The Impact of Joint Participation on Liquidity in Equity and Syndicated Bank Loan Markets*

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Abstract

We examine the impact on market liquidity of the presence of financial intermediaries that are informed and active participants in both the equity and the syndicated bank loan markets. We identify the presence of informationally advantaged lead arrangers of syndicated bank loans that simultaneously act as equity market makers, denoted dual market makers. We find empirical support for our theoretical model's predictions that the presence of dual market makers reduces both equity and loan market spreads and that the likelihood of a dual market maker increases with profitable trading opportunities in both markets.

JEL Classification: G14, G24

Key Words: market maker, bid-ask spread, syndicated bank loans, equity market liquidity, loan market liquidity

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1. Introduction

In order to be considered a major player, a financial intermediary must maintain a market presence in all of the major financial markets in the world. Participating in multiple financial markets can be particularly lucrative if information obtained in one market is useful in other, related markets. For example, information about equity market order flow may be reusable in debt and derivatives markets. Allen and Gottesman (2006) show that information contained in a firm's equity returns impacts returns on that firm's syndicated bank loan returns, and vice versa. Thus, the presence of global financial institutions, simultaneously trading in many financial markets, may increase financial market liquidity and information efficiency of asset prices.

Alternatively, however, the presence of multiple venues in which to conduct informed trading may diffuse the information's impact on securities prices. For instance, the informed trader with access to many related markets may break up the order across markets into easily concealed pieces that dampen the information's impact, thereby reducing price transparency, market liquidity, and, perhaps increasing volatility.[1] Thus, it is possible that joint participation across related securities markets may reduce market liquidity and price efficiency by permitting market makers to trade strategically across markets.

[1] Hansch, Naik and Viswanathan (1999) show that directed execution strategies, such as preferencing and internalization, lead to wider spreads and worse execution.

In this paper we examine the impact on market liquidity and volatility of the presence of financial intermediaries that are informed and active participants in both the equity and the syndicated bank loan markets. We explicitly control for the presence of financial intermediaries that are simultaneously equity market makers and lead arrangers of the bank loan syndicate (denoted dual market makers) in order to examine the impact of their joint participation on both equity and loan market liquidity. In our formulation, these dual market makers are among the most informed participants in the market, because they are the lead arrangers of the loan syndicate. The lead arranger, in contrast to other loan syndicate participants, is, typically, a bank with a prior lending relationship with the borrower. In the course of a long-term banking relationship that includes the provision of a myriad of deposit, cash-management and lending services, the relationship bank gathers private information about the borrower.[2] By virtue of its access to this private information, the lead arranger screens the loan on behalf of all lenders in the syndicate and holds a sizable stake in the syndicated loan, thereby assuring that the bank will actively monitor the loan.[3] This private information will impact the bank's trading activity in both the equity and loan markets when the lead arranger simultaneously acts as an equity market maker. In this paper, we investigate how the sharing of information across financial markets impacts each market's liquidity by examining the liquidity characteristic of both the equity and syndicated bank loan markets in the presence of a dual market maker.

[2] Banks obtain private information about their customers by observing a history of customer information such as the flow of funds through customer checking accounts, past repayment history, customer use of commercial banking products (such as letters of credit), firm hedging activities, etc. For example, Mester, Nakamura and Renault (2002) find that banks can use checking account activity to monitor borrower creditworthiness on a real time basis.

[3] Allen and Gottesman (2006) show that the average share of the syndicated bank loan facility held by the lead arranger is 27% (median 16%). In contrast, the average share of the syndicate participant is less than 3% (median 1.88%).

There is an extensive literature describing the private information generated in the course of a long-term bank-borrower relationship; see Boot (2000) for a survey on relationship lending. Relationship banks often have access to material and price-sensitive information well in advance of its release to the public, which gives them an information advantage that can be used in trading in both the equity and the secondary syndicated loan markets. For example, James (1987), Lummer and McConnell (1989), and Billet, Flannery and Garfinkel (1995) show that bank loans contain private information as measured by the bank loan's positive announcement effect in equity markets. Dahiya, Puri and Saunders (2003) find a negative impact on equity returns upon the announcement of loan sales.[4]

The identification of dual market makers as traders with an information advantage allows us to investigate both the role of informed investors on market liquidity and the informativeness of asset prices. Information asymmetry in the equity markets may also provide incentives for the informed lead arrangers to become natural liquidity providers - market makers - and benefit from their ability to set the price more efficiently. In a competitive market, when the degree of information asymmetry between the informed market makers (the lead arrangers of the bank loan syndicate) and other informed traders is low, the informed market makers are more willing to quote narrower spreads and play a liquidity-provision role (see, for example, experimental evidence provided by Bloomfield and O'Hara, 2000). In addition, the presence of informed market makers that set prices more efficiently reduces the information disadvantage faced by liquidity traders whose trading is driven by portfolio rebalancing and hedging needs. Thus, the existence

[4] Moreover, Allen, Guo and Weintrop (2005) show that negative earnings announcements are reflected in loan prices a month prior to the stock market reaction on announcement date.

of informed market makers encourages more liquidity-based trading volume and improves stock market liquidity. Furthermore, the participation of dual market makers in trading increases the number of informed traders in equity markets. This increase can induce a “rat race” among the informed traders, causing them to compete aggressively, revealing information into prices rapidly and improving the informational efficiency of the price (see, for example, Holden and Subrahmanyam, 1992, and Foster and Viswanathan, 1993), thereby reducing equity market spread.

While making markets for the stock, the dual market makers also extract valuable information from the equity market order flow that is not shared by other traders in the loan market. This information advantage allows the dual market maker to be a superior liquidity provider in the loan market. Similar to the aforementioned rationale that a better informed market maker charges a narrower equity spread, the presence of a dual market maker increases loan market liquidity as well. Thus, it is conceivable that joint participation in the loan and equity markets increases the liquidity in both markets as both the private information produced in the loan market and the information generated from equity market trading decrease the information asymmetry faced by the dual market makers and help them to become effective liquidity providers in both markets. We denote this *the liquidity enhancement effect*. In Section 2, we extend the Glosten and Milgrom (1985) model to illustrate this effect.

Alternatively, the presence of informed traders may induce existing market makers to react defensively and be reluctant to provide liquidity when they perceive the degree of information asymmetry is high. That is, the activities of loan syndicate lead arrangers in the equity market may increase information asymmetries, and thereby widen spreads and lower equity market liquidity. The mere presence of these "super informed" dual market makers may increase information asymmetry in the equity market, since equity market makers do not know if the dual market maker is trading on new private information that has been received from the borrower as mandated by the loan's covenant requirements, only available to syndicate members. Therefore, the presence of a dual market maker may reduce equity market liquidity and increase the spread. Similarly, dual market makers may extract valuable information from the equity market and their existence can increase the degree of information asymmetry in the loan market, thereby reducing loan market liquidity and widening the spread. We denote this process *the negative liquidity effect*.

The presence of a dual market maker is not exogenously determined. Consider, for example, the case of a bank lender that has received negative information about one of its borrowers. The lender may be unwilling or unable to trade on that information in the loan market.[5] Therefore, the bank may choose instead to trade the information on equity markets, thereby engendering both lower transaction costs and less of a negative price impact.[6] In order to benefit from their superior information and to provide an alternative trading channel, bank lenders may therefore choose to act as equity market makers.

Loan syndicate arrangers will have a greater incentive to become equity market makers when the profit making opportunities are high. This will be the case when there is

[5] While SEC regulations and U.S. banking regulations prohibit the transfer of information from an investment bank subsidiary to a related commercial bank subsidiary, there are no restrictions on the reuse of information obtained in the course of a standard lending relationship (e.g., on information flows from the bank's lending department to the equity trading division). The courts have ruled that there is no breach of fiduciary responsibility in such cases as ADP v. Chase Manhattan Bank; see Michael Bender, *Investment Dealers' Digest,* June 30, 1997, p. 9-10.

[6] Moreover, if the bank has a longstanding customer relationship with the borrowing firm, it may be reluctant to trade in a way that would have large detrimental effects on the loan's market value.

a large and active equity market with reasonable spread levels, and when the degree of information asymmetry in the equity market is large. The incentive to become an equity market maker is also negatively related to the profit opportunities in the loan market, which are related to factors such as the competitive pressure from other loan dealers, as well as the size of loan spreads.

To distinguish between the *liquidity enhancement effect* and the *negative liquidity effect,* we model equity market liquidity and loan market liquidity using a two-stage procedure that permits simultaneous multivariate estimation of one continuous dependent variable and one discrete dependent variable, corresponding to the technique detailed in Maddala (1983). That is, our model endogenously estimates the likelihood of dual market maker status simultaneously with the impact of the dual market maker's presence on market liquidity. After accounting for the endogeneity of the dual market maker decision, we find a significant and robust increase in both the equity and the loan market liquidity (reduction of equity and loan spreads) in the presence of dual market makers, consistent with the *liquidity enhancement effect.*

The paper is organized as follows. Section 2 presents an illustrative theoretical model, along the lines of Glosten and Milgrom (1985). The data description appears in Section 3. Section 4 lays out the empirical methodology. Section 5 presents the results of the empirical tests on the impact of the presence of a dual market maker on equity market liquidity and loan market liquidity. Section 6 concludes.

2. Theoretical Model

In this section, we derive an extension of the Glosten and Milgrom (1985) model to analyze the relationship between the informativeness of the market makers and the bid-ask spread of the traded asset. There is a single asset to be traded in the market. The final payoff of the asset is given by the random variable V. For simplicity, V can take two possible values, $\underline{V}$ and $\overline{V}$, with probability δ and $1-\delta$, respectively. There are three types of traders in the market, the informed trader (*i*), the uninformed liquidity trader (*n*) and the market maker (*m*). All the market participants are risk neutral. The informed trader and the liquidity trader trade with the market maker, buy at the ask price and sell at the bid price. The measures of the informed trader and the liquidity trader are γ and $1-\gamma$, respectively. In the model, traders arrive sequentially and only one share of the asset can be traded at a time.

The informed trader observes the true value of V perfectly and can trade on this perfect information. The liquidity trader does not have any information and trades for exogenous liquidity reasons. For simplicity, we assume that the liquidity trader is equally likely to buy or sell.

The market maker in the model receives an imperfect signal (I) about the realization of V. I can take two possible values, $\underline{V}$ and $\overline{V}$. The usefulness of the signal I is determined by a parameter k ($0.5 \le k \le 1$), the probability that the signal is the same as the true value of V. When k takes the minimal value of 0.5, the signal is uninformative: i.e., when I equals $\underline{V}$, the truth could be either $\underline{V}$ or $\overline{V}$ with equal probability. In this case, the market maker is equivalently uninformed and the model reduces to the standard Glosten and Milgrom (1985) setting. When k equals 1, the market maker has perfect information about V and there is no information asymmetry between the market maker and the informed investors. Our discussion focus on the case where *k* takes any intermediate values between 0.5 and 1: i.e., the market maker has useful, but imperfect information.

In a rational expectations equilibrium, the market maker makes correct inferences about the probability that a trade comes from an informed trader based on his prior knowledge, the signal *I*, and the direction of the trade. The bid and ask prices are set in a way that reflects the market maker's expectation about the value of the asset. Due to the presence of the noise trader and the imperfect information available to the market makers, the market maker's expectation about the value of the asset (and therefore the price he sets) only partially incorporates the asset's true value: i.e., it is below the true value if the true value is $\overline{V}$ and above the true value if the true value is $\underline{V}$. Therefore, when trading against such market maker, the informed trader's trading rule is simple -- he always buys when the true value is $\overline{V}$ and sells when the true value is $\underline{V}$.

The market maker's conditional expectation of the asset value based on the signal *I* and the direction of the order is:

$$E[V \mid S, I] = \underline{V}\,\Pr\{V = \underline{V} \mid S, I\} + \underline{V}\,\Pr\{V = \overline{V} \mid S, I\} \tag{1}$$

and

$$E[V \mid B, I] = \underline{V}\,\Pr\{V = \underline{V} \mid B, I\} + \underline{V}\,\Pr\{V = \overline{V} \mid B, I\}, \tag{2}$$

where *B* and *S* represent whether the trade is a buy or a sell, and the signal *I* can take a value of either $\underline{V}$ or $\overline{V}$.

The conditional probabilities in equations (1) and (2) can be derived using Bayes rule and the results are summarized in the following proposition. The derivations are presented in the Appendix.

Proposition 1. *The market maker's expected values of the asset when he receives a signal of low value are:*

$$E[V \mid B, I = \underline{V}] = \underline{V} + \frac{(1-k)(1+\gamma)(1-\delta)}{k(1-\gamma)\delta + (1-k)(1+\gamma)(1-\delta)}(\overline{V} - \underline{V}) \tag{3}$$

$$E[V \mid S, I = \underline{V}] = \underline{V} + \frac{(1-k)(1-\gamma)(1-\delta)}{k(1+\gamma)\delta + (1-k)(1-\gamma)(1-\delta)}(\overline{V} - \underline{V}) \tag{4}$$

The market maker's expected values of the asset when he receives a signal of high value are:

$$E[V \mid B, I = \overline{V}] = \underline{V} + \frac{k(1+\gamma)(1-\delta)}{(1-k)(1-\gamma)\delta + k(1+\gamma)(1-\delta)}(\overline{V} - \underline{V}) \tag{5}$$

$$E[V \mid S, I = \overline{V}] = \underline{V} + \frac{k(1-\gamma)(1-\delta)}{(1-k)(1+\gamma)\delta + k(1-\gamma)(1-\delta)}(\overline{V} - \underline{V}) \tag{6}$$

Consider a simple numerical example. Suppose $\underline{V} = 0$ and $\overline{V} = 1$, and the ex-ante probability that the final payoff of the asset takes one of the two values is 0.5 ($\delta = 0.5$). The measures of the informed investor and the liquidity trader are both set to 0.5 ($\gamma = 0.5$).

In the baseline model where the market maker does not have information, *k=0.5,* the market maker ignores the information signal and bases his expectation of the asset value only on the direction of the orders. Thus, equation (3) yields the same result as equation (5) and equation (4) yields the same result as equation (6): $E[V \mid B] = 0.75$ and $E[V \mid S] = 0.25$. Therefore, the market maker's maximum bid is 0.25 and minimal offer is 0.75, with a minimum spread of 0.5. If the market maker is competitive and makes zero expected profits, then the bid and offer is exactly 0.25 and 0.75.

Next, consider a case where the market maker receives valuable information (*k>0.5*) about the final realization of the asset. When the information indicates low value, the expectation of the market maker is

$$E[V \mid B, I = \underline{V}] = \frac{(1-k)*1.5*0.5}{k*0.5*0.5+(1-k)*1.5*0.5} = \frac{3(1-k)}{3-2k} \tag{7}$$

$$E[V \mid S, I = \underline{V}] = \frac{(1-k)*0.5*0.5}{k*1.5*0.5+(1-k)*0.5*0.5} = \frac{1-k}{1+2k} \tag{8}$$

When the information indicates high value, the expectation of the market maker is

$$E[V \mid B, I = \overline{V}] = \frac{k*1.5*0.5}{(1-k)*0.5*0.5+k*1.5*0.5} = \frac{3k}{1+2k} \tag{9}$$

$$E[V \mid S, I = \overline{V}] = \frac{k*0.5*0.5}{(1-k)*1.5*0.5+k*0.5*0.5} = \frac{k}{3-2k} \tag{10}$$

The minimum spread that the market maker charges is independent of the value of the signal:

$$E[V \mid B, I = \underline{V}] - E[V \mid S, I = \underline{V}] = E[V \mid B, I = \overline{V}] - E[V \mid S, I = \overline{V}].$$

It is easy to demonstrate that the minimum spread is decreasing in *k* which indicates that as the market maker's information gets better, the minimum spread he charges becomes narrower. This suggests that, in a competitive market, a more informed market maker facing lower information asymmetries becomes a natural liquidity provider in the market and sets a narrower spread.

For example, consider the case where *k=0.9*. When the information indicates low value, the expectations of the market maker are $E[V \mid B, I = \underline{V}] = 1/4$ and

$E[V \mid S, I = \underline{V}] = 1/28$. Therefore, upon observing a low value signal, the market maker's maximum bid is 1/28 and minimal offer is 1/4 (i.e., if the market maker is competitive and makes zero expected profits, then the bid and offer is exactly 1/28 and 1/4). When the information indicates high value, the market maker's maximum bid and minimal offer is determined by $E[V \mid B, I = \overline{V}] = 27/28$ and $E[V \mid S, I = \overline{V}] = 3/4$. The minimum spread that the market maker charges (whether the signal is high or low) is 3/14, smaller than the 1/2 spread that he would charge in the benchmark case when the market maker has no information.

The model implies that the information advantage of the lead arranger of the bank loan syndicate relative to the other market makers offers the dual market maker profit opportunities in the equity market. In the previous example, suppose originally the equity market makers are all of the uninformed type and the spread is 1/2. Now the lead arranger with reasonably good information (say *k=0.9*) can enter the market making business and charge a spread of $1/2 - \varepsilon$, where $\varepsilon > 0$. The expected profit to the market maker is then $1/2 - \varepsilon - 3/14 = 2/7 - \varepsilon$. Since $\varepsilon > 0$, we are guaranteed that the dual market maker charges a narrower spread than do the original market makers. The greater the value of ε, the greater the impact of the presence of a dual market maker in reducing the equity market spreads. In reality, ε is determined by the competitiveness of the market and any other costs of market making, such as inventory cost and entry cost.[7]

[7] We do not model these issues here in order to keep the model simple. We also do not model the response of the uninformed market makers to the informed market makers. The uninformed market makers may try to infer the information from the quotes of the informed market makers, but the informed market makers then would have an incentive to manipulate their quotes by, for example, adding random noise. The theoretical modeling of these interactions is beyond of the focus of this paper, although we examine their empirical implications in the loan and equity markets. That is, the *liquidity enhancement effect* hypothesizes that these interactions do not alter the qualitative implications analyzed in Section 2. In

We summarize the discussion above into the following four implications.

Implication 1: The participation of the more informed lead arranger as an equity market maker decreases the degree of information asymmetry in the equity market and narrows the bid-ask spread in the equity market.

Implication 2: The participation of the lead arranger of the loan syndicate in the equity market also allows it to extract valuable information from the equity market that enables the lead arranger to be a natural liquidity provider in the loan market, thereby narrowing the bid-ask spread in the loan market.

Implication 3: The lead arranger of a syndicated bank loan has more of an incentive to become an equity market maker when the profit opportunity of market making is high. That is, the likelihood of entrance of a dual market maker increases when (1) the information asymmetry in the equity market is high because the lead arranger has a greater informational advantage over other equity market makers, and/or (2) when the profit opportunity in the loan market is low due to factors such as relatively low loan spreads and more competition.

Implication 4: The equity market and the loan market bid-ask spreads are jointly determined by the presence of the dual market maker in both markets.

In the remainder of the paper, we empirically test the implications of the model. In particular, we examine whether the presence of a dual market maker reduces the bid-ask spreads in the equity and syndicated bank loan markets (Implications 1 and 2), consistent with the *liquidity enhancement hypothesis*. Moreover, we endogenize the

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contrast, the *negative liquidity effect* conjectures that strategic behavior and random noise in the quotes decrease market liquidity. We test these hypotheses in the empirical model presented in Section 4.

choice to become a dual market maker (Implication 3) and explicitly control for the simultaneity between the two markets (Implication 4).

3. Sample Selection Methodology

To empirically test the implications of the model presented in Section 2, we obtain data on pricing in both the equity and syndicated bank loan markets. Our initial sample is obtained from the Loan Pricing Corporation (LPC) and consists of 129,172 daily secondary loan market quotations, observed on a weekly basis, for which at least two quotes are available for the date of the observation during the sample period from January 1999 through May 2003. These observations are associated with 1,621 individual loan facilities to 763 individual borrowers.[8] The database provides the mean bid and mean ask quotation for each observation. The number of loan quotes for the day of the observation, LOANNBA, is calculated as the sum of the bid and ask quotations for each loan observation. The loan return, LOANRETURN, is calculated as the weekly loan return, where the average of the mean bid and mean ask quotation (denoted the LPC mean of the mean) is a proxy for loan transaction price. The relative loan spread, LOANSPRD, is calculated as the difference between the mean bid and the mean ask divided by the transaction price proxy.

We next merge this sample of secondary loan market data with primary loan market data from the LPC *DealScan* database in order to extract control variables associated with the given facility at loan initiation. Covenants in syndicated bank loans may require borrowers to release private information to the lenders over the life of the

[8] Loan deals to individual borrowers consist of multiple loan facilities that differ in characteristics such as spread, maturity, security, covenants, etc.

loan. To control for this information flow, we define the indicator variable FINCOV, set equal to one if there is a financial covenant associated with the loan, and zero otherwise. Dennis, Nandy and Sharpe (2000) show that collateral is an important loan contracting feature. Thus, we define SECURED as a dummy variable that is equal to one if the loan if secured, and zero otherwise.[9] To control for credit risk, RATEAISD is the basis point loan spread at initiation. PPC is a dummy variable that is equal to one if there is a performance pricing grid associated with the loan and zero otherwise. This controls for sensitivity in the loan spread to changes in the borrower's financial condition (e.g., credit rating, leverage, cash flows, etc.). FACILITYSIZE is the facility size at initiation. NUMBSYN is the number of syndicate members at initiation.

We next merge the above sample with CRSP by comparing the borrower's ticker and name as provided by LPC with the tickers and names specified on CRSP. Of the 763 borrowers, we identify 357 on CRSP, and extract a number of variables, as follows. EQUITYRETURN is the one-week equity return, calculated using the equity price standardized by the cumulative factor to adjust for splits and dividends. MV is the market value, defined as the number of shares outstanding multiplied by the equity price on the day of the observation. For all observations for which at least 350 of the past 500 days of returns are available, we calculate three return volatility measures based on daily, weekly, and monthly equity returns designated EQSTDEV_DAILY, EQSTDEV_WEEKLY, and EQSTDEV_MONTHLY.

We next merge the above sample with COMPUSTAT to extract a number of borrowing firm control variables. LEVERAGE is the borrower's total debt divided by total assets. INCOMETOA is the borrower's operating income before depreciation

[9] Hence, if the security status is missing, this dummy variable is equal to zero.

divided by total assets. EPS is earnings per share. TANGIBLE is gross property, plant and equipment divided by the firm's total assets. FRENCH1-12 are indicator variables that are equal to unity if the firm's industry falls into one of 12 categories as categorized by Kenneth French.[10]

We next merge the above sample with the TAQ database. We extract data that allows us to identify the market makers in the equity market on the date of the observation, and use this information to calculate a number of variables, as follows. DUALMM is a dummy variable that is equal to one if the lead arranger on the syndicated bank loan is also a NASDAQ market maker for the firm's equity on the date of the observation, and zero otherwise.[11] A syndicate member is considered to be a lead arranger as long as the LPC *DealScan* database specifies a role designation other than "participant." Thus, the lead arranger can have the legal titles of administrative agent, documentation agent, arranger, lead manager, etc. EQSPRD is the time-weighted relative equity spread, where the relative equity spread is calculated as the national best bid and offer (NBBO) spread divided by the average of the best bid and the best ask. The NBBO is the best bid and offers aggregated from NYSE, Nasdaq and Amex, measured in percentages.

We also extract two market variables that we use in the tests. EQUITYINDEXRETURN is the weekly return on the S&P 500 Composite Index,

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[10] See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[11] In order to construct strict tests of our hypotheses, we restricted our definition of dual market maker status to those financial intermediaries that are both lead arrangers and equity market makers on the same day. This definition may exclude some cases where the dual market maker does not immediately trade on information, but instead trades in subsequent days. To test for this, we examine whether the dual market maker status changes from week to week; i.e., if the designation of dual market maker status changes from week to week, it may be an indication that our definition is overly restrictive. We find that in 99.14% of the observations in our sample the dual market maker status does not change from week to week, and therefore we utilize the more restrictive, less noisy designation of dual market maker status if the lead arranger acts on the same day as an equity market maker.

extracted from CRSP. LOANINDEXRETURN is the weekly return on the S&P/LSTA syndicated bank loan index.

Using return and accounting data from COMPUSTAT and CRSP, we calculate the implied probability of default (denoted PD) using a Merton options-theoretic model.[12] The variable PD is used to examine the relationship between the level of default risk and market liquidity. However, we also are interested in how changes in default risk interact with liquidity measures and with the dual market maker decision. That is, large changes in default risk may trigger uncertainty about the loan's future value and thereby impact liquidity. Thus, we define two variables, DPD and LAGDPD, that measure the one-week change in the implied default probability for weeks *t* and *t-1*.

Finally, we eliminate any observation for which the following key variables are missing: LOANNBA, LOANRETURN, LOANSPRD, EQSPRD, EQUITYRETURN,

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[12]The contingent claims indicator of default is backed out from a nonlinear system of two equations: (1) $V_{Eti} = V_{Ati}\ N(D_{1ti}) - e^{-rT} L_{ti}\ N(D_{2ti})$, and (2) $\sigma_{Eit} = \frac{V_{Ait}}{V_{Eit}} N(D_{1it})\ \sigma_{Ait}$, where $D_{1it} = [\ln(V_{Ait} / L_{it}) + T(r_t + 0.5\sigma^2_{Ait})] / \sigma_{Ait}\sqrt{T}$, and $D_{2ti} = D_{1ti} - \sigma_{Ait}\sqrt{T}$ and $N(\cdot)$ is the normal distribution. The variables V_{Eit} (market value equity of firm (i) at time (t)), σ_{Eit} (volatility of firm's equity), L_{it} (firm's total debt), and r_t (risk free rate of return) are all known or estimated from a firm's equity price over the period T (in our monthly framework $T = 1/12$). Estimates for the firm's asset value $(\tilde{V}_{Ait})$ and volatility $(\tilde{\sigma}_{Ait})$ can be solved using Newton's nonlinear approximation technique. The market variables V_{Eit} and σ_{Eit} were computed monthly using daily stock return information from CRSP (to obtain a more stable measure of volatility, we used a rolling 6-month horizon). The risk-free rate is measured by the 1-year Treasury bill rate. We use COMPUSTAT information on long-term debt to measure L_{it} as the total debt obligations with maturity greater than one year (primarily, outstanding bonds and loans). The implied default probability is $IDP_{it} = N(-DD_{it})$ where $DD_{ti} = [\ln(V_{Ati} / D_{ti}) + T(\mu - 0.5\sigma^2_{Ati})] / \sigma_{Ati}\sqrt{T}$. The parameter μ representing the instantaneous drift of V_A can be estimated by calculating the average change in $\log(\tilde{V}_{Ait})$. In reality, this implied measure of default does not correspond to the true probability of default because of the normality assumption. Moody's/KMV uses a large proprietary database of defaults to calibrate the distance-to-default to the actual experience. For our purpose, however, IPD_{it} (denoted PD) provides a time-consistent indicator that allows us to measure variations in the solvency of the firm. For a discussion of the options-theoretic approach to credit risk measurement, see Chapter 4 of Saunders and Allen (2002).

DUALMM, and PD. After eliminating the observations for which the key variables are missing, we are left with 22,826 secondary market observations, associated with 384 individual loan facilities to 165 individual borrowers. Table 1 presents descriptive statistics for our sample and Table 2 presents the correlation matrix.

4. Empirical Methodology

Individual banks may be unable to satisfy the demands of their large borrowers because of regulatory capital restrictions and the bank's concerns about a single large loan's impact on its portfolio diversification. Thus, the bank may gather a syndicate of other financial institutions (including other banks, insurance companies, mutual funds, and others) in order to originate the loan. All syndicate members receive private information from the borrower and the lead arranger during the origination of the loan, as well as periodically during the life of the loan. In order to ensure compliance with financial covenants, the borrower must transmit detailed, non-public financial data to all members of the loan syndicate on a predetermined, regular schedule. Covenants can be categorized as financial covenants, related to the borrower's financial performance, and general covenants, that specify behavioral rules. Table 3 demonstrates that most of the loan facilities in our sample are associated with financial and general covenants, thereby providing bank loan syndicate members with access to useful private information.[13] One potential use for this information is trading.[14]

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[13] Allen and Peristiani (2005) and Allen, Jagtiani, Peristiani and Saunders (2004) show that this private information can be reused (both beneficially and detrimentally) in merger advisement.

[14] Allen, Guo and Weintrop (2005) find evidence of this trading on covenant information in an earnings announcement effect in the loan market that predates the public announcement date (and the announcement effect in the equity market) by approximately one month – corresponding to the monthly release of private covenant information to syndicate members.

The focus of our analysis is the impact on market liquidity and volatility of the private information generated by the presence of financial intermediaries that are active participants in both the equity and the syndicated bank loan market. However, the decision to participate both in the equity and the syndicated loan market may be determined by the liquidity of the loan and the equity markets. To account for the endogeneity between the equity (loan) market liquidity and the decision of dual market makers to participate in both equity and loan markets, we utilize a two-stage probit least squares estimation method corresponding to Maddala (1983) that permits simultaneous multivariate estimation when one of the endogenous variables is continuous and the other endogenous variable is discrete.

We first test the relation between DUALMM_t and EQSPRD_t. We estimate the following simultaneous regression model:

$$\mathrm{EQSPRD}_t = \gamma_1 \mathrm{DUALMM}_t + \beta_1' \mathrm{X}_1 + e_1 \tag{11}$$

and

$$\mathrm{DUALMM}_t = \gamma_2 \mathrm{EQSPRD}_t + \beta_2' \mathrm{X}_2 + e_2, \tag{12}$$

EQSPRD_t is the time-weighted relative equity spread on the date of the observation, where the relative equity spread is calculated as the NBBO spread divided by the average of the best bid and the best ask. DUALMM_t is equal to one if the lead arranger on the syndicated bank loan is also an equity market maker on the date of the observation, and zero otherwise. The coefficients associated with the simultaneously estimated variables are γ_1 and γ_2; e_1 and e_2 are the residuals; and X_1 and X_2 are vectors of other independent variables, with coefficients β_1' and β_2'. X_1 and X_2 are defined as:

X_1 = [CONSTANT, EQUITYRETURN$_t$, EQUITYINDEXRETURN$_t$, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, INDUSTRY DUMMIES] (13)

X_2 = [CONSTANT, FINCOV, SECURED, PPC, ln(FACILITYSIZE), NUMBSYN, LOANNBA$_t$, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, INDUSTRY DUMMIES] (14)

where all variables are defined in Table 1, and INDUSTRY DUMMIES represent the industry control variables FRENCH1-FRENCH12, excluding the base case reference dummies FRENCH4 and FRENCH6.

The simultaneous estimation of equations (11) and (12) is complicated by the fact that one dependent variable is continuous (EQSPRD$_t$) while the other is discrete (DUALMM$_t$). Our estimation technique corresponds to the two-stage procedure detailed in Maddala (1983, p. 242).[15] In the first stage, we estimate the following reduced form models:

$$\text{EQSPRD}_t = \prod\nolimits_1 \text{X} + v_1 \tag{15}$$

and

$$\text{DUALMM}_t = \prod\nolimits_2 \text{X} + v_2, \tag{16}$$

where v_1 and v_2 are the residuals associated with the reduced form models and X is a vector of all variables in X_1 and X_2. Because DUALMM$_t$ is a dichotomous variable, we

[15] Our estimation problem is similar to Maddala's (1983) model 3 (pp. 244-245), where one dependent variable is observed and the other is dichotomous. For an example of this estimation where dependent variables include a mix of continuous and non-continuous dependent variables, see Dennis, Nandy, and Sharpe (2000). Our estimation differs from Dennis et al. (2000) as in their estimation the dependent variables are either continuous, discrete, or censored, while in our estimation the dependent variables are either continuous or discrete. Dennis et al. (2000) apply Nelson and Olsen (1978). This exposition corresponds very closely to Maddala (1983). Also see Keshk (2003).

estimate $\prod_2 / \sigma_2$, where $\sigma_2^2 = Var(v_2)$. We therefore rewrite the reduced form model (16) as:

$$\text{DUALMM}_t^* = \frac{\text{DUALMM}_t}{\sigma_2} = \frac{\prod_2}{\sigma_2}\text{X} + \frac{v_2}{\sigma_2} = \prod_2^* \text{X} + v_2^*, \tag{17}$$

and rewrite the structural equations (11) and (12) as:

$$\text{EQSPRD}_t = \gamma_1 \sigma_2 \text{DUALMM}_t^* + \beta_1' \text{X}_1 + e_1 \tag{18}$$

and

$$\text{DUALMM}_t^* = \frac{\gamma_2}{\sigma_2}\text{EQSPRD}_t + \frac{\beta_2'}{\sigma_2}\text{X}_2 + \frac{e_2}{\sigma_2}, \tag{19}$$

We then estimate equations (18) and (19) using a two-stage procedure. In the first stage, we estimate $\prod_1$ through ordinary least squares estimation of the reduced form model (15), and estimate $\prod_2^*$ through probit maximum likelihood estimation of the reduced form model (17). This results in the estimates $\hat{\prod}_1$ and $\hat{\prod}_2^*$. In the second stage, we substitute DUALMM_t^* with $\hat{\prod}_2^* \text{X}$ in the structural equation (18) and estimate the equation using ordinary least squares estimation. We then substitute EQSPRD_t with $\hat{\prod}_1 \text{X}$ in structural equation (19) and estimate the equation using probit maximum likelihood estimation.

Following a procedure similar to Amemiya (1979), Maddala (1983) derives the following asymptotic covariance matrix. Define $\alpha_1' = (\gamma_1 \sigma_2, \beta_1')$ and $\alpha_2' = (\gamma_2 / \sigma_2, \beta_2' / \sigma_2)$. The corrected variances are

$$\text{Var}(\hat{\alpha}_1) = c(H'X'XH)^{-1} + (\gamma_1 \sigma_2)^2 (H'X'XH)^{-1} H'X'XV_0 X'XH(H'X'XH)^{-1} \tag{20}$$

and

$$\mathrm{Var}(\hat{\alpha}_2) = (G'V_0^{-1}G)^{-1} + d(G'V_0^{-1}G)^{-1}G'V_0^{-1}(X'X)^{-1}V_0^{-1}G(G'V_0^{-1}G)^{-1}, \qquad (21)$$

where

$$c = \sigma_1^2 - 2\gamma_1\sigma_{12}, \qquad (22)$$

$$d = (\gamma_2/\sigma_2)^2\sigma_1^2 - 2(\gamma_2/\sigma_2)(\sigma_{12}/\sigma_2), \qquad (23)$$

$$H = (\Pi_2, J_1), \qquad (24)$$

$$G = (\Pi_2, J_2), \qquad (25)$$

$$V_0 = Var(\hat{\Pi}_2), \qquad (26)$$

and J_1 and J_2 are matrices of ones and zeros such that $XJ_1 = X_1$ and $XJ_2 = X_2$.

The instruments we use in Equation (18) to identify equity market liquidity are EQUITYRETURN and EQUITYINDEXRETURN; both are unlikely to determine the decision of becoming dual market makers. In Equation (19), the instruments used to identify the dual market maker decision are the loan market characteristics - FINCOV, SECURED, PPC, FACILITYSIZ, NUMSYN and LOANNBA - that are unlikely to affect the equity market liquidity. The control variables in both equations are: PD, DPD_t, LAGDPD, $\mathrm{EQSTDEV}_t$, $\mathrm{LEVERAGE}_t$, $\mathrm{INCOMETOA}_t$, EPS_t, $\ln(\mathrm{MV}_t)$, and $\mathrm{TANGIBLE}_t$. Equations (18) and (19) are jointly estimated six times: Using the daily, weekly, and monthly measures of EQSTDEV, both with and without the industry dummy variables.

For the loan market, we jointly estimate the equations (18) and (19) with LOANSPRD in place of the EQSPRD variable. That is, we estimate

$$\mathrm{LOANSPRD}_t = \gamma_1\sigma_2\mathrm{DUALMM}_t^* + \beta_1'\mathrm{X}_1 + e_1 \qquad (27)$$

and

$$\mathrm{DUALMM}_t^* = \frac{\gamma_2}{\sigma_2}\mathrm{LOANSPRD}_t + \frac{\beta_2'}{\sigma_2}\mathrm{X}_2 + \frac{e_2}{\sigma_2}, \qquad (28)$$

where

X_1 = [CONSTANT, LOANRETURN$_t$, LOANINDEXRETURN$_t$, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, NUMSYN, FINCOV, SECURED, RATEAISD, PPC, ln(FACILITYSIZE), INDUSTRY DUMMIES] (29)

X_2 = [CONSTANT, LOANNBA, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, NUMSYN, FINCOV, SECURED, PPC, ln(FACILITYSIZE), INDUSTRY DUMMIES] (30)

where all variables are defined in Table 1, and INDUSTRY DUMMIES represent the industry control variables as discussed earlier. The instruments we use in equation (27) to identify loan market liquidity measures are LOANINDEXRETURN and LOANRETURN. The instrument we use in equation (28) to identify the decision of becoming dual market makers is LOANNBA.

5. Empirical Results

5.1 Equity Market Liquidity Effects

To examine how the participation of dual market makers who have private information about the company affect the structure of the equity market, we jointly estimate equations (18) and (19) by regressing the equity spread on a dummy variable indicating whether the equity market maker is the lead syndicate, while simultaneously controlling for the determinants for the syndicate's decision of becoming an equity market maker.

Table 4, Panel A presents the results for the equity spread equation (18). The presence of a dual market maker significantly decreases the equity spread. After controlling for firm-specific and industry effects, the DUALMM variable has a statistically significant (at the 1% level) coefficient that ranges from -0.235 to -0.479 across different specifications. That is, the presence of an equity market maker that is also the lead arranger of a bank loan syndicate decreases the equity spread by between 23.5 to 47.9 basis points. Given that the average equity spread is 111 basis points (see Table 1), the effect of the dual market maker is economically important. This result confirms *Implication 1* that the loan syndicate lead arranger with an information advantage becomes a natural liquidity provider in the equity market and therefore, the presence of a dual market maker decreases overall equity spreads.

In addition, Table 4, Panel A shows that the equity spread narrows when the equity return is positive and widens when the default probability is high or increasing. The spread also correlates positively with all equity volatility measures, consistent with the idea that risk averse market makers charges a higher spreads for more volatile stocks (see, for example, Ho and Stoll, 1981). Equity spreads are also wider the greater the firm's leverage, income to assets earnings per share and tangible assets. The equity of larger firms with greater market capitalization are more liquid, as evidenced by the negative relationship between equity spreads and market capitalization shown in Table 4, Panel A. The adjusted R^2 values show that our specifications are able to explain between 39.6% to 44.3% of the variation in the equity spreads.

Table 4, Panel B describes the determinants of decision to become a dual market maker, as estimated in equation (19). The likelihood of having a dual market maker is higher if trading in stocks based on the lead arranger's information advantage is more profitable: that is, when the stock return volatility is high (especially the daily stock volatility) and when the equity market is large (for the specifications including the industry dummy variables). Lead arrangers are less likely to trade in the equity market if they have less information advantage relative to the other equity market makers; for example, a company that has more tangible assets, and therefore offers a more transparent information environment for equity trading. The lead arrangers are more likely to trade in the equity market when potential competition in the loan market from similarly informed arrangers are high, which is reflected in the positive coefficients on variables LOANNBA and NUMBSYN. Moreover, the lead arranger is more likely to become a dual market maker when it has an informational monopoly over all other equity market makers. This is the case when there are no financial covenants (i.e., FINCOV =0) that require the sharing of private information with other syndicate members. The negative (and significant at the 1% level) coefficient on the FINCOV variable suggests that the more information available to traders in the syndicated bank loan market other than the lead arranger, the less likely the presence of a dual market maker. These findings are consistent with *Implication 3*. Equity spreads, however, do not significantly impact the choice to become a dual market maker.

5.2 Loan Market Liquidity Effects

Table 5, Panel A presents the effect of dual market maker on loan market liquidity estimated from equation (27). The joint participation of lead arrangers in both the loan and the equity market significantly decreases the loan spread and enhances the loan market liquidity. The statistically significant (at the 1% level) coefficient on DUALMM ranges from -0.503 to -0.984 across different specifications, suggesting that having a dual market maker in both the equity and loan market helps to decrease the loan spreads by between 50.3 to 98.4 basis points. These effects are economically significant compared to the average loan spread of 121 basis points (see Table 1). This finding is consistent with *Implication 2* suggesting that, by participating in the equity market, the lead arranger learns valuable information from the equity market order flows that allows it to be a more effective and more competitive market maker in the loan market, which in turn decreases the overall loan spread.

Also note that the marginal effect of DUALMM on spread is greater for the loan market than for the equity market (23.5 to 47.9 basis points), given the roughly similar average spreads in both markets. [16] This can be driven by the fact that the equity market is a substantially more liquid market with more competing market makers and other types of traders, while the loan market is relatively illiquid with a limited number of major players. Therefore, when one player has an informational advantage by virtue of its status as a dual market maker, its effect on loan spreads is substantial. The significance of the coefficients on the DUALMM variable in both the equity spread and loan spread estimations shown in Panel A of both Tables 4 and 5 provides support for *Implication 4*. That is, the presence of a dual market maker significantly reduces spreads in both the equity and loan markets.

[16] Although the average relative equity spread of 111 basis points is almost as large as the average relative loan spread of 121 basis points, this is attributable to the larger price denominations of loans relative to stocks. In absolute terms, the average equity spread is approximately \$0.10, much lower than the average loan spread of approximately \$1.05.

Several other variables also contribute to the loan market liquidity. Loan spreads decrease with increases in the loan prices and overall loan market prices, but increase when the default probability is high or increasing. The firm's equity return volatility is also positively related to the loan spread. The loan market is more liquid (loan spreads are narrower) for a company with a more transparent information environment; i.e., loan spreads tend to be smaller for larger firms, firms with more tangible assets, and firms with financial covenants requiring the release of financial information to all syndicate members.

Table 5, Panel B describes the determinants of the dual market maker decision from the loan market perspective estimation of equation (28). Lead arrangers are less likely to become equity market makers when the loan spread is large. This is because a large loan spread indicates large profit opportunities trading in the loan market alone, and therefore there is less need to incur the fixed setup cost required to become an equity market maker. However, lead arrangers are more likely to trade in the equity market when potential competition in the loan market from similarly informed arrangers are high, which is reflected in the positive coefficients on variables LOANNBA and NUMBSYN and the negative coefficients on the FINCOV variable.

On the other hand, the dual market maker probability is higher the more profitable the equity trading opportunities using the lead arranger's information advantage; i.e., the higher the stock return volatility and the larger the equity market size. Lead arrangers are less likely to trade in the equity market if they have less information advantage relative to the other equity market makers, for example, if a company has more tangible assets and therefore, a more transparent information environment for equity trading. These results are consistent with *Implication 3.*

6. Conclusions

This paper is the first to identify the phenomenon of a dual market maker – i.e., a financial intermediary that simultaneously serves as a lead arranger for a syndicated bank loan and acts as an equity market maker for the borrowing firm's stock. The lead arranger of a syndicated bank loan possesses private information about the borrowing firm, typically obtained over the course of a long-term lending relationship. We extend the Glosten and Milgrom (1985) model to consider the impact on market liquidity of the presence of such an informed market maker. The theoretical model generates implications that are tested empirically using a sample of equity market and syndicated bank loan market spreads.

Our theoretical model implies that loan and equity market spreads are simultaneously determined. Moreover, the choice to become a dual market maker is endogenous. To estimate the resulting system of equations, our empirical model applies Maddala's (1983) two-stage procedure that permits simultaneous multivariate estimation of dependent variables that are both continuous (spreads) and discrete (the probability of becoming a dual market maker). We find empirical support for the simultaneous determination of equity and loan market spreads.

We also find support for the theoretical proposition that the participation of a dual market maker decreases the degree of information asymmetry in the equity market and, therefore, narrows the bid-ask spread in the equity market. That is, equity markets become more liquid in the presence of a dual market maker. Moreover, the lead arranger of a syndicated bank loan has more of an incentive to become an equity market maker when the profit opportunity of market making is high. This occurs when the dual market maker has a greater informational advantage over other equity market makers, and when the profit opportunity in the loan market is low due to factors such as relatively low loan spreads and more competition.

In addition, we estimate the impact of a dual market maker on loan market spreads. The presence of a dual market maker is found to increase liquidity in the secondary market for syndicated bank loans. That is, the bid-ask spread in the syndicated bank loan market is narrower when the lead arranger can use the equity market information it obtains as an equity market maker to trade in the syndicated bank loan market. Thus, the information obtained in the equity market can be used to generate trading opportunities in the loan market and vice versa. We therefore find support for a *liquidity enhancement effect* in both the equity and syndicated bank loan market in the presence of dual market makers.

Appendix: Derivation of Proposition 1

To solve for $\Pr\{V=\underline{V}\mid S,I\}$, we first consider the case where the market maker's signal indicates that the asset is of low value: $I=\underline{V}$. Following Bayes rule, the conditional probability is given by

$$\Pr\{V=\underline{V}\mid S,I=\underline{V}\}= \frac{\Pr\{S,I=\underline{V}\mid V=\underline{V}\}\Pr\{V=\underline{V}\}}{\Pr\{S,I=\underline{V}\mid V=\underline{V}\}\Pr\{V=\underline{V}\}+\Pr\{S,I=\underline{V}\mid V=\overline{V}\}\Pr\{V=\overline{V}\}} \tag{A1}$$

If $V=\underline{V}$, the informed investor will sell with probability 1 and the uninformed investor will sell with probability 0.5. The probability of seeing a sale and receiving a low signal if $V=\underline{V}$ is:

$$\begin{aligned}&\Pr\{S,I=\underline{V}\mid V=\underline{V}\}\\ &=\Pr\{S^i,I=\underline{V}\mid V=\underline{V}\}\Pr\{\text{informed}\}+\Pr\{S^n,I=\underline{V}\mid V=\underline{V}\}\Pr\{\text{liquidity}\},\\ &=k\gamma+0.5k(1-\gamma)=0.5k(1+\gamma)\end{aligned} \tag{A2}$$

where S^i indicates that the sell order is from the informed investor and S^n indicates that the sell order is from the liquidity trader.

Similarly,

$$\begin{aligned}&\Pr\{S,I=\underline{V}\mid V=\overline{V}\}\\ &=\Pr\{S^i,I=\underline{V}\mid V=\overline{V}\}\Pr\{\text{informed}\}+\Pr\{S^n,I=\underline{V}\mid V=\overline{V}\}\Pr\{\text{liquidity}\}\\ &=0+0.5(1-k)(1-\gamma)=0.5(1-k)(1-\gamma)\end{aligned} \tag{A3}$$

Using equation (4) and (5), we can solve for the probability of seeing a sale and receiving a low signal if $V=\underline{V}$ in equation (3) as:

$$\Pr\{V=\underline{V}\mid S,I=\underline{V}\}=\frac{k(1+\gamma)\delta}{k(1+\gamma)\delta+(1-k)(1-\gamma)(1-\delta)} \tag{A4}$$

The probability of seeing a sale and receiving a low signal if $V=\overline{V}$ is simply $\Pr\{V=\overline{V}\mid S, I=\underline{V}\}=1-\Pr\{V=\underline{V}\mid S, I=\underline{V}\}$.

Consider the second scenario, when the market maker receives a low value signal and a buy order, the probability that the true value is low is

$$\Pr\{V=\underline{V}\mid B, I=\underline{V}\}=\frac{\Pr\{B, I=\underline{V}\mid V=\underline{V}\}\Pr\{V=\underline{V}\}}{\Pr\{B, I=\underline{V}\mid V=\underline{V}\}\Pr\{V=\underline{V}\}+\Pr\{B, I=\underline{V}\mid V=\overline{V}\}\Pr\{V=\overline{V}\}} \quad \text{(A5)}$$

Solving for the two conditional probabilities, we have:

$$\begin{aligned}&\Pr\{B, I=\underline{V}\mid V=\underline{V}\}=\Pr\{B^i, I=\underline{V}\mid V=\underline{V}\}\gamma+\Pr\{B^n, I=\underline{V}\mid V=\underline{V}\}(1-\gamma)\\&=0+0.5k(1-\gamma)=0.5k(1-\gamma)\end{aligned}$$

and

$$\begin{aligned}&\Pr\{B, I=\underline{V}\mid V=\overline{V}\}=\Pr\{B^i, I=\underline{V}\mid V=\overline{V}\}\gamma+\Pr\{B^n, I=\underline{V}\mid V=\overline{V}\}(1-\gamma)\\&=(1-k)\gamma+0.5(1-k)(1-\gamma)=0.5(1-k)(1+\gamma)\end{aligned}.$$

Therefore, equation (A5) becomes

$$\Pr\{V=\underline{V}\mid B, I=\underline{V}\}=\frac{k(1-\gamma)\delta}{k(1-\gamma)\delta+(1-k)(1+\gamma)(1-\delta)} \quad \text{(A6)}$$

In the third scenario, the market maker receives a high value signal and a sell order, the probability that the true value is low is

$$\Pr\{V=\underline{V}\mid S, I=\overline{V}\}=\frac{\Pr\{S, I=\overline{V}\mid V=\underline{V}\}\Pr\{V=\underline{V}\}}{\Pr\{S, I=\overline{V}\mid V=\underline{V}\}\Pr\{V=\underline{V}\}+\Pr\{S, I=\overline{V}\mid V=\overline{V}\}\Pr\{V=\overline{V}\}} \quad \text{(A7)}$$

Solving for the two conditional probabilities in equation (A7), we have:

$$\begin{aligned}&\Pr\{S, I=\overline{V}\mid V=\underline{V}\}=\Pr\{S^i, I=\overline{V}\mid V=\underline{V}\}\gamma+\Pr\{S^n, I=\overline{V}\mid V=\underline{V}\}(1-\gamma)\\&=(1-k)\gamma+0.5(1-k)(1-\gamma)=0.5(1-k)(1+\gamma)\end{aligned}$$

and

$$\Pr\left\{S, I=\overline{V} \mid V=\underline{V}\right\}=\Pr\left\{S^{i}, I=\overline{V} \mid V=\underline{V}\right\}\gamma+\Pr\left\{S^{n}, I=\overline{V} \mid V=\underline{V}\right\}(1-\gamma)$$
$$=0+0.5k(1-\gamma)=0.5k(1-\gamma)$$

Therefore, equation (9) becomes

$$\Pr\left\{V=\underline{V} \mid S, I=\overline{V}\right\}=\frac{(1-k)(1+\gamma)\delta}{(1-k)(1+\gamma)\delta+k(1-\gamma)(1-\delta)} \tag{A8}$$

In the fourth scenario, the market maker received a high value signal and a buy order, the probability that the true value is low is

$$\Pr\left\{V=\underline{V} \mid B, I=\overline{V}\right\}=$$
$$\frac{\Pr\left\{B, I=\overline{V} \mid V=\underline{V}\right\}\Pr\left\{V=\underline{V}\right\}}{\Pr\left\{B, I=\overline{V} \mid V=\underline{V}\right\}\Pr\left\{V=\underline{V}\right\}+\Pr\left\{B, I=\overline{V} \mid V=\overline{V}\right\}\Pr\left\{V=\overline{V}\right\}} \tag{A9}$$

Solving for the two conditional probabilities in equation (A9), we have:

$$\Pr\left\{B, I=\overline{V} \mid V=\underline{V}\right\}=\Pr\left\{B^{i}, I=\overline{V} \mid V=\underline{V}\right\}\gamma+\Pr\left\{B^{n}, I=\overline{V} \mid V=\underline{V}\right\}(1-\gamma)$$
$$=0+0.5(1-k)(1-\gamma)=0.5(1-k)(1-\gamma)$$

and

$$\Pr\left\{B, I=\overline{V} \mid V=\overline{V}\right\}=\Pr\left\{B^{i}, I=\overline{V} \mid V=\overline{V}\right\}\gamma+\Pr\left\{B^{n}, I=\overline{V} \mid V=\underline{V}\right\}(1-\gamma)$$
$$=k\gamma+0.5k(1-\gamma)=0.5k(1+\gamma)$$

Therefore, equation (A9) becomes

$$\Pr\left\{V=\underline{V} \mid B, I=\overline{V}\right\}=\frac{(1-k)(1-\gamma)\delta}{(1-k)(1-\gamma)\delta+k(1+\gamma)(1-\delta)} \tag{A10}$$

With the conditional probability for these four scenarios determined, we can calculate the market maker's expected value of the asset when he receives a signal of low value:

$$\begin{aligned} E[V \mid B, I=\underline{V}] &= \underline{V}\Pr\left\{V=\underline{V} \mid B, I=\underline{V}\right\}+\overline{V}\Pr\left\{V=\overline{V} \mid B, I=\underline{V}\right\} \\ &= \underline{V}+\frac{(1-k)(1+\gamma)(1-\delta)}{k(1-\gamma)\delta+(1-k)(1+\gamma)(1-\delta)}(\overline{V}-\underline{V}) \end{aligned} \tag{A11}$$

and

$$
\begin{aligned}
E[V \mid S, I = \underline{V}] &= \underline{V}\Pr\{V = \underline{V} \mid S, I = \underline{V}\} + \overline{V}\Pr\{V = \overline{V} \mid S, I = \underline{V}\} \\
&= \underline{V} + \frac{(1-k)(1-\gamma)(1-\delta)}{k(1+\gamma)\delta + (1-k)(1-\gamma)(1-\delta)}(\overline{V} - \underline{V})
\end{aligned}
\tag{A12}
$$

Similarly, the market maker's expected value of the asset when he receives a signal of high value is:

$$
\begin{aligned}
E[V \mid B, I = \overline{V}] &= \underline{V}\Pr\{V = \underline{V} \mid B, I = \overline{V}\} + \overline{V}\Pr\{V = \overline{V} \mid B, I = \overline{V}\} \\
&= \underline{V} + \frac{k(1+\gamma)(1-\delta)}{(1-k)(1-\gamma)\delta + k(1+\gamma)(1-\delta)}(\overline{V} - \underline{V})
\end{aligned}
\tag{A13}
$$

and

$$
\begin{aligned}
E[V \mid S, I = \overline{V}] &= \underline{V}\Pr\{V = \underline{V} \mid S, I = \overline{V}\} + \overline{V}\Pr\{V = \overline{V} \mid S, I = \underline{V}\} \\
&= \underline{V} + \frac{k(1-\gamma)(1-\delta)}{(1-k)(1+\gamma)\delta + k(1-\gamma)(1-\delta)}(\overline{V} - \underline{V})
\end{aligned}
\tag{A14}
$$

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Table 1: Descriptive statistics. Variables, variable descriptions, number of observations, mean, median and standard deviation are reported for a sample of syndicated bank loans that had at least two quotes from loan dealers on a given date between January 1999 and May 2003.

Variable	Variable Description	Number	Mean	Median	Standard Dev.
DUALMM	Dual market maker dummy	22,826	0.2244	0.00	0.4172
LOANSPRD	Relative loan spread (%)	22,826	1.2109	0.66	2.1054
LOANRETURN	Loan return	22,826	-0.0001	0.00	0.0106
LOANINDEXRETURN	Loan index return	22,698	-0.0002	0.00	0.0032
LOANNBA	Sum of loan bid and ask quotations	22,826	8.0191	6.00	5.6000
EQSPRD	Relative equity spread (%)	22,826	1.1139	0.44	2.2897
EQUITYRETURN	Equity return	22,826	0.0027	0.00	0.0991
EQUITYINDEXRETURN	Equity index return	22,826	-0.0024	0.00	0.0307
EQSTDEV_DAILY	Daily equity volatility	21,724	0.0352	0.0333	0.0125
EQSTDEV_WEEKLY	Weekly equity volatility	19,771	0.0756	0.0701	0.0271
EQSTDEV_MONTHLY	Monthly equity volatility	21,602	0.1599	0.1448	0.0670
PD	Implied probability of default	22,826	0.0367	0.00	0.0971
DPD	Change in implied probability of default	21,826	0.0004	0.00	0.0124
LAGDPD	Lagged change in implied probability of default	20,726	0.0004	0.00	0.0123
FINCOV	Financial covenant dummy	22,826	0.8334	1.00	0.3726
SECURED	Collateralization dummy	22,826	0.8408	1.00	0.3658
RATEAISD	Basis point loan spread at initiation	22,826	266.0756	275.00	105.8605
PPC	Performance pricing grid dummy	22,826	0.3785	0.00	0.4850
FACILITYSIZE	Loan facility size	22,826	479.3394	285.00	579.0908
NUMBSYN	Number of syndicate members at initiation	22,595	17.5789	15.00	14.6432
LEVERAGE	Total debt/total assets	22,826	0.5151	0.50	0.2258
INCOMETOA	Operating income before depreciation/total assets	21,643	0.1267	0.12	0.0769
EPS	Earnings per share	22,826	-0.8212	0.54	31.9816
TANGIBLE	Gross property, plant and equipment/total assets	21,490	0.5153	0.40	0.3400
MV	Market value (Million $)	22,826	2,704	1,122	6,614

Table 2: Correlations. Correlations between the variables in our sample. Correlations in bold are statistically significant at the 10% level or better.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
DUALMM	(1)																								
LOANSPRD	(2)	**0.09**																							
LOANRETURN	(3)	0.01	**-0.08**																						
LOANINDEXRETURN	(4)	**-0.02**	**-0.03**	**0.10**																					
LOANNBA	(5)	**0.17**	**-0.08**	0.00	0.00																				
EQSPRD	(6)	**-0.07**	**0.22**	**-0.06**	**-0.06**	**-0.08**																			
EQUITYRETURN	(7)	0.00	**-0.02**	**0.12**	**0.07**	**0.01**	**-0.05**																		
EQUITYINDEXRETURN	(8)	**-0.04**	0.01	**-0.03**	0.00	0.00	**0.01**	**0.25**																	
EQSTDEV_DAILY	(9)	**0.04**	**0.38**	0.00	-0.01	-0.01	**0.43**	**0.01**	0.01																
EQSTDEV_WEEKLY	(10)	**0.04**	**0.36**	0.01	0.00	**-0.02**	**0.37**	**0.02**	0.01	**0.94**															
EQSTDEV_MONTHLY	(11)	**0.12**	**0.30**	**0.02**	-0.01	**0.03**	**0.30**	**0.02**	0.00	**0.84**	**0.83**														
PD	(12)	0.00	**0.30**	**-0.07**	0.00	**0.03**	**0.48**	-0.01	0.01	**0.59**	**0.59**	**0.45**													
DPD	(13)	0.00	**0.08**	**-0.19**	**-0.07**	0.00	**0.10**	**-0.23**	**-0.03**	**0.04**	0.01	**0.01**	**0.17**												
LAGDPD	(14)	-0.01	**0.10**	**-0.17**	**-0.06**	0.00	**0.11**	**-0.02**	**0.04**	**0.05**	**0.03**	**0.01**	**0.21**	**0.19**											
FINCOV	(15)	**-0.02**	**-0.08**	**-0.01**	**0.01**	**0.16**	**-0.03**	0.00	0.00	**0.02**	0.00	**0.02**	**-0.06**	0.00	0.00										
SECURED	(16)	**0.06**	**-0.01**	**-0.02**	**0.00**	**0.17**	**0.03**	-0.01	0.00	**0.01**	**0.04**	-0.01	**0.08**	0.01	0.01	**0.16**									
RATEAISD	(17)	**0.02**	**0.10**	**-0.02**	-0.01	**0.12**	**0.21**	-0.01	0.01	**0.29**	**0.34**	**0.27**	**0.33**	**0.02**	**0.02**	0.01	**0.46**								
PPC	(18)	**-0.10**	0.01	**-0.01**	**0.04**	**-0.12**	**0.09**	**-0.01**	0.00	0.01	**-0.02**	**0.04**	**0.08**	**0.02**	**0.03**	**0.20**	**-0.02**	**-0.11**							
FACILITYSIZE	(19)	**0.07**	**-0.03**	**0.01**	0.00	**0.28**	**-0.10**	0.00	0.00	**0.02**	-0.01	**0.01**	**-0.03**	-0.01	**-0.01**	**-0.06**	**-0.25**	**-0.22**	**-0.04**						
NUMBSYN	(20)	**0.07**	0.01	0.00	**-0.02**	**0.15**	**-0.06**	0.00	0.00	**-0.02**	**-0.03**	**-0.02**	**-0.01**	0.00	0.00	**0.14**	**-0.06**	**-0.08**	**0.04**	**0.24**					
LEVERAGE	(21)	**0.02**	**0.11**	**-0.04**	**-0.04**	**0.04**	**0.32**	**-0.03**	0.01	**0.27**	**0.32**	**0.27**	**0.32**	**0.04**	**0.04**	**-0.15**	**0.12**	**0.26**	**-0.07**	**-0.08**	-0.01				
INCOMETOA	(22)	**0.06**	**-0.08**	0.00	-0.01	0.01	**-0.08**	**0.02**	0.00	**-0.25**	**-0.26**	**-0.22**	**-0.17**	**-0.02**	**-0.03**	**0.09**	**0.09**	**-0.19**	**-0.03**	**-0.10**	**-0.07**	**-0.14**			
EPS	(23)	**0.02**	**-0.11**	**0.08**	0.00	**0.01**	**-0.08**	**0.03**	0.00	**-0.16**	**-0.33**	**-0.21**	**-0.18**	**-0.13**	**-0.13**	**0.05**	0.00	**-0.03**	0.00	**-0.02**	**-0.02**	**-0.02**	**0.08**		
TANGIBLE	(24)	**-0.05**	**0.02**	0.00	0.01	**-0.02**	**0.16**	0.00	0.00	**0.03**	-0.01	**-0.08**	**0.11**	0.01	0.01	**-0.16**	0.00	**0.04**	**-0.04**	0.01	**-0.08**	**0.19**	0.00	0.00	
MV	(25)	**0.03**	**-0.04**	**0.02**	0.00	**-0.02**	**-0.13**	**0.01**	0.00	**-0.12**	**-0.16**	**-0.14**	**-0.11**	**-0.02**	**-0.02**	**-0.24**	**-0.27**	**-0.21**	**-0.11**	**0.49**	**0.04**	**-0.17**	**0.04**	**0.02**	**0.03**

Table 3: Financial and General Covenants. The incidence of financial covenants and general covenants for our sample of liquid syndicated bank loans. The *Debt to EBITDA Compliance* variable is constructed using Compustat data as of year-end in the year of the loan's origination as follows: {DATA9 (Long Term Debt) / (Data 18 (Income before EI) + Data 15 (Interest Expense) + Data 16 (Income Taxes) + Data 14 (Depreciation & Amortization))} minus the initial maximum debt to EBITDA covenant requirement. General covenants restrict the use of cash flows from asset sales, insurance payoffs, equity or debt issues, as well as state the voting requirements for renegotiation of the loan's terms.

	Number of Facilities	Proportion of Facilities	Mean	Median
Financial Covenant Description				
Maximum debt to EBITDA ratio (Initial)	249	64.84%	6.00	6.00
Maximum debt to EBITDA ratio (Eventual)	242	63.02%	3.69	3.50
Minimum net worth (Base, Million $)	73	19.01%	301.56	190.00
Maximum senior debt to EBITDA (Initial)	53	13.80%	4.11	3.75
Maximum senior debt to EBITDA (Eventual)	49	12.76%	2.86	2.75
Minimum net worth (Percentage)	16	4.17%	70.63	75.00
Minimum current ratio (Initial)	8	2.08%	1.23	1.25
Minimum tangible net worth (Base, Million $)	7	1.82%	784.50	500.00
Maximum debt to equity ratio (Initial)	1	0.26%	5.75	5.75
Maximum debt to equity ratio (Eventual)	1	0.26%	3.25	3.25
Minimum tangible net worth (Percentage)	1	0.26%	50.00	50.00
General Covenant Description				
Dividend restrictions	303	78.91%	1.30	1
% of syndicate required for nonmaterial changes	300	78.13%	52.16	51
Insurance proceeds sweep	290	75.52%	58.61	100
Asset sales sweep	288	75.00%	94.67	100
Equity issue sweep	288	75.00%	51.78	50
Debt issue sweep	287	74.74%	78.92	100
% of syndicate required for changes in loan terms	285	74.22%	100.00	100
Excess cash flow sweep	284	73.96%	47.52	50
Collateral release	256	66.67%	98.05	100
Percent of excess cash flow	232	60.42%	51.09	51

Table 4. Joint multivariate estimation of equity spreads and dual market maker decision. We utilize a two-stage probit least squares estimation method corresponding to Maddala (1983) to simultaneously estimate $\mathrm{EQSPRD}_t = \gamma_1 \mathrm{DUALMM}_t + \beta_1' \mathrm{X}_1 + e_1$ and $\mathrm{DUALMM}_t = \gamma_2 \mathrm{EQSPRD}_t + \beta_2' \mathrm{X}_2 + e_2$, where X_1 = [CONSTANT, $\mathrm{EQUITYRETURN}_t$, $\mathrm{EQUITYINDEXRETURN}_t$, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, INDUSTRY DUMMIES], X_2 = [CONSTANT, FINCOV, SECURED, PPC, ln(FACILITYSIZE), NUMBSYN, $\mathrm{LOANNBA}_t$, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, INDUSTRY DUMMIES], and INDUSTRY DUMMIES represent the industry control variables FRENCH1-FRENCH12, excluding the base case reference dummies FRENCH4 and FRENCH6.

Panel A: Estimation of the equity spread equation.

	EQSPRD	EQSPRD	EQSPRD	EQSPRD	EQSPRD	EQSPRD
DUALMM	-0.417***	-0.449***	-0.479***	-0.257***	-0.235***	-0.340***
	(0.058)	(0.054)	(0.057)	(0.060)	(0.059)	(0.061)
EQUITYRETURN	-0.819***	-0.762***	-0.679***	-0.794***	-0.732***	-0.655***
	(0.152)	(0.162)	(0.157)	(0.145)	(0.153)	(0.149)
EQUITYINDEXRETURN	-0.020	-0.172	-0.214	0.278	0.226	0.004
	(0.498)	(0.519)	(0.508)	(0.481)	(0.497)	(0.492)
PD	4.185***	5.072***	5.558***	4.215***	5.001***	5.821***
	(0.195)	(0.202)	(0.186)	(0.200)	(0.204)	(0.196)
DPD	1.331	3.302**	2.566**	1.271	3.134**	2.486**
	(1.193)	(1.351)	(1.292)	(1.131)	(1.269)	(1.229)
LAGDPD	3.365***	2.652**	1.634	2.674**	1.853	0.892
	(1.198)	(1.280)	(1.280)	(1.142)	(1.208)	(1.223)
EQSTDEV_DAILY	39.850***			42.942***		
	(1.681)			(2.088)		
EQSTDEV_WEEKLY		11.666***			10.014***	
		(0.866)			(1.013)	
EQSTDEV_MONTHLY			4.273***			4.052***
			(0.368)			(0.438)
LEVERAGE	1.010***	1.050***	1.040***	0.831***	1.124***	0.907***
	(0.084)	(0.093)	(0.083)	(0.077)	(0.087)	(0.077)
INCOMETOA	2.103***	1.730***	1.796***	0.639**	-0.955***	0.416
	(0.231)	(0.264)	(0.242)	(0.248)	(0.292)	(0.268)
EPS	0.010***	0.017***	0.015***	0.004***	0.023***	0.015***
	(0.002)	(0.003)	(0.004)	(0.001)	(0.003)	(0.003)
LMV	-0.520***	-0.554***	-0.517***	-0.505***	-0.593***	-0.525***
	(0.018)	(0.018)	(0.019)	(0.025)	(0.025)	(0.026)
TANGIBLE	0.596***	0.549***	0.607***	0.964***	0.983***	0.903***
	(0.047)	(0.048)	(0.047)	(0.053)	(0.055)	(0.054)
INTERCEPT	8.924***	10.146***	9.484***	7.911***	10.778***	9.231***
	(0.464)	(0.478)	(0.490)	(0.736)	(0.707)	(0.765)
INDUSTRY DUMMIES				YES	YES	YES
Adj. R^2	0.414	0.401	0.396	0.443	0.432	0.424
N	17545	16826	17418	17536	16817	17409

Panel B: Estimation of the dual market maker equation.

	DUALMM	DUALMM	DUALMM	DUALMM	DUALMM	DUALMM
EQSPRD	0.000	-0.024	-0.057	-0.004	-0.009	-0.043
	(0.165)	(0.180)	(0.216)	(0.168)	(0.183)	(0.219)
FINCOV	-0.306***	-0.510***	-0.326***	-0.283***	-0.459***	-0.286**
	(0.050)	(0.041)	(0.050)	(0.109)	(0.103)	(0.127)
SECURED	0.343***	0.370***	0.361***	0.406***	0.399***	0.437***
	(0.088)	(0.120)	(0.120)	(0.073)	(0.104)	(0.103)
PPC	-0.089***	-0.042	-0.097**	-0.031	0.002	-0.034
	(0.029)	(0.038)	(0.040)	(0.040)	(0.052)	(0.053)
LN(FACILITYSIZE)	0.060***	0.097***	0.071**	0.063**	0.077***	0.065*
	(0.022)	(0.022)	(0.034)	(0.025)	(0.029)	(0.039)
NUMBSYN	0.005***	0.004***	0.006***	0.005***	0.003***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LOANNBA	0.024***	0.026***	0.022***	0.021***	0.024***	0.017***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
PD	0.292	-0.038	0.446	0.368	0.109	0.707
	(0.647)	(0.892)	(1.126)	(0.685)	(0.900)	(1.184)
DPD	-0.163	0.774	0.485	0.050	1.045	0.464
	(1.059)	(1.307)	(1.311)	(1.063)	(1.312)	(1.315)
LAGDPD	0.806	1.247	1.868*	1.313	1.527	2.115**
	(1.048)	(1.022)	(0.982)	(1.028)	(1.013)	(1.003)
EQSTDEV_DAILY	13.422**			22.744***		
	(5.435)			(6.154)		
EQSTDEV_WEEKLY		9.424***			12.171***	
		(1.390)			(1.474)	
EQSTDEV_MONTHLY			4.754***			5.872***
			(0.429)			(0.463)
LEVERAGE	0.472***	0.302*	0.298	0.328***	0.138	0.128
	(0.136)	(0.166)	(0.195)	(0.112)	(0.178)	(0.161)
INCOMETOA	1.946***	2.171***	2.228***	2.072***	2.174***	2.345***
	(0.316)	(0.261)	(0.297)	(0.215)	(0.346)	(0.229)
EPS	0.019***	0.016***	0.025***	0.009***	0.007	0.013**
	(0.003)	(0.004)	(0.004)	(0.003)	(0.006)	(0.005)
LMV	0.176	0.163	0.152	0.308***	0.291**	0.295*
	(0.115)	(0.134)	(0.158)	(0.117)	(0.141)	(0.169)
TANGIBLE	-0.276**	-0.256**	-0.134	-0.328*	-0.328*	-0.255
	(0.108)	(0.108)	(0.134)	(0.170)	(0.188)	(0.216)
INTERCEPT	-5.885***	-5.835**	-5.722*	-10.596***	-10.038***	-10.536***
	(2.255)	(2.784)	(3.245)	(2.274)	(2.915)	(3.508)
INDUSTRY DUMMIES				YES	YES	YES
Chi^2	1544.180	1749.788	1952.700	2663.522	2769.518	3148.784
N	17545	16826	17418	17536	16817	17409

Table 5. Joint multivariate estimation of loan spreads and dual market maker decision. We utilize a two-stage probit least squares estimation method corresponding to Maddala (1983) to simultaneously estimate $\text{LOANSPRD}_t = \gamma_1 \text{DUALMM}_t^* + \beta_1' \text{X}_1 + e_1$ and $\text{DUALMM}_t = \gamma_2 \text{LOANSPRD}_t + \beta_2' \text{X}_2 + e_2$, where X_1 = [CONSTANT, LOANRETURN_t, LOANINDEXRETURN_t, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, NUMSYN, FINCOV, SECURED, RATEAISD, PPC, ln(FACILITYSIZE), INDUSTRY DUMMIES], X_2 = [CONSTANT, LOANNBA, PD, DPD, LAGDPD, EQSTDEV, LEVERAGE, INCOMETOA, EPS, LMV, TANGIBLE, NUMSYN, FINCOV, SECURED, PPC, ln(FACILITYSIZE), INDUSTRY DUMMIES], and INDUSTRY DUMMIES represent the industry control variables FRENCH1-FRENCH12, excluding the base case reference dummies FRENCH4 and FRENCH6.

Panel A: Estimation of the loan spread equation.

	LOANSPRD	LOANSPRD	LOANSPRD	LOANSPRD	LOANSPRD	LOANSPRD
DUALMM	-0.526***	-0.503***	-0.606***	-0.737***	-0.661***	-0.984***
	(0.087)	(0.079)	(0.093)	(0.132)	(0.116)	(0.185)
LOANRETURN	-13.934***	-11.318***	-13.642***	-13.929***	-11.178***	-14.154***
	(1.062)	(1.086)	(1.144)	(1.270)	(1.255)	(1.554)
LOANINDEXRETURN	-10.183***	-11.361***	-10.781***	-12.865***	-13.644***	-15.592***
	(3.387)	(3.406)	(3.564)	(4.114)	(4.000)	(5.043)
PD	4.641***	4.388***	4.662***	4.584***	4.355***	4.877***
	(0.144)	(0.142)	(0.140)	(0.183)	(0.176)	(0.216)
DPD	-0.286	-0.723	-0.455	-0.110	-0.136	-0.241
	(0.852)	(0.916)	(0.941)	(1.018)	(1.067)	(1.270)
LAGDPD	2.335***	2.520***	3.072***	2.824***	2.921***	3.991***
	(0.877)	(0.891)	(0.961)	(1.055)	(1.033)	(1.323)
EQSTDEV_DAILY	21.560***			31.155***		
	(1.504)			(3.175)		
EQSTDEV_WEEKLY		8.189***			11.310***	
		(0.837)			(1.476)	
EQSTDEV_MONTHLY			5.075***			8.048***
			(0.467)			(1.085)
LEVERAGE	-0.124*	-0.372***	-0.321***	-0.045	-0.294***	-0.269***
	(0.072)	(0.066)	(0.068)	(0.084)	(0.074)	(0.093)
INCOMETOA	1.729***	2.161***	2.084***	2.549***	2.925***	3.577***
	(0.240)	(0.257)	(0.269)	(0.397)	(0.406)	(0.576)
EPS	0.008***	-0.026***	-0.017***	0.004	-0.027***	-0.016***
	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)
LMV	-0.177***	-0.166***	-0.127***	-0.041	-0.068*	0.079
	(0.019)	(0.019)	(0.022)	(0.047)	(0.041)	(0.067)
TANGIBLE	-0.285***	-0.273***	-0.199***	-0.388***	-0.387***	-0.427***
	(0.042)	(0.040)	(0.039)	(0.066)	(0.063)	(0.081)
NUMBSYN	0.008***	0.007***	0.009***	0.009***	0.008***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FINCOV	-0.885***	-1.003***	-0.880***	-0.896***	-0.990***	-0.900***
	(0.037)	(0.047)	(0.039)	(0.049)	(0.059)	(0.060)
SECURED	-0.011	-0.005	0.091*	0.030	-0.031	0.188**
	(0.045)	(0.045)	(0.053)	(0.058)	(0.050)	(0.086)
RATEAISD	-0.001***	-0.000	-0.001***	0.000	0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PPC	-0.049*	-0.053**	-0.095***	-0.036	-0.030	-0.057
	(0.025)	(0.024)	(0.026)	(0.030)	(0.028)	(0.035)
LN(FACILITYSIZE)	0.154***	0.172***	0.124***	0.208***	0.212***	0.185***
	(0.019)	(0.021)	(0.020)	(0.026)	(0.027)	(0.032)
INTERCEPT	3.345***	3.240***	2.297***	-2.021	-0.824	-5.499**
	(0.608)	(0.599)	(0.700)	(1.636)	(1.426)	(2.342)
INDUSTRY DUMMIES				YES	YES	YES
Adj. R^2	0.400	0.390	0.393	0.412	0.402	0.405
N	17431	16714	17308	17422	16705	17299

Panel B: Estimation of the dual market maker equation.

	DUALMM	DUALMM	DUALMM	DUALMM	DUALMM	DUALMM
LOANSPRD	-0.106	-0.141	0.040	-0.259***	-0.306***	-0.151*
	(0.073)	(0.096)	(0.078)	(0.082)	(0.108)	(0.087)
LOANNBA	0.022***	0.025***	0.023***	0.018***	0.020***	0.015***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
PD	0.795**	0.511	0.013	1.508***	1.457***	1.180***
	(0.353)	(0.450)	(0.373)	(0.392)	(0.507)	(0.413)
DPD	-0.096	0.543	0.039	0.390	0.958	0.435
	(0.955)	(1.032)	(0.984)	(1.009)	(1.104)	(1.035)
LAGDPD	1.065	1.546	1.553	2.138**	2.456**	2.581**
	(0.998)	(1.038)	(1.017)	(1.059)	(1.110)	(1.079)
EQSTDEV_DAILY	14.828***			26.183***		
	(1.537)			(1.875)		
EQUITY_STDEV_WEEKLY		9.752***			13.170***	
		(0.646)			(0.751)	
EQUITY_STDEV_MONTHLY			4.582***			6.125***
			(0.253)			(0.305)
LEVERAGE	0.431***	0.206**	0.265***	0.256***	0.021	0.048
	(0.073)	(0.085)	(0.080)	(0.078)	(0.085)	(0.084)
INCOMETOA	2.051***	2.324***	2.142***	2.337***	2.589***	2.552***
	(0.191)	(0.216)	(0.198)	(0.235)	(0.264)	(0.245)
EPS	0.018***	0.010**	0.026***	0.008**	-0.004	0.008*
	(0.003)	(0.005)	(0.005)	(0.003)	(0.005)	(0.005)
LMV	0.149***	0.145***	0.205***	0.239***	0.214***	0.290***
	(0.023)	(0.028)	(0.022)	(0.027)	(0.034)	(0.026)
TANGIBLE	-0.297***	-0.295***	-0.170***	-0.375***	-0.390***	-0.323***
	(0.037)	(0.039)	(0.037)	(0.044)	(0.047)	(0.044)
NUMBSYN	0.006***	0.005***	0.006***	0.007***	0.005***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FINCOV	-0.381***	-0.611***	-0.287***	-0.459***	-0.669***	-0.358***
	(0.061)	(0.079)	(0.062)	(0.067)	(0.086)	(0.067)
SECURED	0.322***	0.362***	0.407***	0.353***	0.347***	0.430***
	(0.038)	(0.040)	(0.038)	(0.042)	(0.044)	(0.041)
PPC	-0.086***	-0.040	-0.085***	-0.034	-0.009	-0.030
	(0.025)	(0.026)	(0.025)	(0.029)	(0.030)	(0.029)
LN(FACILITYSIZE)	0.073***	0.112***	0.059***	0.102***	0.119***	0.075***
	(0.019)	(0.021)	(0.018)	(0.023)	(0.025)	(0.021)
INTERCEPT	-5.246***	-5.339***	-6.848***	-9.057***	-8.191***	-10.315***
	(0.519)	(0.666)	(0.537)	(0.614)	(0.791)	(0.616)
INDUSTRY DUMMIES				YES	YES	YES
Chi^2	1514.18	1748.73	1910.33	2715.11	2900.40	3162.76
N	17431	16714	17308	17422	16705	17299