on the second-stage independent variables. Finally, we use the generated variables as instruments for the CDS indicator using either 2SLS or GMM methods. We need sufficient heteroskedasticity to have

strong instruments. A convenient feature of the Lewbel estimator is that the exogenous variables could be determinants in both the first- and the second-stage equations.

Anecdotal evidence indicates that firm-specific CDS liquidity plays a key role in whether a firm is offered market-based pricing.[15] We, therefore, use $COMPOSITE\ 5YR$ as a predictor of a CDS-based contract in the first-stage equation. This variable represents the number of distinct daily quotes on the borrower's 5-year CDS contract, and so it should be an adequate measure of the liquidity of the firm's CDS contract. We also use this variable in the second-stage equation of bank loan interest rate spreads to allow for the possibility that banks are using information from the CDS market to price loans. We construct the heteroskedasticity-based instruments using all macroeconomic variables: $LIBOR$ – the 3-month LIBOR, $BBBSPREAD$ – the difference between BBB and AAA bond yields, $GDPgr$ – the quarterly seasonally-adjusted real GDP growth of the US economy, $BUSLOAN$ – the quarterly seasonally-adjusted growth rate of commercial and industrial loans in the US, and $COMPOSITE\ 5YR$.

The results of the Lewbel (2012) GMM estimation are reported in Table IV. It is worth mentioning that the Pagan-Hall χ^2 statistic has an associated p-value approaching zero, indicating the presence of substantial heteroskedasticity of the first-stage residuals with respect to the selected exogenous variables: $LIBOR$, $BBBSPREAD$, $GDPgr$, $BUSLOANS$, and $COMPOSITE\ 5YR$. In the second stage equation of loan interest rate spreads, the coefficient estimate of the CDS indicator remains statistically and economically significant, thus confirming our earlier finding that borrowers with loans priced off the CDS market enjoy an interest rate discount at the time of loan origination. The coefficient estimate is similar in magnitude to the coefficients in the matching regressions in Table III. Finally, the overidentification χ^2 statistic has an associated p-value of 0.114 so we fail to reject the null hypothesis that the empirical model is correctly identified. The Kleiberger-Paap χ^2 statistic also indicates that we reject the null hypothesis at conventional levels that the model is

[15] See "Markit Offers Benchmarks for Pricing Investment Grade Loans" DJ Newswires July 1^{st}

underidentified.

4.2 Market-based versus performance-based pricing

The recent financial innovation of tying interest rate spreads to credit default swaps shares some similarities with performance-based pricing, which was introduced in 1990 and became popular within a short period of time. For example, by mid-1990s approximately half of the bank loans in DEALSCAN had some form of performance-based pricing. A common feature of both types of pricing is that they make bank loan spreads dependent on borrowers' future performance. As such, both types of pricing make bank loans more contractually complete as compared to a setting with fixed interest rate spreads. More specifically, both provisions reduce the need for the contractual parties to renegotiate the pricing of the debt contract because of changes in borrower financial health (see, e.g., Ivanov, 2012 for a discussion).

A key difference between both types of interest rate contingencies is that market-based pricing attempts to capture future changes in borrowers' risk via the CDS market while performance-based pricing attempts to do so via measures of firms' financial health such as credit ratings or financial ratios. Even though both types of pricing arrangements are structured so that a deterioration in the borrower's financial condition triggers an increase in loan spreads, there are some key differences. First, CDS prices are a more precise measure of risk than credit ratings or financial ratios because they specify the exact credit spread investors require in order to bear a firm's default risk. They also reflect changes in borrowers' risk ahead of rating changes or even prices in other markets because CDS offer investors unique risk-trading opportunities.[16] Hull et al (2004), for instance, documents that the CDS market anticipates credit rating events, and several researchers have documented that information about firms comes out in the CDS market ahead of other markets.[17]

[16] A CDS is like a traded insurance contract against credit losses; however, in contrast with an insurance contract, investors are not required to hold the underlying asset to claim "compensation" under a CDS contract. Thus, speculators can take long (short) positions in credit risk by selling (buying) protection without the need to trade the underlying.

[17] See also Longstaff et al (2005), Norden and Weber (2004), Blanco et al.(2005), Acharya and Johnson (2007), and Norden and Wagner (2007) for evidence that the CDS market is a source of information on firms.

As a result, market-based pricing has the potential for promoting a closer link between loan spreads and borrower risk at each point in time, thus avoiding some of the contractual rigidity that is typical of performance-based pricing (see, e.g., Battigalli and Maggi, 2002).[18] Banks, therefore, may be able to afford setting lower spreads at origination with market-based pricing than with performance-pricing arrangements. We test this hypothesis both by comparing the coefficient estimates of CDS and $PRICING\,GRID$ and by extending our model of loan spreads to include an interaction term between CDS and $PRICING\,GRID$.

The results of this investigation are reported in Table V. They confirm that CDS-tied loans are associated with lower interest rate spreads at origination than similar fixed-rate loans. An F-test on the sum of coefficient estimates of CDS and the interaction of CDS and performance pricing shows that compared to traditional loans, loans with spreads tied to borrowers' CDS spreads carry statistically lower spreads at the 5% level when taking into account firm fixed effects in the columns (2) and (3). Our results also show that spreads at origination are statistically and economically lower in magnitude for market-based priced loans than for performance-based priced loans.

The coefficient estimate of the interaction term of the CDS and the $PRICING\,GRID$ variables deserves some attention. It is positive and statistically significant indicating that CDS-based loans that specify multiple interest rate caps and floors are associated with higher starting interest rate spreads than simpler market-based pricing loans. This interest rate differential is also economically significant, CDS-based loans associated with a pricing grid pay on average from 42 to 50 basis points more at origination than simpler CDS-based loans. Assuming that we properly control for firm credit quality, this could be because it is costly for lenders to guarantee an interest rate cap in the states of the world in which borrower financial health deteriorates.

[18]Since performance grids specify fixed rates at each grid step, a substantial change in market conditions has the potential to make such fixed spreads inaccurate and thus create distortions.

5 Does market-based pricing reduce the cost of bank credit?

Our finding that market-based pricing is associated with lower loan spreads at origination does not necessarily imply that it results in a reduction in the cost of bank credit to borrowers. This is because one needs to account for changes in loan spreads that may occur during the life of the loan. To investigate this question properly, it is important to consider spreads borrowers would have owed on the same loans under a fixed-rate regime.

Determining the counterfactual interest spread is not a straightforward task because we do not observe the menu of contracts lenders offer borrowers. We derive the counterfactual fixed rate spread from our base OLS specification as described in section 3.2.1. This approach, however, is susceptible to selection bias: it might be optimal (less expensive) for high-quality borrowers to choose market-based pricing loans and for low-quality borrower to pick standard contracts. As a result, CDS-based contracts might mechanically be associated with lower interest rate spreads than fixed-rate loans. There are several reasons why such selection issues might not be problematic.

First, our results in Table IV suggest that endogeneity is not a concern assuming that our instruments are valid. Second, a large part of our sample period coincides with the financial crisis period, a period in which there is added uncertainty about the future financial condition of borrowers. This may discourage banks from lending at fixed rates. As a result, it could be the case that fixed-rate loans belong to higher quality firms than CDS/CDX loans, especially in the financial crisis period. If anything, this will make it difficult to find support for our hypotheses and potentially understate the significance and the economic importance of our results.

Figure 5 plots the difference between the actual and the counterfactual spread over the life of CDS-based loans. Panel (a) depicts the difference for the entire sample of CDS/CDX loans. Panels (b), (c), and (d), in turn, present results for facilities with maturities of one,

three, and five years, respectively. Panel (a) suggests that on average CDS-based contracts allow firms to pay an annualized monthly interest rate spread of approximately 40 basis points lower than with standard fixed-spread loans. This finding is more economically significant for one- and three-year loans (an annualized monthly gap of approximately 60 and 30 basis points, respectively) than for five-year loans (an annualized monthly gap of between 6 and 10 basis points).

These results, combined with our previous finding on the spread difference at origination, indicate that market-based pricing has led to a reduction in the cost of bank debt. In the next section we attempt to shed light on the reason(s) that may explain why banks are able to lower the cost of credit when they substitute traditional ways of setting loan interest rates with market-based pricing.

6 Why does market-based pricing reduce the cost of bank credit?

6.1 Market-based pricing and banks' monitoring incentives

Bank monitoring entails screening borrowers ex ante in order to identify good credits. It also entails both setting covenants, to prevent borrowers from undertaking opportunistic behavior during the realization of projects, and penalizing borrowers when they fail to meet contractual obligations. These activities are costly because they require banks to get detailed information on borrowers prior to loan origination and to monitor borrowers closely during the life of the loan.

Since CDS prices reflect the compensation investors require to bear a firm's default risk, the development of the CDS market has provided banks with an opportunity to use information on CDS to price loan contracts. If the interest cost reduction of MBP borrowers stems from lenders' savings on monitoring costs, then we should find a decline in banks' monitoring

intensity whenever contract pricing is tied to CDS.

We first compare the covenant composition and the number of covenants of both market-based pricing and standard contracts using univariate analysis. We include financial and sweep covenants in the total number of covenants because these provisions are used to directly monitor borrowers. We do not consider security and seniority provisions since even though they are associated with monitoring incentives, they are not employed to directly carry out monitoring. In addition, all else equal banks have lower incentives to monitor secured loans because they can repossess the pledged collateral in the event of default. Similarly, all else equal lenders have lower incentives to monitor senior loans since they have highest priority in the event of borrower default.

We do not employ Murfin's (2012) covenant tightness measure, that is based on the probability of a covenant violation, for several reasons. First, Murfin only considers financial covenants and does not take into account sweep covenants. As shown in Table VI, market-based pricing loans have significantly fewer covenants for all five types of sweeps: asset sales, debt issuance, equity issuance, insurance proceeds, and dividend restrictions. In addition, DEALSCAN may not have a complete coverage of the financial covenants included in a loan contract. Last, DEALSCAN may not include sufficient detail on how to compute each type of covenant threshold. For instance, given a maximum debt-to-equity covenant, it is not clear what type of liabilities to use as the numerator and what type of equity (e.g., market capitalization, book equity) to use in the denominator.

The statistics in Table VI suggest that market-based pricing loans are associated with fewer total covenants. This is a byproduct of substantially fewer maximum Debt-to-EBITDA (a difference of 0.366), minimum fixed charge coverage (a difference of 0.222), and minimum interest coverage (a difference of 0.113) covenants for CDS-based loan facilities. In addition, loans priced off the CDS market do not include maximum senior leverage, minimum current ratio covenants, and sweep covenants. Compared to other standard loans in the sample, MBP loans do not include the following covenants: maximum capital expenditures, maxi-

mum loan-to-value, maximum senior debt-to-EBITDA, maximum senior leverage, minimum cash interest coverage, minimum current ratio, minimum debt service coverage, minimum EBITDA, minimum equity-to-assets, minimum net worth-to-total assets, minimum quick ratio, and sweep covenants. CDS-based loans are also less likely to have dividend restrictions. There is a small set of covenants, such as debt-to-equity, debt-to-tangible net worth, and maximum leverage, which are more likely to appear in market-based pricing than standard loans, but the difference is not large enough to compensate for the decline in the previous set of covenants.

Many of these differences persist if we restrict the comparison to market-based pricing and standard loans belonging to the same borrower (see Table VII). For instance, restricting the sample to CDS-based loans as well as standard loans that belong to CDS-based borrowers within the 2005-2012 period and requiring non-CDS facilities to have the same maturity and loan type (revolver or term loan) as CDS-based loans, we continue to find that market-based pricing loans are associated with fewer total covenants than similar standard loans. In addition, MBP loans are less likely to include debt-to-tangible net worth and minimum fixed charge coverage covenants as well as asset sales, debt issuance, equity issuance, and insurance proceeds sweeps. Last but not least, CDS-based loans are less likely to include dividend restrictions.

Table VIII tests whether there are any multivariate differences in terms of the total number of covenants between CDS-based and standard loan contracts using matched samples as described in Section 4.1. We include firm-specific, loan-specific, and macroeconomic controls with year, bank, and firm fixed effects in all three specifications. The results show that the coefficient estimates of the CDS variable are always negative and significant, indicating that CDS-based loans are associated with fewer financial covenants than standard loans taken out by the same set of borrowers.

As an additional robustness check we use the Lewbel (2012) GMM estimator to account for potential endogeneity of the CDS binary variable. The results are reported in Table IX.

The coefficient estimates of the CDS indicator in the second stage is negative and statistically different from zero. These findings suggest that banks reduce monitoring effort when they administer market-based pricing loans. To the extent that the bank loan market for large corporate loans is competitive, banks pass the monitoring cost savings on to borrowers in the form of lower interest rate spreads.[19]

Another benefit of market-based pricing could be that it reduces renegotiation costs to borrowers. The results in Ivanov (2012) suggest that performance-based pricing is used to delay costly renegotiation when the credit quality of the borrower improves. Since, similar to pricing grids, CDS-based spreads make loan pricing contingent on borrower financial health, loans with this feature might be associated with lower renegotiation costs. While, the renegotiation costs savings hypothesis could potentially explain the simplified covenants structure of CDS-based loans, it does not rationalize the lower interest rate spreads at origination and during the life of the loan. As a result, renegotiation costs savings seems unlikely to be a first-order reason for the use of market-based pricing.

6.2 Market-based pricing and banks' credit-risk hedging

As compared to standard loan contracts, market-based pricing offers banks additional protection against changes in borrower default risk over the life of the loan. This is because market-based pricing adjusts loan interest rates according to the evolution of borrower CDS spreads and in essence it gives the lender a long exposure to a credit default swap on the borrower. The savings banks enjoy in connection with this protection could, in principle, explain the decline in interest rate spreads that we identify in our empirical tests. If this hypothesis is supported by the data, we expect to find that the decline in interest rate spreads is larger for riskier borrowers because the long position in a borrower credit default swap is

[19]Even though we find that there is less bank monitoring when using CDS-based loans, one might be concerned that banks still monitor through the use of covenants in other concurrent loans that are not market-based priced. We investigate this possibility by examining whether there are non-CDS tied loans extended by the same banks concurrently with CDS-based loans and find only one such case in our sample. Our results, therefore, are unlikely to be affected by such concerns.

more valuable than in the case of a stable firm.

To empirically investigate this conjecture, we expand our model of loan spreads at origination to include an interaction term of the CDS binary variable with several measures of the borrower's risk of default, including $LEVERAGE$, $PROF\,MARGIN$, $STOCK\,VOL$, and the borrower's credit rating. The coefficient on the interaction term is negative for some of the measures of borrower risk, thus pointing to a larger decrease in loan spreads for riskier borrowers with CDS-based loans. However, that coefficient estimate of the interaction term is not statistically significant in most of our specifications.[20] These findings do not appear to support the hypothesis that the additional protection market-based pricing offers lenders against borrower default risk explains why banks are able to extend these loans at lower interest rates. It is also possible that we are unable to find support for this explanation because most market-based loans belong to safe borrowers.

6.3 Banks' monitoring vs. credit-risk hedging hypotheses

Since banks use market-based pricing to mostly set credit spreads on credit lines, we investigate whether market-based pricing also leads to a reduction in the all-in-undrawn fees in another attempt to determine the relative importance of the monitoring and credit-risk hedging hypotheses. When borrowers take out a credit line, they pay an all-in-undrawn fee for the right to withdraw on their credit lines. This fee compensates banks for the liquidity risk that arises with the provision of credit lines.[21] To the extent that the bank lending market for mid-sized and large corporate borrowers is competitive and the monitoring hypothesis holds true, then we would expect the monitoring cost savings to be passed onto to the borrowers through a reduction in the credit spreads as well as through a reduction in the undrawn fees. In contrast, under the hedging hypothesis we would not expect to observe

[20] We find mixed results with respect to the interaction term in the OLS regressions (similar to the ones in Table 2). More importantly, none of the coefficient estimates on the interaction term is statistically significant in our matching specifications.

[21] According to Dealscan, the all-in-undrawn fee may include both a commitment fee paid on the undrawn portion of the credit line and any annual fee paid on the full amount for the right to draw down on the credit line.

a decline in the undrawn fees since these fees compensate banks mainly for the liquidity risk associated with the credit line.

Table X replicates our credit spread specifications, but this time using the undrawn fees and restricting our sample to credit lines. Panels A, B, and C are similar to Tables II, III, and IV, respectively. The results in Panel A indicate that CDS-based credit lines carry lower undrawn fees than similar standard contracts. This finding is robust in most matching specifications (see Panel B), but it is not statistically indistinguishable from zero in the Lewbel (2012) model (Panel C). Overall, this evidence on undrawn fees appears to be consistent with the monitoring explanation but the results are not as strong as those in the loan interest rate specifications. Once again, we do not find much support for the hedging explanation.

7 Final remarks

This paper investigates the effects of one of the most recent financial innovations – banks' use of market-based pricing in corporate lending. We find that banks are able to extend funding at lower interest rate spreads when they rely on market-based pricing and that banks reduce the number of covenants on the loans they price off the CDS market. Taken together these results suggest that the reduction in interest rate spreads derives from banks' savings in monitoring costs.

By substituting standard contracts with loans linked to borrowers' CDS spreads, market-based pricing creates a standardized and easy way to value corporate debt securities, and in the process moves bank lending one step closer to market funding. This financial innovation also has the potential to create liquidity spirals in the financial system, whereby shocks to the CDS market increase the cost of bank debt which, in turn, increasing borrowers' CDS spreads and leading to additional spikes in loan rates. In addition, to the extent that market-based pricing decreases banks' monitoring incentives, it will affect the terms under which

other lenders, including bondholders and trade creditors, are willing to extend funding to corporations. Last, pricing corporate loans off borrower CDS may adversely affect the leading role the CDS market plays on the production of information on firms' risk and through this the viability of market-based pricing. As marked-based pricing becomes more widespread, investigating these additional effects seems to be a fruitful area for future research.

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Figure 1: Market Based Pricing

This figure illustrates an example of a market based pricing contract for 3M Co. on August 05, 2011. The LIBOR spread is tied to firm's one year CDS spread. The contract has a pricing grid, which specifies floor spread and cap spread at each interval of firm's credit ratings. Whenever the spread exceeds the cap, the firm pays the interest rate cap; whenever the spread is below the interest rate floor, the borrower pays the interest rate floor.

CATEGORY	Senior Rating	Floor	Cap
1	AA- $\leq$ X $\leq$ AAA	20 bps	87.5 bps
2	A $\leq$ X $<$ AA-	25 bps	100 bps
3	A- $\leq$ X $<$ A	35 bps	112.5 bps
4	X $<$ A-	50 bps	125 bps

$1.5 Billion 5 year revolver of 3M Co (August 05, 2011)
LIBOR margin is tied to company's senior unsecured LTD ratings by S&P and Moody's and one year CDS mid-rate

Figure 2: MBP Loans by Credit Ratings

This figure plots the number and total dollar amount (in billion of US dollars) of market-based pricing loans partitioned by S&P credit ratings from the second quarter of 2008 through the end of 2012. This includes all facilities tied to CDS/CDX from DEALSCAN, before matching the DEALSCAN sample with COMPUSTAT and other databases.

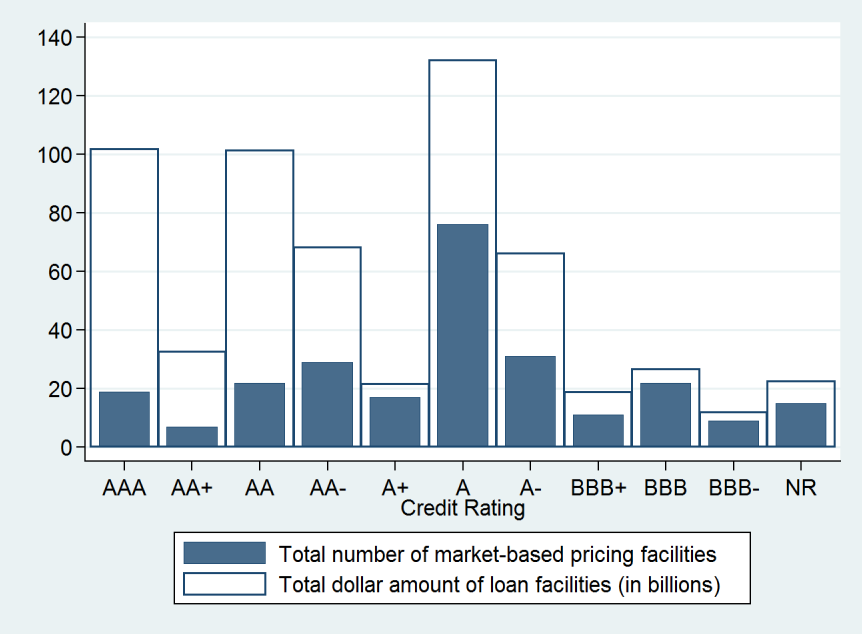


Figure 3: MBP Loans and Total Bank Lending

This figure plots the quarterly total dollar amount (in billion of US dollars) of both market-based pricing loans and all investment-grade commercial loans from the second quarter of 2008 through the end of 2012.

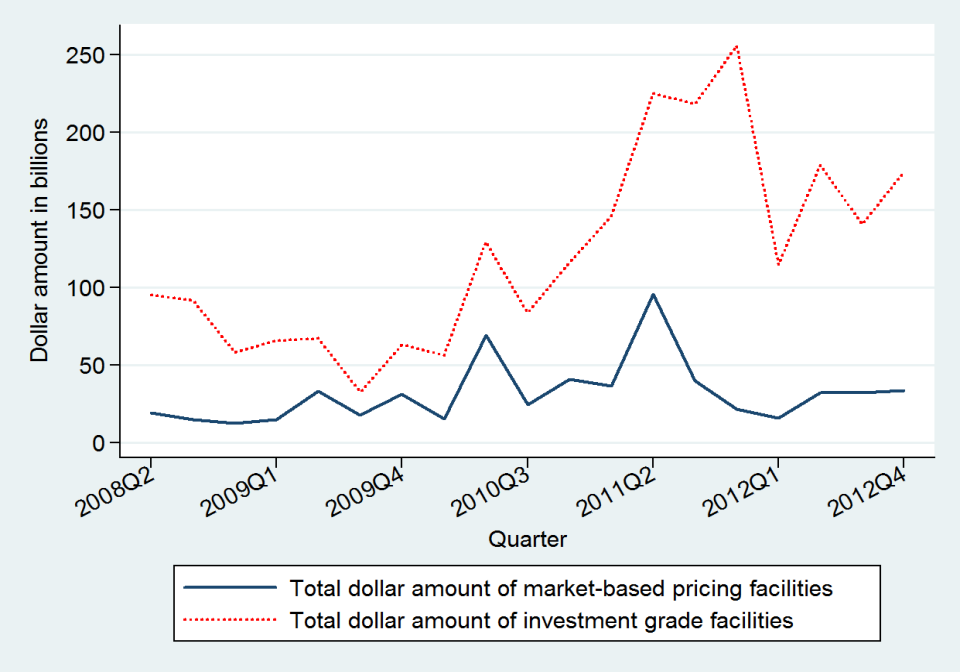


Figure 4: Number and Amount of MBP Loans

This figure plots the number and total dollar amount (in billions of US dollars) of market based pricing loans from the second quarter of 2008 through the end of 2012.

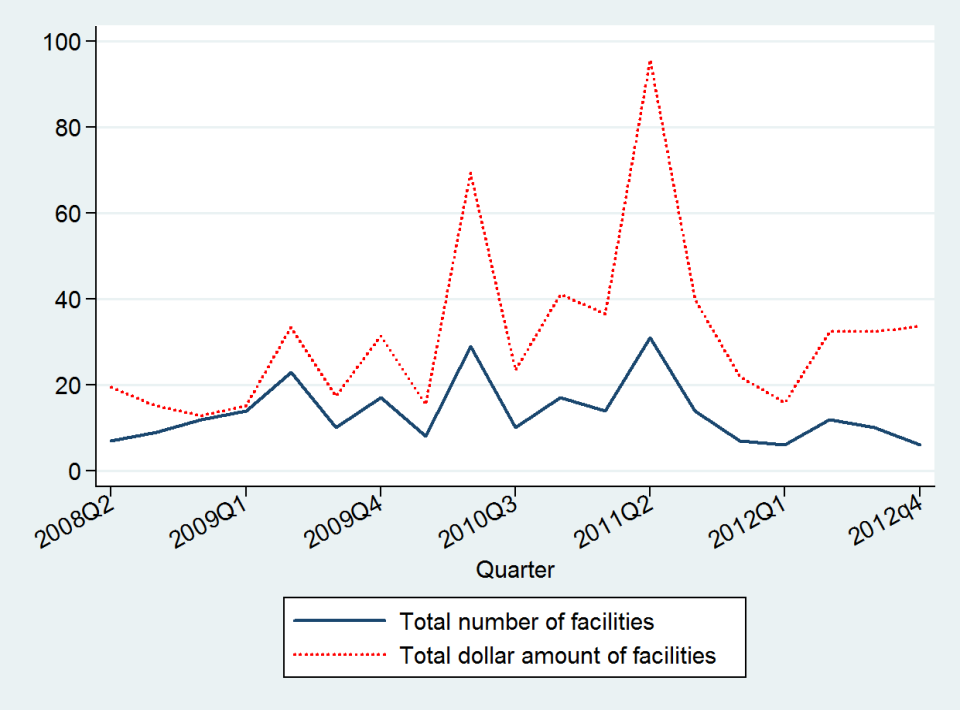
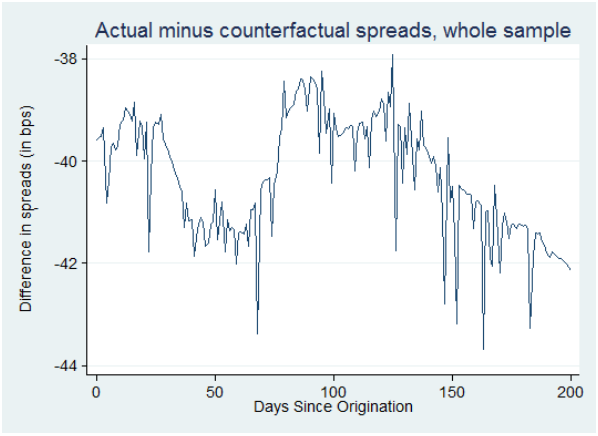
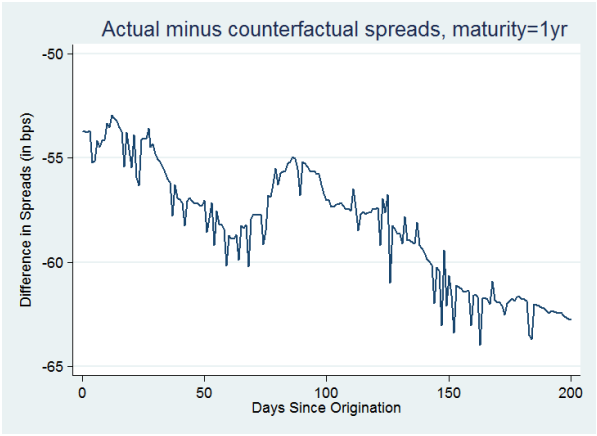


Figure 5: Difference between actual and counterfactual spreads over time

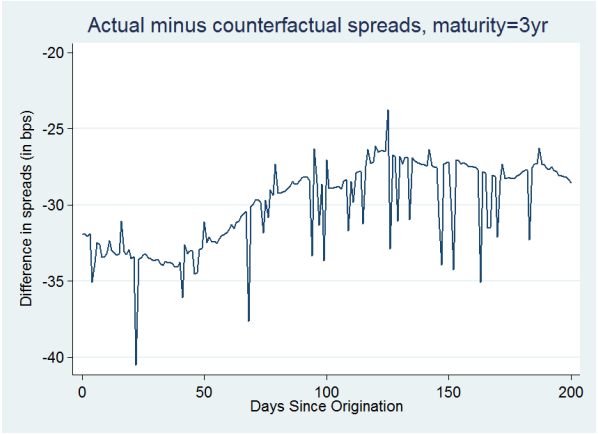
This figure plots the difference between actual and counterfactual spreads in market-based pricing contracts over time. Counterfactual spreads are calculated by first regressing loan spreads on CDS, CDX, and control variables in the full sample at the facility level (bank characteristics are not included). Then, for each market-based pricing facility, we substitute CDS=0 and CDX=0 and calculate the counterfactual spread these borrowers would have owed if they have not had market-based pricing features in their loans. The counterfactual spread is then held constant over time, and is subtracted from the loan's actual variable spreads over time. The first graph plots the difference in spreads in basis points for the entire sample, while the other three panels plot the difference in spreads for subsamples of loans with 1 year, 3 year, and 5 year maturities.



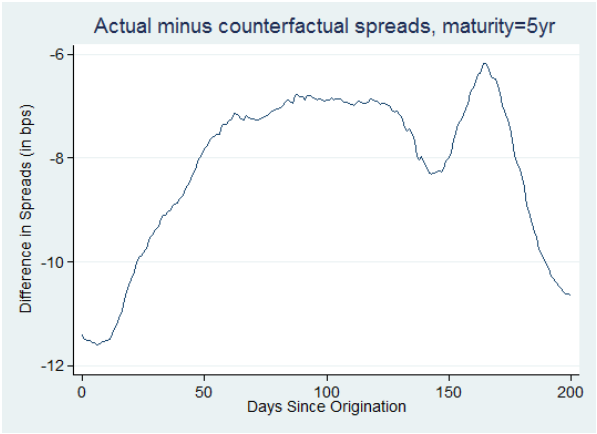
(a) Entire sample



(b) One-year maturity loans



(c) Three-year maturity loans



(d) Five-year maturity loans

Table I: Descriptive Statistics This table presents descriptive statistics for market-based pricing loans (column (1)) and standard loan contracts (column (2)) and the differences in means on multiple dimensions between the two groups. *CDS* is a binary variable that equals to one if loan spreads are tied to the firm's credit default swap contracts, and zero otherwise. *CDX* is a binary variable that equals to one if loan spreads are linked to a CDS index. *SPREAD* is the all-in-drawn spread over LIBOR. *AMOUNT* is the facility amount in millions of US Dollars. *MATURITY* is loan maturity in months. *COVENANT* is equal to the total number of financial and sweep covenants in a given facility. *PRICINGGRID* is binary variable that equals to one if a loan includes a performance pricing grid. *SENIOR* is a binary variable equal to one if the loan is senior. *SECURED* is a binary variable equal to one if the loan is secured. *GUARANTOR* is a dummy variable equal to one if the borrower has a guarantor. *CORP PURPOSE* is a dummy variable equal to one if the loan is for working capital purposes. *DEBT REPAY* is a dummy variable equal to one if the loan is to repay existing debt. *WORK CAPITAL* is a dummy variable equal to one if the loan is for working capital purposes. *TERM LOAN* is a dummy variable equal to one if the loan is a term loan. *CREDIT LINE* is a dummy variable equal to one if the loan is a credit line. *COMPOSITE 5YR* is the number of distinct contributors at the composite fallback level and is used as a measure of the liquidity of the borrower CDS contracts. *LN SALES* is the log of borrower sales. *LEVERAGE* is defined as total debt divided by total assets. *MKTOBOOK* is the Market to Book value of assets. *PROF MARGIN* is defined as Net income divided by sales. *LN INT COV* is the Log of the interest coverage ratio. *NWC* Net working capital (current assets minus current liabilities) divided by total debt. *TANGIBLES* is the Share of the borrower's assets in tangibles. *R&D* is the Research and development expenses divided by sales. *ADVERTISING* is defined as Advertising expenses divided by sales. *STOCK VOL* is the Standard deviation of the borrower's stock returns. *STOCK RET* is the Return on the borrower's common stock in excess of the market return.

	MBP=1 (N=145)	MBP=0 (N=7715)	DIFF	SE
Loan characteristics				
CDS	0.807	0.000	0.807***	0.004
CDX	0.193	0.000	0.193***	0.004
SPREAD %	0.835	2.143	-1.307***	0.131
AMOUNT	2,367.392	523.439	1,843.952***	93.919
MATURITY	28.772	52.321	-23.549***	1.658
COVENANTS	0.703	3.031	-2.327***	0.229
SENIOR	1.000	0.999	0.001	0.003
SECURED	0.007	0.530	-0.523***	0.042
PRICING GRID	0.469	0.516	-0.047	0.042
GUARANTOR	0.138	0.129	0.009	0.028
CORP PURPOSE	0.855	0.475	0.380***	0.042
DEBT REPAY	0.007	0.032	-0.025*	0.015
WORK CAPITAL	0.083	0.220	-0.138***	0.035
TERM LOAN	0.007	0.291	-0.284***	0.038
CREDIT LINE	0.959	0.683	0.276***	0.039
COMPOSITE 5YR	4.835	1.544	3.291***	0.268

Borrowers' characteristics				
SALES	59,289.929	5,246.423	54,043.506***	1,678.534
LEVERAGE	0.242	0.294	-0.052***	0.018
MKTOBOOK	1.926	1.721	0.205***	0.079
$PROF\ MARGIN$	0.102	0.004	0.098	0.094
$LN\ INT\ COV$	2.873	2.263	0.610***	0.106
NWC	0.003	0.026	-0.023***	0.008
TANGIBLES	0.610	0.706	-0.097***	0.034
$R\&D$	0.037	0.024	0.014	0.023
ADVERTISING	0.013	0.011	0.002	0.002
$STOCK\ VOL$	0.020	0.028	-0.007***	0.002
$STOCK\ RET$	0.000	0.000	-0.000	0.000
CREDIT RATING				
AAA	0.097	0.003	0.093***	0.006
AA	0.228	0.008	0.219***	0.009
A	0.510	0.071	0.439***	0.022
BBB	0.145	0.168	-0.024	0.031
BB	0.000	0.205	-0.205***	0.034
B	0.000	0.132	-0.132***	0.028
CCC	0.000	0.007	-0.007	0.007
DEFAULT	0.000	0.001	-0.001	0.002

Table II: Market-based pricing and loan spreads. This table contains estimated coefficients of the regressions of loan spreads for the sample of loans from 2005 through 2012. Models (1)-(3) include MBP indicators, while the MBP variable is split into CDS and CDX indicators in Models (4)-(6). Bank fixed effects, firm fixed effects, and both bank and firm fixed effects are included in Models (1)-(3) and in Models (4)-(6). We include firm credit rating dummies and year fixed effects in all specifications. Robust standard errors are clustered at the firm level and reported in parentheses. See Table 1 for definitions of all variables.

	(1)	(2)	(3)	(4)	(5)	(6)
			SPREADS (%)			
MBP	-0.317***	-0.437***	-0.448***			
	(0.080)	(0.107)	(0.110)			
CDS				-0.394***	-0.549***	-0.562***
				(0.083)	(0.103)	(0.106)
CDX				0.009	0.191	0.200
				(0.182)	(0.333)	(0.319)
Borrower characteristics						
LN SALES	-0.050**	-0.195***	-0.221***	-0.049**	-0.196***	-0.222***
	(0.021)	(0.075)	(0.070)	(0.021)	(0.075)	(0.071)
LEVERAGE	-0.0003	0.137	0.087	-0.0004	0.140	0.089
	(0.120)	(0.329)	(0.311)	(0.120)	(0.329)	(0.311)
MKTOBOOK	-0.099***	-0.113***	-0.114***	-0.099***	-0.113***	-0.114***
	(0.021)	(0.036)	(0.037)	(0.021)	(0.036)	(0.037)
PROF MARGIN	0.021	0.047**	0.021	0.021	0.047**	0.021
	(0.018)	(0.022)	(0.017)	(0.018)	(0.022)	(0.017)
LN INT COV	-0.098***	-0.080**	-0.071**	-0.098***	-0.080**	-0.071**
	(0.019)	(0.035)	(0.034)	(0.019)	(0.034)	(0.034)
NWC	0.016	-0.446	-0.390	0.016	-0.448	-0.392
	(0.193)	(0.366)	(0.345)	(0.193)	(0.366)	(0.345)
TANGIBLES	0.061	0.090	0.121	0.062	0.092	0.123
	(0.053)	(0.175)	(0.167)	(0.053)	(0.175)	(0.167)
R&D	0.011	0.930	0.927	0.011	0.947	0.948
	(0.037)	(0.656)	(0.727)	(0.037)	(0.658)	(0.730)
ADVERTISING	0.436	4.571	5.553*	0.460	4.459	5.447*
	(0.573)	(3.004)	(2.879)	(0.573)	(3.008)	(2.882)
STOCK VOL	16.514***	13.980***	12.882***	16.502***	13.934***	12.836***
	(2.021)	(2.519)	(2.574)	(2.020)	(2.518)	(2.572)
STOCK RET	-18.075*	12.789	12.931	-18.106*	12.774	12.942
	(9.765)	(12.423)	(13.450)	(9.766)	(12.411)	(13.439)

Loan characteristics						
LN AMOUNT	-0.089***	-0.078***	-0.083***	-0.089***	-0.078***	-0.083***
	(0.015)	(0.023)	(0.022)	(0.015)	(0.023)	(0.022)
LN MATURITY	-0.004	0.007	0.007	-0.004	0.006	0.006
	(0.036)	(0.041)	(0.039)	(0.036)	(0.041)	(0.039)
COVENANTS	0.011	0.022	0.018	0.011	0.022*	0.018
	(0.009)	(0.013)	(0.012)	(0.009)	(0.013)	(0.012)
SENIOR	-2.154***	-1.622*	-1.616**	-2.154***	-1.622*	-1.617**
	(0.723)	(0.859)	(0.729)	(0.722)	(0.859)	(0.729)
SECURED	0.338***	0.118*	0.104*	0.339***	0.119**	0.105*
	(0.042)	(0.060)	(0.059)	(0.042)	(0.060)	(0.059)
PRICING GRID	-0.311***	-0.229***	-0.212***	-0.313***	-0.229***	-0.212***
	(0.032)	(0.044)	(0.043)	(0.032)	(0.044)	(0.043)
CORP PURP	-0.377***	-0.331***	-0.286***	-0.377***	-0.330***	-0.285***
	(0.043)	(0.059)	(0.059)	(0.043)	(0.059)	(0.059)
DEBT REPAY	-0.508***	-0.259**	-0.294**	-0.508***	-0.258**	-0.293**
	(0.087)	(0.120)	(0.115)	(0.087)	(0.120)	(0.115)
WORK CAP	-0.428***	-0.356***	-0.319***	-0.427***	-0.354***	-0.317***
	(0.045)	(0.065)	(0.064)	(0.045)	(0.065)	(0.064)
GUARANTOR	0.046	-0.020	-0.014	0.044	-0.024	-0.017
	(0.042)	(0.075)	(0.076)	(0.043)	(0.075)	(0.076)
TERM LOAN	-0.411***	-0.546***	-0.537***	-0.411***	-0.546***	-0.536***
	(0.150)	(0.168)	(0.166)	(0.150)	(0.168)	(0.166)
CREDIT LINE	-0.991***	-1.032***	-0.992***	-0.991***	-1.032***	-0.991***
	(0.146)	(0.167)	(0.165)	(0.146)	(0.166)	(0.165)
LIBOR	-0.150***	-0.117**	-0.109**	-0.150***	-0.116**	-0.108**
	(0.042)	(0.048)	(0.046)	(0.042)	(0.048)	(0.046)
BBB SPREAD	0.200***	0.258***	0.267***	0.201***	0.258***	0.268***
	(0.061)	(0.066)	(0.063)	(0.061)	(0.067)	(0.063)
Firm Credit Rating	Yes	Yes	Yes	Yes	Yes	Yes
SIC	Yes	No	No	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Bank FE	Yes	No	Yes	Yes	No	Yes
Observations	7,860	7,860	7,860	7,860	7860	7860
Adjusted R^2	0.602	0.686	0.710	0.602	0.686	0.711

Standard errors in parentheses

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table III: CDS-tied pricing and loan interest rate spreads using matched samples. This table contains estimated coefficients of loan spreads regressions using matched samples. Model (1) includes CDS-based loans as well as standard loans that belong to CDS-based borrowers within the 2005-2012 period. Model (2) is the same as model (1) in all dimensions, except that non-CDS facilities are also required to have the same maturity and loan type (revolver or term loan) as CDS-based loans. In model (2), CDS loans without a match are deleted from the sample. Model (3) uses a propensity score matching sample in which CDS firms are matched to non-CDS firms for each year from 2008 through 2012. Only regressions with bank fixed effects are reported, but the results are robust to firm fixed effects and both bank and firm fixed effects. Heteroskedasticity-consistent standard errors are clustered at the firm level and reported in parentheses. See Table 1 for definitions of all variables.

	(1)	(2)	(3)
	LOAN SPREADS (%)		
CDS	−0.493***	−0.457**	−0.426***
	(0.183)	(0.199)	(0.088)
Firm controls	Yes	Yes	Yes
Loan controls	Yes	Yes	Yes
Macro variables	Yes	Yes	Yes
Firm Credit Rating	Yes	Yes	Yes
SIC	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	No	No	No
Bank FE	Yes	Yes	Yes
Observations	293	193	232
Adjusted R^2	0.722	0.721	0.773

Standard errors in parentheses

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table IV: CDS-based pricing and loan spreads using the Lewbel (2012) GMM estimator. This table contains estimates from a Lewbel (2012) GMM procedure, correcting for potential endogeneity in tying loan interest rate spreads to firm-specific credit default swaps. The sample of loans is restricted to April 2008 through December 2012 and to firms that have credit default swaps outstanding. The specifications include the same firm-specific variables as in Table II: $LN\,SALES$, $LEVERAGE$, $MKTOBOOK$, $PROF\,MARGIN$, $LN\,INTCOV$, NWC, $TANGIBLES$, $R\&D$, $ADVERTISING$, $STOCK\,VOL$, $STOCK\,RET$ with the addition of $COMPOSITE\,5YR$ that measures the liquidity of the CDS contracts written on a given issuer. The specifications also include the following macroeconomic controls: $LIBOR$, $BBB\,SPREAD$, $GDPgr$, and $BUSLOANS$. All macroeconomic variables and $COMPOSITE\,5YR$ are used to construct the heteroskdasticity-based instruments. We use the Kleibergen-Paap χ^2 to test for underidentification and the Pagan-Hall χ^2 to test for the presence of heteroskedasticity. Heteroskedasticity-consistent standard errors are clustered at the firm level and reported in parentheses. See Table 1 for definitions of all variables.

	LOAN SPREADS(%)
CDS	−0.494***
	(0.117)
Macroeconomic Factors	Yes
Firm-specific Factors	Yes
Quarter Indicators	Yes
Overidentification χ^2 (4)	7.451
	(p-value=0.114)
Kleibergen-Paap χ^2 (5)	33.797
	(p-value<0.001)
Pagan-Hall χ^2 (5)	111.915
	(p-value<0.001)
Observations	1,365
R^2	0.893

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table V: Performance pricing grids and CDS-based pricing This table contains estimated coefficients of interest rate spread regressions on an indicator for a CDS-based contract, a *PRICING GRID* indicator, and the interaction between the two variables for the sample of non-CDX loans from 2005 to 2012. We also include firm-specific, loan-specific, and macroeconomic control variables as well as firm credit rating indicators and year fixed effects in all specifications. Heteroskedasticity-consistent standard errors are clustered at the firm level and reported in parentheses. See Table 1 for definitions of all variables.

	(1)	(2)	(3)
	LOAN SPREADS (%)		
CDS	-0.615^{***}	-0.748^{***}	-0.745^{***}
	(0.088)	(0.103)	(0.116)
PRICING GRID	-0.323^{***}	-0.242^{***}	-0.225^{***}
	(0.033)	(0.045)	(0.043)
CDS × PRICING GRID	0.501^{***}	0.460^{***}	0.416^{***}
	(0.122)	(0.162)	(0.157)
Firm controls	Yes	Yes	Yes
Loan controls	Yes	Yes	Yes
Macro variables	Yes	Yes	Yes
Firm Credit Rating	Yes	Yes	Yes
SIC	Yes	No	No
Year FE	Yes	Yes	Yes
Firm FE	No	Yes	Yes
Bank FE	Yes	No	Yes
Observations	7,832	7,832	7,832
Adjusted R^2	0.612	0.687	0.711
Test: CDS + CDS*PPS = 0			
F	1.244	4.070	6.078
p-value	0.265	0.044	0.014

Standard errors in parentheses

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table VI: Differences in number of covenants between MBP and non-MBP contracts. This table compares the total number of covenants and the presence of each type of financial, net worth, and sweep covenants and dividend restrictions across subsamples of MBP and non-MBP contracts. The sample inclues 7,860 observations from 2005-2012.

	MBP=1 (N=145)	MBP=0 (N=7715)	DIFF	SE
COVENANTS	0.703	3.031	-2.327***	0.229
Max. Capex	0.000	0.169	-0.169***	0.031
Max. Debt/EBITDA	0.097	0.463	-0.366***	0.042
Max. Debt/Equity	0.034	0.001	0.033***	0.004
Max. Debt/Tangible Net Woth	0.034	0.016	0.018*	0.011
Max. Leverage	0.159	0.088	0.070***	0.024
Max. Loan to Value	0.000	0.001	-0.001	0.003
Max. Senior Debt to EBITDA	0.000	0.073	-0.073***	0.022
Max. Senior Leverage	0.000	0.001	-0.001	0.003
Min. Cash Interest Coverage	0.000	0.006	-0.006	0.006
Min. Current Ratio	0.000	0.034	-0.034**	0.015
Min. Debt Service Coverage	0.000	0.016	-0.016	0.010
Min. EBITDA	0.000	0.056	-0.056***	0.019
Min. Equity to Asset Ratio	0.000	0.001	-0.001	0.002
Min. Fixed Charge Coverage	0.007	0.228	-0.221***	0.035
Min. Interest Coverage	0.172	0.285	-0.113***	0.038
Min. Net Worth to Total Asset	0.000	0.000	-0.000	0.001
Min. Quick Ratio	0.000	0.006	-0.006	0.007
Tangible Net Worth	0.034	0.032	0.003	0.015
Net Worth	0.083	0.057	0.026	0.020
Asset Sales Sweep	0.000	0.295	-0.295***	0.038
Debt Issuance Sweep	0.000	0.246	-0.246***	0.036
Equity Issuance Sweep	0.000	0.185	-0.185***	0.032
Insurance Proceeds Sweep	0.000	0.232	-0.232***	0.035
Dividend Restriction	0.083	0.538	-0.455***	0.042

Table VII: Differences in number of covenants between MBP and matched non-MBP contracts. This table compares the total number of covenants and the presence of each type of financial, net worth, and sweep covenants as well as dividend restrictions across subsamples of MBP and non-MBP contracts. The sample includes CDS-based loans as well as standard loans that belong to CDS-based borrowers within the 2005-2012 period. Non-CDS facilities are also required to have the same maturity and loan type (revolver or term loan) as CDS-based loans. CDS loans without a match are deleted from the sample.

	MBP=1 (N=118)	MBP=0 (N=75)	DIFF	SE
COVENANTS	0.576	0.907	-0.330**	0.158
Max. Debt/EBITDA	0.093	0.067	0.027	0.041
Max. Debt/Tangible Net Woth	0.034	0.093	-0.059*	0.034
Max. Leverage	0.136	0.160	-0.024	0.052
Min. Fixed Charge Coverage	0.008	0.067	-0.058**	0.025
Min. Interest Coverage	0.153	0.187	-0.034	0.055
Tangible Net Worth	0.017	0.000	0.017	0.015
Net Worth	0.085	0.013	0.071**	0.034
Asset Sales Sweep	0.000	0.027	-0.027*	0.015
Debt Issuance Sweep	0.000	0.040	-0.040**	0.018
Equity Issuance Sweep	0.000	0.040	-0.040**	0.018
Insurance Proceeds Sweep	0.000	0.027	-0.027*	0.015
Dividend Restriction	0.051	0.187	-0.136***	0.044

Table VIII: CDS-based loan pricing and the total number of covenants using matched samples. This table contains coefficient estimates of regression of the total number of covenants on a CDS-based indicator and control variables using matched samples. Model (1) includes CDS-based loans as well as standard loans that belong to CDS-based borrowers within the 2005-2012 period. Model (2) is the same as model (1) in all dimensions, except that non-CDS facilities are also required to have the same maturity and loan type (revolver or term loan) as CDS-based loans. In model (2), CDS firms with no match are deleted from the sample. Model (3) uses a propensity score matching sample in which CDS firms are matched to non CDS firms for each year from 2008 through 2012. Only regressions with bank fixed effects are reported, but the results are robust to firm fixed effects and both bank and firm fixed effects. Heteroskedasticity-consistent standard errors are clustered at the firm level and reported in parentheses. See Table 1 for definitions of all variables.

	(1)	(2)	(3)
	TOTAL COVENANTS		
CDS	-1.219***	-1.371**	-0.301*
	(0.415)	(0.672)	(0.157)
Borrower characteristics			
LN SALES	0.116	0.258*	-0.055
	(0.120)	(0.134)	(0.115)
LEVERAGE	2.664**	2.964***	1.178
	(1.185)	(0.884)	(1.244)
MKTOBOOK	-0.131	-0.344*	-0.116
	(0.129)	(0.174)	(0.186)
PROF MARGIN	2.850***	2.345**	0.752
	(0.944)	(0.963)	(1.600)
LN INT COV	0.285	0.211	0.191
	(0.176)	(0.185)	(0.194)
NWC	5.768	-7.052	-10.866*
	(6.122)	(5.201)	(6.527)
TANGIBLES	0.378*	0.313	0.351
	(0.220)	(0.354)	(0.316)
R&D	4.320**	3.527**	4.821***
	(1.728)	(1.451)	(1.655)
ADVERTISING	4.815*	1.287	-0.722
	(2.855)	(2.778)	(2.253)
STOCK VOL	33.996**	12.715	-5.128
	(13.340)	(16.892)	(13.483)
STOCK RET	32.509	42.625	12.608

	(70.990)	(100.604)	(70.347)
Loan characteristics			
LN AMOUNT	0.083	-0.233**	-0.053
	(0.075)	(0.105)	(0.128)
LN MATURITY	-0.388***	-0.399***	-0.183
	(0.081)	(0.082)	(0.114)
SECURED	0.405	-0.841	1.408***
	(0.692)	(0.726)	(0.483)
PRICING GRID	1.213***	0.983***	0.873***
	(0.173)	(0.207)	(0.211)
CORP PURP	-0.107	-0.282	-0.696
	(0.194)	(0.268)	(0.487)
DEBT REPAY	-0.146	-0.391	0.171
	(0.355)	(0.477)	(0.750)
WORK CAP	0.395	0.667	-0.212
	(0.391)	(0.530)	(0.582)
GUARANTOR	0.402	-0.390	0.333
	(0.344)	(0.384)	(0.250)
TERM LOAN	-0.373	1.509***	-0.308
	(0.429)	(0.461)	(0.595)
CREDIT LINE	-0.984**	0.255	-0.768
	(0.391)	(0.222)	(0.521)
LIBOR	-0.063	-0.116	0.144
	(0.139)	(0.185)	(0.204)
BBB SPREAD	-0.133	-0.064	0.047
	(0.140)	(0.152)	(0.151)
Firm Credit Rating	Yes	Yes	Yes
SIC	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	No	No	No
Bank FE	Yes	Yes	Yes
Observations	293	193	232
Adjusted R^2	0.677	0.585	0.510

Standard errors in parentheses

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table IX: CDS-based pricing and the total number of covenants using the Lewbel GMM estimator. This table contains estimates from a Lewbel two-step GMM procedure, correcting for potential endogeneity in tying loan interest rate spreads to the firm-specific credit default swaps. The sample of loans is restricted to April 2008 through December 2012 and to firms that have credit default swaps outstanding. The specifications include the same firm-specific variables as in Table II: $LN\ SALES$, $LEVERAGE$, $MKTOBOOK$, $PROF\ MARGIN$, $LN\ INT\ COV$, NWC, $TANGIBLES$, $R\&D$, $ADVERTISING$, $STOCK\ VOL$, $STOCK\ RET$ with the addition of $COMPOSITE\ 5YR$ that measures the liquidity of the CDS contracts written on an issuer. The specifications also include the following macroeconomic controls: $LIBOR$, $BBB\ SPREAD$, $GDPgr$, and $BUSLOANS$. All macroeconomic variables and $COMPOSITE\ 5YR$ are used to construct the heteroskdasticity-based instruments. We use the Kleibergen-Paap χ^2 to test for underidentification and the Pagan-Hall χ^2 to test for the presence of heteroskedasticity. Heteroskedasticity-consistent standard errors are clustered at the firm level and reported in parentheses. See Table 1 for the definitions of all of the variables.

	TOTAL COVENANTS
CDS	−0.923**
	(0.386)
Macroeconomic Factors	Yes
Firm-specific Factors	Yes
Quarter Indicators	Yes
Overidentification χ^2 (4)	5.135
	(p-value=0.274)
Kleibergen-Paap χ^2 (5)	35.925
	(p-value<0.001)
Pagan-Hall χ^2 (5)	111.915
	(p-value<0.001)
Observations	1,365
R^2	0.557

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table X: Market-based pricing and all-in-undrawn fees The table contains estimated coefficients of regressions of all-in-undrawn spreads on market-based pricing variables and controls. The analysis in Panel A corresponds to that in Table 2. The estimation in Panel B uses a matched sample and corresponds to Table 3. Finally, Panel C contains coefficient estimates using the Lewbel (2012) GMM estimator, similar to the analysis in Table 4.

Panel A: Full sample

	(1)	(2)	(3)	(4)	(5)	(6)
			UNDRAWN (%)			
MBP	−4.734***	−4.202**	−4.239**			
	(1.454)	(1.972)	(2.019)			
CDS				−4.986***	−4.761**	−4.830**
				(1.419)	(1.882)	(1.950)
CDX				−3.708	−1.205	−1.042
				(3.874)	(6.106)	(5.976)
Firm and Loan Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm Credit Rating	Yes	Yes	Yes	Yes	Yes	Yes
SIC	Yes	No	No	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Bank FE	Yes	No	Yes	Yes	No	Yes
Observations	4,720	4,720	4,720	4,720	4,720	4,720
Adjusted R^2	0.523	0.671	0.689	0.523	0.671	0.689

Panel B: Matched samples of CDS firms

	(1)	(2)	(3)
		UNDRAWN (%)	
CDS	−5.942**	−7.804***	−0.587
	(2.301)	(2.843)	(2.483)
Loan and firm controls	Yes	Yes	Yes
Firm Credit Rating	Yes	Yes	Yes
SIC	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	No	No	No
Bank FE	Yes	Yes	Yes
Observations	260	183	197
Adjusted R^2	0.694	0.747	0.727

Panel C: Lewbel (2012) estimator

	UNDRAWN(%)
CDS	−0.935
	(2.095)
Macroeconomic Factors	Yes
Firm-specific Factors	Yes
Quarter Indicators	Yes
Overidentification χ^2 (4)	4.681
	(p-value=0.322)
Kleibergen-Paap χ^2 (5)	36.362
	(p-value<0.001)
Pagan-Hall χ^2 (28)	111.915
	(p-value<0.001)
Observations	902
R^2	0.859

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$