The Informational Efficiency of the Equity Market As Compared to the Syndicated Bank Loan Market*

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Abstract

The loan market is a hybrid between a public and a private market, comprised of financial institutions with access to private information about borrowing firms. We test whether this is reflected in informationally efficient price formation in the loan market vis a vis the equity markets, and reject this *private information hypothesis.* We also reject a *liquidity hypothesis* which suggests that equity markets always lead loan markets, despite bank lenders' access to private information, because of greater liquidity in equity markets. We further test, and reject, an *asymmetric price reaction hypothesis* that states that loan returns are more sensitive to negative information whereas equity returns respond symmetrically to both positive and negative information. We find evidence most consistent with an *integrated markets hypothesis* that suggests that both the equity and syndicated bank loan markets are highly integrated such that information flows freely across markets. This is particularly true when the equity market makers are also loan syndicate members.

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1. Introduction

A firm generally issues several types of securities, each of which represents some claim on the firm's assets. If capital markets are perfect and frictionless, then all information about the value of the firm's assets is reflected immediately into the prices of each of the firm's securities. However, capital markets are neither perfect nor frictionless. Different markets have access to different types of firm-specific information. Traders may prefer one market venue to another. The price formation process may differ in efficiency across markets. These market imperfections may prevent the integration of securities markets in incorporating all available information about the value of the firm's assets. In this paper, we compare the relationship between equity returns and the contemporaneous and lagged returns on secondary market prices of syndicated bank loans in order to test the integration between the equity and loan markets. Moreover, we reverse our tests and examine the relation between loan returns and contemporaneous and lagged equity returns. We employ Granger Causality tests to compare each market's impact on the other.

Firms can issue securities in different markets either simultaneously or sequentially. Informationally opaque firms are often forced to rely on private sources of financing that are structured in order to induce the production of private information about the borrower, often gathered over the course of a long-term banking relationship. In their life cycle hypothesis, Carey et al. (1993) show that firms progress from private sources of funds (e.g., bank loans), to publicly traded debt and equity as the firm grows and becomes more well-known to the market. Diamond (1991) shows that financial intermediaries may resolve informational asymmetries through screening.[1] Moreover, information production in the context of a bank-borrower relationship is ongoing through the bank's monitoring role; see, for example, Rajan and Winton (1995), Boot (2000). Petersen and Rajan (1994) and Berger and Udell (1995) further show that relationship loans may significantly impact the availability and cost of financing for credit-constrained, informationally-sensitive firms.[2]

Private information obtained by banks in the course of a lending relationship can create the opportunity for monopoly rents, as the lender exploits its informational advantage (see Sharpe (1990) and

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[1] Song (2004) shows that corporate bond underwriting syndicates are more likely to include commercial banks as co-managers if the issuing firm is informationally opaque (smaller, less prior access to public capital markets and greater use of bank loans). These bank underwriters typically have had a prior lending relationship with the issuer and thus can use their private information to certify the borrower's creditworthiness to the market.

[2] Bond (2004) finds that the form of financial intermediation (bank and non-bank) depends on the risk and information characteristics of the projects financed.

Rajan (1992)). Thus, as the borrower becomes more informationally transparent, and is therefore able to signal its creditworthiness, the firm breaks the relationship bank's lending monopoly by accessing public capital markets. Pagano, Panetta and Zingales (1998) show that firms tend to go public either when they have high growth opportunities resulting in an increased demand for financing, or in an attempt to time the market and issue shares when their value is relatively high. Thus, firms may simultaneously issue securities to informed lenders (e.g., relationship banks) and to arms-length investors (e.g., bondholders and stockholders).

Private securities (such as relationship bank loans) are informationally rich, but illiquid, whereas public securities (such as equity and bonds) are relatively liquid, but contain little or no private information. There is an intermediate class of securities, however, that lie between illiquid relationship bank loans and arms-length public equity: the syndicated bank loan. Both screening and monitoring intermediation services are provided in syndicated bank loans. The lead arranger is typically a relationship bank that has access to private information about the borrower and therefore can effectively screen the loan. Ongoing monitoring is induced by the lead bank's relatively large stake in the loan. For example, Sufi (2004) shows that the lead arranger retains a larger stake in loan syndications if the borrower requires more intense monitoring activity. Moreover, the structure of the syndicated loan mandates ongoing monitoring through a series of financial and non-financial covenants that require the borrower to make regular disclosures of private information to all members of the syndicate. Thus, syndicated bank loans offer some of the same information benefits as do relationship bank loans. However, they are more liquid than relationship bank loans. As of 2003, U.S. secondary syndicated bank loan trading volume exceeded $140 billion, representing an annual growth rate of 25% over the previous thirteen year period.[3] Thus, the syndicated bank loan market offers an opportunity to study the tradeoff between information and liquidity in securities markets.

In this paper, we use secondary market data in the equity and syndicated loan markets in order to examine the ongoing information acquisition and the price formation processes across financial markets. Given the syndicate's access to regularly-provided inside information about the borrowing firm, we hypothesize that loan prices should reflect private information before it is released publicly and only then incorporated into the prices of publicly held equity securities. We denote this as the *private information hypothesis.* Indeed, Altman, Gande and Saunders (2004) find that the syndicated bank loan market is more informationally efficient than the bond market, such that default events are more rapidly incorporated into loan prices than bond prices. Moreover, Allen, Guo and Weintrop (2004) show that

[3] Loan Pricing Corporation provides single-sided secondary trading volume in the U.S. for par and distressed loans. As of 2003, distressed loan trading accounted for almost 40% of the market.

negative earnings announcements are reflected in loan prices a month prior to the stock market reaction on announcement date.

However, debt markets in general, and syndicated bank loan markets in particular, are considerably less liquid than public equity markets. Thus, although lenders may have access to superior information, noise in the price formation process in the syndicated bank loan market may hamper informational efficiency. We denote this the *liquidity hypothesis.* Thus, Kwan (1996) finds that the stock market is more informationally efficient than the bond market. However, Hotchkiss and Ronen (2002) find that neither the bond nor the stock market lead each other in incorporating firm-specific information, but appear to be contemporaneously reacting to common factors.

A third hypothesis that may synthesize the polar extremes represented by the *private information* and the *liquidity hypotheses* is the *asymmetric price reaction hypothesis.* Since loans have limited upside gain potential due to the structure of the debt instrument, we hypothesize that loan markets should be more sensitive to negative information than to positive information. Indeed, Allen, Guo and Weintrop (2004) find no differential announcement effect when information about earnings announcements is positive, but when earnings are declining, the loan market reacts approximately one month prior to the equity market in incorporating that negative information into returns. Thus, the *asymmetric price reaction hypothesis* suggests that loan returns lead equity returns in reflecting negative information that might foreshadow borrower insolvency, whereas positive information is more relevant to equity securities holders that share in potential upside gains.

Finally, if loan and equity securities markets are well integrated and informationally efficient, then we will observe simultaneous trading in both markets as warranted upon the release of any information. We denote this the *integrated markets hypothesis.* This hypothesis can be perceived as an amalgam of the prior hypotheses. For example, if information is received that is either marginally positive or negative, traders may take positions in the equity market, but not in the loan market, because the higher spreads in the loan market might wipe out potential gains from the trade. However, the information will then spread to loan prices in reaction to equity price movements. If, however, the information is dramatically negative, for example, then traders might first trade in the loan market because it would be the more responsive market. Equity prices would then quickly follow loan prices. Thus, the trading venue is separated from the source of the information; i.e., private information obtained by loan market participants can be traded in either the loan or the equity markets. Evidence supporting the *integrated markets hypothesis* would be the finding that no particular market consistently dominates the other, but that each market has an impact on the other.

We find such evidence in this paper. Coefficients on lagged and contemporaneous equity returns are statistically significant in explaining loan returns and vice versa. Moreover, we find evidence of

Granger Causality both ways; lagged weekly equity returns Granger cause loan returns and lagged weekly loan returns Granger cause equity returns. These results are robust to a wide variety of subsampling based on information characteristics and liquidity features, as well as separating positive information ("positive returns") from negative information ("negative returns"). Moreover, we find the greatest degree of market integration if at least one equity market maker is also a member of the loan syndicate.

The paper is organized as follows. In Section 2, we provide descriptive details regarding the liquidity and structure of the syndicated loan market. Although several papers have surveyed the syndicated loan market (see, for example, Dennis and Mullineaux (2000), Dichev and Skinner (2002), Lee and Mullineaux (2004)), to our knowledge, this is the first comprehensive description of the market that incorporates both primary market activity (using the Loan Pricing Corporation's Dealscan database) and secondary market pricing (using LPC's Mark-to-Market database). Our sample covers the most liquid segment of the syndicated bank loan market and is therefore more representative of a hybrid between a public and private financial market. In Section 3, we briefly review the literature. The market integration tests for the full sample are presented in Section 4. In this section, we also re-estimate the Granger Causality model for a variety of subsamples that are differentiated by their access to private information, liquidity in the loan market, liquidity in the equity market, as well as positive returns versus negative returns subgroups. Section 5 concludes.

2. The Syndicated Bank Loan Market

2.1. The Structure and Development of the Syndicated Bank Loan Market

Firms obtain financing from many sources: issuance of equity, preferred stock, (straight and convertible) bonds and other debt instruments, including loans from banks. Bank loans tend to have unique information characteristics resulting from the bank's role as a delegated monitor, cultivated in the course of long-term banking relationships that include provision of a myriad of deposit, cash-management and lending services.[4] Moreover, bank loans are easier to renegotiate and restructure in the event of the firm's financial distress than are publicly traded debt instruments that typically have hundreds or thousands of uncoordinated bondholders that find it hard to reach agreement, at times required to be unanimous. Thus, bank loans offer a certain amount of flexibility that is unavailable to issuers of bonds

[4] That is, 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.

and other publicly traded debt securities. For these reasons, bank loans tend to have the following characteristics:

- They are senior to other claims on the firm's assets, thereby providing the bank with the incentive to monitor the borrower's activities. With the exception of taxes, the bank typically has first repayment claim on the firm's resources.
- They incorporate restrictive covenants that can be invoked in order to trigger contract renegotiation. These covenants may stipulate minimum required cash flows (relative to loan interest payments), restrictions on sales of assets, limits on dividends, limits on leverage, required minimum financial ratios, etc.

Banks may be unable to satisfy the loan demands of their large customers because large loans to individual borrowers may cause the bank's loan portfolio to become undiversified, and therefore subject to excessive risk. One way for banks to satisfy the loan demands of their customers and still reduce their exposure is through loan syndication.[5] In a loan syndication, the lead bank (also known as the agent or arranger) and the borrower agree on the terms of the loan, with regard to the coupon rate, the maturity date, the face value, collateral required, covenants, etc.[6] Then, the lead bank assembles the syndicate, comprised of other lenders called participants. Syndicates can be assembled in one of three ways:

- Firm Commitment (Underwritten) deals: The lead bank commits to making the loan in its entirety and then assembles participants to reduce its own loan exposure. Thus, the borrower is guaranteed the full face value of the loan.
- Best Efforts deals: The size of the loan is determined by the commitments of banks that agree to participate in the syndication. The borrower is not guaranteed the full face value of the loan.
- Club deals: For small deals (usually $200 million or less), the loan is shared among banks, each of which has had a prior lending relationship with the borrower.

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[5] Another way is through outright loan sales, in which the bank originates the loan, but then sells it off either whole or in pieces. Loan sales differ from loan syndications in that the buyer of the loan has no direct lending relationship to the borrower, whereas each financial intermediary in a loan syndication is a direct lender to the borrower. Syndication, as opposed to loan sales, allows the originating bank to diversify its risk without subverting the incentive to monitor the loan's risk exposure. Sales of risky, unmonitored oil and gas company loans to Continental Illinois National Bank (by a small Oklahoma bank called Penn Square Bank) were a primary cause of the demise of that institution in 1984, which at that time ranked among the largest 15 banks in the US. Cebenoyan and Strahan (2004) show that banks that sell loans originate riskier loans and then use the loan sales in order to reduce their risk exposure. Moreover, Dahiya, Puri and Saunders (2003) find that loan sales have a detrimental impact on borrowing firms.

[6] In large syndications, there may be several lead banks. Moreover, the duties of the lead bank may be split up into the following titles: administrative agent (transfers all interest and principal payments), syndication agent (the syndicate underwriter) and documentation agent (handles the legal aspects).

The loan's risk determines the terms of the syndicated loan. Primary market pricing of the loan at the issuance stage typically consists of setting the loan's coupon rate. Most syndicated loans are floating rate loans tied to a market benchmark such as LIBOR or the prime rate.[7] Investment grade loan syndications are made to borrowers rated BBB-/Baa3 or higher. Coupon rates for investment grade loans are typically set at LIBOR plus 50 to 150 basis points. Leveraged loans are non-investment grade loans made to highly leveraged borrowers. Often, they will have debt to cash flow levels in excess of 4 to1, thereby increasing the risk of default. Because of the greater risk of default, coupon rates on leveraged loans are set higher than for investment grade loans (all else being equal). Leveraged loans comprise the bulk of trading in the secondary loan market.

The terms of the loan syndication are set and cannot be changed without the agreement of the members of the loan syndicate. Material changes (regarding interest rates, amortization requirements, maturity term, or collateral/security) generally require a unanimous vote on the part of all syndicate participants. Non-material amendments may be approved either by a majority or supermajority, depending on the contractual terms of the loan syndication. The assembling and setting of the terms of a loan syndication are primary market transactions. After the loan syndication is closed, however, banks can sell their loan syndication shares in the secondary market.[8] Secondary market sales take place through either assignments or participations. Assignments require the consent of the borrower, since the assignee becomes a direct lender, along with other syndicate participants, whereas participations can be sold without consent of the borrower. Under a participation, the original syndicate member receives loan payments of interest and principal and then transfers them to the participation purchaser.

Trading in the secondary market for syndicated bank loans is limited to financial institutions and sophisticated investors as a result of the designation of these instruments as Rule 144a securities. Historically, the market was essentially an inter-bank market. In recent years, there has been increased participation by non-bank financial institutions, such as insurance companies and mutual funds. Madan, et al. (1999) show that in 1998 more than 40% of leveraged loan syndications were purchased by non-bank financial institutions. In particular, they find that 26% of the syndicated bank loans available in 1998 were held by bank loan mutual funds and 5% were held by insurance companies. Exclusion of retail investors

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[7] Beim (1996) finds differences in pricing of loans based on LIBOR as compared with loans based on the prime rate or CD rate that may be the result of liquidity or information problems in the non-LIBOR based segment of the market. We consider spreads over LIBOR in this study.

[8] Mullineaux and Pyles (2004) describe two covenantal constraints that may be imposed on secondary market syndicated loan sales: (1) the requirement that either the borrower or the lead arranger consent to the sale, and (2) a minimum denomination requirement for sales. Lee and Mullineaux (2004) find that loan syndicates are larger (and therefore less prone to renegotiation) if restrictions on secondary market sales are imposed. Mullineaux and Pyles (2004) show that such constraints are more likely to be imposed when borrowers are small and have poor credit ratings.

from direct participation in the syndicated loan market enhances the market's informational efficiency, thereby making market price quotes more informative. That is, uninformed noise traders do not contribute to price volatility in the syndicated loan market.

The volume of transactions in the secondary market for syndicated bank loans has grown rapidly in recent years. Dennis and Mullineaux (2000) document that the volume of loan syndications "has increased at well over a 20% rate annually over the past decade" and "topped $1 trillion in 1997." The *Wall Street Journal* (see Zuckerman and Sapsford, (2001)) referred to the syndicated loan market as a "multi-trillion dollar debt bazaar that has become the nation's largest capital market during the last decade." Thomas and Wang (2004) note that, after 1993, the syndicated bank loan market became as liquid as the high yield bond market.

The dramatic growth in secondary loan market trading volume during the 1990s was fueled, in part, by the adoption of the Basel Capital Accords that induced banks to seek out ways to remove capital-intensive loans from their books. Simons (1993) finds that capital constraints are primary motivations for bank loan syndications. Moreover, the introduction of credit derivatives, such as CLO (collateralized loan obligations) and credit default swaps offer lucrative markets to banks willing to sell their syndicated loans. The 1995/1997 standardization of settlement procedures via the Loan Syndications and Trading Association's (LSTA) development of standardized trading documentation and T+10 settlement procedures for par/near par loans reduced the incidence of trade disputes in the syndicated loan market; replicating the role played by the standardized swap agreement originated by the International Swap Dealers Association (ISDA) in improving the swap market's liquidity and trading efficiency. Finally, the growth of mutual funds of senior bank loans fueled market demand.

Although the syndicated bank loan market has become considerably more liquid in recent years, it is still less liquid than equity markets, in general. Order processing costs in the syndicated bank loan market are quite considerable, particularly for the sale of assignments, which require borrower consent and legal documentation of the transfer of the lender's share of the loan. Moreover, the nature of the syndicated loan market is such that a single informed lender (the lead bank) trades with other less informed banks (syndicate members) and non-banks (mutual funds and investment banks).[9] Thus, the risk shifting concern that the lead bank will syndicate the "bad loans" and keep the "good loans" contributes to an information asymmetry that is implicit in the structure of the market.

The structure of the Loan Pricing Corporation (LPC) Mark-to-Market database also contributes to liquidity constraints in the syndicated bank loan market. LPC does not itself provide any prices in its

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[9] In contrast, information is symmetric in equity markets, particularly in the wake of the SEC's adoption of Regulation FD in October 2000 that mandated fair disclosure of any material and forward-looking information to the market as a whole, rather than to a favored institution.

database of secondary loan prices.[10] It is an independent, third party data warehouser. Thus, it relies on market makers to provide it with bid and asked quotations. LPC gathers the quotes into a database and makes them available to their subscribers. Since the syndicated bank loan market is a negotiated, over-the-counter market, the database consists of indicative quotations, not actual transaction prices. Although the quotations do not obligate the market maker to transact at the quoted price, internal studies conducted by LPC show that transaction prices do not differ considerably from the midpoint of the average of all bid and all ask quotations, particularly for par loans (typically, loans trading at a price in excess of $90 per $100 face value).[11] Thus, in this study, we use the mean of the average bids and average asks (denoted the mean of the mean price) as a proxy for the unobservable transaction price.[12] [13]

2.2. Implications for Testable Hypotheses

Syndicated bank loans are structured so as to reduce moral hazard concerns associated with providing financing to informationally opaque firms. Potential borrowers are screened by relationship banks (lead arrangers) that have a relatively large exposure to the loan upon initiation of the deal.[14] The lead arranger's reputation is impacted by the quality of the due diligence employed in structuring the deal. The ability of the lead arranger to originate deals in the future and obtain the participation of the other lenders that comprise the syndicate depends on the quality of the lead arranger's initial information production. Thus, the structure of the syndicate enhances the production of information upon issuance of the loan so that even informationally opaque firms (e.g., highly leveraged firms and intangible-intensive firms) are able to access the syndicated bank loan market.

Over the life of the loan, continual monitoring is facilitated by the covenant requirements. Detailed financial information about the borrower's leverage, earnings, net worth, cash flows, and liquidity are provided to all syndicate members on a monthly basis. It is the responsibility of the lead arranger to gather and disseminate these data to the syndicate members, thereby assuring that the relationship bank continues to maintain an active monitoring role in the loan. Therefore, the information

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[10] There is no "tape" of transaction prices in the negotiated secondary market for bank loans. We use the average of the bid and ask quotations as an estimate of the transaction price.

[11] Transactions prices for distressed loans tend to be below the average of all bid quotes, suggesting a considerable illiquidity discount for loans priced below par.

[12] Concerns about stale quotes and infrequent trading are addressed by LPC's quality controls and dealer follow-up procedures. For example, if a quote is unchanged for a period of three weeks, then LPC verifies the validity of the quote by contacting the dealer. Moreover, loan quotes with usually wide spreads between the bid and ask are verified for accuracy.

[13] The use of the mean of the mean midpoint between bid and asked prices may also control for any bid-ask bounce, as in Hasbrouck (1988).

[14] However, the lead arranger may reduce that exposure over time by selling participations and by hedging their credit risk exposure using credit derivatives.

flows that we are concerned with in this paper are continual and ongoing, not episodic events, such as default or earnings announcements.[15]

It is sometimes difficult to distinguish between strategic default and liquidity-driven default (see Bolton and Scharfstein (1996)), particularly for the informationally opaque firms that borrow in the syndicated bank loan market. Therefore, the size and composition of the syndicate impose limitations on trading and renegotiation that may discourage strategic default and enable flexibility and loan restructuring in the face of liquidity-driven default. Moreover, the general covenants that require unanimity for major changes in the terms of the loan and restrict free cash flows limit the borrower's ability to strategically default. However, these very features may limit the liquidity of the secondary market. Because of the requirement that assignments be approved by the syndicate and the borrower, secondary market activity is limited to a relatively small universe of financial institutions. Therefore, transactions are negotiated and some syndicated bank loans trade infrequently, if at all. Our sample contains the most liquid of the syndicated bank loans, with an average of more than four quotes per facility on any given date. However, the syndicated loan market is not as liquid as public equity markets. Thus, the comparison of syndicated bank loan returns with equity returns offers an opportunity to compare the information-producing attributes of the syndicated bank loan market to the liquidity-enhancing structure of public equity. We thus examine the tradeoff between the *private information hypothesis* and the *liquidity hypothesis.*

- *Private Information Hypothesis:* Private information obtained by members of loan syndicates impacts prices in the syndicated bank loan market before public equity prices react.
- *Liquidity Hypothesis:* Although private information is initially revealed to loan syndicate members, illiquidity in the syndicated bank loan market prevents the informed trader from benefiting from the information. Thus, private information is reflected first in the more liquid public equity market.

An intermediate case between these polar extremes (i.e., strict adherence to either the *private information* or the *liquidity hypotheses*) recognizes that some information impacts certain securities prices more than others. Debt instruments have limited upside gain potential as a result of the security's maximum potential cash flows that are restricted to the stipulated interest payments. Thus, positive information (as measured by positive returns) about a solvent firm is unlikely to benefit debtholders who can receive no more than their promised interest payments. Positive information about the firm, in contrast, should be incorporated into stock prices because equityholders share in the firm's upside gain

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[15] Other papers have examined the information content of syndicated bank loan prices for episodic events. For example, Allen, Guo and Weintrop (2004) examine the impact of earnings announcements on syndicated bank loan prices and Altman, Gande and Saunders (2004) compare the reaction to default in the loan market to the public bond market.

potential. However, negative information (as measured by negative returns) that threatens the borrower's ability to make those promised payments will be valuable to debtholders and should be quickly reflected in loan prices. Thus, a form of the *private information hypothesis* should prevail for negative returns signaling credit problems, whereas a form of the *liquidity hypothesis* should prevail for positive returns about solvent firms. We call this the *asymmetric price reaction hypothesis.*

- *Asymmetric Price Reaction Hypothesis:* Loan markets are more sensitive to negative information that would signal declines in credit quality than positive information on potential upside gains that are more relevant to equityholders.

Finally, all of the prior hypotheses may hold at different points in time. That is, if equity and syndicated bank loan markets are well integrated, then traders will use both markets to trade on their information. The market makers in syndicated bank loan markets are financial intermediaries with trading activities across many financial markets. Thus, they would choose the appropriate market for a particular trade on a case-by-case basis, regardless of the source of the information. We denote this hypothesis the *integrated markets hypothesis.* For example, some private information cannot be profitably traded upon if liquidity costs outweigh the potential gains from the trade. Moreover, substantial information can motivate trades in less liquid markets if the potential gains exceed the costs of trading. Indeed, traders may choose to spread their trades over several markets in order to hide their information so as to take positions before market prices adjust. However, eventually all markets will react to the information provided in other related markets.

- *Integrated Markets Hypothesis:* Information is reflected in all markets, although which market leads or lags will fluctuate over time.

2.3. Sample Selection Methodology

We obtain a sample of secondary market data from the Loan Pricing Corporation (LPC) that consists of the average bid and average ask quotations on all syndicated bank loans that had at least 2 quotes on a given date for any week during the January 1999 through May 2003 period. A total of 129,172 observations met these criteria, associated with 1,621 loan facilities to 763 borrowers. The loan facility is the fundamental security that is priced in the market. However, a loan deal may consist of a package of several facilities that are issued simultaneously. These facilities can differ with regard to maturity, covenant structure and loan type (e.g., term loan, revolver, line of credit, etc.) We perform our analysis on the individual loan facility. However, to control for potential clustering across the different facilities that comprise a given loan deal, we utilize a fixed effects model that adds firm-specific dummy variables to all multivariate estimation (see Greene (1997, pg. 615) and Sufi (2004)).

For each observation for which the previous week's loan price is available for the loan facility, we calculate the weekly loan return for loan facility i, RB_t, using the average of the mean bid and mean

ask quotation as a proxy for loan transaction price.[16] [17] We calculate the sum of the number of bid and ask quotations for the loan facility *i* on the secondary loan market for the date *t* of the observation, denoted NBA_t. We also calculate the relative loan spread, denoted $SPRD_t$, as the difference between the average ask and average bid loan *i* price on the date *t* of the observation, divided by the average of these two values.

We next extract from CRSP the weekly equity returns that correspond to the weekly loan returns. Through the comparison of tickers and names, we identify 357 of the 763 borrowers on CRSP. We use this weekly information to calculate weekly equity returns for borrower *i*, denoted RS_t, after standardizing the price by the cumulative factor to adjust for splits and dividends. We also extract from CRSP the volume of trades in the equity market for borrower *i* on the date *t* of the observation, denoted V_t, and the relative equity spread, denoted $ESPRD_t$, calculated as (average ask - average bid)/((average ask + average bid)/2), where the ask and bid prices are associated with equity *i* on the date *t* of the observation.

We extract the S&P 500 Composite Index from CRSP and calculate the weekly equity index return, RM_t, for each observation. Using the S&P/LSTA syndicated bank loan index, we calculate the weekly loan index return, RL_t, for each observation.[18] We also obtain the annualized 3-month secondary market US Treasury bill rates from the Federal Reserve Bank of St. Louis as of the date of each observation to the observation date and calculate the weekly 3-month Treasury bill rate, RD_t.

We next extract from TAQ the sum of the number of bid and ask quotations divided by 1,000 for stock *i* in the equity market for the date *t* of the observation, denoted $ENBA_t$. After eliminating any observation for which the return, spread, or number of quotes information is unavailable, we are left with 51,830 observations, associated with 787 loan facilities to 357 borrowers. Requiring two weeks of lagged equity returns and one week of lagged loan returns yields a sample size of 43,578 individual secondary market observations, associated with 719 loan facilities to 334 borrowers.[19]

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[16] We calculate weekly returns from daily bid/asked prices for two reasons: (1) data availability and (2) to minimize the impact of infrequent trading.

[17] Quotes are "clean prices" that exclude the value of accrued interest. Since syndicated bank loans are generally floating rate instruments, fluctuations in accrued interest payments most often result from general interest rate changes, as opposed to firm-specific effects. In this paper, we focus on the impact of firm-specific information on security prices and therefore we do not include accrued interest in our calculation of loan returns.

[18] LSTA, in conjunction with Standard & Poor's, maintains a weekly index of senior bank loan prices. The S&P/LSTA syndicated bank loan index currently includes 470 loan facilities totaling $104 billion in value outstanding, covering around 70% of the institutional secondary loan market. Starting in January 1999, the S&P leverage loan index provides weekly quotes on the syndicated loan market index.

[19] To perform the integration tests, we test several price formation models, incorporating lagged equity (loan) returns ranging from one (zero) week lags to four (three) week lags. Our results are extremely robust to all lag structures, and are available from the authors upon request.

2.3.1. Descriptive Statistics of the Syndicated Bank Loan Market

Tables 1 through 4 present descriptive statistics for the entire sample of 719 loan facilities and 43,578 secondary market observations in our final sample. Table 1 provides descriptive statistics for the variables used in the tests reported in this paper. The average loan return is negative over the sample period (a mean of –0.07%, statistically different from zero at the 1% level of significance of the t-test), as is the loan index return. This is most likely the outgrowth of the sample period, a considerable portion of which coincided with a recession, the deepening of liquidity discounts, declining loan prices and a large group of "fallen angels," i.e., distressed loans that formerly traded at or around par. The mean equity return is positive, while the equity index return is zero. In addition to the measures of return described above, we also identify the year of each observation, denoted Y_t.

Table 1 also presents variables that will be used to explicitly test the hypotheses discussed in Section 2.2. Measures of loan market liquidity include (1) NBA_t; (2) $SPRD_t$; and (3) the designation of *TERM* or *REVOLVER,* since term loans are less likely to have institutional participation.[20] The mean sum of bid and ask quotes on the syndicated loan market is approximately 8, while the median sum is 6. The mean loan spread is 1.65%. Approximately 73% and 21% of the sample is composed of loans designated as term and revolver loans by LPC, respectively.

Table 1 further presents measures of equity market liquidity. The variables are: (1) V_t; (2) $ESPRD_t$; and (3) $ENBA_t$. The average volume is approximately one million shares, though the median volume is approximately 250,000 shares. The mean and median equity spreads are 5.99% and 4%, respectively.[21] The mean and median number of equity bids and asks are approximately 2,244 and 980, respectively.

Finally, Table 1 presents variables describing the private information available in the loan market. These variables are: (1) an indicator variable with the value of one (zero otherwise) if financial covenants are present in loan *i*, denoted *COV*; (2) an indicator variable, $DISTRESS_t$, designating whether loan *i* at time *t* is distressed (i.e., trading at a price less than or equal to 70) or an indicator variable, PAR_t for loans trading at a price greater than or equal to 90; (3) an indicator variable, *INTANGIBLE,* designating borrowing firms with assets that are predominately intangible (see Table 3); and (4) an indicator variable, $DUALMM_t$, that is equal to unity if at least one lender associated with the given syndicated loan facility is also a market maker for the equity of the borrower on the day of the observation, and zero otherwise. In

[20] Revolvers and lines of credit are more likely to be relationship loans, whereas term loans can be transactional loans that are backed by specific assets.

[21] Note that the average relative equity spread of 5.99% is larger than the average relative loan spread of 1.65%. This result is attributable to the larger price denominations of loans relative to stocks. In absolute terms, the average equity spread is approximately $0.83, much lower than the average loan spread of approximately $1.29.

approximately 41% of the 28,947 observations for which the market makers are reported on *TAQ*, at least one lender associated with the loan facility is also a market maker on the day of the observation.

Table 2 provides additional descriptive statistics for the primary and secondary syndicated loan markets. The average loan deal size in our sample is $1,117.7 million. While each loan deal is composed of several loan facilities, only approximately two of these are liquid loan facilities that trade in the secondary market.[22] The average size of these facilities is $415.2 million. There is an average of 16 lenders per facility, with each lender holding an average of 5.3% of the loan. In keeping with the information structure of the syndicated bank loan market, the lead arranger (informed lender) holds an average of 27% of the loan, whereas participant lenders hold only 2.7% of the loan on average.[23] The loans have an average maturity of 2,151 days (less than 6 calendar years). Table 2 shows that the average mean of the mean price is positively related to the time remaining until maturity. This is consistent with a general deterioration in creditworthiness over the 1999-2003 sample period. Older loans (with shorter remaining time until maturity) are more likely to be priced at below market spreads that do not reflect the increasing risk exposures in the syndicated bank loan market in the wake of dramatic defaults, such as Russian sovereign debt, Enron and WorldCom. The general decline in syndicated loan prices over our sample period is also shown by the decline in average mean of the mean prices from $96.31 per $100 in 2000 to $93.93 in 2002. The upheaval in the debt market during 1999 (following the Russian debt default and the LTCM debacle) is shown by the low average mean of the mean price in 1999 of $94.86 per $100 face value.

The borrowers in our sample are highly leveraged as shown by the high ratio of debt to EBITDA shown in Table 2. On average, the borrower's debt to EBITDA ratio is 7.97 to 1 during the year of the loan deal's origination.[24] Primary market pricing is in line with the preponderance of leveraged loans included in our database of liquid syndicated bank loans. That is, the average spread over LIBOR, shown in Table 2, is 289.2 basis points, reflecting the high levels of borrower indebtedness. However, the spread over LIBOR is determined at loan origination. Over the life of the loan the borrower's creditworthiness may deteriorate, and this would be reflected in the secondary loan prices for the loan facilities over time.

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[22] There are a total of 432 loan deals and 719 loan facilities in our final sample; thus, the average number of facilities per loan deal in our sample is 1.72. However, since many facilities are not traded, this represents the average number of liquid facilities per deal available in the secondary loan market.

[23] We define the lead arranger as any syndicate member with a designation other than participant. Thus, the lead arranger can have the legal titles of administrative agent, documentation agent, arranger, lead manager, etc. Because the share of the loan facility held by each member of the syndicate is often unreported in the LPC Dealscan database, the number of observations for these variables is far fewer than the total sample size.

[24] The debt/EBITDA ratio is constructed using Compustat data for the year of the loan origination as follows: DATA9 (Long Term Debt) / (Data 18 (Income before Extraordinary Items) + Data 15 (Interest Expense) + Data 16 (Income Taxes) + Data 14 (Depreciation and Amortization)).

Table 2 shows that the mean of the mean price is lowest for the loan facilities with either the lowest or highest spreads over LIBOR. Table 2 shows that the average mean of the mean price for loan facilities with spreads of less than 100 basis points over LIBOR is $94.44 per $100 face value, reflecting "fallen angels," i.e., firms that were highly rated upon loan origination that experienced a decline in creditworthiness over the life of the loan. Similarly, the loan facilities with spreads exceeding 250 basis points are those high risk loans that trade consistently at a relative price discount. However, this discount does not appear to be related to illiquidity as measured by the number of bids, as the group of loan facilities with the least number of bids (between 2 to 3) has the highest average mean of the mean price, shown as $95.44 in Table 2.

The upfront fee is paid by the borrower upon closing of a loan. The fee is charged on the total amount of borrowings available, with the exception of revolving credit, which levies the upfront fee only on the amount of debt that is taken down. Table 2 shows that the average (median) upfront fee in our sample is 55.57 (50) basis points.[25] In addition, an annual fee (also known as the facility fee) is charged against the entire loan commitment amount, whether used or unused.[26] On average, the annual fee for those facilities reporting this information is 77.11 basis points, with a median of 50 basis points. The commitment fee is charged on the commitment amount that is unused. In our sample, the average (median) commitment fee is 53.46 (50) basis points. The cancellation fee is charged upon termination or reduction in the line of credit. Table 2 shows that the cancellation fee averaged 171.7 basis points with a median of 200 basis points.

In terms of our sample of syndicated bank loan facilities, Table 2 shows that the loans are par loans on average, with an average mean of the mean price of $94.94 per $100 face value (average bid price of $94.30 and average asked price of $95.59). There are an average of more than 4 bid and ask quotes for each loan in our sample. The depth of market quotations is relatively constant across the spectrum of the secondary market for syndicated bank loans. That is, for extremely distressed loans (mean of the mean price less than 70 that have an average mean of the mean price of $55.70 per $100 face value) the sum of bid and ask quotes is 7.92 on average, whereas for par loans (mean of the mean price greater than 90 that have an average mean of the mean price of $98.48 per $100 face value) the sum of bid and ask quotes is 8.05 quotes per loan facility on average. Table 2 shows that the median minimum amount that can be traded under a secondary market loan assignment is a $5 million round lot. The fee paid to the agent bank for handling the assignment documentation required for trading assignments averaged $3,272.30 in our database.

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[25] Unreported fees are assumed to be missing rather than zero.

[26] Most syndicated bank loans are only partially utilized and thus may have significant unused available lending capacity at any point in time.

Most of the facilities (32,428 out of a total of 43,578 observations) are below $500 million in size. Table 2 shows that these small loan facilities are relatively high priced, with an average mean of the mean price of $95.04 per $100 face value, as compared to an average mean of the mean price of $94.77 ($94.35) for facilities between $500 million to $1 billion (over $1 billion). However, the facilities with the highest average mean of the mean price belong to the largest deals (greater than $2.5 billion), suggesting that large loan deals that are broken into smaller loan facilities tend to trade at relatively high prices on average.

Table 3 shows the wide range of industries represented in our syndicated bank loan database. The largest industry representation (comprising 21.84% of the 617 facilities and 21.11% of the size of the facilities) is comprised of borrowers in the telecommunications industry (SIC code 48). Following Amir, Lev, and Sougiannis (2003), we define intangible intensive firms using the following three-digit SIC codes: 283 (Drugs); 284 (Chemicals); 357 (Computer and Office Equipment); 366 (Communications Equipment); 367 (Electronics); 371 (Motor Vehicles); 382 (Measurement and Control Devices); 384 (Medical Instruments); and 737 (Software). The final row of Table 3 shows that the percent of facilities in our sample representing loans to intangible intensive borrowers is 20.17% by number of facilities and 18.33% by size.

Table 4 shows that most syndicated bank loans are originated for acquisition-related purposes, with 46.18% of 526 facilities for which the purpose is reported, acquisition-related. An additional 26.43% of the loans are designated as refinancing. In terms of specific loan purposes, the most common reasons stated are change of control (46.45%), takeover (32.27%) and debt repayment (26.43%). Table 4 also shows that 94.16% of the facilities in our sample are classified as non-investment grade upon origination. Out of these, 80.39% are leveraged and 54.24% are highly leveraged. Further evidence that most of the loan facilities in our sample are below investment grade is shown in the credit ratings presented in Table 4. Average S&P and Moody's ratings are below 3 (B-rated).[27]

As discussed in Section 2.1, syndicated bank loans are more flexible than publicly traded debt. That is, borrowers in financial distress often renegotiate their bank debt, thereby avoiding the deadweight costs of bankruptcy and liquidation that are more prevalent for publicly held bonds. Renegotiation is often triggered by the breaching of covenants that dictate rules defining the borrower's technical default of the loan agreement. There are two types of covenants described in Table 4: financial covenants and general covenants. Financial covenants institute rules that circumscribe the borrower's financial performance. General covenants institute behavioral rules that bind the borrower and the syndicate. Covenant

[27] Credit ratings are coded numerically as follows: all A ratings (including all notches from AAA to A-)=4; all B ratings=3; all C ratings=2; default=1. Although more than 80% of the borrowers in our sample have rated publicly traded debt, less than 35% of the bank loans are rated.

compliance is monitored through the release of detailed financial information to the syndicate on a monthly basis. This provides syndicate members with a steady stream of private information not available to investors in public equity markets.[28]

Table 4 shows that the most prevalent financial covenant is a restriction on the maximum debt to EBITDA ratio (i.e., total debt divided by cash flow as measured by net income plus depreciation and other non-cash charges). In our sample, 73.96% of the reporting facilities have such a limitation included in the terms of the syndicated bank loan. The initial values denote the starting level restrictions that must be met at the time of the loan origination. The eventual values denote the ongoing limitations that constitute a technical default over the life of the loan if the eventual covenant levels are breached. On average, the maximum initial debt to EBITDA ratio permitted on the loan facilities in our sample is 5.71 to 1 (a median of 5.25:1). However, the borrower is declared in technical default if the maximum debt to EBITDA ratio over the life of the loan exceeds 3.70 to 1 on average (median value of 3.5:1). For a subsample of 466 loan facilities, we test whether the initial debt to EBITDA covenant is met upon initiation of the loan. Using Compustat data for the year of the loan deal origination, we construct a variable denoted *Debt/EBITDA Compliance* by deducting the Debt/EBITDA initial covenant restriction from the actual Debt/EBITDA ratio obtained from Compustat.[29] The mean value is 0.0255, insignificantly different from zero, with a median value of –0.32. This suggests that although the average borrower is in compliance upon loan origination, the debt covenants are very tight upon origination of the loan. That is, the maximum allowable debt/EBITDA is set at levels just slightly above the borrower's actual debt/EBITDA ratio at the time of the loan's origination. This provides lenders with a tripwire that can trigger technical default with only slight increases in the borrower's leverage ratio. This tripwire covenant is also reflected in Table 4 by the stricter eventual (ongoing) maximum debt to EBITDA ratio covenant requirement that is included in 69.93% of the loan facilities in our sample.

Table 4 also shows that 24.43% of the loan facilities in our sample have financial covenants restricting senior debt to EBITDA to an initial maximum of 4.44 to 1 on average, and an eventual maximum of 2.78 to 1 on average. In our sample, 20% of the loan facilities have a limitation on the minimum value of net worth.[30] This covenant suggests that, on average, if net worth falls below the base

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[28] Bradley and Roberts (2004) find that a loan is more likely to include covenants if the borrower is small, highly leveraged, and relies on intangible growth opportunities for firm value.

[29] The debt/EBITDA ratio at year-end of the year of the loan's origination is constructed using Compustat data as follows: DATA9 (Long Term Debt) / (Data 18 (Income before Extraordinary Items) + Data 15 (Interest Expense) + Data 16 (Income Taxes) + Data 14 (Depreciation and Amortization)). Only 466 loan facilities had sufficient data to calculate the *Debt/EBITDA Compliance* variable.

[30] The financial covenant denoting a minimum percentage of net worth is computed as follows: (assets minus liabilities)/assets. The financial covenant denoting a minimum percentage of tangible net worth is computed as follows: (assets minus intangible assets minus liabilities)/assets.

amount of $614.3 million plus 62.06% of cumulative quarterly net income (calculated from a start date specified in the loan covenant), then the average borrower would be declared in technical default of this financial covenant. Much less prevalent are financial covenants on the minimum tangible net worth (calculated as total assets less intangible assets less total liabilities), maximum debt to tangible net worth and a maximum debt to equity ratio.[31]

General covenants are also quite prevalent in syndicated bank loans, as indicated in Table 4. Most loan facilities report an array of different general covenants. All loan facilities contain some restriction on the disposition of excess income. The most prevalent of these is the restriction on dividends, included in 90.26% of the loan facilities. This restriction limits the percent of net income that can be paid to shareholders in the form of a dividend. Table 4 shows that, on average, the dividend restriction maximum percentage are 95% (median of 100%) of net income.

The sweep covenants require the borrower to make mandatory prepayments on the loan under certain circumstances. For example, Table 4 shows that 83.31% of the loan facilities had an asset sales sweep. This would require that the median value of 100% of the proceeds of asset sales be utilized to prepay the loan facility. Table 4 shows a 100% median value for the following general covenant sweeps: asset sales, insurance proceeds, debt issues, and collateral release. Thus, this general covenant mandates that the borrower prepay the loan using 100% of the proceeds of collection on an insurance policy or issuance of debt or release of collateral due to an alteration in the company's financial structure. Table 4 shows that the median trigger of the equity issue sweep and the excess cash flow sweep is 50%, denoting that only 50% of the proceeds from the issuance of equity or excess net income must be utilized to prepay the bank loan. Finally, 70.93% of the facilities in our sample require that a median of 51% of excess cash flows (from any source) be used to prepay the loan.

An advantage of syndicated bank loans over publicly held debt is the flexibility afforded both borrower and lender to renegotiate the terms of the loan as circumstances dictate. However, this can encourage borrowers to strategically default in order to exploit their renegotiation option at the expense of the lenders. Thus, most syndicate agreements contain general covenants describing the mechanism required to alter the terms of the loan deal. Table 4 shows that 88.46% of the loans in our sample have a covenant that requires unanimity among syndicate members in order to alter material loan terms (i.e., interest rates, amortization requirements, maturity term, or collateral/security). In our sample, 89.85% of

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[31] An example of the text describing the tangible net worth covenant is: "(a) Tangible Net Worth. Borrower and its Subsidiaries on a consolidated basis shall maintain at all times Tangible Net Worth equal to or greater than the sum of (i) $275,000,000, plus (ii) fifty percent (50%) of cumulative net income (but without subtracting net losses for any Fiscal Quarter for which there was no net income) for each Fiscal Quarter from January 1, 1999 to the date of determination, plus (iii) fifty percent (50%) of the net cash proceeds of Stock issued by Borrower after January 1, 1999."

the loan facilities contain a general covenant that states the percentage of lenders that must approve any non-material amendments and waivers. Table 4 shows that, on average, a simple majority 51.73% (median value of 51%) approval is required for non-material amendments.

3. Brief Literature Review

There are several literatures that are relevant to our study. First, we briefly review the theoretical literature comparing the information attributes of debt versus equity securities and private versus public securities markets. Second, we review the empirical literature on integration between equity and debt markets.

3.1. Public Equity versus Private Debt

There are two major distinguishing features differentiating publicly held equity from bank loan markets. First, bank loans are debt instruments, and may therefore be less sensitive than equity to certain firm-specific information because of debt's contractual limitation on the potential for upside gain. Second, bank loans are private debt instruments, and therefore have different information and liquidity features than publicly traded debt or equity.

There has been a voluminous literature on the conflicts between equityholders and debtholders dating back to Jensen and Meckling (1976). Because of the myriad agency problems associated with the issuance of residual claims on a firm with a separation between ownership and control, equity markets rely on minimum standards of informational transparency. Debt claims may be issued in order to constrain the risk-shifting tendencies of shareholders, but carry their own agency problems that may limit the firm's pursuit of positive NPV investment opportunities. Thus, informationally opaque firms that have intangible investment opportunities and risk-shifting capabilities may be forced to access the intermediated market. The role of the financial intermediary is to screen against adverse selection and to monitor moral hazard. The resulting privately held securities may be in the form of intermediated equity (e.g., venture capital or private equity claims) or intermediated debt (e.g., bank loans). Much more attention has been paid to the issuance of intermediated debt and that is the focus of this brief survey of the literature.[32]

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[32] An exception is an empirical paper by Gomes and Phillips (2004) that examines 13,000 issues in public and private debt and equity markets. They find that firms with more asymmetric information are more likely to utilize private rather than public markets. Conditional on using public markets, riskier firms are more likely to issue public debt rather than equity, supporting the pecking order hypothesis of Myers and Majluf (1984). However, for those informationally opaque firms that issue in private markets, the reverse holds; the riskier firms issue private equity and the less risky informationally opaque firms issue private debt (bank loans). These results are supported by Denis and Mihov (2002) focusing on public and private debt issuance. They find that the most creditworthy firms issue public debt, the next most creditworthy issue private bank debt and the riskiest firms issue private non-bank debt.

Models dating back to Holmstrom (1979) and Holmstrom and Tirole (1997) introduce an informed lender that screens and monitors borrowers in order to certify the borrower's creditworthiness to uninformed lenders. Without this certification, informationally opaque borrowers may be unable to offer sufficient rewards to lenders and will be rationed out of the credit markets in equilibrium; see Stiglitz and Weiss (1981). Boyd and Prescott (1986) endogenize the development of financial intermediary coalitions that allocate scarce resources to screen potential borrowers on behalf of uninformed lenders. Diamond (1984) identifies economies of scale and diversification benefits that accrue to financial intermediaries that monitor large numbers of borrowers. Thus, information considerations distinguish between intermediated debt markets (bank loans) and non-intermediated, arms-length debt markets in Rajan (1992). Intermediated debt markets (relationship bank loans) offer informationally opaque firms access to external financing; see Boot (2000). In his survey of the literature, Greenbaum (1996) describes the benefits to borrowers from relationship banking as including credit availability, confidentiality, the monitoring of collateral, and intertemporal smoothing.

Reliance on private debt, however, exposes the borrower to hold-up problems resulting from the lender's monopoly power; see Sharpe (1990) and Rajan (1992). Thus, borrowers will often access multiple bank relationships (see Detragiache, Garella and Guiso (2000)), issue short term, senior debt as opposed to long term, subordinated debt (see Park (2000)), and demand a renegotiation option (Grossman and Hart (1986)).

Syndicated bank loans are structured so as to maximize the information benefits while minimizing the hold-up costs. In describing the syndicated bank loan primary and secondary markets in detail in Section 2, we find evidence consistent with theoretical predictions. Thus, the structure of the syndicate creates the incentive for an informed lead arranger to screen and monitor the activity of the borrower. Moreover, covenants regarding disposition of free cash flow limit the lenders' exposure to moral hazard. However, the borrower retains the option to renegotiate the loan so as to limit the lenders' monopoly control. This option is constrained by covenants requiring unanimity for material term changes so as to protect the lenders from strategic default on the part of the borrower. All of these structural considerations make it possible to trade high risk distressed loans in secondary syndicated bank loan markets.

3.2. Testing the Integration Between the Loan and the Equity Markets

There is a fairly extensive literature comparing the informational efficiency of the bond market to the stock market. For example, Keim and Stambaugh (1986), Campbell (1987) and Campbell and Ammer (1993) examine the problem in the aggregate. Kwan (1996) examines the relative informational efficiency of the stock and bond market for individual firms. Hotchkiss and Ronen (2002) examine the question using intraday data. A literature has developed comparing the informational efficiency of public debt to

public equity markets, but there has been virtually no work on the efficiency of integration of public and private financial markets.

Cornell and Green (1991) and Blume, Keim, and Patel (1991) were among the first to examine the pricing performance of below-investment grade corporate bonds relative to high grade corporate bonds and stocks. Cornell and Green (1990) use mutual fund data and find that the market for low-grade corporate bonds is as efficient as the market for high-grade bonds. Similarly, Blume, Keim and Patel (1991) use individual bond data and find no evidence that below investment grade bonds are significantly mispriced relative to investment grade bonds and stocks. However, these studies do not explicitly test for informational efficiency. Kwan (1996) rectifies this and employs market integration tests of whether contemporaneous and lagged stock returns explain bond returns. He finds evidence of significant coefficients on lagged stock returns for both investment grade and below investment grade bonds, suggesting that the stock market leads the bond market.[33] However, Hotchkiss and Ronen (2002) refute this result, using intraday data on individual high yield bonds that trade on NASD's Fixed Income Pricing System (FIPS). This relatively liquid corporate bond market displays greater informational efficiency than found in Kwan's sample. Although Hotchkiss and Ronen (2002) do not test it directly, their results offer support for the *liquidity hypothesis*, since they find informational efficiency for the liquid corporate bonds in their sample. However, neither Kwan (1996) nor Hotchkiss and Ronen (2002) reverse their model specification in order to explicitly test whether lagged bond returns can explain stock returns.[34] We perform that analysis in this paper using returns on syndicated bank loans.

There is an empirical literature showing an informational link emanating from the loan market to equity markets. The extension of a bank loan is shown to be a positive signal to equity markets in James (1987) and Lummer and McConnell (1989). Moreover, loan sales send a negative signal to equity markets, as shown in Slovin, Shushka and Polonchek (1993) and Dahiya, Puri and Saunders (2003) that find that stock returns are negatively impacted by the announcement of a loan sale or termination of a lending relationship.[35] However, these studies focus on non-traded relationship bank loans rather than the syndicated bank loan market.

Allen, Guo and Weintrop (2004) compare abnormal returns in the syndicated bank loan market to equity markets in response to information about earnings. They find that negative earnings

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[33] The exception to the finding that lagged stock returns explain bond returns in Kwan (1996) is for AAA-rated corporate bonds, which depend more on the risk free rate than on firm-specific information. However, Hotchkiss and Ronen (2002) find that the distinction between high grade and low-grade bonds is only weakly significant.

[34] Also see Fang (2005).

[35] Ongena, Smith and Michalsen (2003) find significant declines in equity returns for Norwegian firms that have lending relationships with distressed banks that are capital constrained and therefore likely to terminate their lending relationships.

announcements are reflected more rapidly in bank loan prices than in stock prices. Indeed, whereas earnings announcements are reflected in equity prices around quarterly announcement dates, loan returns reflect this information approximately one month earlier. This timing coincides with the private release of earnings information to syndicate members as mandated by bank loan covenants.[36] These results suggest that negative information about firm-specific events (e.g., loan sales or earnings announcements) is incorporated in the bank loan market and transmitted to the stock market. Although the results are consistent with the *asymmetric price reaction hypothesis*, they are not tests of integration across markets.

Altman, Gande and Saunders (2004) also employ an event study, episodic test of integration between debt and equity markets. They examine abnormal returns around default announcement dates in syndicated bank loan, public debt and equity markets. They find that syndicated bank loan markets lead all public markets in reacting to default announcements.[37] Syndicated bank loan secondary market prices fall significantly more during the preannouncement period than do bond prices or stock prices. Moreover, the announcement effect is smaller (for various windows around the announcement date) in the syndicated bank loan market than in either the bond or equity markets.

While suggestive, none of these papers addresses the question whether the loan market is more informationally efficient than the stock market on a day-to-day, regular basis. By focusing on market-moving events (e.g., default announcements, bankruptcies, earnings declines, termination of lending relationships, etc.), these papers bias their results in favor of the *private information hypothesis* and the *asymmetric price response hypothesis* to the detriment of testing the *liquidity hypothesis.* That is, a market-moving event such as an impending default will most likely overcome illiquidity constraints in loan markets, thereby biasing results in favor of the *private information hypothesis*. For example, Green (2004) examines transaction data in the US Treasury market and finds that the more substantial the information release (e.g., the greater the surprise or precision of the macroeconomic announcement), the less important the liquidity considerations (in terms of order flow data) in impacting prices. Moreover, Chen, Lung and Tay (2005) show that informed participants trade in both the equity and options markets, first accessing the greater liquidity of the equity markets (so that stock returns lead options trading), but preferring the options markets in the presence of information asymmetries. Thus, traders use all available financial markets to opportunistically benefit from information. Prices will adjust rapidly to information

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[36] As discussed in Section 2.3.1, 73.96% of the loans in our sample require the borrower to release sensitive information about earnings (EBITDA) on a regular basis in compliance with financial covenants limiting firm leverage.

[37] The events considered are loan default dates, bond default dates and bankruptcy announcement dates. Results are qualitatively similar across all events.

revealed in other companion markets. This process of informational integration and efficiency is consistent with the *integrated markets hypothesis.*

In this paper, we consider whether loan and equity markets are integrated on an ongoing basis, without focusing only on significant, market-moving events. Information is released to syndicate members throughout the life of the bank loan. We consider how markets react to all information releases, from the release of the headline-making announcements studied in earlier papers to the ongoing release of information that may simply validate market expectations.

4. Market Integration Tests

We utilize three different empirical methodologies to test the integration between loan and equity markets. First, we assess the lead-lag relationship between loan and equity markets using Granger Causality tests. As a robustness test, we also use a Seemingly Unrelated Regressions (SUR) approach, structured similar to the GMM approach specified in Hotchkiss and Ronen (2002), in order to examine the relationship between contemporaneous and lagged loan returns and equity returns. Finally, we construct portfolios using returns in other markets to determine whether trading on information can offer abnormal returns. That is, we test whether one could earn abnormal returns in the loan market by buying loans with positive lagged equity returns and selling loans with negative lagged equity returns. In addition, we test whether one could earn abnormal returns in the equity market by trading on loan return information; that is, buying stocks with positive lagged loan returns and selling stocks with negative lagged loan returns. Because of space constraints, we present only the results of the Granger Causality tests in the body of the paper, although our results were robust to all methodologies. Discussion and tables related to full sample robustness tests (using both the SUR approach and the abnormal trading returns approach) are provided in the appendix, with subsample results available from the authors upon request.

All of our results suggest that equity returns have explanatory power in determining loan returns, and loan returns have explanatory power with regard to equity returns. These results are consistent with the *integrated markets hypothesis* in that each market simultaneously impacts the other.

4.1.Full Sample Granger Causality Tests

In this section, we test whether we can identify evidence of Granger causality (Granger (1969), Sims (1972)) in the relationship between loan and equity returns. We use the Bivariate Granger Causality Test to separately test whether we can reject the null hypothesis that equity returns do not Granger cause

loan returns, and whether we can reject the null hypothesis that loan returns do not Granger cause equity returns. We implement the tests through OLS estimating the following models:[38]

$$RB_t = \alpha_t + \beta_1 RB_{t-1} + \beta_2 RS_{t-1} + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t, \quad (1)$$

$$RS_t = \alpha_t + \beta_1 RS_{t-1} + \beta_2 RB_{t-1} + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t. \quad (2)$$

where β_1 , β_2 , and β_i^{FIRM} are coefficients. Each model is estimated twice. First, the restricted estimation excludes the variables RS_{t-1} and RB_{t-1} from equations (1) and (2), respectively. Second, the unrestricted estimation of equations (1) and (2) is performed without excluding any variables. Comparing the sum of squared residuals for the unrestricted and restricted models, we conduct *F*-tests and asymptotically equivalent tests of the null hypothesis that $\beta_2 = 0$ in equations (1) and (2).[39] The results of the tests of equation (1) whether we can reject the null hypothesis that equity returns do not Granger cause loan returns are reported in the first column of Table 5, whereas the results of the Granger Causality test of equation (2) of the null hypothesis that loan returns do not cause equity returns are reported in the second column of Table 5.

The results of the Granger tests of equation (1) reject the null hypothesis using both the *F*-test and the asymptotically equivalent test. The value of the *F*-test statistic is 318.42, whereas the value of the asymptotically equivalent test statistic is 318.44, both strongly significant at the 1% level. Thus, the results of Column (1) of Table 5 suggest that equity returns Granger cause loan returns.

The results of the Granger causality tests of equation (1) also reject the null hypothesis using both the *F*-test and the asymptotically equivalent test. The values of both test statistics are 14.9, both statistically significant at the 1% level. Thus, the results of Column (2) of Table 5 support the contention that loan returns Granger cause equity returns. Both sets of Granger causality test results, therefore, support the *integrated market hypothesis* and are inconsistent with the *private information hypothesis* and *liquidity hypothesis.*

4.2. Direct Tests of Hypotheses

The results of the tests reported in Section 4.1 provide some support for the *integrated markets hypothesis* in that we find that equity and loan markets appear to be cointegrated. However, we have not tested the alternative hypotheses directly. In this section, we divide our sample of 43,578 paired weekly loan and equity returns into various subsamples in order to construct weekly portfolios that differ

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[38] The standard approach utilizes OLS to estimate Granger Causality, although we also estimated a Seemingly Unrelated Regression (SUR) model that obtains the same results as reported in the paper (available upon request).

[39] The asymptotically equivalent test is specified as: $S_1 - \frac{T(RSS_0 - RSS_1)}{RSS_1} \approx \chi^2(p)$.

systematically on the basis of liquidity and information content. For each criterion, we split the sample in half using the sample median to construct subsamples. Thus, for example, the entire sample has a median of 6 loan quotes. Therefore, in Tables 6 and 7 the low (high) number of loan quotes subsample comprises the observations with less than (more than) 6 bid plus ask quotations. Each of the subsamples in Tables 6 and 7 is similarly defined.

4.2.1. Testing the Private Information Hypothesis

Private firm-specific information is obtained by the members of the syndicate in the course of the lending relationship through the borrower's release of regular information used to judge covenant compliance. Financial covenants require regular reporting of sensitive, private financial data about earnings and leverage to the members of the syndicate. To reflect the availability of this private information, we segment our sample into those loans that have financial covenants and those that do not, denoted *YESCOV* and *NOCOV*, respectively.

Other indications of information sensitivity are par loans versus distressed loans. Industry convention is to designate distressed loans as loans trading at prices of 70 or below. These are the loans that are in imminent danger of default and would consequently generate the most intensive monitoring by bank lenders. Thus, banks should have more private information for the distressed loan subsample than for the subsample of par loans (trading at 90 or above). Thus, the *private information hypothesis* would anticipate that the lagged loan returns would have more explanatory power in determining equity returns for the distressed subsample as compared to the par loan subsample. Similarly, since intangible firms are more likely to be subject to information asymmetries than firms with predominately tangible assets, there would be more intensive monitoring of these borrowers and thus the *private information hypothesis* would anticipate that the lagged loan returns would have more explanatory power in determining equity returns for the subsample of intangible borrowers.

In Panel A of Tables 6 and 7, we utilize Granger Causality equations (1) and (2) to test the *private information hypothesis.* Panel A of Table 6 shows that equity returns Granger cause weekly loan returns for all information subsamples. Both the *F*-test and the asymptotically equivalent test are statistically significant at the 1% level, whether private information is received or not. This result is inconsistent with the *private information hypothesis* since private information does not impact the Granger Causality of equity returns on the syndicated bank loan market.

Panel A of Table 7 reports results that are also inconsistent with the *private information hypothesis.* Loan returns Granger cause (at the 10% level of significance or better) weekly equity returns for all subsamples. These results are strongest for the subsample of par loans and loans without financial covenants. Par loans are less information intensive. That is, par loans are less likely to be actively monitored by loan syndicate members than are distressed loans. Loans without financial covenants are

loans without regularly mandated transfers of information to the syndicate members. Thus, the results of Table 7, Panel A fail to support the contention that Granger Causality of equity returns by loan returns is due to private information available in the syndicated bank loan market.

4.2.2. Testing the Liquidity Hypothesis

We designate subsamples of the database to directly test the *liquidity hypothesis* such that the subsamples are segmented on the basis of trading activity in the loan and equity markets. We have six subsamples defined by differential liquidity in the loan (equity) market shown in Panels B (C) of Tables 6 and 7.

Panel B in Tables 6 and 7 designates measures of loan market liquidity. We divide our full sample into segments on the basis of the number of bid and ask loan quotes, the size of the loan bid/ask spread and whether the loan is a term or revolver.[40] Thus, loan markets are expected to be more liquid, the larger the number of bid and ask quotes and the smaller the spread. Moreover, since data on loan trading volume is unavailable in this market, we posit that revolver lines of credit are less liquid, ceteris paribus, because revolvers are more likely to be backup lines of credit and the market is more likely to be dominated by banks, whereas banks and non-bank financial institutions both hold term loans in their portfolios.[41]

Panel C in Tables 6 and 7 designates measures of equity market liquidity. Paralleling our variables designating loan market liquidity, we divide our full sample into segments on the basis of the number of bids and ask equity market quotes and bid/ask spreads in the equity market. In addition, however, we utilize equity trading volume as a measure of equity market liquidity. Thus, equity markets are more liquid if they have higher than median trading volume, number of bids and asks and lower than median spreads.

The *liquidity hypothesis* implies that more liquid markets will lead less liquid markets in incorporating information into prices. The *liquidity hypothesis* receives no support from Panels B and C of Table 6, which present the results of tests of whether weekly equity returns Granger cause weekly loan returns. For all subsamples, the null hypothesis is rejected at a 1% level of statistical significance, suggesting that equity returns Granger cause loan returns no matter how liquid or illiquid is the equity or loan market. However, the Granger Causality tests shown in Panels B and C of Table 7 show some

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[40] A term loan has a fixed time to maturity and a fixed principal amount, with designated principal and interest payments, whereas a revolving line of credit has a maximum time to maturity and a maximum principal amount. The borrower determines how much and when to take down the line of credit, thereby determining the loan's principal amount. Many revolvers back up commercial paper programs and may never be taken down over the life of the loan facility.

[41] Moreover, since lines of credit are more likely to be relationship loans, they are less likely to be traded in secondary markets.

limited support for the *liquidity hypothesis*. Lagged loan returns Granger cause equity returns for the most liquid loan markets only, i.e., those markets with the highest number of quotes and for term loan markets, as well as for markets with the widest loan spread.[42] Moreover, the results presented in Panel B of Table 7 show that lagged loan returns do not Granger cause equity returns for the least liquid loan markets (revolver loans and those with fewer quotes). In contrast, however, the Granger Causality of equity markets by loan returns is not related to equity market liquidity. Panel C of Table 7 shows that loan returns Granger cause equity returns (at the 5% level or better) for all markets except those equity markets with the lowest spreads or the lowest number of quotes.

4.2.3. Testing the Asymmetric Price Reaction Hypothesis

The *asymmetric price reaction hypothesis* states that loan markets are more sensitive to negative information ("negative returns") than to positive information ("positive returns"), whereas equity markets react symmetrically to both positive and negative information about firm values and risk exposures. In order to test this hypothesis, we divide our full sample into "positive returns" and "negative returns" subsamples. Although we utilize several methodologies, we report the results using the definition of the "positive returns" subsample as those markets with positive abnormal returns and "negative returns" as those markets with negative abnormal returns.[43] Hence, the "positive returns" subsample contains those observations for which loan returns in excess of the loan index are greater than zero, while the "negative returns" subsample are those observations for which loan return in excess of the loan index are less than or equal to zero.

The Granger Causality tests presented in Table 8 do not support the *asymmetric price reaction hypothesis.* All tests reject (at the 5% level or better) the null hypothesis, thereby supporting the conclusion that loan returns Granger cause equity returns for both positive and negative returns groups, as well as equity returns Granger cause loan returns for both positive and negative returns groups.[44]

4.2.4. Testing the Integrated Markets Hypothesis

In Table 9, we further test the *integrated markets hypothesis*. We posit that trading is most likely to be integrated across markets if the same financial intermediary acts as an equity market maker and a

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[42] Since distressed loans with wide spreads tend to trade actively in the syndicated loan market, the results in Panel B of Table 7 could be consistent with the *liquidity hypothesis.* That is, the wider spreads on distressed debt may be consistent with greater loan liquidity. Thus, the equity returns are Granger caused by loan returns for liquid loans.

[43] We also subdivide our full sample on the basis of positive and negative absolute returns, as well as use one-week lags to define "positive returns" and "negative returns" groups. Results are not sensitive to the methodology and are available upon request.

[44] We also examine the interaction among the *private information, liquidity* and *asymmetric price reaction hypotheses* by subdividing the positive returns and negative returns groups into information and liquidity subsamples. The results support the *integrated market hypothesis* in that most subsamples exhibit Granger Causality across both equity and loan markets. There does not appear to be a consistent pattern with regard to either information or liquidity for the few subsegments that reject Granger Causality.

syndicate member. Using the designation of equity market makers provided in the TAQ database, we separate our sample into observations in which there was at least one financial intermediary that is both a syndicate member and an equity market maker. We expect the greatest degree of integration across markets for this subsample.

Our results suggest that information flows more quickly between markets when the same financial intermediary participates in both the equity and the syndicated loan market. Panel A of Table 9 shows the results of the Granger Causality estimation of equation (1), with the loan return as the dependent variable. Whether or not the financial intermediary simultaneously acts as an equity market maker and a loan syndicate member, Panel A, Table 9 shows equity returns significantly (at the 1% level) Granger cause loan returns. However, Panel B of Table 9 shows that loan returns Granger cause (significant at the 5% level) equity returns for the subsample in which at least one financial intermediary simultaneously acts as an equity market maker and a loan syndicate member. This suggests that information flows freely from equity markets to loan markets, but that access to private information (available to syndicate members) is required to enhance the flow of information from loan markets to equity markets, consistent with the *integrated markets hypothesis.*

5. Conclusions

In this study, we use a novel database of paired secondary market loan and equity prices to comprehensively study the informational efficiency of equity markets and syndicated bank loan secondary markets. We utilize three methodologies to conduct our tests: Seemingly Unrelated Regression (SUR) market integration tests of the return generating function for each market individually, Granger Causality tests, and estimation of abnormal returns on portfolios constructed using lagged market data. We examine the integration of the two markets on a day-to-day basis, without focusing exclusively on large market-moving events such as defaults or earnings announcements, as is done in previous studies.

We formulate four hypotheses. The *private information hypothesis* posits that loan markets lead equity markets because members of loan syndicates have access to superior, private information about borrowing firms. The *liquidity hypothesis* states that equity markets lead loan markets because loan markets are relatively illiquid as compared to public equity markets. The *asymmetric price reaction hypothesis* states that loan markets are more sensitive to negative information, due to the limited upside gain potential of debt contracts, whereas equity markets respond equally to both positive and negative information. Our empirical tests do not offer strong support for any of these hypotheses. Rather we find support for the *integrated markets hypothesis.* We find a considerable level of market integration between equity and loan markets such that contemporaneous and lagged equity returns impact loan returns and vice versa. Moreover, we find that lagged equity returns Granger cause weekly loan returns and, in most

cases, lagged loan returns Granger cause weekly equity returns. This is particularly true if the same financial intermediary simultaneously acts as an equity market maker and a loan syndicate member.

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Table 1: Equity Market and Syndicated Bank Loan Market Descriptive Statistics. Using a sample of syndicated bank loans that had at least two quotes from loan dealers during the January 1999-May 2003 period, we combine primary market data from LPC's Dealscan database with secondary market pricing from LPC's Mark-to-Market database. We obtain a sample of 719 loan facilities on 432 loan deals with 43,578 weekly quotes for individual loan facilities. The weekly quote consists of the average of all bids and average of all asks received by LPC on a given date for each week during the sample period. Since actual transaction prices are not observable in this market, we use the mean of the average bid and the average asked (denoted the mean of the mean price) as a proxy for the actual transaction price. Variable definitions are as follows: RB_t is the loan return. RS_t is the equity return. RL_t is the loan index return. RM_t is the equity index return. RD_t is the T-Bill return. Y_t is the year of the observation. NBA_t is sum of the number of bids and asks for the loan. $SPRD_t$ is the relative loan spread. *TERM* is a dummy variable equal to unity if the loan is designated a term loan by LPC and zero otherwise. *REVOLVER* is a dummy variable equal to unity if the loan is designated a revolver loan by LPC and zero otherwise. V_t is the volume of trades on the equity market. $ESPRD_t$ is the relative equity spread. $ENBA_t$ is the sum of the number of bid and ask quotations divided by 1,000 for the equity. *COV* is a dummy variable equal to unity if financial covenants are preset in the loan and zero otherwise. $DISTRESS_t$ is a dummy variable equal to unity if the loan price is les than or equal to 70 and zero otherwise. PAR_t is a dummy variable equal to unity if the loan price is greater or equal to 90 and zero otherwise. *INTANGIBLE* is a dummy variable equal to unity if the borrowing firm has 2-digit SIC codes 28, 73, 37, 35, 36 and 38 and zero otherwise. $DUALMM_t$ is a dummy variable that is equal to unity if at least one lender associated with the given syndicated loan is also a market maker for the equity of the borrower on the day of the observation, and zero otherwise.

Variable	Variable Definition	Number	Mean	Median	Standard Dev.
Measures of Return and Year of Observation					
RB_t	Loan return (%)	43,578	-0.07	0.00	1.80
RS_t	Equity return (%)	43,578	0.11	0.00	14.34
RM_t	Equity index return (%)	43,578	0.00	0.00	0.30
RL_t	Loan index return (%)	43,578	-0.16	0.00	3.05
RD_t	T-Bill return (%)	43,578	0.09	0.00	0.05
Y_t	Year of observation	43,578	2001.09	2001.00	1.17
Measures of Loan Market Liquidity					
NBA_t	Sum of loan bids and asks quotes	43,578	8.08	6.00	5.31
$SPRD_t$	Relative loan spread (%)	43,578	1.65	1.00	3.37
TERM	Term loan dummy	43,578	0.73	1.00	0.44
REVOLVER	Revolver loan dummy	43,578	0.21	0.00	0.40
Measures of Equity Market Liquidity					
V_t	Volume of trades on equity market	43,578	994,889.53	249,647.00	3,166,782.32
$ESPRD_t$	Relative equity spread (%)	43,578	5.99	4.00	6.02
$ENBA_t$	Sum of equity bid and ask quotes/1,000	43,578	2.24	0.98	5.22
Measures of Private Information					
COV	Financial covenant present dummy	43,578	0.84	1.00	0.36
$DISTRESS_t$	Loan price < = 70 dummy	43,578	0.04	0.00	0.19
PAR_t	Loan price > = 90 dummy	43,578	0.85	1.00	0.36
INTANGIBLE	Intangible borrower dummy	43,578	0.09	0.00	0.28
$DUALMM_t$	Dual lender-market maker dummy	28,947	0.41	0.00	0.49

Table 2: Primary and Secondary Market Descriptive Statistics of the Syndicated Bank Loan Market. Primary and Secondary market descriptive statistics are reported for our samples of syndicated bank loans. Loan deal and facility size are the size of entire loan deal and the size of the individual facilities for the 719 loan facilities in our sample. Spread over the LIBOR is the basis point difference between the rate and LIBOR. The upfront fee is a fee paid by the borrower upon closing the loan. The annual fee is charged against the entire loan commitment amount, whether used or unused. The commitment fee is charged on the commitment amount that is unused. The cancellation fee is charged upon termination or reduction in the line of credit. Assignment minimum is the minimum amount that can be traded under an assignment. The assignment fee is the fee paid to the agent bank for handling the assignment documentation. Time to maturity is the time to maturity associated with the loan facility at initiation. The Debt/EBITDA ratio at year-end of the year of the loan's origination is constructed using Compustat data as follows: DATA9 (Long Term Debt) / (Data 18 (Income before Extraordinary Items) + Data 15 (Interest Expense) + Data 16 (Income Taxes) + Data 14 (Depreciation and Amortization)). Share of lender, lead arranger, and participant lenders are the percentage share of the loan facility held by each. Since actual transaction prices are not observable in this market, we use the mean of the average bid and the average asked (denoted the mean of the mean price) as a proxy for the actual transaction price.

	Number	Mean	Median	Standard Dev.
PRIMARY MARKET DESCRIPTIVE STATISTICS				
Loan Deal Size	719	1,117.69	750.00	1,271.21
Loan Facility Size	719	415.22	250.00	592.24
Spread Over LIBOR	719	289.20	275.00	113.38
Upfront_Fee	361	55.57	50.00	50.49
Annual_Fee	159	77.11	50.00	75.08
Commitment_Fee	77	53.46	50.00	25.84
Cancellation Fee	15	171.67	200.00	54.17
Assignment Minimum	645	4,617,914.73	5,000,000.00	3,202,102.74
Assignment Fee	639	3,272.30	3,500.00	611.57
Time to Maturity	715	2,150.88	2,192.00	698.21
Debt/EBITDA, year of loan origination date	595	7.97	4.58	62.25
Number Lenders per Facility	715	15.98	12.00	14.03
Share of Lender	2,806	5.26	3.00	9.33
Share of Lead Arranger	175	26.99	15.79	25.21
Share of Participant Lenders	1,787	2.69	1.88	2.73
SECONDARY MARKET DESCRIPTIVE STATISTICS				
Average Bid Price	43,578	94.30	98.62	10.84
Average Asked Price	43,578	95.59	99.37	9.84
Mean of the Mean Price	43,578	94.94	99.00	10.33
Number of Bid Quotes	43,578	4.04	3.00	2.65
Number of Ask Quotes	43,578	4.04	3.00	2.65
Sum of Bid and Ask Quotes for Mean of the Mean Price < 70	1,652	7.92	6.00	4.08
Average Price < 70	1,652	55.70	61.42	15.77
Sum of Bid and Ask Quotes for Mean of the Mean Price: 70-80	1,744	8.22	6.00	4.48
Average Price: 70-80	1,744	75.22	75.25	3.02
Sum of Bid and Ask Quotes for Mean of the Mean Price: 80-90	3,311	8.46	6.00	4.97
Average Price: 80-90	3,311	85.56	85.75	2.88
Sum of Bid and Ask Quotes for Mean of the Mean Price > 90	36,871	8.05	6.00	5.42
Average Price > 90	36,871	98.48	99.41	2.45
1999 Mean of the Mean Price	4,577	94.86	99.08	10.87
2000 Mean of the Mean Price	9,517	96.31	99.32	8.00
2001 Mean of the Mean Price	11,716	95.28	98.84	9.60
2002 Mean of the Mean Price	13,033	93.93	98.79	11.50
2003 Mean of the Mean Price	4,735	94.24	98.75	11.85
Facility Size Segments:				
Facility size< $500 m.	32,428	95.04	99.25	10.50
$500 m.<=Facility size < $1,000 m.	8,120	94.77	98.57	9.60
$1,000 m.<=Facility size	3,030	94.35	98.08	10.40
Deal Size Segments:				
Deal size< $500 m.	12,286	94.98	99.25	11.56
$500 m. <=Deal size < $1,000 m.	14,017	95.34	99.07	9.89
$1,000 m. <=Deal size < $2,500 m.	13,712	94.09	98.75	10.37
$2,500 m.<=Deal size	3,563	96.57	98.62	6.31
Spread Over Libor Segments:				
Spread Over Libor < 100 b.p.	1,514	94.44	98.62	11.02
100 b.p. <= Spread Over Libor < 250 b.p.	17,535	95.22	98.54	9.33
250 b.p. <= Spread Over Libor	24,529	94.78	99.37	10.95
Average Weekly Bid Count Segments:				
2 <= Average Weekly Bid Count < 3	16,189	95.44	98.87	10.66
3 <= Average Weekly Bid Count < 4	8,904	94.35	98.55	10.05
4 <= Average Weekly Bid Count	18,485	94.80	99.48	10.14
Time Remaining Until Maturity Segments:				
Maturity < 1 year	2,570	92.50	99.06	18.04
1 <= Maturity < 3 years	6,686	94.71	97.87	9.96
3 <= Maturity < 5 years	15,838	94.72	98.80	9.80
5 years <= Maturity	18,484	95.56	99.50	9.33

Table 3: Industry Groupings of Borrowers in the Syndicated Bank Loan Market. The 2-digit SIC codes are reported for the loan facilities in our sample of liquid syndicated bank loans. The percent of facilities column is tabulated by the number of facilities, while the percent of total facility size column is tabulated by facility size. SIC code groups with less than 1% of the total number of facilities are excluded from the table; hence these results are reported for 617 of the 719 loan facilities in our sample.

SIC Code	Description	# of Facilities	% of Facilities	% of total facility size
48	Telecommunications	157	21.84%	21.11%
80	Health Care Services	59	8.21%	6.66%
49	Public Utilities: Electric, Gas, Water	45	6.26%	10.25%
28	Chemical Manufacturing	42	5.84%	5.83%
70	Services: Hotels & Motels	34	4.73%	4.48%
73	Services: Advertising & Computer Facilities	33	4.59%	3.70%
37	Manufacturing: Transportation Equipment	28	3.89%	2.16%
27	Manufacturing: Printing & Publishing	22	3.06%	2.54%
26	Manufacturing: Pulp & Paper	21	2.92%	4.34%
20	Manufacturing: Food Products	20	2.78%	2.77%
35	Manufacturing: Machinery	18	2.50%	3.07%
67	Financial Holding & Other Investment Offices	18	2.50%	3.50%
34	Manufacturing: Hardware & Metal Products	17	2.36%	1.54%
36	Manufacturing: Electrical Machinery, Equipment & Supplies	16	2.23%	2.94%
50	Wholesale Trade: Durable Goods	15	2.09%	0.71%
79	Services: Amusement & Recreation	15	2.09%	1.29%
78	Services: Motion Picture & Video Tape	12	1.67%	5.50%
58	Retail Trade: Eating & Drinking Places	11	1.53%	2.05%
59	Retail Trade: Stores	9	1.25%	1.10%
63	Insurance Carriers	9	1.25%	2.18%
38	Manufacturing: Measuring & Controlling Devices (Photographic Equip.)	8	1.11%	0.62%
51	Wholesale Trade: Dry Goods	8	1.11%	0.90%
	Intangible Industries: SIC codes 28, 73, 37, 35, 36 and 38, as defined by Amir, et al (2003)	145	20.17%	18.33%

Table 4: Structure of Loans in the Syndicated Bank Loan Market. We tabulate the incidence of financial covenants, general covenants, purposes of the deal, market segment and credit rating for our sample of liquid syndicated bank loans (see description of sample in Table 1). 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. Credit ratings are coded numerically as follows: all A ratings (including all notches from AAA to A-)=4; all B ratings=3; all C ratings=2; default=1.

	# of Facilities	% of Facilities	Mean	Median
Financial Covenant Description				
Maximum debt to EBITDA ratio (Initial)	551	73.96%	5.71	5.25
Maximum debt to EBITDA ratio (Eventual)	521	69.93%	3.70	3.5
Debt to EBITDA Compliance (initial)	466	62.55%	0.03	-0.32
Maximum senior debt to EBITDA (Initial)	182	24.43%	4.44	3.75
Maximum senior debt to EBITDA (Eventual)	152	20.40%	2.78	3
Minimum net worth (Base)	149	20.00%	614251792.62	250,000,000
Minimum tangible net worth (Base)	19	2.55%	893386263.16	650,000,000
Minimum net worth (Percentage)	17	2.28%	62.06	50
Minimum current ratio (Initial)	11	1.48%	1.49	1.5
Maximum debt to tangible net worth (Initial)	5	0.67%	2.02	2.25
Maximum debt to equity ratio (Initial)	3	0.40%	0.41	0.39
Minimum tangible net worth (Percentage)	3	0.40%	50.00	50
Maximum debt to equity ratio (Eventual)	2	0.27%	0.25	0.25
General Covenant Description				
Dividend restrictions	649	90.26%	95.38	100
% of syndicate required for nonmaterial changes	646	89.85%	51.73	51
% of syndicate required for changes in loan terms	636	88.46%	100.00	100
Asset sales sweep	599	83.31%	96.24	100
Insurance proceeds sweep	596	82.89%	64.09	100
Equity issue sweep	592	82.34%	53.88	50
Debt issue sweep	591	82.20%	78.84	100
Excess cash flow sweep	554	77.05%	45.49	50
Collateral release	552	76.77%	99.94	100
Percent of excess cash flow	510	70.93%	51.10	51
Credit Rating				
S&P Senior Debt Current	602	83.73%	2.73	3
S&P Senior Debt at Close	598	83.17%	2.96	3
S&P Bank Loan Current	172	23.92%	2.90	3
S&P Bank Loan at Close	124	17.25%	2.98	3
S&P Subordinated Debt Current	370	51.46%	2.69	3
S&P Subordinated Debt at Close	369	51.32%	2.86	3
Moody's Senior Debt Current	559	77.75%	2.84	3
Moody's Senior Debt at Close	497	69.12%	2.94	3
Moody's Bank Loan Current	261	36.30%	2.93	3
Moody's Bank Loan at Close	172	23.92%	2.99	3
Moody's Subordinated Debt Current	354	49.24%	2.68	3
Moody's Subordinated Debt at Close	310	43.12%	2.88	3

(Continued)

Table 4 (continued): The percent of total column is tabulated by number of facilities, whereas the percent of total facility size column is tabulated by facility size. The purpose and market segment variables are assigned by LPC such that each loan may be assigned to more than one category.

	# of Facilities	% of Facilities	# of Total Facility Size
Broad Purpose			
Acquisition Related	332	46.18%	44.31%
Refinancing	190	26.43%	27.24%
Project Finance	4	0.56%	0.23%
Specific Purpose			
Change of control	334	46.45%	44.43%
Takeover	232	32.27%	32.59%
Debt Repayment	190	26.43%	27.24%
Ongoing business	138	19.19%	23.24%
Corporate Purposes	73	10.15%	11.61%
Working Capital	46	6.40%	4.39%
Acquisition Line of Credit	43	5.98%	5.88%
Spinoff	29	4.03%	4.22%
LBO/MBO	28	3.89%	1.61%
Recapitalization – General	25	3.48%	2.12%
Telecommunications Buildout	18	2.50%	1.58%
Commercial Paper Backup	11	1.53%	5.87%
Capital Expenditures	4	0.56%	0.51%
Debtor-in-possession	4	0.56%	0.85%
Project Finance	4	0.56%	0.23%
Other	3	0.42%	0.47%
IPO Related Financing	2	0.28%	0.12%
Stock Buyback	2	0.28%	0.18%
Leveraged Build Up	1	0.14%	0.05%
Real Estate	0	0.00%	0.00%
Recapitalize Project	0	0.00%	0.00%
Market Segment			
Non-Investment Grade	678	94.16%	88.87%
Leveraged	579	80.39%	61.90%
Highly Leveraged	390	54.24%	38.08%
Institutional	327	45.48%	30.02%
M&A	318	44.23%	42.95%
U.S. Middle Market	97	13.49%	3.86%
U.S. Large Middle Market	92	12.80%	3.75%
LBO	27	3.76%	1.60%
Investment Grade	14	1.95%	7.03%
U.S. Traditional Middle Market	5	0.70%	0.10%

Table 5: Full Sample Bivariate Granger Causality Tests. We test causality between loan and equity return using OLS estimates of the following models:

$$RB_t = \alpha_t + \beta_1 RB_{t-1} + \beta_2 RS_{t-1} + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t, \quad (1)$$

$$RS_t = \alpha_t + \beta_1 RS_{t-1} + \beta_2 RB_{t-1} + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t. \quad (2)$$

Each model is estimated twice: restricted, through excluding the variables RS_{t-1} and RB_{t-1} from the equations, and unrestricted where these variables are not excluded. We then compare the sum of squared residuals for the unrestricted and restricted models, and conduct *F*-tests and asymptotically equivalent tests of the null hypothesis that $\beta_2 = 0$. Significance denotes a finding of Granger causality. Variable definitions are as follows: RB_t is the loan return. RS_t is the equity return. $FIRM_i$ is the firm-specific dummy variable associated with firm *i*, and *NFIRM* is the number of borrowers. ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)
Variable	Do equity returns Granger cause loan returns? Eq. (1) (RB_t is dependent)	Do loan returns Granger cause equity returns? Eq. (2) (RS_t is dependent)
Observations	43,578	43,578
SSE restricted	13.20	868.55
SSE unrestricted	13.10	868.25
F-test	318.42***	14.90***
Asympt. equivalent test	318.44***	14.90***

Table 6: Subsample Bivariate Granger Causality Tests, Loan Return Dependent Variable. We test causality between loan and equity return using OLS estimates of equation (1). For each subsample, each model is estimated twice: restricted, through excluding the variable RS_{t-1}, the lagged equity return, from the equation, and unrestricted where RS_{t-1} is not excluded. We then compare the sum of squared residuals for the unrestricted and restricted models, and conduct *F*-tests and Asympt. equivalent tests of the null hypothesis that $\beta_2 = 0$. Significance denotes a finding of Granger causality. ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

Table 6, Panel A

Variable	Distressed loans (Price<=70)	Par loans (Price>=90)	Loans with financial covenants	Loans without financial covenants	Loans to Intangible Firms
	(1)	(2)	(3)	(4)	(5)
Observations	1,695	36,956	36,800	6,778	3,778
SSE restricted	7.19	0.99	10.13	3.06	0.94
SSE unrestricted	7.13	0.98	10.04	3.05	0.93
F-test	15.72***	281.79***	324.72***	21.03***	36.64***
Asympt. equivalent test	15.75***	281.81***	324.74***	21.04***	36.67***

Table 6, Panel B

Variable	Low number of loan quotes	High number of loan quotes	Low loan spreads	High loan spreads	Term loans	Revolver loans
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	25,093	18,485	21,956	21,622	31,877	8,940
SSE restricted	7.42	5.57	0.05	13.09	7.58	3.23
SSE unrestricted	7.39	5.50	0.05	12.97	7.53	3.20
F-test	87.62***	238.72***	58.70***	188.29***	218.28***	69.35***
Asympt. equivalent test	87.63***	238.76***	58.71***	188.31***	218.30***	69.38***

Table 6, Panel C

Variable	Low equity volume	High equity volume	High equity spreads	Low equity spreads	High number of equity quotes	Low number of equity quotes
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	21,789	21,789	21,816	21,762	21,795	21,783
SSE restricted	3.21	9.78	12.25	0.83	6.13	6.36
SSE unrestricted	3.19	9.71	12.16	0.82	6.06	6.33
F-test	119.37***	173.89***	159.71***	120.72***	246.42***	101.59***
Asympt. equivalent test	119.39***	173.91***	159.73***	120.73***	246.45***	101.60***

Table 7: Subsample Bivariate Granger Causality Tests, Equity Return Dependent Variable. We test causality between loan and equity return using OLS estimates of equation (2). For each subsample, each model is estimated twice: restricted, through excluding the variable RB_{t-1}, the lagged loan return, from the equation, and unrestricted where RB_{t-1} is not excluded. We then compare the sum of squared residuals for the unrestricted and restricted models, and conduct *F*-tests and Asympt. equivalent tests of the null hypothesis that $\beta_2 = 0$. Significance denotes a finding of Granger causality. ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

Table 7, Panel A

Variable	Distressed loans (Price<=70)	Par loans (Price>=90)	Loans with financial covenants	Loans without financial covenants	Loans to Intangible Firms
	(1)	(2)	(3)	(4)	(5)
Observations	1,695	36,956	36,800	6,778	3,778
SSE restricted	108.65	438.33	657.88	208.70	64.62
SSE unrestricted	108.44	438.23	657.79	208.29	64.57
F-test	3.25*	7.76***	4.80**	13.29***	3.39*
Asympt. equivalent test	3.26*	7.76***	4.81**	13.30***	3.39*

Table 7, Panel B

Variable	Low number of loan quotes	High number of loan quotes	Low loan spreads	High loan spreads	Term loans	Revolver loans
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	25,093	18,485	21,956	21,622	31,877	8,940
SSE restricted	500.60	364.64	161.97	702.10	609.27	177.13
SSE unrestricted	500.56	364.14	161.96	701.80	609.09	177.13
F-test	1.79	25.33***	0.36	9.52***	9.32***	0.21
Asympt. equivalent test	1.79	25.34***	0.36	9.52***	9.32***	0.21

Table 7, Panel C

Variable	Low equity volume	High equity volume	High equity Spreads	Low equity spreads	High number of equity quotes	Low number of equity quotes
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	21,789	21,789	21,816	21,762	21,795	21,783
SSE restricted	316.89	526.65	770.28	92.53	346.28	475.94
SSE unrestricted	316.83	526.27	769.86	92.53	345.64	475.93
F-test	3.89**	15.79***	11.83***	0.36	40.52***	0.07
Asympt. equivalent test	3.89**	15.79***	11.83***	0.36	40.53***	0.07

Table 8: Bivariate Granger Causality Tests, "Positive Returns" and "Negative Returns" Subamples. We test causality between loan and equity return using OLS estimates equations (1) and (2) for two subsample: a "positive returns" subsample consisting of those observations for which loan return in excess of the loan index is greater than zero, and a "negative returns" subsample consisting of those observations for which loan return in excess of the loan index is less than or equal to zero. Each model is estimated twice: restricted, through excluding the variables RS_{t-1} and RB_{t-1} from the equations, and unrestricted where these variables are not excluded. We then compare the sum of squared residuals for the unrestricted and restricted models, and conduct *F*-tests and Asympt. equivalent tests of the null hypothesis that $\beta_2 = 0$. Significance denotes a finding of Granger causality. Variable definitions are as follows: RB_t is the loan return. RS_t is the equity return. ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

Table 8, Panel A: Positive Returns Subsample

	(1)	(2)
Variable	Do equity returns Granger cause loan returns? Eq. (1) (RB_t is dependent)	Do loan returns Granger cause equity returns? Eq. (2) (RS_t is dependent)
Observations	20,444	20,444
SSE restricted	3.28	353.70
SSE unrestricted	3.25	353.32
F-test	163.37***	21.97***
Asympt. equivalent test	163.39***	21.97***

Table 8, Panel B: Negative Returns Subsample

	(1)	(2)
Variable	Do equity returns Granger cause loan returns? Eq. (1) (RB_t is dependent)	Do loan returns Granger cause equity returns? Eq. (2) (RS_t is dependent)
Observations	23,134	23,134
SSE restricted	7.27	485.49
SSE unrestricted	7.23	485.38
F-test	135.37***	5.08**
Asympt. equivalent test	135.39***	5.08**

Table 9. Bivariate Granger Causality Tests, Dual Market Maker/Lender Subsamples. We test causality between loan and equity return using OLS estimates equations (1) and (2) for two subsample: a subsample consisting of those observations for which at least one lender associated with the given syndicated loan facility is also a market maker for the equity of the borrower on the day of the observation, and a subsample consisting of those observations for which no lender is also a market maker on the day of the observation. Each model is estimated twice: restricted, through excluding the variables RS_{t-1} and RB_{t-1} from the equations, and unrestricted where these variables are not excluded. We then compare the sum of squared residuals for the unrestricted and restricted models, and conduct *F*-tests and Asympt. equivalent tests of the null hypothesis that $\beta_2 = 0$. Significance denotes a finding of Granger causality. Variable definitions are as follows: RB_t is the loan return. RS_t is the equity return. ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

Panel A: Loan Return Dependent Variable

Variable	At least one market maker is also a lender	No market maker is also a lender
	(2)	(3)
Observations	11,862	17,085
SSE restricted	3.54	4.01
SSE unrestricted	3.51	3.98
F-test	109.63***	165.01***
Asympt. equivalent test	109.66***	165.04***

Panel B: Equity Return Dependent Variable

Variable	At least one market maker is also a lender	No market maker is also a lender
	(2)	(3)
Observations	11,862	17,085
SSE restricted	145.59	243.29
SSE unrestricted	145.53	243.28
F-test	5.25**	0.40
Asympt. equivalent test	5.26**	0.40

Appendix

A.1. Market Integration Tests

In this section we examine the lead-lag relation between loan and equity returns. We use Seemingly Unrelated Regressions with fixed effects to jointly estimate the following return-generating processes:

$$RB_t = \alpha_t + \beta_1^B RB_{t-1} + \sum_{i=0}^{2} \beta_i^S RS_{t-i} + \sum_{i=0}^{2} \beta_i^M RM_{t-i} + \beta_0^L RL_t + \beta_0^D RD_t + \beta^Y Y_t + \beta^{LN} NBA_t + \beta^{LS} SPRD_t + \beta^V V_t + \beta^{ES} ESPRD_t + \beta^{EN} ENBA_t + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t, \quad \text{(A.1)}$$

$$RS_t = \alpha_t + \sum_{i=0}^{1} \beta_i^B RB_{t-i} + \sum_{i=1}^{2} \beta_i^S RS_{t-i} + \sum_{i=0}^{2} \beta_i^M RM_{t-i} + \beta_0^L RL_t + \beta_0^D RD_t + \beta^Y Y_t + \beta^{LN} NBA_t + \beta^{LS} SPRD_t + \beta^V V_t + \beta^{ES} ESPRD_t + \beta^{EN} ENBA_t + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t, \quad \text{(A.2)}$$

where $FIRM_i$ is the firm-specific dummy variable associated with firm i, $NFIRM$ is the number of borrowers, and all other variables are defined in Table 1. This specification is similar to the market integration tests specified in Hotchkiss and Ronen (2002).[45]

Table A.1 reports the results of estimation of the processes specified in equations (A.1) and (A.2) for our sample of 43,578 paired equity-loan return observations. The results indicate that the equity market leads the loan market in incorporating firm-specific information. The estimation of equation (A.1) results in statistically significant (at the 1% level) coefficients on contemporaneous and lagged equity returns (RS_t, RS_{t-1}, RS_{t-2}) in explaining loan returns.[46] Moreover, the estimation of equation (A.2) shows that lagged and contemporaneous loan returns have statistically significant (at the 1% level) impacts on equity returns. Thus, equity returns have explanatory power in determining loan returns, and loan returns have explanatory power with regard to equity returns. These results are consistent with the *integrated markets hypothesis* in that each market simultaneously impacts the other.

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[45] We use two lags for equity returns in Eq. (A.1) whereas only one lag for loan returns in Eq. (A.2) as the greater liquidity of the equity market results in a quicker absorption of information. The results are robust to alternative lag specifications. One notable distinction between our model and Hotchkiss and Ronen (2002) is that we include both the loan index return and US Treasury bill rate in the same model, whereas Hotchkiss and Ronen (2002) alternate between these two variables. Our tests are robust to the exclusion of either loan index return or the T-Bill rate. Another notable distinction is that we use SUR estimation while Hotchkiss and Ronen (2002) uses GMM estimation.

[46] The equity regression results presented in Table A.1 (RS_t dependent) suggest that weekly equity returns are negatively correlated. This result is consistent with evidence presented by Lo and MacKinlay (1999, Chapter 5). In particular, we present results using a two-week equity lag following the results presented in Table 5.2 of Lo and MacKinlay (1999) showing that weekly equity returns are most negatively correlated over a two week lag. However, our results are robust to different lag structures.

Other results of the estimation are unsurprising. For each regression, the respective index has statistically significant explanatory power on the contemporaneous index, whether the loan index, RL_t for equation (A.1) or the S&P 500 index, RM_t for equation (A.2). Moreover, the liquidity variables (*NBA, SPRD, ENBA, ESPRD*) are all statistically significant (at the 10% level or better) for equation (A.1), but not for equation (A.2).

A.2. Abnormal Portfolio Returns

In Section A.1, we demonstrate that the equity returns lead loan returns, and loan returns lead equity returns. In Section 4.1, we demonstrate that equity returns Granger cause loan returns, and loan returns Granger cause equity returns. These results imply predictability in loan returns that may be used to generate abnormal portfolio returns in equity markets, and vice versa. Therefore, as another test of the results in Sections A.1 and 4.1, we construct portfolios based on lagged returns and test for possible arbitrage opportunities resulting from predictability in pricing across the bank loan and equity markets.

For every week in the time period, we separately form equally weighted portfolios consisting of loan (equity) return observations for which the lagged equity (loan) return in excess of the T-bill return is positive or negative. We then subtract the loan (equity) return on the negative lagged equity (loan) portfolio from the return on the positive lagged equity (loan) to simulate a portfolio consisting of long positions in loans (stocks) with positive lagged equity (loan) returns and short positions in loans (stocks) with negative lagged equity (loan) returns. Thus, we test whether one could earn abnormal returns in the loan market by buying loans with positive lagged equity returns and selling loans with negative lagged equity returns. In addition, we test whether one could earn abnormal returns in the equity market by trading on loan return information; that is, buying stocks with positive lagged loan returns and selling stocks with negative lagged loan returns.

To test whether this investment strategy can generate abnormal returns, we first report the mean weekly return on the long/short portfolio returns in excess of US Treasury bill rates over the sample period. Table A.2 presents these results. The top row of Table A.2 examines whether abnormal returns can be earned by using lagged equity returns to construct loan portfolios. We find evidence of significant (at the 5% level) abnormal returns, averaging 7 basis points per week, supporting our earlier findings that the equity market leads the loan market. Thus, information about equity returns can be profitably used to trade in the loan market.

We also use a single factor model to regress excess returns on the constructed long/short loan portfolio against excess loan index returns. The intercept of this regression should denote abnormal returns on the portfolio. The top row of Table A.2 presents an intercept (alpha) term of 6 basis points

(significant at the 10% level). This suggests the presence of abnormal returns when constructing portfolios of loans using lagged equity returns.

We find no evidence of abnormal returns in the equity market. That is, we test an investment strategy using lagged loan returns to design equity portfolios, such that the portfolio is rebalanced each week to buy stocks with positive lagged loan returns and sell stocks with negative lagged loan returns. The bottom row of Table A.2 reports that the average return on these portfolios is insignificantly different from zero. Moreover, using a single index model of excess equity returns on excess equity market returns, we find that the intercept term (alpha) is insignificantly different from zero. Thus, information about loan returns alone is insufficient to generate abnormal returns in equity markets. This may be due to the relative illiquidity of loan markets.[47]

[47] Another possible explanation is that loan prices are stale, thereby reflecting only lagged information.

Table A.1: Regression Tests, Full Sample. We use the Seemingly Unrelated Regressions estimation technique to estimate:

$$RB_t = \alpha_t + \beta_1^B RB_{t-1} + \sum_{i=0}^{2} \beta_i^S RS_{t-i} + \sum_{i=0}^{2} \beta_i^M RM_{t-i} + \beta_0^L RL_t + \beta_0^D RD_t + \beta^Y Y_t + \beta^{LN} NBA_t + \beta^{LS} SPRD_t + \beta^V V_t + \beta^{ES} ESPRD_t + \beta^{EN} ENBA_t + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t, \quad \text{(A.1)}$$

$$RS_t = \alpha_t + \sum_{i=0}^{1} \beta_i^B RB_{t-i} + \sum_{i=1}^{2} \beta_i^S RS_{t-i} + \sum_{i=0}^{2} \beta_i^M RM_{t-i} + \beta_0^L RL_t + \beta_0^D RD_t + \beta^Y Y_t + \beta^{LN} NBA_t + \beta^{LS} SPRD_t + \beta^V V_t + \beta^{ES} ESPRD_t + \beta^{EN} ENBA_t + \sum_{i=1}^{NFIRM-1} \beta_i^{FIRM} FIRM_i + \varepsilon_t, \quad \text{(A.2)}$$

for the sample of 43,578 secondary market observations. Variable definitions are as follows: RB_t is the loan return. RS_t is the equity return. RL_t is the loan index return. RM_t is the equity index return. RD_t is the T-Bill return. Y_t is the year of the observation. NBA_t is sum of the number of bids and asks for the loan. $SPRD_t$ is the relative loan spread. V_t is the volume of trades on the equity market. $ESPRD_t$ is the relative equity spread. $ENBA_t$ is the sum of the number of bid and ask quotations divided by 1,000 for the equity. $FIRM_i$ is the firm-specific dummy variable associated with firm i, and $NFIRM$ is the number of borrowers. Coefficient estimates are not reported for firm-specific dummies. ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

	Eq. (1) (RB_t is dependent)		Eq. (2) (RS_t is dependent)	
Variable	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	0.7859***	0.3036	-13.3673***	2.4623
RB_t			1.3403***	0.0387
RB_{t-1}	0.0809***	0.0048	-0.1950***	0.0393
RS_t	0.0204***	0.0006		
RS_{t-1}	0.0117***	0.0006	-0.0729***	0.0049
RS_{t-2}	0.0122***	0.0006	-0.0438***	0.0049
RM_t	-0.031***	0.0027	1.0457***	0.0217
RM_{t-1}	-0.0054**	0.0027	0.3137***	0.0220
RM_{t-2}	-0.0118***	0.0027	0.2019***	0.0221
RL_t	0.2928***	0.0284	1.6404***	0.2308
RD_t	-0.5377*	0.3120	18.6081***	2.5297
Y_t	-0.0004***	0.0002	0.0067***	0.0012
NBA_t	0.0000*	0.0000	-0.0001	0.0002
$SPRD_t$	-0.1674***	0.0043	0.2658***	0.0357
V_t	0.0000***	0.0000	0.0000***	0.0000
$ESPRD_t$	-0.0130***	0.0017	-0.0193	0.0134
$ENBA_t$	0.0005***	0.0000	0.0001	0.0002
Adjusted-R^2	0.1191		0.0872	
N	43,578		43,578	

Table A.2: Abnormal Returns on Long/Short Portfolios. For every week in the time period, we separately form equally weighted portfolios consisting of loan (equity) return observations for which the lag equity (loan) return in excess of the T-bill return is positive or negative. We then subtract the loan (equity) return on the negative lag equity (loan) portfolio from the return on the positive lag equity (loan) to simulate a portfolio consisting of long positions in loans (stocks) with positive lag equity (loan) returns and short positions in loans (stocks) with negative lag equity (loan) returns. We report the long/short portfolio returns in excess of the T-bill return, the t-statistic for a test whether these excess portfolio returns are significantly different from zero, and the alpha associated with the following regression:

$$RP_t = \alpha_t + \beta_1 RI_t + \varepsilon_t,$$

where RP_t is the return on the excess long/short loan (equity) portfolio and RI_t is the return on the excess loan (equity) index portfolio. ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.

Portfolio	Mean	Alpha
Long/short loan portfolios formed using lag equity returns	0.0007**	0.0006*
Long/short equity portfolios formed using lag loan returns	0.0031	0.0030