The Impact of Mark-to-Market Accounting On Credit Supply*

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Abstract

We document the impact of mark-to-market accounting for originations in the syndicated lending market. Institutions with mark-to-market accounting increase originations to capture fees and make capital gains during booms. When secondary market prices fall sufficiently below par, as observed in the Great Recession and late 2015, new originations as well as existing loans face mark-to-market losses. Banks that syndicate more often with mark-to-market lenders respond by cutting originations and increasing loan spreads even in markets with low dependence on mark-to-market lenders, i.e., there is a spillover across markets. By contrast, banks with limited mark-to-market dependence maintain originations through the cycle. A one standard deviation increase in mark-to-market dependence accompanied by a drop in secondary market price of 10bp reduces aggregate bank originations by an extra 15%. We establish that this relationship is causal and independent of bank health.

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1 Introduction

Accountants and regulators have long grappled with the problem of whether and how changes in the market value of assets should be incorporated into the accounting reports of banks and financial institutions. Proponents of mark-to-market (MtM) focus on financial stability, and argue that historical-cost-based financial statements obscure underlying economic losses, allowing troubled institutions to continue operating without regulatory intervention. Others, however, focus on credit provisioning and argue that practical problems of measurement render a mark-to-market accounting system unreliable. Alan Greenspan, for example, argued that "*the entire procedure ... conflicts with the true nature of banking. Banks should not be treating long portfolios as if they believed that they have to be out of business tomorrow... This is fundamentally wrong, because commercial banking, and savings and loan activities as well, are a very special form of activity. Commercial banking is the practice by which you make illiquid loans.*"[1]

This debate is the subject of a small – and almost exclusively theoretical – literature. Most of the literature focuses on financial stability, emphasizing the interaction between liquidity, downward price spirals and contagion effects across markets (see Heaton, Lucas, and McDonald (2010), Bernard, Merton, and Palepu (1995), Planin, Sapra, and Shin (2008), Allen and Carletti (2008)). Planin, Sapra, and Shin (2008), in particular, develop a framework to study the tradeoffs in MtM accounting, which can be summarized as follows: on the one had, MtM reporting improves the price signals and therefore leads to more efficient decisions by banks. On the other hand, MtM reporting can distort the prices of illiquid assets, introducing strategic complementarities to bank origination decisions when the decision horizons are shortened relative to the life of the assets. In that case, MtM risks injecting artificial volatility into prices, pushing firms to become even more sensitive to short-term price movements in their behavior. They conclude that mark-to-market accounting induces the most inefficiencies for long-lived, illiquid and senior claims – characteristics that closely resemble those of bank's loan portfolios.

Until now, credit provisioning and related activities had largely escaped the reach of

[1] https://www.nytimes.com/1991/02/10/us/calling-bank-supervision-archaic-greenspan-seeks-major-change.html

MtM accounting. Such regulations applied to trading and available for sale securities (see Laux and Leuz (2010)), as described below. But the relentless push towards mark-to-market accounting, which has generally followed period of stress, continued after the global financial crisis. In 2016, FASB introduced the Current Expected Credit Loss accounting standard (commonly known as CECL). CECL replaces the current Allowance for Loan and Lease Losses (ALLL) accounting standard, requiring banks to estimate and provision for *expected* losses over the life of the loans, as opposed to *incurred* losses. While not exactly mark-to-market, CECL aims to improve "financial reporting by requiring timelier recording of credit losses on loans and other financial instruments held by financial institutions and other organizations." It moves credit provisioning activities – including most of commercial bank's credit portfolios towards fair value accounting.[2]

The goal of this paper is to study the implications of MtM accounting on credit provisioning, a subject that has received virtually no attention in the literature, likely due to the use of common accounting standards at the country-level. We argue in this paper that accounting, which is often considered a detail of measurement, can in fact, affect economic fundamentals. The main challenge with addressing the role of MtM accounting on economic outcomes is the fact that nearly all markets are either entirely MtM or not, i.e., every player in the market is receives the same treatment. Thus, any changes in market prices and behavior are confounded by time-varying market characteristics.

To address this challenge, we focus on a market where firms using historical-cost-based and mark-to-market accounting coexist, and study the differential sensitivity of these institutions to changes in secondary market prices. We focus on the Syndicated Lending Market for three reasons: first, this market includes a substantial share of MtM institutions (Broker-Dealers, Hedge Funds and CLOs) and historical-cost-based institutions (Commercial and Regional Banks) that often participate in the same deals. Second, syndicated loans are precisely the types of claims that Planin, Sapra, and Shin (2008) argue are most likely to be negatively affected; and third, syndicated loans are in the process of transitioning towards fair value accounting with CECL, hence it is critical to understand any potential negative

[2]Plantin et. al. show that historical cost with impairment (like CECL regulations) lead to similar predictions as MtM in their model.

consequences.

In Figure 1, we show that the aggregate share of mark-to-market lending is positively correlated to the movement of loan prices in the secondary market. In this paper, we argue that the correlation to secondary market price movements would vary based on the accounting rules followed by the lender. Figure 2 summarizes the main result of this paper. We show that lenders who originate loans that are more frequently marked-to-market exhibit far more credit cyclicality than institutions using historical cost accounting. The figure includes all loans, and hence may be affected by differences in borrower characteristics, lender characteristics or other contemporaneous factors. The goal of this paper is to document the causal effect of secondary market loan prices on primary market originations.

To understand the role of mark-to-market accounting on loan originations, several endogeneity concerns need to be addressed. To be clear, any change in lending could be driven by changes in either demand or supply. Under the demand side argument, originations increase or decrease due to time-varying borrower demand. Under the supply side argument, changes to lending are driven by lender's willingness to participate in the market. Within the supply side argument, multiple factors could drive changes in supply - specifically, it could be driven by changes in secondary market prices (affecting the ability to resell loans or facing book losses on loans), or other lender characteristics (such as lender health, losses in other businesses etc.). We aim to argue that lender supply, specifically supply driven by changes in secondary market prices, are a significant determinant of credit.

First, we show that when secondary market prices move from the 90th to the 10th percentile, an additional one standard deviation increase in mark-to-market dependence reduces aggregate bank lending by 27.4%, an economically significant value. These results hold within the subset of real investment loans and loans made to investment grade borrowers - markets that are traditionally thought to be less reliant on mark-to-market lenders. These results are not explained away by bank-level measures of health.

To estimate the causal effect of mark-to-market on supply of credit, we then study change in lending at the borrower level. We establish that lending to the *same* borrower in the *same* quarter drops more with secondary market prices if the lender is, on average, more reliant on mark-to-market lenders for the syndication process. By studying change in lending to

the same borrower, we address concerns about unobservable firm characteristics that could affect lending. For example, if firm fundamentals fall in a recession, borrower credit would decrease along with a contemporaneous decline in loan prices without secondary market prices being the causal channel. The within-firm estimator addresses these concerns. We show that when secondary market prices move from the 90th to the 10th percentile, an additional one standard deviation increase in mark-to-market dependence reduces lending to the *same* borrower in the *same* quarter by a value equivalent to 7.1% of mean probability a borrower receives a loan in a given quarter.

Next, we focus on specific episodes of large secondary market price drops to study the timing and persistence of the credit supply shock. We focus on two such episodes - i) the 2008 financial crisis when secondary market prices fell significantly to almost 60c on the dollar; ii) late 2014 where we saw secondary market prices drop below 96c on the dollar. Focusing on these episodes, we show that prior to the drop in secondary market prices, both at the bank-level and bank-borrower-level, lenders with high and low mark-to-market dependence provide credit at similar rates. However, when secondary market prices drop, lending from mark-to-market lenders drops significantly compared to lenders with low mark-to-market dependence. At the peak of the financial crisis, a one standard deviation increase in mark-to-market dependence reduced bank lending by 72%.

Finally, we show that secondary market prices also affect the pricing of loans in the primary market. On average, loan spreads increase by 5.1bps when secondary market prices fall from the 90th to 10th percentile for an additional one standard deviation increase in mark-to-market dependence.

In sum, this paper documents the important economic implications of mark-to-market accounting rules. The rest of the paper is structured as follows. Section 2 provides a brief background on mark-to-market accounting for banks in the U.S. Section 3 summarizes the related literature. Section 4 describes the data sources and calculation of mark-to-market measures. Section 5 describes the empirical strategy and results. Section 6 concludes.

2 Introduction to Mark to Market

Traditionally, accounting rules can be classified into fair-value accounting and historical-cost accounting. Under "fair-value" accounting, assets are continuously adjusted to reflect market value. The main contrast to fair-value accounting is "historical-cost accounting". In the method, assets are recorded at historical values, i.e., fair values at time of purchase. They are adjusted over time for amortization and impairments but not for increases in asset values.

For US Banks, the transition towards MtM accounting began in earnest with (i) the introduction of financial derivatives, which include zero-investment positions that can quickly realize large gains and losses; and (ii) the Savings and Loan crisis, which was partly blamed on historical-cost accounting delaying the realization of losses.

The process of fair-value accounting began in 1981 with the issuance of SFAS 52 and 80, which required fair value accounting for foreign exchange contracts. SFAS 107 (issued in 1991) required fair value accounting when "practiceable", where practiceable was allowed to vary across institutions.[3] SFAS 115 (issued in 1993) created the basic accounting structure for "debt and equity securities". Securities can be classified as - i) *held-to-maturity* and reported at amortized cost; ii) securities that are primarily meant for trading purposes are reported under *trading securities* reported at fair value; iii) securities that do not fall under either of those categories are classified as *available-for-sale* securities reported at fair value, with unrealized gains and losses excluded from earnings and reported under "other comprehensive income" (a component of shareholders' equity). When decline in fair value is "other than temporary", available for sale securities have to be written down and included in earnings. However, since assets cannot be marked back up, write downs may be conservative.

SFAS 157 (issued in 2006) defined fair value as "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date". The statement created a hierarchy of valuations: Levels 1, 2, and 3, defined as prices observed in the market (level 1), based upon inputs observed in the market

[3] "practicable means that an estimate of fair value can be made without incurring excessive costs. It is a dynamic concept: what is practicable for one entity might not be for another; what is not practicable in 1 year might be in another." SFAS 107 (FASB 1991)

(level 2), and with unobservable inputs (level 3). This is sometimes described as "mark-to-market, mark-to-matrix, and mark-to-model". The notion of an orderly transaction was further clarified at the height of the Global Financial Crisis (April 2009), in a move generally viewed as giving banks flexibility to avoid downward revaluations. SFAS 159 (issued in 2007) expanded the range of assets that could receive fair value treatment, including all AFS securities as well as liabilities.

Most importantly, bank regulatory capital is calculated based on standard financial accounting rules. Capital is defined by adding up various accounting categories, whose value is assigned based on the accounting rules for that category. Thus, changes in market values of assets could affect bank capitalization if banks are required to recognize losses for accounting purposes.

3 Related Literature

Our paper relates multiple strands of the literature. First, we relate to the literature on Mark-to-Market Accounting. Allen and Carletti (2008) argue that mark-to-market accounting may not be beneficial when markets are illiquid. In illiquid markets, market prices may not be determined by future payoffs of the asset but rather by amount of cash available to participants in the market. Sapra (2008) provides extensions to this model where historical cost accounting (i.e. not marking-to-market) may lead to inefficient continuation. Heaton, Lucas, and McDonald (2010) document that mark-to-market accounting can adversely impact the real economy through their effect on regulatory capital requirements. Laux and Leuz (2010) argue, on the other hand, that mark-to-market accounting played a limited role in exacerbating the 2008 financial crisis. Finally, Planin, Sapra, and Shin (2008) show that the adverse effects of mark-to-market accounting are largest for assets that are long-term, illiquid, and senior - exactly the type of market we consider in our setting of syndicated loans. We add to the literature on mark-to-market accounting by providing, to the best of our knowledge, the first empirical test for the various theories on MtM accounting.

The second strand of literature studies the growing importance of institutional in the syndicated lending market. Bord and Santos (2012) highlight the rise of institutions in

syndicated lending, while Ivashina and Sun (2011) show that increased institutional participation created downward pricing pressures before the crisis. Irani, Iyer, Meisenzahl, and Peydro (2018) document the growing participation of nonbanks in the syndicated lending market after the crisis, primarily through through secondary market acquisitions. Finally, Cherenko, Erel, and Prilmeier (2018) study direct lending by nonbanks and conclude that nonbanks are responsible for almost a third of total commercial lending. These papers highlight the role played by nonbanks either before or after the financial crisis. We add to the literature by studying some of the negative externalities of institutional investor participation in syndicated loan markets.

Third, our paper relates to the literature studying the decline in lending during the Great Recession, with a focus on bank health. It contributes to a long literature that studies bank health shocks and their transmission to the real economy. Ivashina and Scharfstein (2010) document the drop in syndicated lending volumes during the crisis, and argue that it can be explained by deteriorating bank health, as measured by bank capital, liquidity and credit losses. They propose an indicator of declining liquidity – a bank's exposure to the Lehman Brothers – that has been used as in instrument for bank health throughout the literature (see, for example, Chodorow-Reich (2013)). The idea is that, in the run-up to Lehman's default, its borrowers rushed to exercise their credit lines, reducing the syndicate members liquidity. Santos (2010) moved from quantities to prices and showed that banks with weaker balance sheets increased their prices more. We argue that the drop in lending was not only driven by bank health, but also by the withdrawal of nonbanks from this market. Nonbanks were critical for a substantial portion of originations – even of real investment loans. Their exit, therefore, led banks to decrease originations and an increase in prices above and beyond bank health. Our paper is therefore complimentary to Ivashina and Scharfstein (2010) and Santos (2010).

Several mechanisms have been proposed in the literature for decline in origination of investment bank and nonbank lenders. Culp (2013) and Bruchey, Malherbez, and Meisenzahlx (2017), for example, study pipeline risk – i.e., the risk that a bank is unable to find investors for a loan after committing to origination. While our work is closely related, we argue that pipeline risk is not a necessary condition for our mechanism. Even in the absence of pipeline

risk, changes in secondary market prices affect loan originations through book losses on already originated loans when prices fall. We contribute to this literature by studying how credit supply varies, not just during the financial crisis but even during normal, non-crisis times.

4 Data Sources

Our primary data source is Dealscan, which compiles data on syndicated loan originations (i.e., loans originated by one or more banks and sold to a syndicate of banks and shadow banks). Syndicated loans are large loans given to large borrowers. They are often organized into a deal, containing multiple facilities. The average (median) deal included 1.6 (1) facilities and was worth \$472 (\$175) million. 40% of packages include both term and revolving facilities, 40% include only revolving facilities and 20% include only term facilities. The average (median) facility since 1995 was for \$300 (\$100) million, and 90% of loans were larger than \$13 million. Borrowers had mean sales of \$3.8 billion and median sales of \$0.6 billion. Importantly, Dealscan provides only data at origination. Bord and Santos (2012) study the evolution of ownership following origination.

All packages and facilities are assigned a type and a purpose. We group facility types into term and revolving; and purposes into real investment deals (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures) and restructuring packages (primary purpose of "LBO", " Merger", "Acquis. line", " Restructuring", or "Stock buyback"). Since most of the literature on real effects has focused on real investment and/or corporate purpose facilities (e.g., Chodorow-Reich (2013)), we report results for all deals and real investment deals in the body. Results for restructuring deals are reported in the appendix, and yield similar conclusions.

Mark-to-Market players have played an increasingly important role in syndicated lending markets. We classify lenders who traditionally mark to market their loan portfolio based on the lender's line of business. Investment banks, CLOs, mutual funds, hedge funds etc. are the group of lenders who traditionally mark-to-market their portfolio.

These players are more important for restructuring deals but are also significant for

real investment deals, as described below. We classify mark-to-market deals as deals where Investment Banks hold more than 25% of the loan at origination or loans that are traditionally held by institutional (nonbank) investors. We follow Ivashina and Sun (2011) and define Term Loans B to G as facilities held by institutional investors. Not all Term Loans B to G are held by institutions (Lim, Minton, and Weisbach 2014), but we still prefer this measure to capture both institutional investor participation at origination as well as the desire to sell the facility after origination. Indeed, Term Loan Bs are by far the most common facility traded in the secondary market, and carry the features desired by institutional investors (long maturities and limited amortization). Nearly 80% of Term Loans Bs end up in CLOs.[4] Thus, we believe the combination of Term Loan Bs and investment bank participation captures the extent of involvement of mark-to-market players in this lending space. In robustness tests, we confirm that all our results hold if we consider actual share of participation/contribution of mark-to-market players, as in Lim, Minton, and Weisbach (2014).

A deal is classified as mark-to-market if it satisfies one of the following conditions- 1) If over 25% of the deal is held by Investment Banks[5], 2) It contains one or more nonbank (institutional investor) facilities. We focus on whether facilities include a nonbank tranche, rather than individual facilities and/or nonbank balance contributions for two reasons. First, bank allocation data is missing for more than 80% of facilities. Second, and more importantly, nonbanks often act as lenders of last resort (Lim, Minton, and Weisbach 2014). They participate in tranches that could not be filled by banks, often commanding higher prices for otherwise equivalent facilities. Nonbanks are, therefore, more important for originations than their contribution of balances may suggest. If lead lenders are (or expect to be) unable to syndicate or sell the term facilities of a given package, they may refrain from originating (or commiting to originate) an entire deal (Bruchey, Malherbez, and Meisenzahlx 2017). Thus, even though nonbanks participate almost exclusively in Term loans, their withdrawal can limit originations of both term and revolving facilities.

We measure lending as the raw count of number of loans originated by a given lender.

[4]Payden&Rygel Research, "A Primer on Syndicated Term Loans", January 2013

[5]Results robust to other cutoff choices

In robustness checks, we measure bank lending as in Chodorow-Reich (2013). That is, we define total originations of bank i for period t as

$$M_{it} = \sum_{j \in t} \alpha_{ij} L_j$$

where α_{ij} denotes the estimated funding allocations for bank i in facility j. Allocations α_{ij} are missing for a large portion of loans. We estimate missing allocations based on the allocation of similar loans for which data are available, in line with Chodorow-Reich (2013).

For the event study around the 2008 financial crisis, we measure changes in originations between the pre-crisis and two crisis periods, where the pre-crisis period covers two 9-month periods (October 2005 to June 2006 and October 2006 to June 2007 period); the Crisis I period covers October 2007 to 2008 and the Crisis II period covers October 2008 to June 2009. For the 2015 episode, we measure changes in originations between September 2012 to June 2014 and September 2014 to June 2016. Like Chodorow-Reich (2013), we focus on the top 43 lenders in the syndicated lending market which account for the vast majority of originations; and adjust historical originations for mergers among banks.

We complement Dealscan with two additional sources: bank-level measures of health and Lehman exposure during the financial crisis are gathered from the replication file of Chodorow-Reich (2013); and firm-level financials from Compustat. We match Dealscan to Compustat using the linking table of Chava and Roberts (2008), available through WRDS. Matching to Compustat limits the sample of borrowers to public firms.

Finally, we make use of data on secondary market loan prices from the Loan Syndication and Trading Authority (LSTA). After a loan is closed and allocated in the primary market, the primary market investors are free to trade in the secondary market. Loan sales are usually traded through dealer desks at large underwriting banks.[6] and every ask and bid quote is reported to the LSTA. Loan quotes[7] provided by LSTA cover more than 80% of all secondary

[6]The current LSTA members include - Bank of America Merrill Lynch, BNP Paribas Group, Credit Agricole, Goldman Sachs, Santander, US Bank, Barclays, Credit Suisse, Morgan Stanley, TD Securities (US), Wells Fargo, Citigroup, Deutsche Bank, JP Morgan Chase, Societe Generale, UBS Securities, Royal Bank of Canada, HSBC Bank USA, PNC Capital Markets to name a few

[7]Used interchangeably with prices in this paper

market listed loans.[8] Since the arranger is paid a fee for its services, and as fee increases with risk and complexity, the most profitable loans tend to be those to leveraged borrowers. Large, high quality borrowers pay little or no fee, and typically take out unsecured revolving credit for short term credit requirements. Because investment-grade loans are rarely drawn down and have much lower yields, they form a very small chunk of secondary market trades.[9]

5 Empirical Methodology and Results

5.1 Empirical Strategy

In this paper, we study how mark-to-market accounting rules on loan portfolios affect the supply of credit. Specifically, we are interested in understanding whether changes to secondary market prices of syndicated loans affects the originations of new loans in the primary market for lenders who have to mark-to-market their portfolio. As observed in Figure 1, amount of loan originations are correlated with secondary market price movement. Our aim is to argue that the changes in secondary market prices are *driving* the observed changes in lending.

To understand the role of mark-to-market accounting on loan originations, several endogeneity concerns need to be addressed. To be clear, any change in lending could be driven by changes in either demand or supply. Under the demand side argument, originations increase or decrease due to time-varying borrower demand. Under the supply side argument, changes to lending are driven by lender's willingness to participate in the market. Within the supply side argument, multiple factors could drive changes in supply - specifically, it could be driven by changes in secondary market prices (affecting the ability to resell loans or taking book losses on loans), or other lender characteristics (such as lender health, losses in other businesses etc.). We aim to argue that lender supply, specifically supply driven by changes in secondary market prices, are a significant determinant of credit.

We establish two main facts in this paper. First, we document that lenders who mark-to-market their portfolios reduce lending more when secondary market prices fall than lenders

[8] Visit http://www.lsta.org/about for details on the LSTA as well as the LSTA/LPC database.
[9] Standard & Poor's "A Guide to the U.S. Loan Market"

who do not mark-to-market their loan portfolios. Second, and more interestingly, we show that banks that syndicate more often with mark-to-market lenders reduce lending more when secondary market prices fall.

After establishing the broad correlation between secondary market prices and originations, we focus on two main events to identify the timing and persistence of the effect. Specifically, we study how drop in secondary market prices around the financial crisis and in 2015 differentially affected origination of lenders with more or less mark-to-market dependence.

To estimate the causal effect of mark-to-market on supply of credit, we then study change in lending at the borrower level. We establish that lending to the *same* borrower in the *same* quarter drops more with secondary market prices if the lender is, on average, more reliant on mark-to-market players for the syndication process. By studying change in lending to the same borrower, we address concerns about unobservable firm characteristics that could affect lending. For example, if firm fundamentals fall in a recession, borrower credit would decrease along with a contemporaneous decline in loan prices without secondary market prices being the causal channel. The within-firm estimator addresses these concerns. Furthermore, we show that secondary market prices also affect the pricing of loans in the primary market.

Finally, we show that effects of mark-to-market accounting spills over to markets with almost *no* lenders who mark-to-market their portfolio. In the investment grade loan market comprised almost entirely of banks that hold loans to maturity and do not mark-to-market their portfolio, we still see a decline in originations. Again the decline in concentrated among lenders with greater dependence on MtM syndicate members.

Below, we present each of results in detail.

5.2 Bank-Level Lending

First, we document that origination by mark-to-market lenders is correlated with secondary market prices. Figure 1 shows the correlation between share of MtM lenders in the market against secondary market loan prices over time. The two series have a correlation of 62.9%. Figure 1 documents the direct correlation between mark-to-market accounting and loan

originations.

In Figure 2, we document the indirect effect of mark-to-market accounting on originations. To do this, we estimate the mark-to-market dependence of the lender as the share of loans originated in the previous two year period involving a mark-to-market lender in the deal. Lenders have a greater MtM dependence if they originated loans more often with mark-to-market lenders. We note that lenders in the highest tercile (solid connected line) of dependence on MtM syndicate members have a significantly higher correlation with secondary market price movements than lenders in the bottom tercile (dashed connected line). In fact, lenders with low MtM dependence maintain a similar level of origination throughout the sample period, unaffected by price changes in the secondary market This figure documents the indirect effect of mark-to-market accounting on loan originations through the effect on syndicate member lending decline.

Figure 3a presents more evidence on the correlation between mark-to-market dependence and lending change by focusing on originations around the 2008 financial crisis. The scatter plot shows that change in lending during the financial crisis (change between 2007Q3 to 2009Q2 and 2005Q3 to 2007Q2) plotted against pre-crisis mark-to-market dependence of the lender. We see a strong correlation again between the level of mark-to-market dependence and total lending drop in the crisis. There appears to be clustering by lender type on the level of mark-to-market dependence. Investment banks have the greatest dependence on MtM lenders while regional banks appear to be the least dependent.

To ensure results are not driven by just drop in lending by investment banks, in Figure 3b we exclude investment banks and non-bank lenders (finance companies like GE Capital and CIT) and show that the effect persists within this subset.

Table 2 presents the correlation between lending change during the financial crisis and mark-to-market dependence after accounting for other potential drivers of credit supply during the financial crisis. In Column 1, we show that a one standard deviation increases in pre-crisis MtM dependence reduces lending during the crisis by 11.4%. Including the share of loans originated in syndicates with Lehman Brothers does not affect the coefficient on MtM dependence. In Column 3, we additionally include controls for loading of bank's stock return on an index of Residential MBS (ABX), share of trading revenues to total bank assets,

net real estate charge offs in 2007-08 to total bank assets, bank depsoit to asset ratio and an indicator for whether the lender is a investment bank of finance company. A one standard deviation increase in MtM dependence reduce loan originations in the crisis by 17.6%. In Column 4 and 5 we restrict our sample to real investment loans and loans made to investment grade firms respectively to study spill overs to markets with traditionally low dependence on MtM lenders. The effect in these markets is economically and statistically significant with a 19.4% and 18.4% decile in lending respectively for a one standard deviation increase in MtM dependence.

To study the effect of secondary market prices on lending in the long-run, we run the following regression:

$$\begin{aligned}\text{Log(Number Loans)}_{bt} =& \alpha_b + \delta_t + \beta_1 \text{Lag Mark-to-Market Dependence}_b \times \text{Secondary Market Price}_t \\ & \beta_2 \text{Lag Mark-to-Market Dependence}_b + \beta_3 \text{Secondary Market Price}_t + \epsilon_{bt}\end{aligned}$$

for the set of term loans in the sample. The dependent variable is the number of loans originated by bank b in quarter t. Mark-to-Market dependence is the one year lag share of loans of the bank that involve mark-to-market lenders as syndicate members. Secondary Market Price is the quarterly average of market quotes on loans in the secondary market. The coefficient of interest is β_1 or how the lending sensitivity to secondary market prices varies by mark-to-market dependence of the lender.

The results are presented in Table 3. Column 1 provides results for all term loans in the sample. Lag MTM dependence is standardized. When secondary market prices from move the 90th to 10th percentile (equivalent to price change from 101.8 cents on the dollar to 86.1 cents on the dollar), an additional one standard deviation increase in mark-to-market dependences reduces lending by a further 27.4%. Columns 2 and 3 present these results for only real investment and investment grade (IG) loans. We focus on these subsets to document the effect of mark-to-market dependence on the set of loans least likely to be affected by demand-side concerns. The magnitude of the effect of change in price from 90th to 10th percentile for an additional one standard deviation increase in mark-to-market dependence is 21.0% and 10.2% respectively for real investment and IG loans.

Columns 4-6 present the results in Column 1-3 with the increase of quarter fixed effects to absorb any seasonalities in lending. The effect is similar or larger on controlling for time period.

After establishing the general effect of secondary market prices on loan originations, we now focus on two episodes when secondary market prices fell significantly below par. Through these event studies, we document two key facts - 1) parallel pre-trends in lending across banks with varying level of dependence on MtM lenders, 2) the timing of the effect of secondary market price drop on loan originations.

The two episodes we focus on throughout this paper are the 2008 financial crisis and the drop in secondary market loan prices in the last quarter of 2014.

To study lending changes during the financial crisis, we run the following regression:

$$\text{Log(Number Loans)}_{bt} = \alpha_b + \delta_t + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for bank b in quarter t. Sample is restricted to term loans originated between years 2004-2010. Mark-to-Market dependence measured based on pre-crisis (2005Q4-2006Q2, 2006Q4-2007Q2) originations. Standard errors clustered at the bank-level.

Figure 4a presents the time-varying coefficient on mark-to-market dependence, capturing how loan originations vary with mark-to-market dependence over time. We see that prior to 2007Q2, the pre-crisis peak, lending across banks with high and low mark-to-market dependence was growing on similar paths. After 2007Q3, however, lending by banks reliant on mark-to-market lenders decreased by significantly larger amounts than lending by banks with low reliance on mark-to-market lenders. This effect persists till the end of the crisis. At the peak of the crisis in 2008Q4, a one standard deviation increase in mark-to-market dependence reduced lending by nearly 72%.

Figure 5b presents coefficients for the same regression but by restricting the sample to real investment loans. We observe a similar pattern in lending change over time. Figure 5c presents results for investment grade loans.

To study the effect of secondary market prices around the price drop in 2015, we test the

following specification:

$$\text{Log(Number Loans)}_{bt} = \alpha_b + \delta_t + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for bank b in quarter t. Mark-to-market (MtM) dependence of the bank is calculated as the share of MtM deals originated by the lender in the pre period (2013 Q1 to 2014 Q3). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Post takes a vlue of 1 for years 2015 and 2016 when secondary market prices drop below 96c on the dollar. Standard errors clustered at the bank-level.

Results are presented in Table 4. A one standard deviation increase in MtM dependence decreases lending in the post period by 14%. A similar change in MtM dependence decreases lending of real investment and investment grade loans by 29.7% and 12.3%, an economically significant amount. On looking at just loans originated as lead arrangers, the effect of a one standard deviation increase in MtM dependence on lending as a lead arranger falls by 20.3% and 36.1% for total loans and real investment loans respectively. There is no significant change in lending to investment grade firms in 2015.

5.3 Borrower-Level Lending

Having established the correlation between mark-to-market dependence and lending change with secondary market prices at the bank-level, we study lending changes at the bank-borrower level.

First, we document that borrower-level lending varies by lender based on their sensitivity to secondary market prices. To be more clear, we test:

$$\begin{aligned}\text{Loan}_{fbt} =& \alpha_b + \gamma_f + \delta_t + \beta_1 \text{Lag Mark-to-Market Dependence}_b \times \text{Secondary Market Price}_t \\ &+ \beta_2 \text{Lag Mark-to-Market Dependence}_b + \beta_3 \text{Secondary Market Price}_t + \epsilon_{bt}\end{aligned}$$

for the set of term loans in the sample. The dependent variable takes value of one if a loan is originated by bank b in quarter t to borrower f, and zero otherwise. Lag Mark-to-Market dependence is the one year lag share of loans of the bank that involve mark-to-market lenders

as syndicate members. Secondary Market Price is the quarterly average of market quotes on loans in the secondary market. The coefficient of interest is β_1 or how the lending sensitivity to secondary market prices varies by mark-to-market dependence of the lender.

This specification addresses the endogeneity concerns described earlier. Specifically, we address whether differences in borrower type or bank characteristics may be responsible for observed lending behavior by studying lending to the same borrower in the same quarter.

The results are presented in Table 5. Panel A presents results for the full sample of loans. In Column 1, when secondary market prices from move the 90th to 10th percentile (equivalent to price change from 101.8 cents on the dollar to 86.1 cents on the dollar), an additional one standard deviation increase in mark-to-market dependences reduces firm lending by a further 0.42%, which is equivalent to 13.6% of the mean probability a firm gets a loan from a bank in a given quarter. In Column 2, we include bank fixed effects to control for bank unobservables. Since mark-to-market dependence is identical across bank-quarter, we cannot include bank-quarter fixed effects. Instead, we include bank-year fixed effects. The effect here of price movement from 90th to 10th percentile decreases lending by an additional 5.1% of the mean for a one standard deviation change in MtM dependence. In Column 3, we include borrower fixed effects. The effect is now equivalent to 7.6% of the mean likelihood fo a loan. Finally, we include both bank and borrower-quarter fixed effects in Column 4. The effect for our strictest specification in 7.1% of mean loan likelihood decrease in lending. Panel B presents results by loan type. Results are similar across the loan categories.

Finally, we study the effect of change in lending to the borrower around the two episodes described above, namely the 2008 financial crisis and the 2015 drop in secondary market prices.

Again, for the financial crisis, we run the following regression:

$$\text{Loan}_{fbt} = \alpha_{fb} + \delta_{ft} + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for firm f, bank b and quarter t. Sample is restricted to term loans originated between years 2004-2010 for the financial crisis. Mark-to-Market dependence measured based on pre-crisis (2005Q4-2006Q2, 2006Q4-2007Q2) originations. Standard errors clustered at the bank-level.

Results are presented in Figure 6a, 6b, and 6c for the full set of loans, real investment loans, and loans to investment grade borrowers respectively. Similar to the bank level results, we see that prior to 2007Q2 lending to the same borrower across banks with high and low mark-to-market dependence was growing on similar paths. After 2007Q3, however, lending by banks reliant on mark-to-market lenders decreased by significantly larger amounts than lending by banks with low reliance on mark-to-market lenders to the same borrower in the same quarter. This effect persists till the end of the crisis. At the peak of the crisis in 2008Q4, a one standard deviation increase in mark-to-market dependence reduced lending to the same borrower by nearly 0.63%, equivalent to 20.2% of the mean probability of a firm getting a loan from a bank.

To study the effect of secondary market prices around the price drop in 2015, we test the following specification:

$$\text{Loan}_{fbt} = \alpha_{fb} + \delta_t + \beta_1 \text{Mark-to-Market Dependence}_b \times \text{Post}_t + \epsilon_{fbt}$$

for borrower f, bank b and quarter t. Dependent variable takes a value of one if the borrower gets a loan in the given quarter from the bank. Mark-to-market (MtM) dependece of the bank is calculated as the share of MtM deals originated by the lender in the pre period (2013 Q1 to 2014 Q3). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Post takes a vlue of 1 for years 2015 and 2016 when secondary market prices drop below 96c on the dollar. Standard errors clustered at the bank-level.

Results are presented in Table 6. A one standard deviation increase in MtM dependence decreases lending in the post period by 34bp compared to the average likelihood of lending between the bank borrower pair. For reference, the mean likelihood of a borrower receiving a loan from a given bank in a single quarter is 3.13%. Thus, the reduction is sizable decrease likelihood of new loan by 11% of the mean. A similar change in MtM dependence decreases lending of real investment and investment grade loans by 23bp and 3bp respectively. These are equivalent to 12.5% of the respective means, an economically significant amount. On looking at just loans originated as lead arrangers, the effect is economically and statistically

similar.

5.4 Pricing

Finally, to disentangle effects of demand vs. supply in our sample, we conduct an additional test. We study how secondary market loans prices affects the pricing of loans in the primary market. By studying pricing, we can clearly establish whether reduction in lending is driven by demand or supply side concerns. If lending drops with secondary market prices due to reduced demand, we expect loan prices to fall simultaneously. However, if supply side concerns drive reduction in lending, prices on loans originated by mark-to-marker lenders will increase by a greater amount than prices on loans originated by lenders who have a low dependence on market prices.

We test the effect on pricing through a specification similar to the test for changes on the quantity margin:

$$\begin{aligned}\text{Loan Spread}_{fbt} =&\alpha_b + \gamma_f + \delta_t + \beta_1 \text{Mark-to-Market Dependence}_b \times \text{Secondary Market Price}_t \\ &\beta_2 \text{Mark-to-Market Dependence}_b + \beta_3 \text{Secondary Market Price}_t + \epsilon_{bt}\end{aligned}$$

for borrower f, bank b and quarter t. Dependent variable is the all-in-drawn spread on the loan. Loan controls include log facility amount, loan maturity, and indicators for loan type.

Table 7 presents results on pricing. A one standard deviation increase in mark-to-market dependence increases loan spreads by 5.4bps when secondary market prices drop from the 90th to 10th percentile of the price distribution. Including bank-borrower fixed effects further exaggerates the effect of price drops. Spreads increase by 8.2bps when secondary market prices drop from 90th to 10th percentile. In Column 3, we only look at loans where the bank is a lead arranger if lead arrangers decide loan pricing terms. The effect is economically similar. Including loan controls in Column 4, such as loan amount, maturity of loan, indicator for whether the loan is a term loan, the loan type (real investment, corporate purpose or restructuring loan) changes the effect to 6.1bps increase for a reduction in secondary market prices from 90th to 10th percentile.

6 Conclusion

This paper documents the economic implications of accounting rules. Specifically, we show that mark-to-market accounting rules can increase the volatility of credit supply in the economy. To demonstrate this, we focus on the syndicated loan market which comprises both of lenders who mark-to-market their portfolios as well as traditional banks that maintain loans at historical values. Our unique setting allows us to identify the causal impact of mark-to-market accounting rules on credit provision.

We show that the aggregate share of mark-to-market lenders in the economy is cyclical. Lenders with a greater share of their portfolio marked-to-market are more susceptible to changes in secondary market prices. This, in turn, affects quantity as well as pricing of new loans originated by them. On average, lenders with a greater exposure to mark-to-market accounting rules, reduce lending to a larger extent when secondary market prices fall, or conversely, increase lending to a larger extent when prices rise.

We show that this effect holds when comparing lending to the same borrower in the same quarter, identifying a causal channel for changes in credit supply. Our paper provides the first test of the implications of mark-to-market accounting rules for credit supply.

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7 Figures

Figure 1: Share of Mark-to-Market Players Over Time

This figure examines the relation between the share of mark-to-market lenders and prices in the secondary market for syndicated loans over time. The sample includes loans and quotes between 2004 and 2016. On the left axis, we plot the share of deals originated by mark-to-market lenders in a given quater. On the right axis, we plot the mean quarterly quote on the secondary market from the Loan Syndication and Trading Authority (LSTA, right axis). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G.

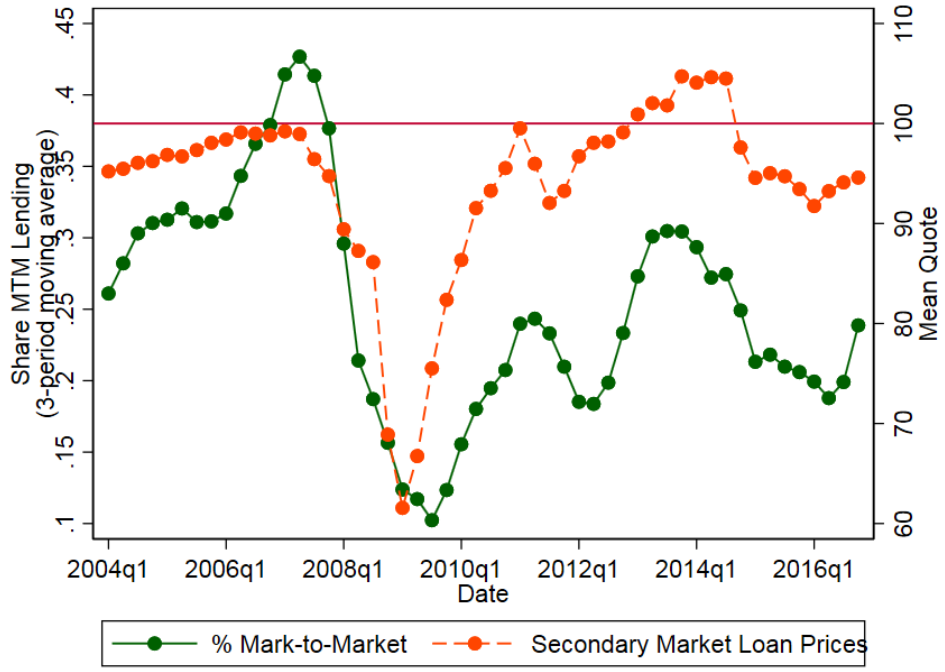


Figure 2: Total Originations

This figure examines the relation between secondary market prices and new loan originations by lenders with varying mark-to-market dependence. The sample includes loans and quotes between 2004 and 2016. On the left axis, we plot the total originations as lead arranger in a given quarter by banks in the top and bottom terciles of mark-to-market dependence. Values are demeaned by level of lending in 2004 Q2. Mark-to-market (MtM) dependence is calculated based on the loans originated by the lender in the previous two years. Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Graph overlayed with mean quarterly quote on the secondary market from the Loan Syndication and Trading Authority (LSTA, right axis).

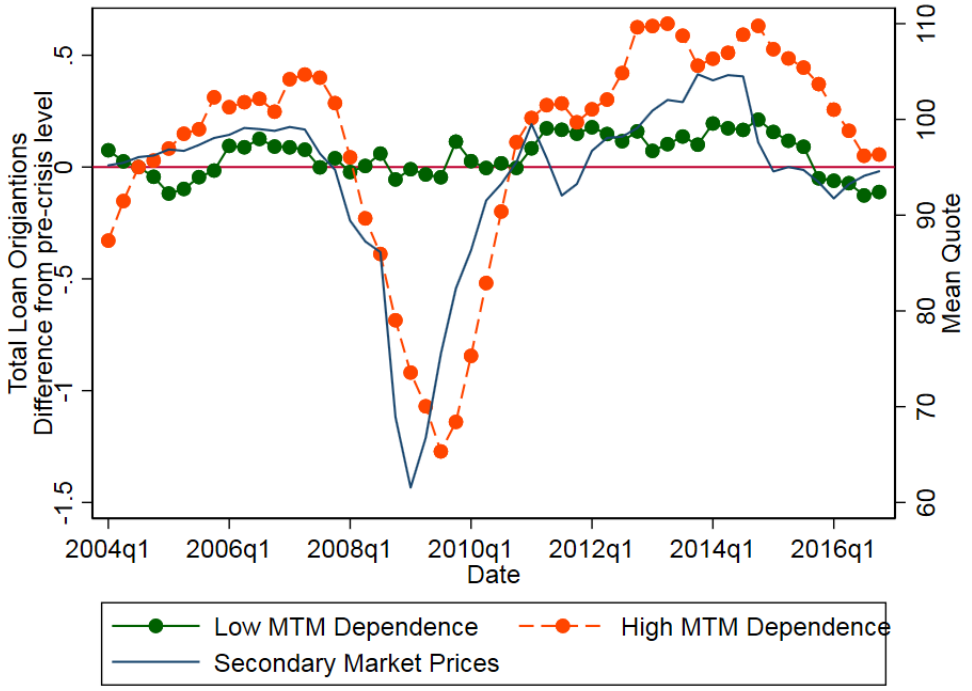
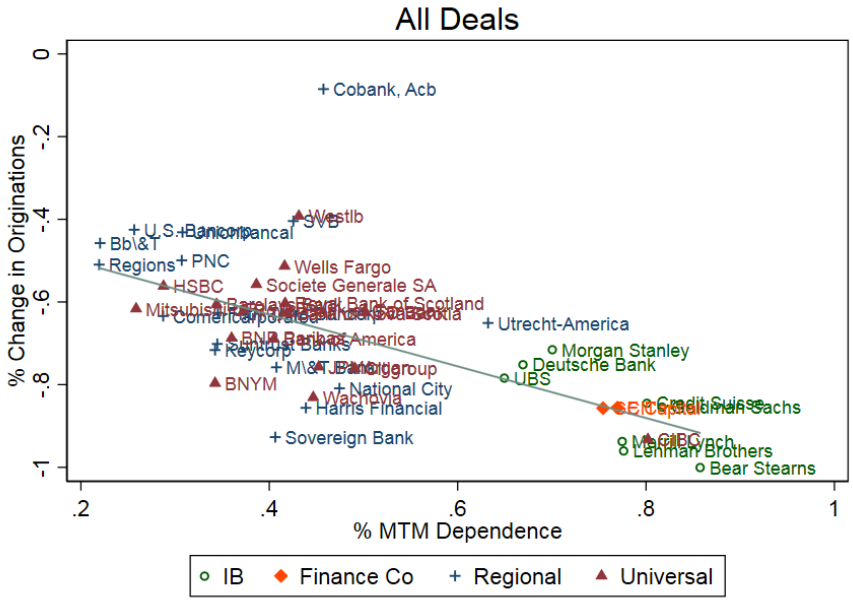


Figure 3: Correlation between Crisis Lending Change and MTM Dependence

This figure examine sthe correlation between mark-to-market dependence and change in lending during the 2008 financial crisis. Mark-to-market (MtM-dependece) of the bank is calculated as the share of MtM deals originated by the lender in the pre-crisis period (October 2005 to June 2006 and October 2006 to June 2007 period). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. We measure changes in originations between the pre-crisis and the Crisis period, where the crisis period covers October 2007 to 2008 and October 2008 to June 2009.

(a) **All Lenders**



(b) **Change in Lending by Group**

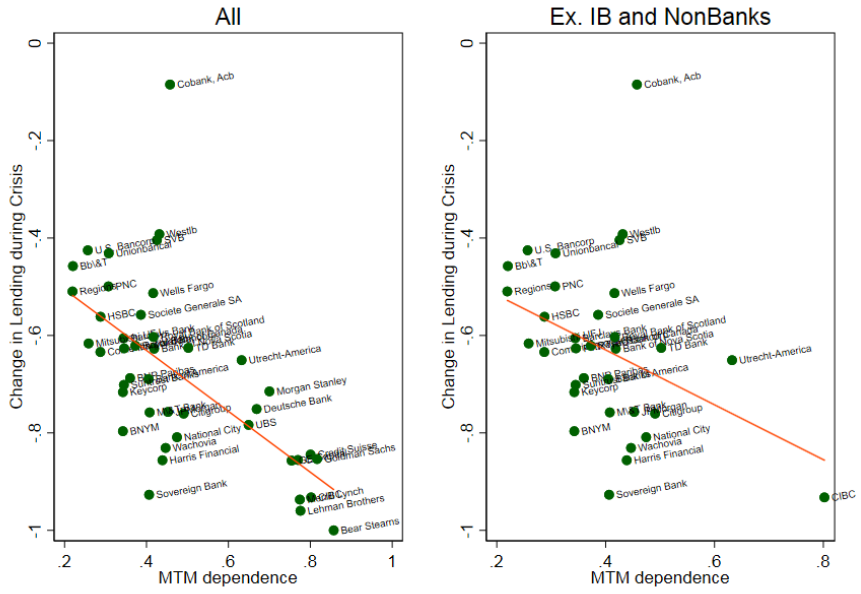


Figure 4: Event study - Financial Crisis - Bank Level

This figure examines change in lending around the Great Recession. The sample is all term loans originated between 2004 and 2010. Unit of observation is a bank-quarter. Regression coefficients from the following regression are plotted

$$\text{Log(Number Loans)}_{bt} = \alpha_b + \delta_t + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for bank b in quarter t. Mark-to-market (MtM) dependece of the bank is calculated as the share of MtM deals originated by the lender in the pre-crisis period (October 2005 to June 2006 and October 2006 to June 2007 period). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Standard errors clustered at the bank-level. Figue 4a includes all loans, figure 5b includes only Real Investment loans (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures), and figure 5c includes loans originated to investment grade borrowers.

(a) **All Loans**

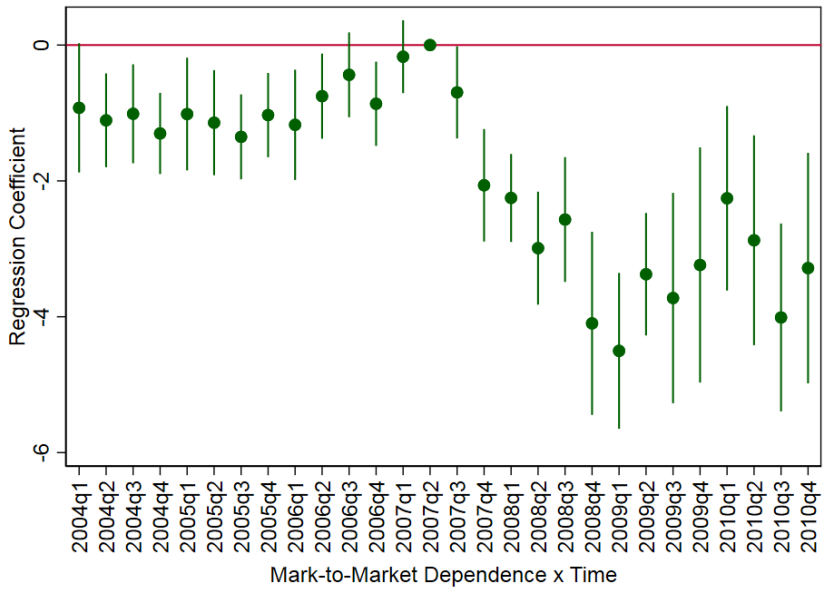
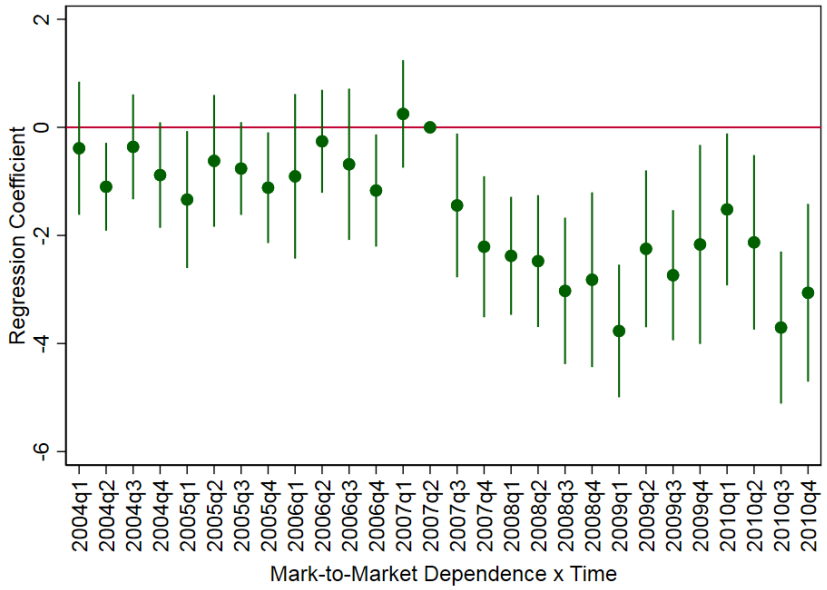


Figure 5: Event study - Financial Crisis - Bank Level - Continued

(b) **Real Investment Loans**



(c) **Investment Grade Loans**

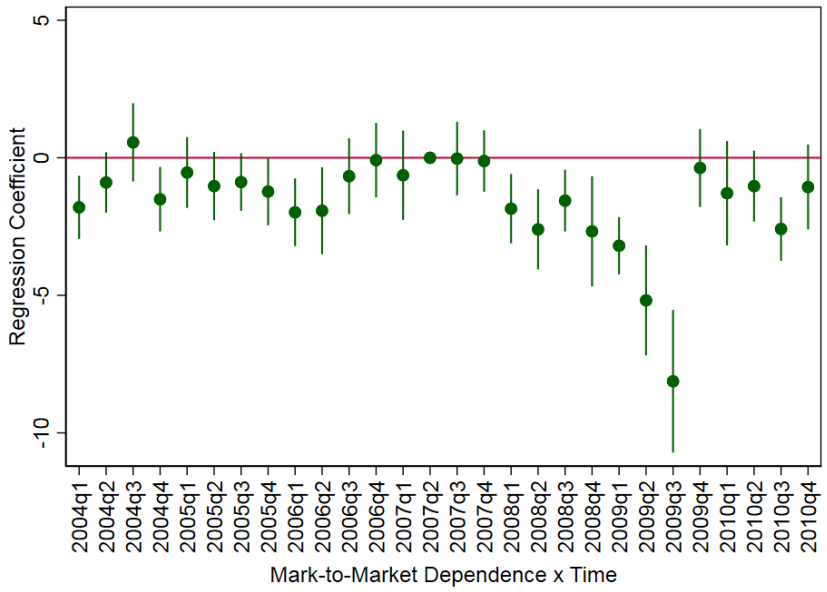


Figure 6: Event study - Financial Crisis - Bank-Borrower Level

This figure examines change in lending around the Great Recession. The sample is all term loans originated between 2004 and 2010. Unit of observation is a bank-borrower-quarter. Regression coefficiens from the following regression are plotted:

$$\text{Loan}_{fbt} = \alpha_{fb} + \delta_{ft} + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for firm f, borrowing from bank b in quarter t. Dependent variable takes a value of one if the borrower gets a loan in the given quarter from the bank. Mark-to-market (MtM) dependece of the bank is calculated as the share of MtM deals originated by the lender in the pre-crisis period (October 2005 to June 2006 and October 2006 to June 2007 period). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Standard errors clustered at the bank-level. Figue 6a includes all loans, figure 6b includes only Real Investment loans (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures), and figure 6c includes loans originated to investment grade borrowers.

(a) **All Loans**

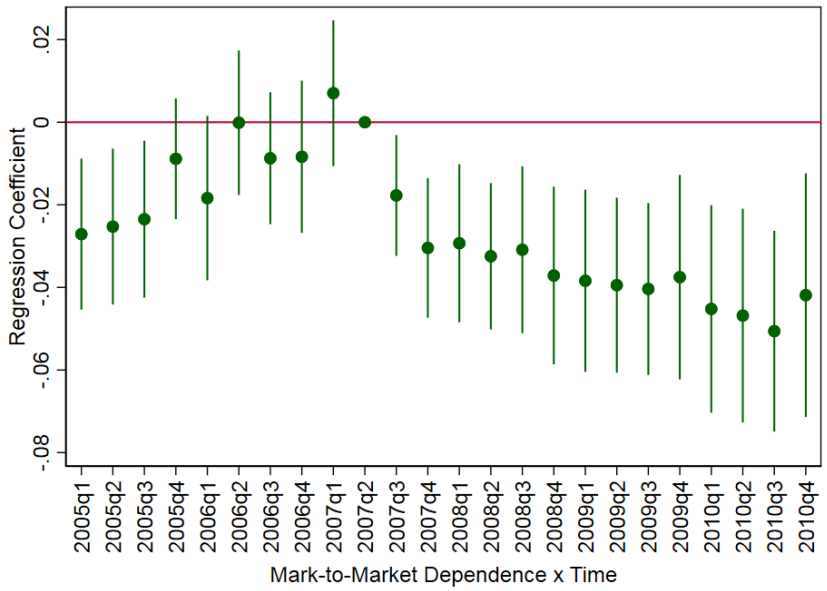
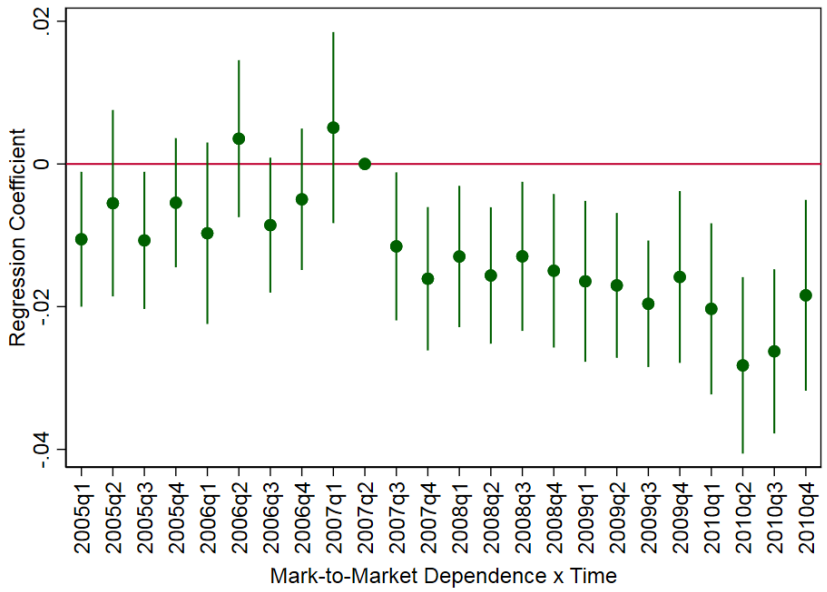
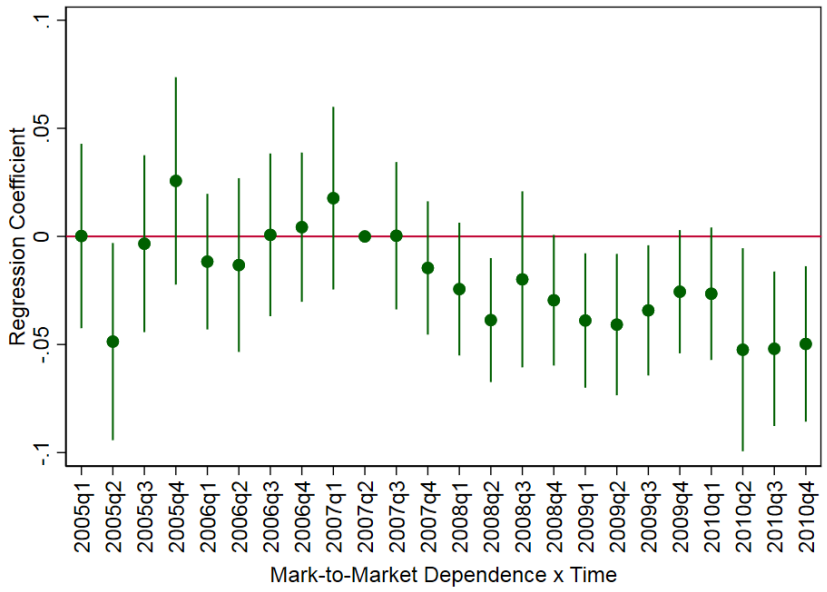


Figure 6: Event study - Financial Crisis - Bank Level - Continued

(b) **Real Investment Loans**



(c) **Investment Grade Loans**



8 Tables

Table 1: Mark-to-Market Facilities by Loan and Lender Type

Table shows the average share of mark-to-market deals originated as lead arrangers through the sample period. A deal is mark-to-market if at least 25% of the deal is held by investment banks or if the deal includes a Term Loan B-G. Only deals arranged as lead is included in the table.

		All Lenders	Universal	Regional	IB/NB
All Loans	MTM Share (2007)	0.563	0.436	0.284	0.892
	MTM Share (2009)	0.241	0.214	0.084	0.623
	MTM Share (2016)	0.376	0.313	0.231	0.792
Real Investment	MTM Share (2007)	0.371	0.301	0.199	0.803
	MTM Share (2009)	0.195	0.181	0.048	0.631
	MTM Share (2016)	0.264	0.212	0.171	0.729
IG	MTM Share (2007)	0.393	0.280	0.231	0.864
	MTM Share (2009)	0.141	0.114	0.020	0.559
	MTM Share (2016)	0.106	0.076	0.044	0.367

Table 2: Correlation in Lending Change

This table examines the correlation between mark-to-market dependence and change in lending during the 2008 financial crisis.

$$\Delta\text{Loan}_b = \alpha + \beta\text{Mark-to-Market Dependence}_b + X_b + \epsilon_b$$

for bank b. Mark-to-market (MtM-dependece) of the bank is calculated as the share of MtM deals originated by the lender in the pre-crisis period (October 2005 to June 2006 and October 2006 to June 2007 period). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. We measure changes in originations between the pre-crisis and the Crisis period, where the crisis period covers October 2007 to 2008 and October 2008 to June 2009. Controls include the pre-crisis exposure to Lehman Brothers through the syndicated loan market, loading of bank's stock return on an index of Residential MBS (ABX), share of trading revenues to total bank assets, net real estate charge offs in 2007-08 to total bank assets, bank depsoit to asset ratio and an indicator for whether the lender is a investment bank of finance company. Column 1-3 include all loans originated by the lender. Column 4 and incude only real investment (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures) and investment grade loans respectively. Robust standard errors.

	All Loans			Real Inv	IG
	(1)	(2)	(3)	(4)	(5)
MTM Dependence	−0.114***	−0.125***	−0.176***	−0.194***	−0.184**
	(−7.101)	(−5.108)	(−5.054)	(−4.660)	(−2.464)
Lehman exposure		0.022	−0.009	0.016	0.012
		(0.977)	(−0.219)	(0.315)	(0.137)
ABX Exposure			−0.009	0.000	0.024
			(−0.388)	(0.002)	(0.495)
07-08 Trading Rev/AT			0.026	0.013	0.009
			(1.045)	(0.436)	(0.232)
07-08 RE NCO/AT			−0.051**	−0.060**	−0.055*
			(−2.540)	(−2.582)	(−1.726)
07 Deposits/Assets			0.050	0.065	0.050
			(1.297)	(1.443)	(0.711)
IB/FinCo Indicator			0.230***	0.242***	0.168
			(3.291)	(2.770)	(1.276)
Constant	−0.720***	−0.717***	−0.760***	−0.707***	−0.713***
	(−39.189)	(−36.953)	(−33.090)	(−25.357)	(−16.810)
Obs.	43	42	38	38	37
R^2	0.427	0.413	0.621	0.558	0.367

Table 3: Lending Change - Bank Level

This table examines the effect of secondary market loan prices on primary market originations. We test the interaction between mark-to-market dependence of the lender and secondary market pricing on new loan origination through the following specification:

$$\begin{aligned}\text{Log(Number Loans)}_{bt} =& \alpha_b + \delta_t + \beta_1 \text{Mark-to-Market Dependence}_b \times \text{Secondary Market Price}_t \\ & \beta_2 \text{Mark-to-Market Dependence}_b + \beta_3 \text{Secondary Market Price}_t + \epsilon_{bt}\end{aligned}$$

for bank b and quarter t. Standard errors are clustered at the bank level. Column 1 and 4 include all loans originated by the bank. Column 2 and 5 include loans classified as Real Investment (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures), and Columns 3 and 6 include loans originated to investment grade borrowers.

	Log Number of Loans					
	(1) All	(2) Real Investment	(3) IG	(4) All	(5) Real Investment	(6) IG
Lag MTM Dependence	−1.503***	−1.294***	−0.590**	−1.499***	−1.053***	−0.978***
	(−7.049)	(−6.214)	(−2.073)	(−6.466)	(−4.729)	(−3.386)
Secondary Mkt Price	4.031***	3.763***	2.235***			
	(16.934)	(15.038)	(7.361)			
Lag MTM Dependence x Secondary Mkt Price	1.743***	1.338***	0.648**	1.818***	1.321***	1.046***
	(7.297)	(5.403)	(2.181)	(7.886)	(5.407)	(3.532)
Bank FE	Y	Y	Y	Y	Y	Y
Year x Quarter FE	N	N	N	Y	Y	Y
Obs.	1,857	1,808	1,316	1,857	1,808	1,316
Bank Cluster	43	43	43	43	43	43
R^2	0.706	0.638	0.361	0.742	0.708	0.537

Table 4: Lending Change - Bank-Level - 2015 episode

This table examines change in lending around the secondary market price drop in 2015. The sample is all term loans originated between 2013 and 2016. Unit of observation is a bank-quarter. Regression coefficients from the following regression are plotted

$$\text{Log(Number Loans)}_{bt} = \alpha_b + \delta_t + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for bank b in quarter t. Mark-to-market (MtM) dependece of the bank is calculated as the share of MtM deals originated by the lender in the pre period (2013 Q1 to 2014 Q3). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Post takes a vlue of 1 for years 2015 and 2016 when secondary market prices drop below 96c on the dollar. Standard errors clustered at the bank-level. Column 1 includes all loans originated by the bank. Column 2 includes loans classified as Real Investment (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures), and Column 3 includes loans originated to investment grade borrowers.

Panel A- All Loans

	Log Number of Loans		
	(1) All	(2) Real Investment	(3) IG
MTM Dependence x Post	−0.140*	−0.297***	−0.123**
	(−2.010)	(−5.157)	(−2.484)
Bank FE	Y	Y	Y
Year x Quarter FE	Y	Y	Y
Obs.	580	565	432
Bank Cluster	39	37	33
R^2	0.841	0.807	0.656

Panel B- Lead Loans

	Log Number of Loans		
	(1) All	(2) Real Investment	(3) IG
MTM Dependence x Post	−0.203***	−0.361***	−0.092
	(−3.239)	(−5.638)	(−1.551)
Bank FE	Y	Y	Y
Year x Quarter FE	Y	Y	Y
Obs.	541	509	300
Bank Cluster	39	37	29
R^2	0.872	0.814	0.682

Table 5: Lending Change - Bank-Borrower Level

This table examines the effect of secondary market loan prices on primary market originations. We test the interaction between mark-to-market dependence of the lender and secondary market pricing on new loan origination at the borrower-level through the following specification:

$$\text{Loan}_{fbt} = \alpha_b + \gamma_f + \delta_t + \beta_1 \text{Mark-to-Market Dependence}_b \times \text{Secondary Market Price}_t$$
$$\beta_2 \text{Mark-to-Market Dependence}_b + \beta_3 \text{Secondary Market Price}_t + \epsilon_{bt}$$

for borrower f, bank b and quarter t. Dependent variable takes value 1 if the borrower gets a loan from the bank in the given quarter and zero otherwise. Standard errors are clustered at the bank level.

Panel A- All Loans

	Loan			
	(1)	(2)	(3)	(4)
Lag MTM Dependence	−0.023***	−0.010***	−0.012***	−0.010***
	(−8.679)	(−4.038)	(−5.615)	(−3.792)
Secondary Mkt Price	0.101***	0.068***		
	(31.531)	(13.812)		
Lag MTM Dependence x Secondary Mkt Price	0.027***	0.010***	0.015***	0.014***
	(8.189)	(3.611)	(5.186)	(4.429)
Bank FE	N	Y	N	Y
Bank x Year FE	N	Y	N	N
Borrower x Quarter FE	N	N	Y	Y
Obs.	1,565,129	1,565,129	1,485,743	1,485,743
Bank Cluster	43	43	43	43
R^2	0.003	0.008	0.683	0.683

Panel B- Other Loan Types

	Loan			
	(1) All	(2) Real Investment	(3) IG	(4) Lead
Lag MTM Dependence	−0.010***	−0.004**	−0.004	−0.015***
	(−3.792)	(−2.633)	(−1.472)	(−4.512)
Lag MTM Dependence x Secondary Mkt Price	0.014***	0.007***	0.005**	0.018***
	(4.429)	(3.483)	(2.091)	(4.875)
Bank FE	Y	Y	Y	Y
Borrower x Quarter FE	Y	Y	Y	Y
Obs.	1,485,743	1,485,743	172,601	1,485,743
Bank Cluster	43	43	43	43
R^2	0.683	0.681	0.739	0.421

Table 6: Lending Change - Bank-Borrower Level - 2015 episode

This table examines change in lending around the secondary market price drop in 2015. The sample is all term loans originated between 2013 and 2016. Unit of observation is a bank-borrower-quarter. Regression coefficiens from the following regression are plotted:

$$\text{Loan}_{fbt} = \alpha_{fb} + \delta_t + \beta_1 \text{Mark-to-Market Dependence}_b \times \text{Post}_t + \epsilon_{fbt}$$

for borrower f, bank b and quarter t. Dependent variable takes a value of 100 if the borrower gets a loan in the given quarter from the bank. Mark-to-market (MtM) dependece of the bank is calculated as the share of MtM deals originated by the lender in the pre period (2013 Q1 to 2014 Q3). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Post takes a vlue of 1 for years 2015 and 2016 when secondary market prices drop below 96c on the dollar. Standard errors clustered at the bank-level. Column 1 includes all loans originated by the bank. Column 2 includes loans classified as Real Investment (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures), and Column 3 includes loans originated to investment grade borrowers.

Panel A- All Loans

	New Loan		
	(1) All	(2) Real Investment	(3) IG
MTM Dependence x Post	−0.338***	−0.227**	−0.031**
	(−2.763)	(−2.624)	(−2.685)
Bank x Borrower FE	Y	Y	Y
Year x Quarter FE	Y	Y	Y
Obs.	528,032	528,032	528,032
Bank Cluster	41	41	41
R^2	0.082	0.084	0.102

Panel B- Lead Loans

	New Loan		
	(1) All	(2) Real Investment	(3) IG
MTM Dependence x Post	−0.370***	−0.271***	−0.026***
	(−3.570)	(−3.602)	(−3.092)
Bank x Borrower FE	Y	Y	Y
Year x Quarter FE	Y	Y	Y
Obs.	528,032	528,032	528,032
Bank Cluster	41	41	41
R^2	0.102	0.098	0.117

Table 7: Pricing Regressions

This table examines the effect of secondary market loan prices on the pricing of loans in the primary market. We test the interaction between mark-to-market dependence of the lender and secondary market pricing on loan spreads at the borrower-level through the following specification:

$$\text{Loan Spread}_{fbt} = \alpha_b + \gamma_f + \delta_t + \beta_1 \text{Mark-to-Market Dependence}_b \times \text{Secondary Market Price}_t + \beta_2 \text{Mark-to-Market Dependence}_b + \beta_3 \text{Secondary Market Price}_t + \epsilon_{bt}$$

for borrower f, bank b and quarter t. Dependent variable is the all-in-drawn spread on the loan. Loan controls include log facility amount, loan maturity, and indicators for loan type. Column 1-2 include loans originated as lead as well as the syndicate participant. Columns 3 and 4 restict the sample to loans originated as lead arranger. Standard errors are clustered at the bank level.

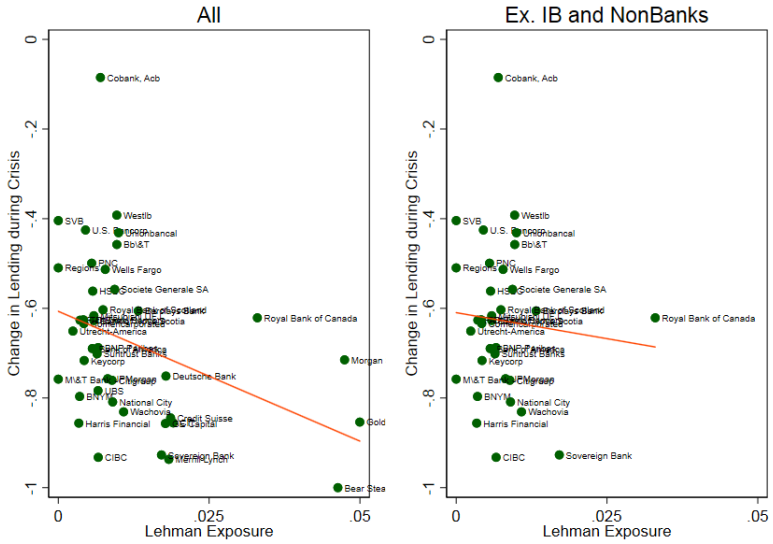
	All In Drawn Spread			
	(1) All	(2) All	(3) Lead	(4) Lead
Lag MTM Dependence	29.565**	45.988***	40.153**	33.511**
	(2.290)	(2.874)	(2.265)	(2.025)
Lag MTM Dependence x Secondary Mkt Price	−34.105**	−52.046***	−47.686***	−39.206**
	(−2.685)	(−3.281)	(−2.714)	(−2.377)
Bank FE	Y	N	N	N
Borrower	Y	N	N	N
Bank x Borrower FE	N	Y	Y	Y
Year x Quarter FE	Y	Y	Y	Y
Loan Controls	N	N	N	Y
Obs.	45,619	28,504	15,424	15,131
R^2	0.801	0.800	0.779	0.792

Appendix A1 Additional Results

Figure A1: Lending Change in the Financial Crisis vs. Bank Controls

This figure examines the correlation between change in lending during the 2008 financial crisis and bank controls. We measure changes in originations between the pre-crisis and the Crisis period, where the crisis period covers October 2007 to 2008 and October 2008 to June 2009. Lehman Exposure is the fraction of a bank's syndication portfolio where Lehman Brothers had a lead role. Deposits to assets is the share of deposits to total bank assets.

(a) **Lehman Exposure**



(b) **Deposits to Assets**

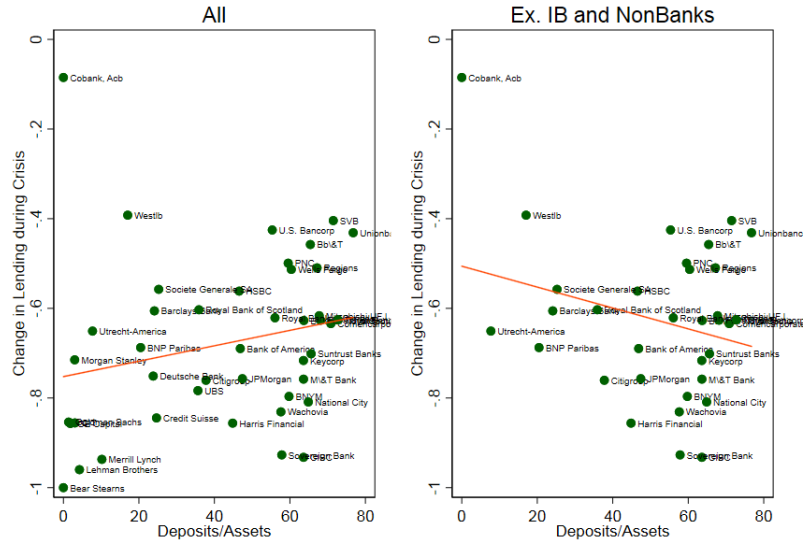


Table A1: Lending Change

This table examines the effect of secondary market loan prices on primary market originations. We test the interaction between mark-to-market dependence of the lender and secondary market pricing on new loan origination through the following specification:

$$\begin{aligned}\text{Log(Number Loans)}_{bt} =& \alpha_b + \delta_t + \beta_1 \text{Mark-to-Market Dependence}_b \times \text{Secondary Market Price}_t \\ & \beta_2 \text{Mark-to-Market Dependence}_b + \beta_3 \text{Secondary Market Price}_t + \epsilon_{bt}\end{aligned}$$

for bank b and quarter t. Standard errors are clustered at the bank level. Column 1 and 4 include all loans originated by the bank. Column 2 and 5 include loans classified as Real Investment (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures), and Columns 3 and 6 include loans originated to investment grade borrowers. Regession is weighted by share of loan retained by the lender.

	Log Number of Loans					
	(1) All	(2) Real Investment	(3) IG	(4) All	(5) Real Investment	(6) IG
Lag MTM Dependence	−1.421***	−1.642***	−0.720	−1.271***	−1.121***	−1.188**
	(−7.824)	(−7.412)	(−1.408)	(−5.966)	(−4.640)	(−2.568)
Secondary Mkt Price	0.043***	0.044***	0.018***	−1.1e+05	774.407	−8.2e+04
	(19.208)	(19.252)	(4.444)	(−0.001)	(0.000)	(−0.000)
Lag MTM Dependence x Secondary Mkt Price	0.016***	0.016***	0.007	0.016***	0.014***	0.013***
	(7.828)	(6.260)	(1.361)	(7.678)	(5.282)	(2.755)
Bank FE	Y	Y	Y	Y	Y	Y
Year x Quarter FE	N	N	N	Y	Y	Y
Obs.	1,790	1,678	884	1,790	1,678	884
Bank Cluster	43	43	39	43	43	39
R^2	0.727	0.663	0.364	0.785	0.760	0.587

Table A2: Bank-Level Lending - Around 2008 Financial Crisis

This table examines change in lending around the Great Recession. The sample is all term loans originated between 2004 and 2010. Unit of observation is a bank-quarter. Regression coefficients from the following regression are presented

$$\text{Log(Number Loans)}_{bt} = \alpha_b + \delta_t + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for bank b in quarter t. Mark-to-market (MtM) dependece of the bank is calculated as the share of MtM deals originated by the lender in the pre-crisis period (October 2005 to June 2006 and October 2006 to June 2007 period). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Standard errors clustered at the bank-level.

	(1)	(2)	(3)
	All	Real Investment	IG
MTM Dep x 2004q1	−0.924*	−0.387	−1.801***
	(−1.961)	(−0.634)	(−3.164)
MTM Dep x 2004q2	−1.108***	−1.099***	−0.899
	(−3.239)	(−2.727)	(−1.652)
MTM Dep x 2004q3	−1.012***	−0.361	0.560
	(−2.804)	(−0.751)	(0.796)
MTM Dep x 2004q4	−1.301***	−0.883*	−1.508**
	(−4.398)	(−1.825)	(−2.598)
MTM Dep x 2005q1	−1.016**	−1.337**	−0.535
	(−2.472)	(−2.128)	(−0.840)
MTM Dep x 2005q2	−1.143***	−0.620	−1.029
	(−2.983)	(−1.026)	(−1.679)
MTM Dep x 2005q3	−1.351***	−0.762*	−0.883*
	(−4.360)	(−1.793)	(−1.702)
MTM Dep x 2005q4	−1.031***	−1.117**	−1.230**
	(−3.355)	(−2.201)	(−2.028)

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Table A2 – *Continued from previous page*

	(1)	(2)	(3)
	Loan	Loan	Loan
MTM Dep x 2006q1	−1.174***	−0.907	−1.984***
	(−2.921)	(−1.202)	(−3.258)
MTM Dep x 2006q2	−0.753**	−0.258	−1.925**
	(−2.425)	(−0.548)	(−2.462)
MTM Dep x 2006q3	−0.438	−0.683	−0.669
	(−1.416)	(−0.985)	(−0.981)
MTM Dep x 2006q4	−0.864***	−1.169**	−0.085
	(−2.814)	(−2.273)	(−0.127)
MTM Dep x 2007q1	−0.171	0.249	−0.635
	(−0.645)	(0.505)	(−0.790)
MTM Dep x 2007q2	0.000	0.000	0.000
MTM Dep x 2007q3	−0.697**	−1.444**	−0.029
	(−2.072)	(−2.192)	(−0.044)
MTM Dep x 2007q4	−2.064***	−2.209***	−0.117
	(−5.033)	(−3.418)	(−0.212)
MTM Dep x 2008q1	−2.251***	−2.378***	−1.851***
	(−7.016)	(−4.396)	(−2.969)
MTM Dep x 2008q2	−2.990***	−2.475***	−2.601***
	(−7.260)	(−4.094)	(−3.616)
MTM Dep x 2008q3	−2.569***	−3.026***	−1.559***
	(−5.644)	(−4.509)	(−2.802)
MTM Dep x 2008q4	−4.097***	−2.819***	−2.674**
	(−6.136)	(−3.519)	(−2.694)

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Table A2 – *Continued from previous page*

	(1)	(2)	(3)
	Loan	Loan	Loan
MTM Dep x 2009q1	−4.502***	−3.768***	−3.197***
	(−7.921)	(−6.196)	(−6.198)
MTM Dep x 2009q2	−3.374***	−2.248***	−5.184***
	(−7.550)	(−3.126)	(−5.241)
MTM Dep x 2009q3	−3.724***	−2.736***	−8.126***
	(−4.854)	(−4.586)	(−6.330)
MTM Dep x 2009q4	−3.238***	−2.167**	−0.370
	(−3.775)	(−2.375)	(−0.527)
MTM Dep x 2010q1	−2.256***	−1.518**	−1.288
	(−3.351)	(−2.180)	(−1.371)
MTM Dep x 2010q2	−2.874***	−2.128**	−1.030
	(−3.756)	(−2.659)	(−1.617)
MTM Dep x 2010q3	−4.010***	−3.705***	−2.588***
	(−5.852)	(−5.315)	(−4.519)
MTM Dep x 2010q4	−3.283***	−3.061***	−1.063
	(−3.905)	(−3.755)	(−1.388)
Bank FE	Y	Y	Y
Year x Quarter FE	Y	Y	Y
Obs.	1,158	1,129	755
Bank Cluster	43	43	42
R^2	0.815	0.756	0.575

Table A3: Lending Change - Bank-Level - 2015 episode

This table examines change in lending around the secondary market price drop in 2015. The sample is all term loans originated between 2013 and 2016. Unit of observation is a bank-quarter. Regression coefficients from the following regression are plotted

$$\text{Log(Number Loans)}_{bt} = \alpha_b + \delta_t + \beta_t \text{Mark-to-Market Dependence}_b \times \mathbf{1}_t + \epsilon_{bt}$$

for bank b in quarter t. Mark-to-market (MtM) dependece of the bank is calculated as the share of MtM deals originated by the lender in the pre period (2013 Q1 to 2014 Q3). Deals are classified as MtM if an investment banks hold over 25% at origination or the deal includes Term Loan B-G. Post takes a vlue of 1 for years 2015 and 2016 when secondary market prices drop below 96c on the dollar. Standard errors clustered at the bank-level. Column 1 includes all loans originated by the bank. Column 2 includes loans classified as Real Investment (i.e., those with primary purpose of corporate purposes, working capital or capital expenditures), and Column 3 includes loans originated to investment grade borrowers. Regession weighted by share of loan held by the lender.

Panel A- All Loans

	Log Number of Loans		
	(1) All	(2) Real Investment	(3) IG
MTM Dependence x Post	−0.155**	−0.279***	−0.138**
	(−2.395)	(−4.816)	(−2.676)
Bank FE	Y	Y	Y
Year x Quarter FE	Y	Y	Y
Obs.	575	553	314
Bank Cluster	37	36	21
R^2	0.816	0.792	0.666

Panel B- Lead Loans

	Log Number of Loans		
	(1) All	(2) Real Investment	(3) IG
MTM Dependence x Post	−0.231***	−0.376***	−0.082
	(−4.222)	(−6.311)	(−1.441)
Bank FE	Y	Y	Y
Year x Quarter FE	Y	Y	Y
Obs.	537	506	246
Bank Cluster	37	36	20
R^2	0.864	0.812	0.654