The "Marketization" of Bank Business Loans in the United States*

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Abstract

The effect of changes in market interest rates on bank lending rates will depend on the regulatory environment and the structure of banking markets. A new, consistent measure of the average interest rate charged on new bank loans since the late 1930s shows a sharp change in the behavior of bank business loan rates around 1970. Before that time, loan rates reacted only sluggishly to changes in short-term market rates. By contrast, by the mid-1980s loan rates moved essentially one-for-one with short-term market rates. The 1970s represent a transitional phase. I explain the earlier muted response of loan rates to market rates as the result of an implicit contract between banks and their borrowers that helped to smooth their profitability. This model also shows how changes in the regulatory and banking environment, including the gradual erosion of Regulation Q limits on deposit interest rates and increased access to short-term capital markets by businesses between the late 1960s and the early 1980s undermined this implicit contract, leading to loan pricing that followed market rates closely. A range of empirical and narrative evidence from before, during, and after the change in loan rate behavior supports this explanation.

Key words: Bank lending, loan interest rates.

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I. Introduction

Economists and policymakers have long considered the possible effects of monetary policy on bank lending and economic activity. Research on this "bank lending channel" of monetary policy has focused on how easier monetary policy might stimulate bank lending by increasing the reserves that banks can use to lend (Bernanke and Blinder, 1986; Kashyap and Stein, 2000), by strengthening the balance sheets of banks and borrowers (Bernanke and Gertler, 1997), by easing bank capital constraints (Van den Heuvel, 2012), or by encouraging banks to take on greater risk (Gambacorta, 2009). Since the financial crisis of 2007-09, policymakers in many countries have developed a range of policies to try to stimulate bank lending more directly in order to boost aggregate demand and support economic recovery. These efforts included "funding for lending" programs in the U.K, the E.U., and Japan; and, more recently, a range of programs to encourage bank lending to businesses in response to the coronavirus crisis.[1]

However, the importance of these policy effects and the way that they are transmitted to the economy may depend on the structure of the bank loan market and the relationships between banks and their borrowers. Because these structures and relationships evolve in response to financial innovations and regulatory changes, the likely impact of monetary and other policies on bank lending terms and the economy can differ, both across time and across countries. In this paper I consider the changing relationship between market interest rates affected directly by monetary policy and bank business loan rates in the United States between 1939 and 2017. I start by presenting a new, consistent measure of the average

[1] For funding for lending programs, see for example, Bank of England (2020) and Lane (2020). For the coronavirus response, see English and Liang (2020) and English, Forbes, and Ubide (2021).

rate on new short-term business loans at large U.S. banks over this period. Using these new data and simple VAR models, I document the changing behavior of loan rates over time. Most notably, before the late 1960s, business loan rates moved very modestly relative to changes in short-term market rates, but between about 1970 and the mid-1980s bank loan rates became much more sensitive to changes in market rates, and by the mid-1980s business loan rates generally followed short-term market rates very closely.

I argue that in the earlier period, there was an implicit contract between banks and their customers. Under that contract, business loan rates were smoothed over time in order to avoid the income risks – both to banks and to borrowers – that would be associated with larger fluctuations in loan rates. This contract reflected two institutional features of the bank loan market. First, the long-term relationships that banks and businesses had in that era, based on the information that banks had about their customers and their market areas, and the limited ability of banks to branch into new areas. Second, banks at that time were dependent on deposits to fund lending, and the rates paid on deposits were limited by Regulation Q.[2] As a result, banks engaged in "asset management," under which they attempted to arrange their securities holdings in order to maintain their liquidity and so their ability to make loans when loan demand was elevated. When, in a period of strong loan demand (and higher market interest rates), a bank became "loaned up," – i.e., could not fund additional loans – or was afraid that it soon would be loaned up, it would ration credit to borrowers rather than raise loan interest rates to limit demand. This rationing involved reducing lending to new or

[2] Regulation Q set ceilings on deposit interest rates under the Banking Act of 1933. The Regulation Q ceilings on savings and time deposit interest rates were phased out under the Depository Institutions Deregulation and Monetary Control Act of 1980, with the last restrictions on time and savings deposit rates ending in 1986 (Mahoney et al, 1987, Appendix A). Ceilings on rates on the demand deposits of businesses were eliminated following the passage of the Dodd-Frank Act in 2010 (see Federal Reserve Board, 2011).

risky customers while continuing to lend to established, safer customers at rates below those that would have cleared the loan market.

However, this arrangement broke down after about 1970, reflecting developments in banking and financial markets – including new financing alternatives for both banks and businesses – that made the implicit contract no longer tenable.[3] Starting in the early to mid-1960s, banks became increasingly able to obtain funding in money markets – including the negotiable CD market, the federal funds market, the repurchase agreement market, the Eurodollar market, and market for bank holding company commercial paper. The development of these new markets had two effects. First, banks' cost of funds became more closely linked to market rates, making it more difficult for banks to lend at smoothed interest rates without inducing large fluctuations in their earnings. Second, since banks had access to funds beyond their core deposits, albeit at market interest rates, they no longer became loaned up. However, making additional loans at a smoothed loan rate while funding them at market rates could reduce bank earnings in periods of high market interest rates and strong loan demand. Thus, the availability of new sources of market funding provided an incentive for banks to price loans at rates closer to those prevailing in financial markets.

Perhaps even more important, the expansion of the commercial paper market allowed larger and higher-quality bank customers to obtain funds directly at market rates. Thus, such customers could borrow opportunistically from banks if the smoothed bank loan rate was low relative to market rates, but they could borrow in the commercial paper market when market rates were low relative to the bank loan rate. The ability of borrowers to

[3] As discussed in the concluding section, these changes, in turn, seem likely to have come in response to the higher and more volatile level of market interest rates between the late 1960s and mid-1980s, which made the Regulation Q ceilings bind more often and more tightly, causing disintermediation and significant constraints on the ability of banks to meet their customers' credit needs.

arbitrage between the money market and the bank loan market would presumably provide banks with a strong incentive to price loans at rates closer to those prevailing in financial markets.[4]

The next section briefly describes the construction of the new series on bank business loan rates since 1939 (details are provided in appendices), displays the resulting series, and notes the change in the behavior of business loan rates around 1970. Section III uses simple VAR models to examine the changes in the behavior of the loan rate quantitatively, confirming the change in behavior around 1970. Section IV presents a simple implicit contracting model that can explain the earlier sluggish adjustment of loan rates to market rates, and section V provides a range of empirical and narrative evidence supporting the model. Section VI provides information on changes in the banking environment around 1970 and extends the model to show how those changes undermine the smoothing of loan rates. It also discusses some historical developments in bank lending markets in the 1970s and 1980s that point to the continuing importance of smoothed loan rates for smaller borrowers. Section VII discusses other factors that may have contributed to the sluggishness of business loan rates in the earlier period, but argues that those factors were likely less important than the implicit contract. A final section presents some concluding remarks.

II. A consistent series for bank business loan rates

The raw material for the construction of a consistent business loan rate series for the United States is the output from two Federal Reserve surveys: The Quarterly Interest Rate

[4] As discussed below, increased lending by foreign banks, which lacked retail deposits and so raised and loaned funds at market rates, likely had a similar effect.

Survey (QIRS) and the Survey of Terms of Business Lending (STBL).[5] Between 1939 and 1976, the QIRS collected data on business loan rates at large banks. From 1977 to 2017, similar data for business loan rates at banks of all sizes was collected on the STBL. The results of the QIRS and the STBL were published on the Federal Reserve's E.2 Statistical Release and in the Federal Reserve *Bulletin*. In addition, the microdata for the STBL are maintained in archival files at the Federal Reserve Board.[6]

By splicing together data from the various versions of the QIRS one can construct a time series for short-term (maturity between one month and one year) business loan rates at large banks from 1939 to 1976.[7] However, the resulting loan rate series has a number of discontinuities owing to periodic changes in the survey. These discontinuities include changes in the types of loans covered by the survey, changes in the panel of respondent banks, and changes in the method used to calculate national averages based on the sample responses. The coverage, panel, and averaging method of the surveys for various periods are reported in Appendix A. In most cases, the sizes of the effects of changes were reported in articles in the Federal Reserve *Bulletin*, and the series can be adjusted to remove the effects of the resulting discontinuities. Moreover, in some cases, the effects of changes in weighting method can be removed by recalculating the average loan rate based on the published disaggregated data (e.g., rates by region and size of loan) and an alternative set of weights.

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[5] The Survey of Terms of Business Lending was called the Survey of Terms of Bank Lending to Business between 1977 and 1997. I use the acronym STBL for both.

[6] Archival files from the QIRS also have been retained, but the results of some surveys from the 1970s are missing and the documentation is not complete. As a result, these data were not utilized here.

[7] Rates on long-term loans (maturities over a year) are not available before 1967 and are not considered here. Without information on the changes, if any, in the average maturity and repricing interval of such loans, it would be difficult to interpret such a series.

Finally, one can splice the QIRS-based series to a comparable series constructed from the STBL data for 1977 on. Doing so requires a number of adjustments to take account of differences between the two sources, and these adjustments can be calibrated based on published information or calculated directly using the STBL micro data. The details of the adjustments made in the calculation of the loan rate series are provided in Appendix B.

In a few cases, there are no data available to evaluate the size of the effects of changes in the survey method on the average loan rate. However, given that the known adjustments are generally small and the loan rate series do not appear to move erratically at the time of the changes, it seems unlikely that the resulting discontinuities are large enough to affect the interpretation of the data.

Some possible changes in the coverage of the survey remain. In particular, it is likely that the average maturity of the loans in the survey has shortened over time. As noted in Appendix B, the fraction of loans with maturities under a month increased considerably in the 1980s, and even for loans with maturities over a month the average maturity has likely declined. In the empirical work reported below, I use a commercial paper rate series that also moves to a shorter maturity over time, reflecting changes in that market. Thus, the comparison between loan rates and commercial paper rates takes at least approximate account of the change in the maturity of business loans.

In addition, the fraction of surveyed loans that have floating rates has probably increased, as loans drawn down under revolving lines of credit became more common. Rates on such loans commonly were tied to the prime rate as early as the late 1950s (San Francisco Fed, 1959; Weaver and Fry, 1971). And over the late 1970s and 1980s, the rates on business

loans, especially at large banks, were increasingly tied to short-term market rates (Simpson, 1988).

The final adjusted series for the average interest rate charged by large banks on business loans with maturities between one month and one year is shown in Figure 1.[8] One observation stands out clearly: The loan rate was relatively smooth from the late 1930s to the late 1960s and much more variable thereafter. In part, this change reflects the larger variation in the general level of market interest rates after the late 1960s, but the behavior of the loan rate relative to private market rates changed considerably as well. For example, over the first half of the sample, the loan rate moves fairly closely with the AAA bond rate and is far less variable than the commercial paper rate (Figure 2). Most strikingly, between 1960Q3 and 1965Q3 the loan rate was essentially unchanged, while the commercial paper rate rose more than 1-1/4 percentage points. By the late1970s and early 1980s, however (and leaving aside the volatile period of reserve targeting in 1979-82), the loan rate generally moved much more closely with the commercial paper rate.[9]

Since the mid-1980s, the loan rate has moved even more closely with the federal funds rate (Figure 2). Indeed, during the "great moderation" period prior to the financial crisis, the spread of the loan rate over the federal funds rate was remarkably stable, ranging only between about 150 and 250 basis points. While the 1990-91 and 2001 recessions were

[8] As noted in Appendix A, the surveys have been conducted on a quarterly basis, but the timing of the survey within the quarter has changed over time. The timing of the market rates discussed here matches that of the loan rate surveys. See Appendix C for details.

[9] Some of the wide swings in the spread during the late 1970s and early 1980s may reflect the effects of measurement error. It is possible that some of the loan rates reported on the STBL were not priced in the survey week (either because of lags in the posting of loans to the respondents' reporting systems or because informal agreements reached before formal loan extensions affected reported loan pricing). As a result, there may be small discrepancies in the timing of the loan rates and the market rates. Since short-term market rates were volatile in this period, such discrepancies could lead to wide swings in the measured spread.

associated with modestly wider loan spreads, spreads jumped much more sharply in the financial crisis, presumably reflecting the pressures on bank liquidity and capital at that time, as well as the weaker economic outlook and consequent increase in loan risk. The spread of the loan rate over the federal funds rate spiked to nearly 4 percent after the Lehman failure and fell back only gradually through the end of the sample.[10]

Given the changes in the Federal Reserve surveys discussed above, it is natural to ask whether the apparent change in the behavior of the loan rate between the 1960s and the 1980s reflects an actual change in loan pricing behavior or differences in measurement. However, the muted adjustment of the survey measure of the actual average loan interest rate in the earlier subperiod is corroborated by data on the prime rate, which is also shown in Figure 1.[11] From 1939 through the 1970s, the two series move very closely together, confirming the sluggishness with which loan rates adjusted through this period. Indeed, both the average loan rate and the prime rate are essentially flat between 1961 and 1965, a period during which short-term market rates rose roughly 1-1/2 percentage points. Starting around 1980, the loan rate follows the prime rate considerably less closely, but the average spread between the two seems broadly similar until about 1990. At that time, the average loan rate falls substantially relative to the prime rate. This development reflected a sharp rise in the prime rate relative to short-term market rates. This change, in turn, may have owed to a deterioration in the average quality of prime-rate borrowers, as well as a reduction in such borrowers' size. (In the presence of fixed loan costs, smaller loans require a higher rate to

[10] Unfortunately, the Federal Reserve discontinued the collection of the STBL following the 2017Q2 survey.

[11] The prime rate is the rate commonly announced by banks and used as a base rate for floating rate loans. Prior to the late 1970s, the prime rate was generally the rate charged on loans to a bank's highest-quality business customers. For a discussion of the prime rate in the 1970s and early 1980s, see Goldberg (1982). For a discussion of the prime rate in the 1980s and early 1990s, see Mester and Saunders (1995).

cover banks' costs). These changes were initially accompanied by a shift in the base rate for loans to larger and lower-risk firms to market rates (Brady, 1979; Simpson, 1988). Subsequently, the prime rate became an increasingly important base rate for loans to households, including credit card loans and loans drawn down under home equity lines of credit (Board of Governors, 1993).

III. Empirical results

While the change in the behavior of business loan rates seems apparent from the figures, I confirm the change using simple VAR models. To do so, I estimate four-variable VARs, including the log of real GDP, the log of the GDP price index, a market interest rate, and the loan rate. I include the output and price measures because it is possible that the change in the behavior of the loan rate relative to the market rate reflects changes in the dynamics of the macroeconomy or monetary policy – which could influence loan-pricing behavior – rather than independent changes in the behavior of the loan rate. The market rates used include a long-term rate (the AAA bond rate), a money market rate (the commercial paper rate[12]), and a policy rate (the federal funds rate).[13] I put the loan rate last in the VAR because it seems unlikely to influence the other variables contemporaneously, but it may well

[12] The commercial paper rate is for 6-month commercial paper until 1997, 3-month commercial paper from 1997Q4 to 2004Q4, and 1-month commercial paper thereafter. See Appendix C for details.

[13] Similar estimation was conducted with the discount rate, but the results were disappointing. The results for the federal funds rate were generally more significant and the fraction of variance explained was generally higher. One problem in the first and last subperiods may be the change from an above-market discount rate to a below-market discount rate in the mid-1960s, and the shift back to an above-market rate in 2003. For a discussion, see Madigan and Nelson (2002).

be influenced contemporaneously by macroeconomic factors and the market rate. The VARs employ four lags of the endogenous variables.[14]

The VARs are estimated over three different subperiods based on data availability and the timing of macroeconomic and financial events. The BEA's quarterly GDP and GDP price data are not available until 1947, and the federal funds rate is not available until 1954. Given the Federal Reserve's substantial interventions in the Treasury market until the Accord was reached in March 1951, as well as controls on prices during the Korean War, I start the first subperiod (allowing for lags) in 1955 and end it in late 1969. The credit crunch of 1969, and the higher interest rates and inflation it reflected, marked the end of the period of relatively low and stable inflation and interest rates that had prevailed over the previous decade and a half. Moreover, as noted below, developments in banking and financial markets also suggest a break in loan pricing behavior about this time. The second subperiod runs from late 1969 to 1979, covering the period of rising and volatile inflation. The reserve targeting period, from 1979Q4 to 1982Q3 is excluded, since interest rate volatility was very high relative to the earlier and later periods, and the interval is too short to support estimation of the VAR. (If the period is included in the 1969-79 subperiod, the empirical results are not greatly changed.) The final subperiod runs from 1982 to 2007, covering the period after the lifting of most deposit rate ceilings and during which inflation declined and then was again low and stable, but prior to the financial crisis and the period of near-zero interest rates and quantitative easing that followed. The differences in parameters across these three periods are statistically significant at any reasonable confidence level. While the timing of the starts and

[14] The use of four lags when data are quarterly is fairly standard in the literature. I have also run the VARs with two lags, and the results for the loan rate are qualitatively similar. In the first subperiod I include dummy variables to take account of the change in the timing of the survey from the last month of the quarter to the middle month of the quarter (see Appendix A).

ends of these subperiods are somewhat arbitrary, the empirical results discussed below do not depend importantly on their exact dating.

The results of the VARs for the loan rate are summarized in Table 1 and Figures 3-5. Table 1 shows the significance level of each of the market rates over each subperiod and the fraction of the variance in the loan rate explained by the market rate at three horizons for each subperiod. The figures show, for a 100-basis point shock to the market rate, the impulse response functions of the market rate and the loan rate, allowing one to assess the dynamic effects of market rate changes on the loan rate. The bands in the figures show a 90 percent confidence interval.

A. AAA Bond Rate

The first VAR results use the AAA bond rate.[15] Although that seems like a mismatch for a short-term loan rate, figure 2 shows that the loan rate moved fairly closely with the bond rate before the late 1960s. The VAR results show that the bond rate is significant at conventional levels in the first two subperiods, consistent with the observation that loan rates moved sluggishly with short-term market rates during this period. Before 1970, the bond rate explains a large fraction of the variance of the loan rate. However, once the loan rate began to move more closely with shorter-term rates after 1970, the bond rate performs much less well, explaining a much smaller fraction of the variance in the loan rate, particularly beyond the initial quarter. The impulse-response functions shown in Figure 3 are consistent with these results, showing that the loan rate response to shocks to the bond rate

[15] I also estimated VARs using a BBB bond yield. The results for the first and last periods were broadly similar, with the variance decompositions showing a much lower fraction of the variance in the loan rate accounted for by the bond rate in the later period. However, the impulse-response function for the middle period had explosive dynamics for the bond rate, perhaps because of the relatively short sample used for the estimation.

are broadly similar to the movements in the bond rate in size and shape in the first period, but are more erratic and imprecisely estimated thereafter.

B. Commercial Paper Rate

The VAR results using the commercial paper rate show that the commercial paper rate is significant at conventional levels in all three subperiods, and the paper rate accounts for a substantial share of the variance of the loan rate over the last two periods. The impulse-response functions shown in Figure 4 are consistent with the observations from Figure 2: The effects of a shock to the commercial paper rate on the loan rate are fairly small in the early subperiod, with the loan rate rising less than half as much as the paper rate. The reaction of the loan rate is somewhat larger in the middle interval, but it still appears to lag the move in the paper rate. By the final period, the effect on the loan rate is nearly as large as the move in the paper rate, and it follows a broadly similar contour to that of the paper rate after the first few quarters.

C. Federal Funds Rate

The federal funds rate yields results quite similar to those for the commercial paper rate over the middle and final periods, but it is not significant in the earlier period. Consistent with the narrow variation in the loan-funds rate spread in the final subperiod shown in Figure 2, the funds rate accounts for a high fraction of the variance in the loan rate in that period. The impulse-response functions shown in Figure 5 are similar to those for the commercial paper rate, but the response of the loan rate to shocks to the federal funds rate shows a somewhat tighter comovement between the two in the final period.

To summarize these empirical results, in the first subperiod the loan rate responded in a very muted way to changes in market rates of comparable maturity and

moved relatively closely with the long-term bond rate. However, by the 1970s, and to an even greater extent by the 1980s and later, movements in the loan rate came to parallel those of short-term market rates. This change in behavior cannot be explained as a result of changes in the dynamics of the economy more broadly, at least as those dynamics are captured by movements in output and prices in the VARs.

IV. An implicit contracting model of loan rates

While the facts appear clear – business loan rates began to adjust more rapidly and completely to changes in short-term market rates around 1970 – the reason for this transition is not. In this section, I develop a simple model of the bank-borrower relationship in which banks and their customers share risks associated with movements in market interest rates as part of an implicit contract. This contract is based on three key stylized facts characterizing the banking environment in the period characterized by loan rate smoothing. First, banks and borrowers had long-term relationships, likely reflecting in part the information that incumbent banks had about their customers (which made it difficult for their customers to move to other banks), the lack of market alternatives to banks as a source of short-term finance for most firms, and the inability of most banks to obtain new customers outside their market area.[16] Second, the interest rate on bank deposits responded relatively little to changes in market rates because deposit rates were limited by Regulation Q. Third, banks had little access to other sources of funds at market rates, and so they had to depend on their core deposits or sales of securities to fund their lending activity.

[16] Hester and Pierce (1975, p. 65) emphasize the importance of long-term relationships. In part, their point is that the bank needed to manage its balance sheet so as to be able to fund loans to its customers on demand. If it could not do so, it ran the risk of losing the customer and so the future profits that it could earn on the relationship.

As discussed below, over the course of the 1960s and 1970s, these key features of the environment eroded, reflecting the modernization of the financial system. As a result, the implicit contract could no longer be sustained, and loan rates came to move more closely with market rates.

A. Environment

The model of loan price stickiness developed here is similar to those used to explain wage stickiness in the implicit labor contracting literature (see, e.g., Rosen, 1985). The model is intended to capture the institutional features of the lending environment in the 1950s and 1960s, and to offer a way to assess the effects of changes in those features in the 1970s and 1980s.

For simplicity, the model has only one "timeless" period. The existence of multiple periods may be important in keeping both parties' behavior in line with the implicit contract (the cost of deviating from the contract would be that the benefits of the contract are lost in future periods or with other customers), but that issue is not made explicit here. There are two types of agents in the model, banks and firms. There are many competitive banks. Firms are identical and atomistic. There is, on average, a continuum of measure 1 of firms per bank. Firms may have access to an investment project with a fixed size of 1. The state of nature determines the probability with which firms have access to such an investment project. The state is assumed to be observable, and there is no private information. Banks and firms agree in advance to a loan contract. This contract is assumed to be implicit rather than explicit because both parties realize that unforeseen changes in factors not taken account of in the contract could make it undesirable. But both parties can benefit from the contract given

unchanged circumstances, and so they are willing to abide by it so long as they believe that the other party will do so.

By assumption, once banks and firms have agreed to their contracts, firms cannot borrow from any other bank and the bank cannot lend to any other firms – that is, bank-customer relationships play an important role.[17] The contract specifies, for each state of nature, a loan rate and the probability that a firm with access to a project will obtain a loan. Projects are funded entirely with bank loans. Those firms having access to a project receive credit from the bank with a probability determined by the contract and invest. Firms that have an investment opportunity and obtain a loan are assumed to repay the loan with certainty at the end of the period. (It would be straightforward to have a fixed, state-contingent probability of default). Firms that do not receive loans do not invest. Banks have a fixed amount of deposits, and the deposit interest rate is fixed by regulation and does not depend on the state. If the bank does not lend all of its deposits, it purchases risk-free securities with the remainder, earning the market interest rate (which differs depending on the state of nature).

There are two possible states of nature, one with high loan demand (state H) and the other with low loan demand (state L). In state H, a fraction p_H of firms has access to an investment project. This project requires a loan of size 1 and yields a gross return of R^H. In state L, a fraction p_L (with $p_L < p_H$) of firms have access to an investment project also requiring a loan of size 1 and with a gross return of R^L. Banks have deposits of D in either state, and I assume that $p_L \leq D \leq p_H$. As a result, all firms with projects in the low demand

[17] Relationship lending may matter for other reasons as well. For example, Boot and Thakor (1994) show that relationship lenders may be able to lend at lower rates than would be possible in the absence of long-term bank-borrower relationships.

state receive loans, but deposits are not sufficient to fund all investment projects in the high-investment state. This assumption is consistent with anecdotal evidence that banks sometimes became "loaned up" in periods of high loan demand and chose to ration credit.[18] The gross loan rates set in the contract are R^{LH} and R^{LL} in the two states. The gross deposit interest rate is R^{Q} in both states.[19] The gross market rates of interest in the two states are R^{MH} and R^{ML}, respectively, with $R^{MH} > R^{ML}$. The market interest rates in each state are assumed to be less than the gross return on projects, so that borrowing and investing is always socially desirable.

The resulting loan contract smooths interest rates across states if:

$$R^{LH} - R^{LL} < R^{MH} - R^{ML}$$

Whether this will be optimal or not depends on the parameters of the model as described below.[20]

B. Optimal contract

Since banks are competitive *ex ante*, they will offer the contract that gives borrowers the highest expected utility subject to the bank's participation constraint, which is that the bank's utility must be at least as high as it would be if it did not contract with firms and instead simply invested its deposits in securities yielding the market interest rate in each state. This contracting problem is given by:

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[18] See below for a discussion. In practice banks would generally still have bonds on their books in such situations, but they did not want to sell the bonds to provide additional cash for loans because doing so would force them to realize capital losses on the bonds. See English (1979) for an anecdotal description and Federal Reserve (1958) for results of a survey of banks. Woodworth (1967) emphasizes banks' aversion to selling long-term securities at a loss to fund loans.

[19] The Regulation Q ceilings were not always binding, of course, but the key assumption here is that deposit rates were constrained in high interest rate periods, so that banks could not bid up deposit rates and get the amount of deposits they would like. See Gilbert (1986) for a discussion of the effects of Regulation Q.

[20] Clearly, if firms and banks cannot commit to the implicit contract, so that firms can shop for loans across banks after the state is realized and banks can either enter or leave the market after the state is realized, the outcome would be for the loan rate in state L to be R^{ML} and the loan rate in state H to be R^{MH}. In other words, there would be no smoothing.

$$Maximize\ \varphi DU(R^H - R^{LH}) + (1-\varphi)p_L U(R^L - R^{LL})$$

subject to:

$$\varphi V(D(R^{LH} - R^Q)) + (1-\varphi)V(p_L(R^{LL} - R^Q) + (D - p_L)(R^{ML} - R^Q))$$

$$= \varphi V(D(R^{MH} - R^Q)) + (1-\varphi)V\big(D(R^{ML} - R^Q)\big) \qquad (1)$$

where φ is the probability of the high-investment state, U(.) is the utility function (defined over income) of the firms, V(.) is the utility function (defined over income) of the banks, and maximization is over the choice of the loan rates in each state, R^{LH} and R^{LL}.[21]

The first-order conditions for this problem are the participation constraint (holding with equality) and:

$$U'(R^H - R^{LH}) = \lambda V'(D(R^{LH} - R^Q))$$

$$U'(R^L - R^{LL}) = \lambda V'\big(p_L(R^{LL} - R^Q) + (D - p_L)(R^{ML} - R^Q)\big)$$

where λ is the Lagrange multiplier on the constraint. Dividing to eliminate λ, these two equations can be rewritten as:

$$\frac{U'(R^H - R^{LH})}{U'(R^L - R^{LL})} = \frac{V'(D(R^{LH} - R^Q))}{V'\big(p_L(R^{LL} - R^Q) + (D - p_L)(R^{ML} - R^Q)\big)} \qquad (2)$$

This equation shows that the optimal contract requires the equalization of the marginal rates of substitution between the two states across banks and those firms with investments.

Linearizing equation (2) around a contract with the loan interest rates equal to the market interest rates in each state yields:

[21] Note that I assume U(0) and V(0) are finite, as are U'(0) and V'(0). The assumption of a utility function for the bank (rather than for investors in the bank) is a convenient short cut intended to capture the desire of bank managers to avoid bank failure, either because of the charter value of the bank or because of concern for their own employment and income.

$$\frac{U'\left(R^{H}-R^{MH}\right)}{U'(R^{L}-R^{ML})}\left\{1+\alpha_{F}\left(R^{LH}-R^{MH}\right)-\ \alpha_{F}\left(R^{LL}-R^{ML}\right)\right\}$$

$$=\frac{V'(D\left(R^{MH}-R^{Q}\right))}{V'(D\left(R^{ML}-R^{Q}\right))}\left\{1-\alpha_{B}D\left(R^{LH}-R^{MH}\right)+\ \alpha_{B}p_{L}\left(R^{LL}-R^{ML}\right)\right\} \qquad (3)$$

Where α_F and α_B are the coefficients of absolute risk aversion of the firms and banks, respectively, evaluated at $R^{LH} = R^{MH}$ and $R^{LL} = R^{ML}$. Similar linearization of equation (1) yields:

$$\frac{V'(D\left(R^{MH}-R^{Q}\right))}{V'(D\left(R^{ML}-R^{Q}\right))}D\left(R^{LH}-R^{MH}\right)+\frac{1-\varphi}{\varphi}p_{L}\left(R^{LL}-R^{ML}\right)=0 \qquad (4)$$

Substituting (4) into (3), one can show that:

$$R^{LH}-R^{LL}=R^{MH}-R^{ML}-S$$

where S is given by:

$$S=(A-B)\frac{1+\frac{1-\varphi}{\varphi}\frac{p_{L}}{BD}}{(A\alpha_{F}+B\alpha_{B}D)\frac{1-\varphi}{\varphi}\frac{p_{L}}{BD}+(A\alpha_{F}+B\alpha_{B}p_{L})} \qquad (5)$$

and I have defined A and B to be:

$$A\equiv\frac{U'\left(R^{H}-R^{MH}\right)}{U'(R^{L}-R^{ML})}$$

$$B\equiv\frac{V'(D\left(R^{MH}-R^{Q}\right))}{V'(D\left(R^{ML}-R^{Q}\right))}$$

The contract implies smoothing of the loan rate relative to the market rate if S is positive. Note that since all of the terms in the fraction on the right-hand side of equation (5) are positive, S will be positive if $A > B$, that is, if:

$$\frac{U'\left(R^{H}-R^{MH}\right)}{U'(R^{L}-R^{ML})}>\frac{V'(D\left(R^{MH}-R^{Q}\right))}{V'(D\left(R^{ML}-R^{Q}\right))}$$

Note that since R^{MH} is greater than R^{ML}, the right-hand side of this expression is less than 1. The left-hand side will be greater than one so long as

$$R^H - R^{MH} < R^L - R^{ML}$$

Thus, a sufficient condition smoothing is that

$$R^H - R^L < R^{MH} - R^{ML} \qquad (6)$$

That is, the high state is primarily one in which more firms have projects, but the projects are not all that much more profitable than in the low state.

The intuition for this smoothing result is straightforward. To see why, assume that there is no smoothing, so that the loan rate in the low-demand state is R^{ML} and the loan rate in the high-demand state is R^{MH}. But those loan rates imply that the income of borrowing firms in the high-demand state is less than the income of borrowing firms in the low-demand state (given equation (6)). At the same time, the income of banks in the high-demand state is greater than the income of banks in the low-demand state (since R^{MH} - R^{Q} is greater than R^{ML} - R^{Q}). Thus, the left-hand side of equation 2 is greater than 1 and the right-hand side is less than 1, and unsmoothed loan rates cannot be optimal. Instead, both firms and banks would be better off if the loan rate in the high-demand state were cut (boosting the income of borrowers and cutting that of banks in that state) and the loan rate in the low-demand state was increased by a compensating amount (raising bank income and trimming that of borrowers in that state). Thus, the implicit contract implies at least some degree of loan rate smoothing, with the degree of smoothing depending on the risk aversion of banks and firms. [22]

[22] Note that the condition in equation (6) is not a necessary condition for smoothing. In particular, if either banks or firms value smoothing very highly, while the other finds smoothing only mildly costly, the equilibrium will be one with smoothing. In that case, the party desiring smoothing would, in effect, pay the other party for

V. Evidence for the implicit contracting model

To evaluate this model of loan rate smoothing, I consider three types of evidence. First, I consider whether the assumptions about banks costs of funds underlying the model are a plausible characterization of the situation before 1970. Second, I use the results of Federal Reserve surveys in the late 1950s to assess the model. Finally, I consider narrative evidence from informed observers in the 1950s and 1960s to see if they are consistent with the implicit contracting model. In the next section, I present evidence on how changes in the banking environment around 1970 undermined the implicit contract and so led to much less loan rate smoothing. This shift provides additional evidence in favor of the implicit contracting model presented here.

A. Cost of funds

The top panel of Figure 6 shows that the average rate paid on bank liabilities (measured as gross interest expense divided by average liabilities) was very smooth until the early 1970s, suggesting that the regulations on deposit rates considerably limited the response of deposit rates to market rates as assumed in the model. The smooth rise in banks' average cost of funds over the 1960s reflected increases in the Regulation Q deposit rate ceilings during that period (see Mahoney et al, 1987), as well as the development of new market-priced liabilities that got around the ceilings, discussed below.

B. Survey evidence

smoothing in the equilibrium contract. Freid and Howitt (1980) consider the possible effects of implicit contracting on loan interest rates and loan supply, assuming that risk-neutral banks borrow at market rates and provide (implicit) insurance to risk-averse borrowers by lending at smoothed rates.

Federal Reserve surveys in the 1950s provide more-direct evidence for the existence of an implicit contract limiting interest rate variation for firms having a relationship with a bank. The Federal Reserve conducted detailed surveys of loan rates charged by more than 1500 banks in 1955 and 1957 (Federal Reserve, 1958). Between those two years, business loans at banks expanded rapidly, and short-term market interest rates increased by about 2-1/2 percentage points. However, the surveys showed that, over the same period, the business loan rate at banks rose less than 1 percentage point, implying a narrowing of the spread of bank loan rates over market rates of more than 1-1/2 percentage points (Table 2).[23]

With loan demand outstripping growth in deposits, Federal Reserve surveys found that banks employed a number of alternatives to higher rates to limit their loan growth (Federal Reserve, 1958). In addition to tightening their lending standards, the Federal Reserve reported that banks were giving priority in lending to "regular borrowers as opposed to new customers ... [or] those who were 'shopping around' for credit, or ... national concerns approaching the bank for the first time."[24] The survey also found "frequent expression of reduced willingness to grant loans to non-local borrowers, mostly sales finance companies and commodity dealers." The mention of sales finance companies is particularly interesting since finance companies were the major issuers of commercial paper at that time (Selden, 1963). Since these companies would be paying market rates on their commercial paper, they would presumably have been eager to increase their borrowing from banks at the relatively low rates being charged on bank loans in times of high credit demand and high market rates.

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[23] The business loan rate series developed in this paper shows an increase in the loan rate for all firms at large banks of about 1 percentage point between the second half of 1955 and the second half of 1957.

[24] This view is supported by the description of "traditional credit crunches" in English (1979). He relates that, "No matter how nimble a bank was...it eventually ran out of money to lend... As it approached this wretched state, the bank...began to ration its funds. It began to say 'no.' It began to distinguish between good and indifferent customers, and between worthy and speculative purposes."

Not surprisingly, however, banks did not want to provide new credit to them at the relatively low rates they were charging their regular customers since the finance companies would not continue to borrow when market rates fell.

The relative treatment of large and small borrowers described in the surveys is also supportive of the implicit contracting model. As noted, the existence of the implicit contract depends on borrowers not having direct access to financial markets. If borrowers have access to non-bank finance, then banks may not be able to sustain a loan rate above the market rate in times of low market rates, since borrowers could turn to other credit sources instead, while still borrowing from the bank at relatively low rates in times of high credit demand. As a result, one would expect less smoothing of loan rates for firms with greater potential access to other forms of credit. Conversely, one would expect to see more smoothing for small borrowers, since they would be less likely to have access to direct borrowing in the credit markets and also might find it harder to shift to another bank because of the greater information asymmetry involved with loans to smaller firms and the geographic constraints on banking at the time. Indeed, the Federal Reserve survey shows that interest rates for smaller firms increased considerably less than those for larger firms: Between mid-1955 and mid-1957, the average rate on short-term business loans at banks rose 120 basis points for large borrowers (those with assets of more than $100 million), while the rise was only 60 basis points for small borrowers (those with assets of less than $250,000).[25]

C. Narrative evidence

[25] A similar pattern is observable in the published QIRS data over this period: Rates on larger loans varied more over time than those on smaller loans.

The implicit contracting model presented here is also consistent with commentary by economists and others about bank lending markets in the 1950s and 1960s. For example, Federal Reserve officials, notably Roosa (1951), emphasized the "availability doctrine" when discussing the transmission of monetary policy to bank lending and the economy (see Jaffee, 1971, for a summary). In this view, monetary policy did not operate through large movements in interest rates, but rather through the effects of open market operations on the availability of funds for banks to lend. This view was consistent with considerable discussion by bank analysts at the time about the management of cyclical bank liquidity – that is, how banks could manage their assets so that they would have liquidity available in periods of high loan demand. For example, Robinson (1962) in his book on bank management devotes four chapters to liquidity management, but only one short chapter to interest rates charged on loans. The chapter on loan interest rates notes that the bank needs to cover its deposit costs, including interest costs on saving deposits, as well as to compensate for risk. But it does not suggest that loan rates should be lifted beyond such levels in response to elevated loan demand. Woodworth (1967) devoted an entire book to the cyclical management of bank liquidity, with the focus on managing reserves of liquid assets, with hardly any discussion of loan pricing.[26]

This focus of bank analysts and researchers on managing bank assets to try to ensure that banks could meet loan demand in high-demand periods is consistent with the implicit contracting model. Before the late 1960s, most banks could not raise additional

[26] Moreover, while Woodworth (1967) notes the availability of managed liabilities, his "practical program of cyclical liquidity management" is based solely on asset management. By contrast, by the mid-1970s, banking textbooks – e.g., McKinney and Brown (1974) – included chapters on both asset and liability management in their discussion of bank liquidity planning. This development is consistent with the discussion below on the effects of changes in the banking environment on the setting of loan interest rates.

funding when loan demand rose, and they did not raise loan rates to discourage customers from borrowing. A focus on cyclical liquidity is what one would expect in such an environment because competition among banks would focus on their ability to make loans in periods of high loan demand. Banks that did a poor job of managing their liquidity relative to their competitors would find it difficult to maintain existing customers, let alone to obtain new ones.

As emphasized by Jaffee (1971), the argument that the effects of monetary policy are felt through movements in the quantity of lending rather than its price would seem to require credit rationing, since otherwise banks would presumably adjust loan rates to equilibrate the demand for loans to their available supply. Indeed, many researchers believed that banks did ration credit, at least to some extent, in periods of high loan demand and high market interest rates. As Bach (1963) put it, "When available bank reserves are restricted, banks…ration credit more stringently." Though he goes on to say that "sooner or later" banks have to charge higher interest rates (p. 256). Hodgman (1963) quotes bankers he surveyed as saying, "The primary device for controlling loan volume is to deny credit. We do not control commercial and industrial loans by varying the rate or other terms, but by imposing conditions on the borrower and by refusing to lend additional amounts. [The] interest rate is not useful to control volume with good customers." Hodgman (1963) also notes that banks' decisions on which firms to ration depended on the value of the entire banking relationship, including the prospective borrower's deposits at the bank and other business they provided (such as trust activities) on which the bank would earn fee income.

However, as Jaffee noted, a compelling model of why banks chose to ration credit in this way rather than raise loan rates had not been developed.[27] Moreover, the model Jaffee presented was not entirely satisfactory, since it required that banks lend at the same interest rate to groups of borrowers of differing risk despite having information that would allow them to increase profits by offering different loan rates to each borrower rather than rationing. And, as the new loan rate series presented in this paper shows, at just about the time that Jaffee was developing his model of rationing, loan rates began to move much more closely with market rates, suggesting that the extent of rationing had declined significantly for reasons that his model could not explain. By contrast, the implicit contracting model presented here can explain both why banks rationed credit in the earlier period, and also why they subsequently stopped doing so.

VI. Why did the implicit contract break down?

Additional evidence for the implicit contracting model presented here comes from its ability to explain why loan rates began to move more closely with market rates around 1970. By that time, a number of aspects of the lending environment were changing in ways that undermined the degree of smoothing of loan rates that could be sustained under the implicit contract described above. These changes affected both parties to the implicit contract. First, during the 1960s banks gradually developed funding sources with rates that were not constrained by the Regulation Q ceilings on deposit interest rates. These methods included large negotiable certificates of deposit, Eurodollar deposits, repurchase agreements,

[27] The first model showing the possible optimality of credit rationing was Keeton (1978). See also Stigliz and Weiss (1981).

federal funds, and holding company commercial paper.[28] Second, larger and more credit-worthy firms increasingly had direct access to short-term, market-rate funding, and so could exploit cyclical differences between loan rates at banks and market interest rates.

A. Revised model results

Before considering the evidence for the changed environment in detail, we can use a revised version of the model from Section IV to show how these changes would be expected to affect the implicit contract between banks and borrowers.

Environment without Regulation Q. To show the effects of the weakening of Regulation Q deposit rate ceilings, consider the same model setup as before, but with banks assumed to pay market rates on deposits. That is, rather than paying a fixed rate, $R^{\underline{Q}}$, on deposits in both the high and low states, banks pay R^{MH} on deposits in the high state and R^{ML} on deposits in the low state. In addition, banks are assumed to no longer get loaned up in the high state because they can raise the funds needed to provide loans to all firms that have projects, p^H.

Optimal contract. With these changed assumptions, the contracting problem is given by:

$$Maximize\ \varphi p_H U(R^H - R^{LH}) + (1-\varphi)p_L U(R^L - R^{LL})$$

subject to:

$$\varphi V(p_H(R^{LH} - R^{MH})) + (1-\varphi)V(p_L(R^{LL} - R^{ML})) = V(0) \qquad (1')$$

where, as before, maximization is over the choice of the loan rates in each state, R^{LH} and R^{LL}.

[28] For an early assessment of the use of negotiable CDs, including a discussion of the effects of Regulation Q on such instruments, see Lindsay (1963). Carlson and Wheelock (2018) provide a detailed history of the application of Regulation Q to negotiable CDs, and well as evaluating the implications of these new instruments for the implementation of monetary policy.

The first-order conditions for this problem are the participation constraint (holding with equality) and:

$$U'(R^H - R^{LH}) = \lambda V'(p_H(R^{LH} - R^{MH}))$$

$$U'(R^L - R^{LL}) = \lambda V'\left(p_L(R^{LL} - R^{ML})\right)$$

where λ is the Lagrange multiplier on the constraint. Proceeding as before, these two equations can be rewritten as:

$$\frac{U'(R^H - R^{LH})}{U'(R^L - R^{LL})} = \frac{V'(D(R^{LH} - R^{MH}))}{V'\left(p_L(R^{LL} - R^{ML})\right)} \qquad (2')$$

Linearizing equation (2') around a contract with the loan interest rate equal to the market interest rate in each state yields:

$$\frac{U'\left(R^H - R^{MH}\right)}{U'(R^L - R^{ML})}\left\{1 + \alpha_F\left(R^{LH} - R^{MH}\right) - \alpha_F\left(R^{LL} - R^{ML}\right)\right\}$$

$$= 1 - \alpha_B p_H\left(R^{LH} - R^{MH}\right) + \alpha_B p_L\left(R^{LL} - R^{ML}\right) \qquad (3')$$

Similar linearization of the constraint (equation (1')) yields:

$$p_H\left(R^{LH} - R^{MH}\right) + \frac{1-\varphi}{\varphi} p_L\left(R^{LL} - R^{ML}\right) = 0 \qquad (4')$$

Substituting (4') into (3'), one can show that:

$$R^{LH} - R^{LL} = R^{MH} - R^{ML} - S'$$

where *S'* is given by:

$$S' = (A-1)\frac{1 + \frac{1-\varphi}{\varphi}\frac{p_L}{p_H}}{(A\alpha_F + \alpha_B p_H)\frac{1-\varphi}{\varphi}\frac{p_L}{p_H} + (A\alpha_F + \alpha_B p_L)} \qquad (5')$$

where *A* is defined as before. The contract implies smoothing of the loan rate relative to the market rate if S is positive. And because all of the terms in the fraction on the right-hand side of equation (5') are positive, S will be positive if $A > 1$, which will be the case if:

$$\frac{U'\left(R^H - R^{MH}\right)}{U'(R^L - R^{ML})} > 1$$

And, as before, a sufficient condition for that inequality is that that

$$R^H - R^L \leq R^{MH} - R^{ML} \qquad (6)$$

Thus, even with banks paying the market rate on deposits, there will be some smoothing of loan interest rates so long as firms are risk averse and so prefer some smoothing.[29]

However, the extent of smoothing is now reduced – that is, *S'*< *S*. To show this, note that the condition that S > *S'* is given by:

$$(A-B)\frac{1+\frac{1-\varphi}{\varphi}\frac{p_L}{BD}}{(A\alpha_F + B\alpha_B D)\frac{1-\varphi}{\varphi}\frac{p_L}{BD} + (A\alpha_F + B\alpha_B p_L)}$$

$$> (A-1)\frac{1+\frac{1-\varphi}{\varphi}\frac{p_L}{p_H}}{(A\alpha_F + \alpha_B p_H)\frac{1-\varphi}{\varphi}\frac{p_L}{p_H} + (A\alpha_F + \alpha_B p_L)}$$

where A and B are defined as before. Since the denominators are positive, one can cross multiply and factor to get:

$$(1-B)A\alpha_F\left(\varphi + (1-\varphi)\frac{p_l}{BD}\right)\left(\varphi + (1-\varphi)\frac{p_L}{p_H}\right)$$

$$> (A-1)\left(\varphi + (1-\varphi)\frac{p_L}{p_H}\right)B\alpha_B p_L - (A-B)\left(\varphi + (1-\varphi)\frac{p_L}{BD}\right)\alpha_B p_L$$

The left-hand side of this expression is positive because B is less than 1 and the other terms are positive. The right-hand side is negative because *A-B* is greater than *(A-1)B*, and p_H is greater than *BD,* making the second term on the right-hand side larger than the first. Thus,

[29] If they are not, then *A=1*, and *S* is zero.

the inequality holds and the degree of smoothing is reduced when banks have to pay market rates on deposits.

The intuition for this result is clear. Before, with a fixed rate, R^Q, on deposits in both states, banks had higher profits in the high state than the low state if loan rate were equal to market rates. Thus, banks were eager to lower loan rates in the high state and raise them in the low state to smooth their income across states – that is, banks wanted to smooth loan rates. But with banks paying market rates on deposits, their profits are the same (zero) in both the high and low states, making them less willing to smooth interest rates. In addition, with the ability to raise additional funds in the high state, banks will not become loaned up. But with smoothed interest rates, that is, with the loan rate in the high state below the market rate, additional loans in the high state mean greater losses for the bank, since the loan rate is below the rate paid on deposits. As a result, the ability to obtain additional funds and make additional loans in the high state makes banks even less willing to smooth loan rates.[30]

Environment if firms have direct access to market finance. To show the effects of the second change that occurred around 1970, increased direct access by firms to market financing, we can assume that firms can opportunistically choose whether to borrow from their bank or in the market in each state. The ability of firms to make this choice means that the loan rate cannot be above the market rate in either state because firms would then choose to borrow directly in the market. Thus:

$$R^{LH} \leq R^{MH}$$

[30] One can show that if banks are not risk averse, so $\alpha_B = 0$, then the amount of smoothing doesn't change – that is, $S = S'$.

and

$$R^{LL} \leq R^{ML}$$

However, if we assume that Regulation Q is still in force, the bank's participation constraint can be written as:

$$\varphi V(D(R^{LH} - R^{MH}) + D(R^{MH} - R^{Q})) + (1 - \varphi)V(p_L(R^{LL} - R^{ML}) + D(R^{ML} - R^{Q}))$$

$$= \varphi V(D(R^{MH} - R^{Q})) + (1 - \varphi)V\big(D(R^{ML} - R^{Q})\big)$$

This condition means that the loan rate cannot be below the market rate in one state and equal to the market rate in the other, since the bank can always invest deposits at the market rate in both states. Thus, once firms can opportunistically choose to borrow at the market rate, the loan rate must equal the market rate in both states, eliminating the possibility of smoothing.

B. Changes in bank funding costs and the waning of Regulation Q

As shown in the previous subsection, the availability of market sources of funds for banks has two effects on smoothing. First, it makes banks' cost of funds more sensitive to movements in market rates. As can be seen in the top panel of Figure 6, the average cost of bank liabilities became much more responsive to movements in short-term market interest rates in the early 1970s. This responsiveness, in turn, made smoothed lending rates more costly for banks in high-rate periods, making them less desirable for the banks. Second, access to funds at market rates means that banks no longer became loaned up – i.e., they no longer have to ration customers in periods of elevated loan demand. This development is supported by the narrative evidence in Rockefeller (2002, p. 197), who noted that negotiable CDs and Eurodollars "solved the 'availability of funds' problem" that banks had previously

faced, but at the cost of forcing banks to pay interest on a larger fraction of their funding. As shown in the bottom panel of Figure 6, this change is also visible in bank balance sheet data, which show that the volume of commercial banks' interest-bearing liabilities that were not deposits increased substantially over the 1960s and 1970s as banks increasingly raised funds using money market instruments that were not subject to Regulation Q ceilings. But as shown in the previous subsection, obtaining funds at market prices to meet periods of high loan demand is costly if loan rates do not move closely with market rates, further reducing the willingness of banks to smooth loan rates.

C. Businesses' increased access to market financing

As demonstrated above, the availability of deposit funds at market rates for banks still allows for some degree of smoothing of loan rates under an implicit contract, but direct access to market funding by firms undermines the existence of the contract itself because borrowers can take advantage of the smoothing of bank loan rates by borrowing from banks when loan rates are relatively low, but borrowing directly in the market when loan rates are relatively high. Indeed, one commentator in the early 1980s noted that banks had to respond to this change with "more flexibility" in the setting of business loan rates than had previously been the case (Fisher, 1982, p. 20).[31]

As shown in Figure 7, non-financial commercial paper increased as a percentage of bank loans from under 2 percent in 1965 to nearly 7 percent in 1970 and more than 15 percent by 1980. Rockefeller (2002, p. 380) noted that by the early 1970s the profitability of lending to major corporations had been eroded by competition from other lenders and "even

[31] Simpson (1988, p. 7) notes that loan rates at large banks moved more closely with market rates because their customers had better access to competing sources of credit.

more important...from the growing use of commercial paper." Hurley (1977) states that by the mid-1970s some nonfinancial firms were using commercial paper as "a substitute for bank credit because of relative cost" and that most of the issuers were large firms or medium-sized firms with strong credit histories. At that time, the purchasers of commercial paper included a range of financial firms, pension funds, state and local governments, and foundations (Hurley, 1977, p. 529). Moreover, starting in the late 1970s, the spectacular growth in money market mutual funds provided a robust source of demand for commercial paper.

Fisher (1982) points to a related innovation that had a similar effect – the increased penetration of large foreign banks in U.S. corporate loan markets. These banks, because they lacked a U.S. deposit base, obtained funds in money markets and so could not afford to lend at smoothed loan rates. But they offered another way for larger U.S. firms to obtain funding outside their traditional bank lending relationships at prices closely tied to market rates. Unfortunately, data on the extent of such lending are only available starting in 1973. However, the share of bank business loans accounted for by the U.S. branches and agencies of foreign banks rose from about 5 percent in 1973 to more than 11 percent by 1980 and 25 percent by the early 1990s.[32]

While the increase in commercial paper issuance and loans from foreign banking institutions were significant, it is really the possibility of such borrowing that makes the implicit contract difficult to sustain. Unless borrowers can credibly promise not to borrow from other sources in future periods, banks will not be willing to continue with the smoothing arrangement. Of course, one can imagine reputational equilibria in which firms would

[32] The shares are calculated from data in the Federal Reserve's H.8 statistical release.

choose to borrow only from banks, even if loan rates were higher than market rates, because if they ever borrowed directly in the market, they would not be able to obtain smoothed loan rates from banks in the future. That such equilibria did not emerge may suggest that the benefits of smoothing accrued mostly to banks, or that firms were not sufficiently forward-looking to sustain such an equilibrium.

D. The gradual shift to market pricing of loans

While the smoothing of loan interest rates began to break down around 1970, some smoothing persisted into the 1980s. One source of evidence on this point comes from the operations of the Committee on Interest and Dividends (CID). The CID was formed in 1971 as part of the Nixon Administration's wage and price control program. The Committee was intended to ensure that banks and others did not profit at the expense of firms and households that were constrained by the various wage and price control regimes that were put in place.[33] For a time in 1973, the CID successfully pressured banks to limit rises in the prime rate. The resulting low level of the prime rate relative to market rates led large businesses with access to the commercial paper market to shift their borrowing from that market to banks, boosting bank lending substantially, as shown in Figure 8, and also trimming commercial paper outstandings (for a discussion, see Francis, 1973, and Hurley, 1977). This shift is consistent with the view that improved access to financial markets by large firms allowed them to shift opportunistically between commercial paper and bank loans, making the earlier degree of loan rate smoothing difficult to sustain for such firms.

[33] For a summary of the actions of the CID, see CID (1974).

Also in 1973, the CID introduced a two-tier prime rate regime, under which banks had a separate prime rate for small businesses.[34] The CID indicated that the standard prime rate (which applied to larger businesses) was supposed to reflect current market conditions, while the small-business prime rate was intended to move more gradually, and only in response to changes in banks' cost of funds or other lending costs (CID, 1974). While this arrangement was imposed on banks, some commentators thought it was desirable in any case, suggesting that there was some support for interest rate smoothing. Moreover, the differential treatment of larger and smaller firms continued well after the controls expired and the CID was disbanded in April 1974.[35] Figure 9 shows the two prime rates as well as the 3-month Treasury bill rate for the period for which data on the dual prime rates were collected and published by the Federal Reserve.[36] Over this interval, the standard prime rate appears to have moved relatively closely with the Treasury bill rate, while movements in the small business prime appear to have been far more muted and to have lagged movements in market rates. While this is what you would expect under the CID guidelines, it continued to be the case for more than a year after the controls ended, suggesting that banks continued to provide some smoothing of loan interest rates to their small business customers.[37] Perhaps most strikingly, over the last few months of the period for which we have these data, as market rates fell sharply, the standard prime rate fell below the small business prime rate. This move suggests that the buffering of high rates that small businesses enjoyed over much

[34] The CID controls were voluntary, but they appear to have been widely adopted by banks. See Hutnyan (1973).

[35] See the *American Banker* editorial on April 9, 1973, and Hutnyan (1974).

[36] The Federal Reserve collected and published data on the two prime rates on its G.10 statistical release between mid-1973 and mid-1975.

[37] Moreover, the continued difference in the responsiveness of rates on large and small loans is also visible in the subsequent QIRS data, which show sluggish movement in small loan rates relative to rates on larger loans. See Simpson (1988, p. 7) for a discussion of the sluggish adjustment of loan rates at smaller banks.

of 1973 and 1974 would be offset by relatively high rates in the low-interest-rate period that followed, exactly as the implicit contract view would suggest.

This bifurcation of the business loan market continued in a more subtle form in the late 1970s and into the 1980s. In that period, large banks made loans to larger and more-credit-worthy firms at rates that were increasingly tied formally to short-term market rates (Brady, 1979; Simpson, 1988). At the same time, they continued to lend to smaller firms at rates that were tied to the prime rate announced by the bank. Econometric analysis of the prevailing prime rate in this period by Goldberg (1982) demonstrates that the prime rate continued to move somewhat sluggishly, tracking a mix of current and recent monthly yields on bank CDs. This difference in pricing behavior suggests that market participants still saw value to smoothing some of the variation in business loan rates relative to money market interest rates, at least for smaller business borrowers.[38]

Only in the early 1990s did the prime rate come to move essentially one-for-one with the target federal funds rate (with a spread of 300 basis points). The apparent unwillingness of banks to provide even small business customers with insurance against changes in market interest rates by that time likely owed to a number of factors. First, the end of Regulation Q constraints on savings and time deposit interest rates (which were phased out over the first half of the 1980s) meant that the rate banks paid on deposits moved more closely with market interest rates.[39] As a result, banks would have found providing the

[38] Some large banks had explicitly indexed their prime lending rate to market rates in the early 1970s, perhaps in order to avoid pressures from the CID. By the late 1970s, these political complications had passed. For a discussion, see Goldberg (1982).

[39] Although not as closely as one might have expected – see Dechsler, Savov, and Schnable (2017) for a discussion of the striking comovement between (short-term) deposit rates and longer-term yields.

insurance more costly in terms of the variability in their own profits.[40] Second, the continued development of financial markets (e.g., broader access to the commercial paper market) provided more firms with relatively direct access to market financing. Third, the increased role of other credit providers, including finance companies and foreign banks, may have made implicit contracts difficult to sustain.[41]

VII. Other possible contributing factors

While the evidence presented here supports the view that the smoothing of bank loan rates relative to market rates reflected an implicit contract that depended on the institutional and market arrangements at the time, other factors could also have contributed to the smoothing behavior.

First, rates may have been smoothed because the level of loan rates was constrained during periods of tight monetary policy by state usury laws. Such laws limited business loan rates to a maximum of 6 to 15 percent in states having such laws at this time (Bach, 1963). Since smaller borrowers generally paid higher rates, they were more likely to be affected by the laws, which would be consistent with the greater smoothing of rates on loans to smaller borrowers seen in the data.

However, usury laws are unlikely to account for a significant amount of smoothing. Corporate borrowers were exempt from usury laws in many states.[42] Moreover, as shown in Table 2, the loan rate increases seen between 1955 and 1957 were much smaller

[40] Simpson (1988, p. 7) emphasizes the effects of the deregulation of deposit rates on the speed of adjustment of loan rates at smaller banks.

[41] For evidence on the increasing role of finance companies in business lending at this time, see Carey et al (1998),

[42] See Hodgman (1963, p. 130) for a discussion of New York. Cooper (1970) provides a summary for all 50 states, showing that a large majority of states with usury laws had special exemptions for business loans.

than the rise in short-term market rates (about 2-1/2 percent over this period) even for large firms, for which average loan rates in 1957 were well under 5 percent.[43] In addition, if usury laws were an important determinant of loan rate dynamics in the pre-1970 period, one would expect that loan rates would follow market rates closely when rates were low but diverge from them when rates were high. However, examination of Figure 2 shows that this was not the case.

A second factor that might have contributed to loan rate smoothing is the use of compensating balance requirements in loan contracts. Such contracts required borrowers to maintain a minimum average balance in non-interest-bearing demand deposits in order to obtain loans.[44] The opportunity cost of the funds deposited drives a wedge between the contracted loan rate and the effective marginal cost of credit. Since the wedge is proportional to the size of the compensating balance, the effective cost of borrowing would be more variable than the stated loan interest rate over time. Moreover, to the extent that banks tightened compensating balance requirements in periods of high interest rates, the requirements would imply an even greater sensitivity of total borrowing costs to market interest rates.[45]

However, there are a number of reasons why compensating balance requirements likely cannot account for the muted movements in loan interest rates in the earlier period. First, compensating balance requirements applied mainly to larger borrowers (Federal

[43] Unfortunately, there is little information on the distribution of loan rates within categories reported in Federal Reserve (1958). It is noted, however, that rates on loans to smaller firms were concentrated in the 6-8 percent range in the 1957 survey, a pattern attributed in part to "usury laws and banking tradition" (Federal Reserve, 1958, p. 407).

[44] Indeed, Hodgman (1963) goes as far as to suggest that banks provided loans at subsidized prices in periods of high interest rates and strong loan demand in order to retain firms' deposits.

[45] Federal Reserve (1958, p. 406) suggests that some banks did tighten compensating balance requirements when interest rates increased between 1955 and 1957.

Reserve, 1958). But, as we have seen, the smoothing of rates was greater for smaller firms. Second, as noted by Guttentag (1962), borrowers presumably had a need for demand deposits to make their payments, so it is only the excess of the compensating balance requirement over the firm's desired holdings of demand deposits that would impose a cost on the borrower.[46] Third, while arrangements varied widely, a Federal Reserve survey in the early 1960s showed that the most common use of compensating balance requirements was for lines of credit (Baxter and Shapiro, 1964). Typically, there would be a 10 percent compensating balance requirement on the total agreed line of credit as well as a 10 percent compensating balance requirement on the part of the line that was drawn. The first part – the balance required for arranging the line – was essentially a fee for obtaining the line of credit and not a marginal cost of borrowing funds. And the 10 percent marginal requirement, even if in excess of the borrowing firm's desired demand deposits, would only increase the variability of the borrowing cost by a tenth.[47] But such a small effect is not enough to explain the behavior of loan rates prior to 1970. For example, in the 1955 to 1969 sample, the VAR results shown earlier suggest that a 100 basis point shock to the commercial paper rate would lead to a rise in the loan interest rate of about 50 basis points. With a 10 percent compensating balance requirement, assumed to be entirely in excess of the borrowers desired holdings of demand deposits, the increase in the marginal cost of credit would be 55 basis points – still far below the move in the market interest rate.

[46] Note that the compensating balance requirements generally applied on average over time, providing flexibility to the borrower in meeting them – see Guttentag (1962).

[47] For example, if a borrower needed $100 for a project, and was required to hold another $10 as a demand deposit with the lending bank, then the borrower might have to borrow $110 to meet the compensating balance requirement and invest in the project.

Third, one might think that loans extended under lines of credit could contribute to the smoothing of loan rates if the line of credit set a fixed rate for draws. A Federal Reserve survey in 1956 found that about half of the banks surveyed extended lines of credit, with larger banks more likely to provide lines and larger and higher quality borrowers more likely to obtain them (Cagle, 1956). At that time, most lines of credit were informal and had tenors of a year or less. Moreover, the lines were "generally an informal understanding between the borrower and the bank as to the maximum amount of credit which the bank will provide the borrower at any one time" (Cagle, 1956). While the survey did not provide information on the rates on loans extended under such lines, it appears that borrowers still had to apply for each loan (Cagle, 1956, p. 575). Thus, the rates on such loans likely reflected the pricing of new loans at the time.

By the mid-1960s, the lines of credit had become more formal, and were "generally governed by a contract of 1 to 2 years maturity" (Bulletin, 1967). The loans provided under the lines were generally short-term, perhaps 90 days, but the Federal Reserve noted that the rate on such loans did not necessarily "reflect the current level of rates on new loans" (Bulletin, 1967). However, starting in 1967Q1, the Federal Reserve collected separate data on the average rate on loans extended under lines of credit and on other short-term business loans. At that time, the average rate on the two types of loans differed by only 8 basis points (6.05 percent versus 6.13 percent), and the rates subsequently moved very closely together from quarter to quarter. Thus, changes in the behavior of rates on loans drawn under lines of credit seem unlikely to explain the shift in behavior of the average business loan rate found earlier.

A final possible factor to consider is imperfect competition.[48] Some researchers – e.g., Goldberg (1982, 1984) – have argued that the sluggish reaction of the prime rate to changes in market rates reflected oligopolistic behavior, as large banks tacitly coordinated on the setting of loan rates. Imperfect competition could also help to explain the asymmetry some have reported in the adjustment of the prime rate to changes in market rates in some periods.[49]

However, while some banking markets may have been characterized by imperfect competition, there are a number of reasons to doubt the importance of imperfect competition for the smoothing result seen in the pre-1970 period. First, although it is possible that the prime rate served as a coordination device for larger banks, smaller banks often had prime rates that differed from the prevailing prime rate at the larger banks.[50] Second, it isn't clear that banking became significantly more competitive around 1970. Indeed, the average spread of the loan rate over short-term market rates actually rose around this time (see Figure 2). While that development may reflect changes in the risk or other characteristics of business loans at the time, overall measures of bank profitability changed little, on balance, between the 1960s and 1970s, also suggesting that competitive conditions in the sector did not change

[48] Boot and Thakor (2000) consider the possible effects of increased bank and capital market competition on banks' relationship lending. Their emphasis is not on smoothing of loan rates, but on the ability of banks to lend more efficiently because of the expertise that they can develop about particular sectors. They find that increased competition among banks leads to an increase in relationship lending while increased capital market competition leads to a decrease.

[49] Mester and Saunders (1995) report such an asymmetry, with the prime rate rising more quickly than falling in response to changes in market rates. However, Arak, Englander, and Tang (1983) suggest that the asymmetry emerged in the late 1970s and likely reflected differences in the loan market in periods of strong and weak loan demand rather than imperfect competition. By the early 1990s, the prime rate was essentially the effective federal funds rate plus 300 basis points and showed no asymmetry.

[50] See Brady (1985) for a discussion. At that time, the prevailing prime was the "most common rate posted by 30 large banks that announce their prime or base rate on a regular basis."

notably.[51] Finally, simple models of imperfect competition in the loan market would imply that loan rates be set as a markup over the bank's marginal cost of funds. Since that marginal cost would move with market rates (either because the marginal liability has a market-determined rate or because the marginal asset has a market-determined rate and provides a measure of the opportunity cost of a loan), the result would be loan rates that moved more, rather than less, than comparable market rates.[52,53]

VIII. Concluding remarks

Between the mid-1960s and the mid-1980s movements in business loan rates in the United States became increasingly similar to those of short-term market rates. This change in behavior appears to have reflected changes in the regulatory and banking environment that made it more difficult to sustain an implicit contract under which banks and borrowers had smoothed loan interest rates relative to movements in market rates. Given this interpretation, there are two natural questions to ask. First, why did the change come when it did? Second, did this change in loan pricing behavior matter for monetary policy and the behavior of the macroeconomy?

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[51] Based on the FDIC's historical bank data, the average annual return on assets in the 1960s was 0.79 percent, only slightly higher than in the 0.74 percent posted in the 1970s. Since there were two recessions in the 1970s and only one in the 1960s, this simple measure, at least, doesn't suggest a notable increase in competition in the 1970s.

[52] This is the flip side of the sluggish movements in deposit rates resulting from market power, as discussed in Neumark and Sharpe (1992) and emphasized recently by Dechsler, Savov, and Schnable (2017).

[53] Of course, more complicated models of imperfect competition could have different implications. For example, less than full pass-through of increases in market interest rates to loan interest rates in periods of strong loan demand could result from the need to limit monopoly profits in good states to help sustain collusion among imperfectly competitive banks (similar to the model of oligopoly pricing in Rotemberg and Saloner, 1986). See the introduction to BIS (1993) for a discussion.

The breakdown of the smoothing regime likely owed indirectly to the higher and more volatile inflation and interest rates that prevailed in the late 1960s. Higher interest rates made the Regulation Q ceilings on deposit rates bind more tightly in high rate periods, disintermediating banks. In response, banks presumably increased their efforts to find ways around the regulation, and their customers were encouraged to find alternative sources of funds. But these responses, by changing the environment in which bank lending took place, made the smoothing of loan rates hard to sustain.

As for the second question, in the simple implicit contracting model presented here, the elimination of loan rate smoothing has no implications for the macroeconomy. The implicit contract between banks and borrowers smooths the pricing of loans across states, so that periods of high market rates and strong loan demand are characterized by credit rationing at relatively low loan rates rather than market clearing at high rates. But the allocation of lending is not affected. As is the case with the wage in many implicit contracting models of the labor market, the price in a given state, in this case the loan interest rate, is not allocative – that is, it does not affect the quantity supplied or demanded in that state (Rosen, 1985). Thus, for example, it would be wrong in this view to believe that the relatively rapid and more complete adjustment of loan rates to changes in short-term market rates since the 1960s necessarily has implications for the speed with which monetary policy changes feed through to changes in borrowing and spending.

However, in a more complex contracting model the implicit contract could have significant effects. For example, in the labor contracting literature, private information can have important implications for the efficiency of labor market outcomes under implicit contracting (Rosen, 1985). Moreover, the importance of having an ongoing relationship with

a bank in order to obtain credit in the high-demand state could have macroeconomic effects. To the extent that new firms find it hard to get credit in periods of high credit demand, innovation may be damped as a result of the implicit contract. Similarly, banks, constrained in the interest rates they felt they could charge, may have been less willing to lend to riskier firms in periods of high loan demand, potentially affecting the characteristics of the investments undertaken. Finally, to the extent that smoother interest rates helped support firms' income in periods of high interest rates, smoothing may have reduced the likelihood of bankruptcy, and so may have eased the effects of higher rates on employment and investment.

More generally, the developments in regulations and banking markets that led to the breakdown in loan rate smoothing likely had broader implications for monetary policy and the macroeconomy. For example, Carlson and Wheelock (2018) show that deregulation and the integration of money markets required larger open market operations to implement a given change in the stance of monetary policy. In addition, the phasing out of Regulation Q ceilings on savings and time deposit interest rates meant that banks and thrifts were no longer disintermediated when market rates rose above the Regulation Q ceilings. As a result, high interest rates no longer had outsized effects on sectors that were heavily dependent on intermediated credit, especially housing.[54] Indeed, Dynan, Elmendorf, and Sichel (2005) find that the spread between the bank business loan rate and the federal funds rate is a useful indicator of the extent of disintermediation. Specifically, they find that the spread of the bank loan rate over the federal funds rate has a significant positive impact in quantitative

[54] For a discussion of the modelling of the effects of disintermediation on the housing sector in the 1960s and 1970s, see Brayton and Mauskopf (1985). More recently, Koch (2015) uses bank-level data to show the effects of Regulation Q ceilings on bank lending activity.

models of residential investment and some types of business investment in the Regulation Q period.[55] However, this effect is absent after the mid-1980s. Their result is broadly consistent with the smoothing model provided in this paper, in which higher market rates are associated with a narrowing of the spread between the loan rate and market rates, as well as with constraints on loan supply.

After the phase-out of Regulation Q in the mid-1980s, the spread of the business loan rate over the federal funds rate was relatively flat until the financial crisis of 2007-2009 (Figure 2). There is some sign of a widening of the loan rate spread during and immediately after the recessions of the early 1990s and the early 2000s, which would be consistent with a weak economy increasing the credit risk of business loans, and banks pulling back from lending in response to pressures on their balance sheets. Indeed, there was considerable concern in the early 1990s that bank lending was constrained by losses on commercial real estate as well as the introduction of the first Basel Capital Accord.[56] There was a much larger widening of the spread during and after the financial crisis, presumably reflecting the extraordinary pressure on banks at that time, and the widening of bank funding spreads relative to the federal funds rate (English and Mosser, 2020). Perhaps more strikingly, the spread narrowed only gradually after the crisis abated and remained above its pre-crisis level at the end of the series in 2017. It is possible that that persistently wider spreads reflected banks' reassessment of the risks associated with business lending or the effects of tighter bank capital and liquidity regulation implemented after the crisis.

[55] Dynan, Elemndorf, and Sichel (2005) used the bank business loan rate series reported here, taking it from a preliminary draft of this paper prepared in 2004.

[56] For example, see the discussion in Bernanke and Lown (1991).

The arguments in this paper suggest that loan rates would have been smoothed in other economies, at least in earlier periods when financial markets and institutions were constrained by regulatory and other factors. Indeed, a cross-country analysis by Borio and Fritz (1995) suggests that bank business loan rates adjusted sluggishly to changes in market and policy rates in a number of countries. They also report that the speed of adjustment increased after 1985 in a number of countries – particularly Japan and Spain – reflecting various institutional changes. In three countries where the data allowed for a test (Germany, Italy, and Spain), they find that loan rates moved in part with banks' average, rather than marginal, cost of funds, suggesting that banks' may have wanted smoother loan rates in order to stabilize their profits over time. These observations indicate` that the experience in the United States is not unique, and empirical work on the effects of bank lending behavior and the bank credit channel on the economy have to take account of changes in the structure of business loan markets.

Appendix A: Available series on bank business loan rates

This appendix presents information on the business loan rate series collected by the Federal Reserve since 1939.[57] The Quarterly Interest Rate Survey (QIRS) was introduced in 1939, and changes were made to the survey in 1948, 1959, 1967, and 1971. In 1977 the QIRS was replaced by the Survey of Terms of Bank Lending to Business (later, the Survey of Terms of Business Lending – both are referred to here at the STBL). This Appendix notes the changes in the coverage of the surveys, the weighting system used to convert the survey data to national averages, and the availability of the resulting series.

I. Quarterly interest rate survey (QIRS)

A. 1939-1948 (See Collier, 1939)

Coverage: New commercial loans with maturities of 30 days to 12 months, inclusive. The definition may have included agricultural loans, but the *Bulletin* (January 1939, page 17) claims that such loans were negligible. The loans were included if made during the first 15 days of the last month of each quarter. The survey covered about 90 large banks in 17 cities. Whereas previously the banks had reported a prevailing rate on prime business loans, the survey now required the reporting of the dollar volume of lending at various rates and in various rate ranges.

Weighting: City averages were based on the sum of the reports of the reporting banks in the city. City averages were then accumulated using weights shown in the *Bulletin* (1939, page 965). The weights were calculated based on commercial and industrial loans outstanding at

[57] An earlier survey, running back to 1928, asked large banks to report the prevailing rate on prime commercial loans on a monthly basis, and an even earlier survey collected information on "customer's loans," including business loans but also loans of other types, back to 1919. See the discussion in Federal Reserve Board (1943), pp. 426-27. The subsequent surveys reported here collected data on the actual rates charged. There appears to be a notable break when the new series was introduced in 1939. The development of a consistent series for the 1919-1938 period is left for future work.

all weekly reporting banks. Regional weights were based on the share of loans at weekly-reporting banks in each region. City weights within each region were based on the loans of weekly-reporting banks in that city relative to loans at weekly-reporting banks in all of the surveyed cities in the region.

Availability: The *Bulletin* published data for 3 regions. The weights used to construct the overall average series from these 3 series can be found in the 1939 article.

B. 1948-1966 (See Youngdahl, 1949)

Coverage: New commercial loans and renewals with maturities of less than a year made in the first 15 days of the final month of each quarter. Starting in September of 1959, loans to non-bank financial institutions were excluded. As before, the survey covered about 90 banks in 19 cities (the number of banks dwindled over time). The panel changed slightly in 1948. Note that data were now reported for each loan extended rather than for the volume of loans extended at particular rates or in particular rate ranges. This change allowed for the calculation of average rates by size as well as region.

Weighting: Average rates for each of 9 size categories (by loan size) were calculated for each of the three regions using all of the data reported by banks in that region (no city weights). These nine rates were then combined into 4 broader size categories based on weights taken from a 1946 survey of the stock of business loans outstanding. The resulting 12 series (4 sizes times 3 regions) were combined into regional, size, and overall averages based on weights obtained from the 1946 survey.

Availability: The *Bulletin* published data for 3 regions and 4 size categories (12 series in all). The (1946) weights used to construct the overall average series from these 12 series are available in the March 1949 *Bulletin* (page 235).

C. 1967-1971 (See Eckert et al, 1965; *Bulletin*, May 1967)

Coverage: New commercial loans and renewals during the first 15 days of the middle month of each quarter. The survey excluded loans to foreign businesses and business instalment loans. (As noted in the May 1967 *Bulletin* article, these had not been reported by many respondents in any case, see page 721; Eckert et al (1965) suggests about a half may have reported them). Loans were separated into short-term, long-term, and revolving credit. Revolving credit loans had been included in both short-term and long-term loans before (see the May 1967 *Bulletin* article, page 722). The panel was expanded from 66 banks (note the substantial decline from about 90 in the 1940s) to 126; the number of cities was increased from 19 to 35. The survey still generally was of large banks in large cities. Published data includes six regions (rather than three) and five (new, larger) size categories.

Weighting: Based on the actual volume of new loans reported during 1967.

Availability: Aggregate data is available by type of loan, size, and region for 1967-1970 in the June 1971 *Bulletin*.

D. 1971-1977 (See Weaver and Fry, 1971)

Coverage: Accounts receivable loans were dropped from the survey because they generally had fees that were hard to convert to interest rate equivalents. For most respondents, the reporting was cut to the first seven business days of the middle month of the quarter.

Weighting: Revised to reflect the volume of loans reported in 1971.

Availability: Aggregate rate data is available by type of loan, size, and region in the annual statistical digest. The volume of loans of each type is available in the E.2 statistical release.[58]

[58] The historical statistical releases are available in the Research Library at the Federal Reserve Board in Washington, DC.

II. Survey of terms of bank lending to business (STBL)

A. 1977 to present (See Boltz, 1977)

Coverage: All new commercial and industrial loans and renewals during the first full week in the middle month of each quarter. Construction and land development loans, including those collateralized with real estate, were included until 1989. The panel was expanded to include a stratified random sample of up to 348 banks of all sizes in all parts of the country.

Weighting: The banks are divided into six strata by size, and the loans in each stratum are weighted by the inverse of the ratio of business loans at surveyed banks in that size stratum to business loans at all banks in that stratum. Weights are calculated based on the most recent but one Call Report. The resulting overall average rate is an estimate of the average rate on all loans extended by all domestically chartered commercial banks in the survey week.

Availability: The microdata is available on the Federal Reserve Board computer system. Average rates and the volumes of new loan extensions are reported by size and maturity of loan on the E.2 statistical release, as well as in the Federal Reserve *Bulletin*.

Appendix B: Adjusting for breaks in the series

When the various loan rate series from the QIRS and the STBL are spliced together, there are breaks in the combined series resulting from three types of changes: the weighting method used to calculate the overall average rate, the types of loans covered, and the panel of banks covered. It is generally possible, however, to obtain an estimate of the size of the resulting breaks from either published or unpublished sources, or, for the STBL, to calculate such an estimate from the microdata. I have removed these breaks from the series in one of two ways: proportional or tapered break adjustments. Proportional adjustments are used for breaks in the series that one could reasonably expect to affect all earlier observations equally, such as breaks caused by the inclusion or exclusion of certain categories of business loans. In such cases, the affected loan rate observations are multiplied by a factor (either greater or less than one) that removes the effect of the break at the time it occurred. By contrast, the effects of some breaks are known to have cumulated over time (for example the effect of reversing in one step a slow attrition of banks from the survey panel). In these cases, the multiplicative factor is tapered smoothly to one over the period to be adjusted, so that earlier data are unaffected.

I. Adjusting for the effects of changes in weighting method

The method used to calculate an estimate of the overall average rate on short-term loans at all large banks based on the data reported by the panel banks has changed several times since 1939. Between 1939 and 1948 the reported data were averaged for each of 19 cities, the city averages were then averaged using city weights based on the distribution of large bank business loans within each of three regions in the late 1930s to form three regional averages (New York City, Other Northern and Eastern Cities, and Other Southern and

Western Cities). These in turn were averaged, again using weights based on the distribution of large bank business loans, to form a national average. (For details, see Collier, 1939). The weights used were not updated over time.

The weighting method was changed in mid-1948 to take explicit account of the size distribution of loans. This was possible because banks began reporting both the rate and size of individual loans at that time. For each of the three regions an average rate – weighted by the volume of lending – was calculated for 9 size categories of loan (these averages were not published). The nine averages were then combined into averages for 4 broader size categories using weights calculated from the panel banks' responses to a 1946 Federal Reserve survey of the characteristics of the stock of bank business loans by size of loan. The overall average rate was then calculated as a weighted average of the 12 (4 size categories times 3 regions) published region-size averages. Again, the weights were based on the panel banks' responses to the 1946 survey. (See Youngdahl, 1949, for details).[59]

The weighting method was changed again in 1967. At that time, the number of regions was increased to six, the broader size categories were redefined, and the number of such categories increased. It is not indicated in the description of the changes published in the Federal Reserve *Bulletin* (*Bulletin*, 1967) if the number and definitions of the narrower size categories used in the construction of the data were changed. The average rates for these narrower categories continued to be unpublished. In addition, the weights used to construct the overall average from the region-size specific averages were changed. Initially these

[59] Youngdahl (1949) also reports a revised series for 1939 to 1948Q1 intended to be a comparable recalculation of the old average rates based on the 1948 weighting system. I have not used that series for two reasons. First, I do not want to use fixed weights, but rather weights that move over time reflecting the actual distribution of loans extended. Chain weights might be best for this, but fixing the weights at their 1948 levels is clearly not right. Second, the calculation is necessarily very approximate (since the sizes of loans were not reported until 1948); Youngdahl only reports rates rounded to the nearest 10 basis points.

weights were based on the volume of loans reported on the February 1967 survey, but revised rates were published later based on the volume of loans reported on all of the 1967 surveys.[60] (The effect of the revisions was very small. The revised series have been used here). Unfortunately, the new weights were not published, and they cannot be backed out of the reported rates because of a lack of data.

These changes in the weighting method are handled in two steps: first by calculating revised aggregate loan rates using interpolated weights, and, second, by smoothing additional effects of changes in the weighting method over the period during which the weights were fixed. For the period from 1939 to 1946, I interpolate quarterly series for the regional weights using the weights selected in 1939 and those from the 1946 survey as endpoints. For 1947 to 1966 I interpolate and extrapolate region/size weights using the 1946 survey weights and a second set of region/size weights reported in Eckert et al (1965, Appendix 3) that reflected the actual volume of loans reported in the survey in 1964. I then use these interpolated weights to calculate an overall average rate based on the regional rate series reported in 1939-48 and the regional/size rate series reported in 1948-66.

Youngdahl (1949) and the 1967 *Bulletin* article show the effects of the changes in the weighting methods in 1948 and 1967. Unfortunately, the reweighing described above removes only a small portion of these effects (only 2 of 12 basis points in 1948 and 1 of 7 basis points in 1967). The difference in 1948 may result from the change from purely geographic weights to weights based on both loan size and geography, while the difference in

[60] Initially it seems unattractive to use the reported volumes of loans extended rather than the stock of loans outstanding to calculate the weights. So long as the maturity structure of the loans does not differ across size/region categories, however, the weights are the same. Oddly, there was a 1955 survey similar to the one in 1946, but it was not used to update the QIRS weights. Eckert, et al (1965) presents evidence that the effects of different weighting schemes are fairly small.

1967 may reflect a large change in the distribution of loans between 1964 and 1967. In addition, changes in the (unreported) weights used to combine the (unpublished) narrow region-size category series into the published broad region-size series may matter. In any case, the effects not accounted for by my reweighing are smoothed over 1939-1948 and 1948-1966 respectively.

In 1971, the weights were changed to reflect the distribution of the volume of loans reported in that year. (As in 1967, the preliminary results were based on the volumes in the February survey, and these results were later revised to reflect the volumes reported in all four surveys in 1971. Again, the effect of the revision was very small). The effect of the change in weights (8 basis points) is shown in Weaver and Fry (1971). Since the new weights, like those introduced in 1967, were not published, I have simply smoothed the effect of the change over the 1967-71 interval.

Starting in 1977, the STBL weighting system is based on the size of banks, rather than the size and geographical distribution of reported loans. Initially, the STBL included the 48 largest banks in the country and then 5 strata of 60 banks of declining size. Coverage of the largest banks is no longer complete, although it is nearly so. Each stratum is assigned a weight ("blowup factor") equal to the inverse of the share of the surveyed banks in the total business loans of all banks in that size category on the most recent available Call Report. Thus, the blowup factor for the top stratum of 48 banks was 1 (and is still nearly 1) and the blowup factors are larger for the samples of smaller banks, owing to their more limited coverage. Because the QIRS surveyed only large banks, I focus here on the loans reported by the top two stratums. Since the weights used in 1971 were not published, it is not possible to evaluate the size of the effect of shifting to the new weighting system, although the effect of

applying the stratum blowup factor to the loans of the stratum 2 banks is accounted for below. It seems likely that the effect of shifting from the 1971 weights to weights based on the current volume of loans extended (effectively what I do here) would be similar in size to the shift in weights between 1967 and 1971 (i.e., about 5-10 basis points). Since there is no available information, however, I cannot make an adjustment.

II. Adjusting for the effects of changes in loan coverage

The types of loans included in the QIRS were changed in 1948, 1959, 1967, and 1971. I have made proportional break adjustments reflecting the changes in 1959, 1967, and 1971. The shift to the STBL in 1977 requires a further proportional adjustment.

Between 1939 and 1948, the QIRS excluded loans with maturities under 30 days. However, the effect of including such loans starting in June 1948 was not noted in Youngdahl (1949), which reported on the changes in the survey at that date.[61] It is likely that there were few such loans at that time, and so their inclusion had very small effects; no adjustment is made for this change in coverage.

Starting in September 1959, loans to non-bank financial institutions were excluded from the QIRS. The effect of excluding such loans in the September survey was reported in the *Bulletin* (Jan. 1960, page 49) by size of loan and region of the country. I used the weights for that date to calculate the effect on the overall average rate (about 1/2 basis point) and made a proportional adjustment to the earlier data to reflect the change.

In the 1967 revision of the QIRS, loans to foreign businesses and a particular type of business instalment loan were excluded. These loans had not been reported by a

[61] Similarly, the QIRS may have included farm loans (not secured by real estate) between 1939 and 1948. Such loans were included in a preliminary version of the QIRS that was fielded in September 1938, but Collier (1939, page 17) notes that the effect of including farm loans was negligible.

"substantial number of banks" in any case (*Bulletin*, 1967, page 721). Unfortunately, the 1967 *Bulletin* article does not provide an estimate of the size of this break. Eckert, et al (1965, page 11) estimate, however, that the effect of excluding foreign loans was to reduce the overall average rate by "a few basis points" in 1965. Translating "a few" as 3, I removed the break with a proportional adjustment to the data for 1939-1966.

The excluded business instalment loans were loans on which interest payments were calculated on the basis of the original principal of the loan even after part of the principal had been repaid. Evidently, some banks priced small business loans in this manner, which led to an understatement of the effective interest rate by roughly a factor of two. These were presumably high-cost loans, and had the effective rates been calculated correctly their exclusion would have reduced the reported average rate on business loans. But, since the effective rate was understated, the effect may have been to increase the average rate. In any case, no estimate of the effect of the exclusion is provided in Eckert, et al (1965), or in *Bulletin* (1967), and I have made no adjustment. The effect of the exclusion was likely small in any case, since Eckert, et al (1965, page 13) report that only about 40 percent of the respondents were including such loans in their reported data, and business instalment loans tended to be quite small (*Bulletin*, 1967, page 722).

Between 1967 and 1976, loans were reported as short-term loans (those with maturities under a year), term loans (with maturities over a year), or revolving credits (drawdowns under revolving credit agreements). Before 1967, loans were categorized as either short-term or term, and revolving credits were generally included in the term loan category, although one Reserve Bank included them in the short-term loan category (Eckert, et al, 1965, page 7n). Loans under revolving credit agreements would generally have

maturities under a year, and it is not possible to separate them from other short-term loans on the STBL after 1976. Thus, I include revolving credit loans between 1967 and 1976, and adjust the data before 1967 for their exclusion. Between 1971 and 1976, the volumes of short-term and revolving credit loans are available from the E.2 Statistical Release, and I have used these reported volumes to form a weighted average of the published rates on short-term loans and revolving credits. For 1967 to 1970, I used the ratio of short-term loans to revolving credits in the February 1971 survey to form the weighted average. I then used the ratio of the combined average rate to the average rate on short-term loans to make a proportional adjustment to the pre-1967 data. (This adjustment is just 2 basis points in 1966).

Between 1971 and 1976, accounts receivable loans were excluded from the survey because it was felt that difficulties in calculating a correct effective interest rate on such loans – taking account of fees and other institutional arrangements that were not reported on the QIRS – made it not worthwhile (Weaver and Fry, 1971, pages 468-9). Like revolving credits, however, accounts receivable loans cannot be excluded from the STBL data available from 1977 on. Fortunately, Weaver and Fry provide an estimate of the effect of excluding these loans in the February 1971 survey for short-term loans and revolving credits. I have used these estimates to make a proportional adjustment to the short-term and revolving credit rates between 1971 and 1976. These adjustments are then combined to construct the adjustment to the total short-term rate.[62] The adjustment was 13 bps in 1971.

[62] I used the ratio times 11/12 to take account of the one Reserve Bank that had been including the revolving credits in short-term loans.

As noted above, the STBL data available from 1977 on include all types of business loans, including revolving credits, accounts receivable loans, and business instalment loans. Moreover, these loan types are not reported separately, and so they cannot be excluded. Changes to the report form allowed for the correct calculation of the effective interest rate on business instalment loans, eliminating the problem that had caused these loans to be dropped in 1967. The STBL also included (until 1989) construction and land development loans collateralized with real estate. Such loans are not commercial and industrial loans and had not been included on the QIRS. Fortunately, these loans can be identified, and I have not included them in the calculation of the average effective rate.[63]

The STBL data include more detailed information on maturity than the QIRS. Between 1977 and 1982, the maturity of each loan in months was reported, and after that time the maturity in days was reported. In addition, some loans (for example, many prime rate drawdowns under revolving credit agreements) have no stated maturity. These "demand" loans comprise about a quarter of the loans reported. In defining short-term loans for the STBL, I include all loans with maturities between one month and one year, and loans with no stated maturity. I exclude loans with maturities of less than a month because their share of total short-term loans varied widely over time, and this variation would have large effects on the behavior of the average loan rate. Loans with maturities under a month were only about 5 percent of the dollar volume of STBL loans in 1977, but their share expanded rapidly over the next few years, peaking at just over 75 percent of the volume of new short-term loans extended in the surveys in November 1982 and February 1983 before falling back. Since the

[63] I have, however, included the very small number of construction and land development loans not secured by real estate. These loans are commercial and industrial loans, but they were not included in the calculations of the published business loan rates during the period when they were reported. The effect is extremely small because the volume of such loans was very small.

mid-1980s, these very short-term loans have accounted for about one-third to one-half of the volume of lending in the STBL. Since these loans are likely for cash management purposes rather than traditional commercial and industrial purposes – such as the financing of inventories, account receivable, or investment – I exclude them. If they are included, the overall average rate on short-term loans looks very much like the federal funds rate from the early 1980s on since most of the excluded loans are made at narrow spreads over the funds rate.

Since loans with maturities under a month were included in the QIRS between 1948 and 1976, I have made a proportional adjustment over that interval based on the calculated effect of excluding them in 1977. The effect is very small (less than 2 basis points in February 1977).

III. Adjusting for the effects of changes in the panel

The size of the QIRS reporting panel declined from 91 banks in 1948 to just 66 in 1966. As part of the 1967 revisions to the QIRS, the panel was expanded to 126 large banks. The series break caused by the increase from 66 to 126 respondents was 5 basis points (*Bulletin*, May 1967, page 726). I divide the 5 basis points into two parts: 2 basis points (which is 5 basis points times (91-66)/(126-66)), which represents the effect of bringing the panel back to its 1948 level; and 3 basis points, which represents the effect of increasing the sample size from 91 to 126. The 2-basis point effect is removed with tapered break back to 1948, and the 3 basis points is removed with a proportional break for 1939-1967.[64]

[64] Jaffee (1971) also used the QIRS data, generally without any adjustments. However, he made a level adjustment in the series in 1967Q1 to take account of this change (Jaffee, 1971, p. 100).

There is a break reflecting the change from the QIRS data to the STBL data in 1977. From 1977 on, I have used the weighted average rate for banks in the top two strata of the STBL panel (a total of 108 banks) weighted by the blowup factors used in the STBL. The blowup factors for the two strata indicate that this part of the panel represents roughly 150 commercial banks. If one calculates an average rate on all loans reported by the largest 126 banks in the STBL panel in order to mimic the QIRS approach, the resulting rate is about 1-1/2 basis points lower than the rate based on the STBL weights. I have made a proportional adjustment to the earlier data to remove this break.

IV. Adjusting for other breaks in the series

In 1967 and again in 1971, the method used for calculating the effective interest rate on discounted loans was changed. In both cases, the effect of the change was reported in the Federal Reserve *Bulletin* (3 bps, *Bulletin*, 1967, page 726; 2 bps, Weaver and Fry, 1971, page 470). The effects of these breaks were removed by making proportional adjustments to the earlier data.

Appendix C: Constructing comparable market rate series

There are two complications when calculating the comparable rate series employed here. First, daily market rate data are not available in the Federal Reserve's US database over the entire period of the loan rate series.[65] Second, the timing and duration of the survey period changes over time. I deal with the first problem by interpolating daily rate observations based on the lower frequency data that are available using a cubic spline. This interpolation is required before 1953 for the 3-month Treasury bill rate (using monthly data), before 1962 for the 10-year Treasury note rate (using monthly data), and before 1983 for the AAA bond yield (using weekly data, but using monthly data before 1962), and before 1970 for the 6-month commercial paper rate (using weekly data). Data on the federal funds rate are available daily from 1954 and are not available at all before that time. Data on the discount rate (in the New York District) and the prime rate are available throughout.

Given these daily rate series, I can then calculate the average rate for the appropriate survey interval for each quarterly observation. The survey was for the first 15 days of the last month of the quarter until 1966. Between 1967 and 1970, it was for the first 15 days of the middle month of the quarter. Between 1971 and 1976, it was for the first 7 business days of the middle month of the quarter. From 1977 on, it has been for the first full week in the middle month of the quarter. In the regressions, I have included dummy variables to account for the change in timing in the first quarter of 1967.

The commercial paper rate changes over time, reflecting changes in the available data. In particular, I used the 6-month commercial paper rate through the third quarter of

[65] After I retired from the Board of Governors, I updated the series using data from the Federal Reserve Economic Data website maintained by the Federal Reserve Bank of St. Louis.

1997, after which it was no longer reported. However, the 3-month commercial paper rate was reported starting in the first quarter of 1997. I splice the two series together in the fourth quarter of 1997, making a level adjustment of 17 basis points, reflecting the average difference between the two series over the first three quarters of 1997. The 3-month commercial paper rate was increasingly not available starting in late 2003, reflecting the lack of enough daily data on underlying transactions to allow the computation of the aggregate series. As a result, I spliced the 3-month series into the 1-month series in the first quarter of 2005, again making a level adjustment – in this case of 12 basis points – reflecting the average difference between the two series over 2004.

Note that I used the bond-equivalent yield for the Treasury bill and commercial paper rates.

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Table 1
VAR Results

	Significance level *(percent)*	**Fraction of variance explained** *(percent)*		
Market Rate		At 0 quarters	At 4 quarters	At 12 quarters
AAA bond yield				
1955:2-1969:2	1.8	56.4	52.5	42.0
1969:3-1979:3	1.3	24.0	6.4	7.9
1982:3-2007:2	35.3	9.9	3.4	8.6
Commercial paper rate				
1955:2-1969:2	0.5	17.4	30.4	16.4
1969:3-1979:3	2.9	67.1	63.4	58.0
1982:3-2007:2	0.8	66.0	40.6	26.1
Federal funds rate				
1955:2-1969:2	53.6	23.6	10.0	6.8
1969:3-1979:3	0.2	64.8	45.4	48.2
1982:3-2007:2	1.1	69.8	47.2	30.9

Notes: The table shows results from a vector autoregression including the log of GDP, the log of the GDP price index, the market rate shown in the left column, and the bank business loan rate (with that ordering). The VARs employ four lags of each variable, and the data are quarterly. The VARs over the first time period included a dummy variable to account for the change in the timing of the bank loan variable in 1967 (see Appendix A). The second column shows the significance level of the F-statistic for the inclusion of the four lags of the market rate in the equation for the loan rate. The next three columns show the fraction of the variance of the loan rate accounted for by shocks to the market rate at horizons of 0, 4, and 12 quarters, calculated from a variance decomposition based on the estimated VAR.

See the appendices for a description of the market and loan rate variables.

Table 2

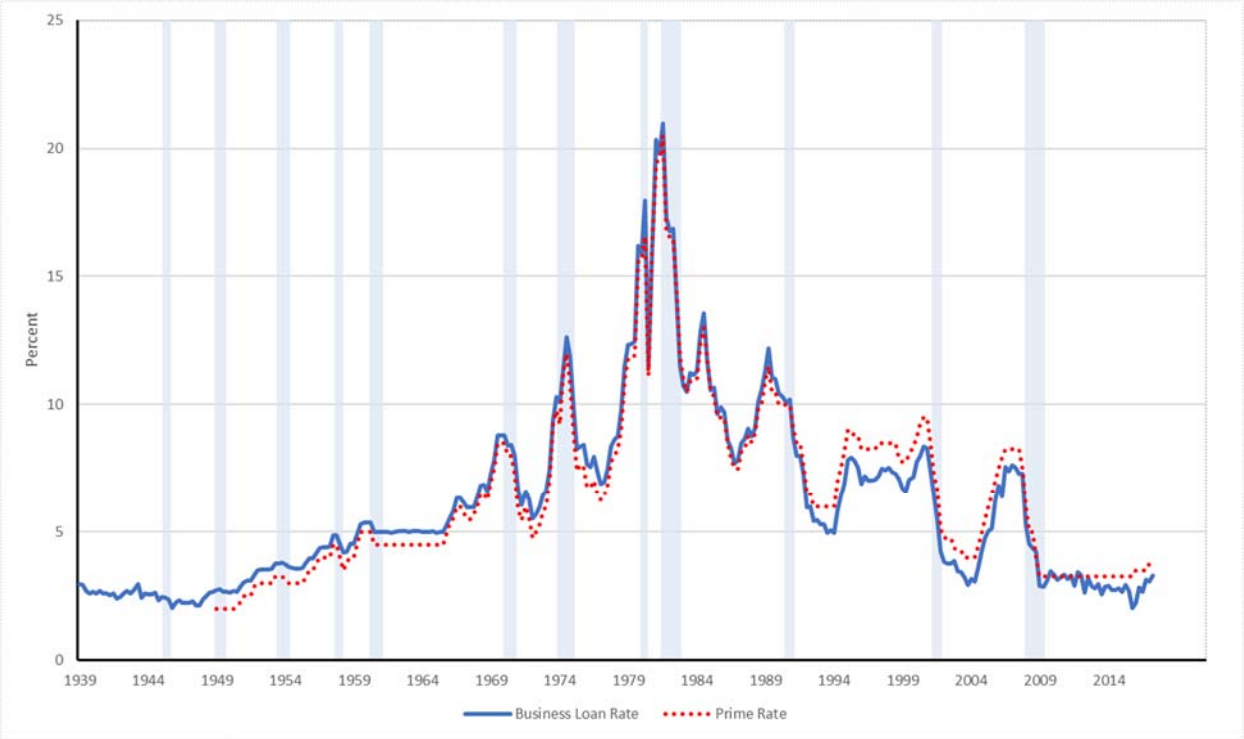
Business Loan Rates by Size of Borrower

Size of borrower *(Assets, in $thousands)*	**Average loan rate** *(percent)*		**Increase, 1955-57** *(percentage points)*
	1955	**1957**	
<50	5.5	6.1	0.6
50-250	5.0	5.6	0.6
250-1000	4.6	5.4	0.8
1000-5000	4.1	5.1	1.0
5000-25,000	3.7	4.8	1.1
25,000-100,000	3.4	4.6	1.2
>100,000	3.2	4.4	1.2
All sizes	4.2	5.0	0.8

Source: Board of Governors of the Federal Reserve System (1958), p. 388.

Notes: The table shows the average rate charged on business loans between July 1 and the survey date in the fall of each year. The "all sizes" category includes some loans to borrowers of unknown size. See source for details.

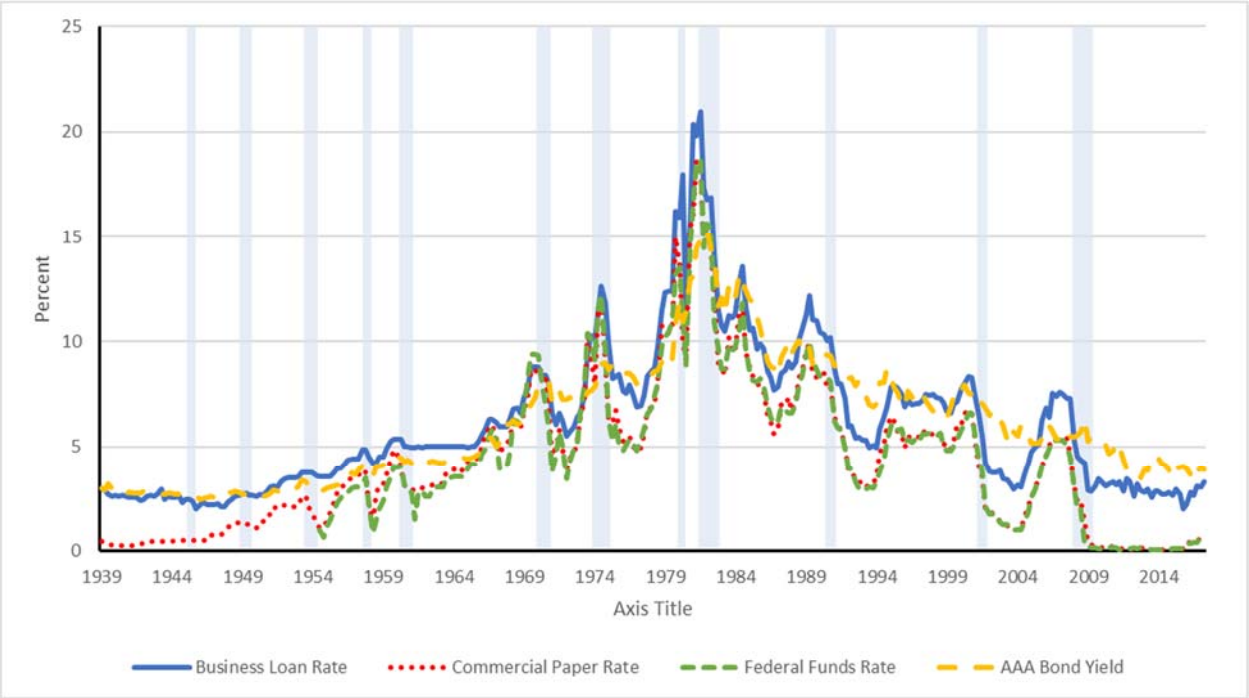
Figure 1: Short-term Business Loan Rate at Large U.S. Banks

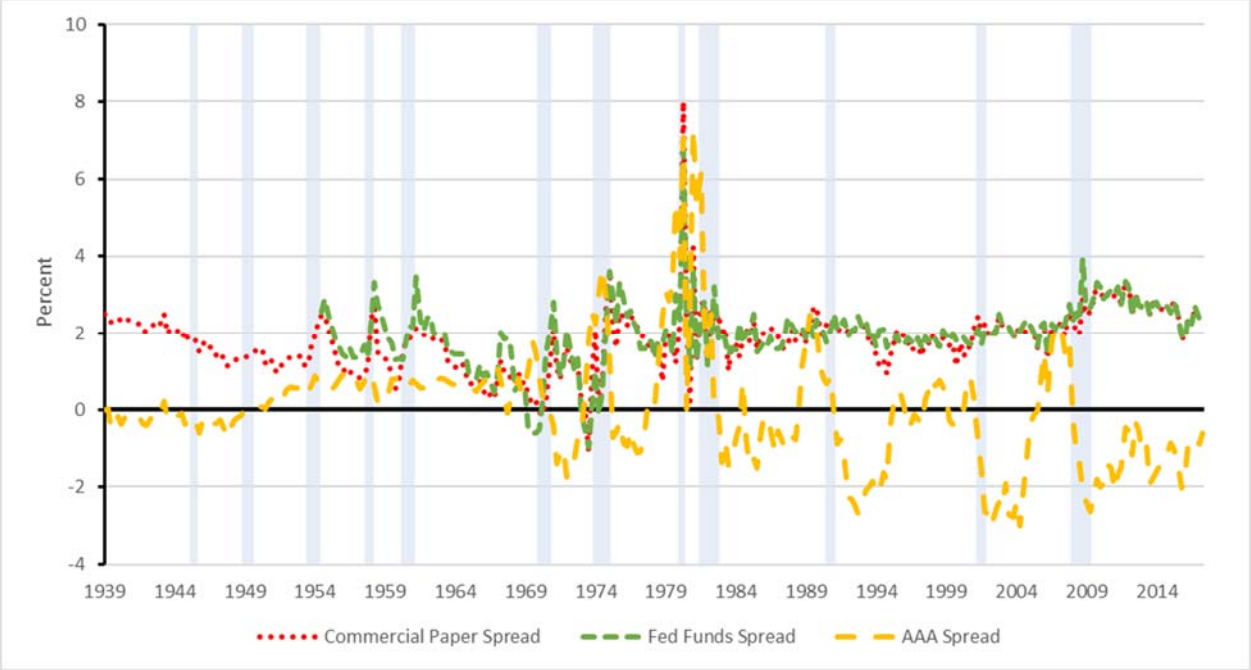


Source: For loan rate, see text and appendices. For prime rate, Federal Reserve Economic Database.

Note: Data are quarterly.

Figure 2: Bank Business Loan Rate and Market Rates





Source: See text and appendices.

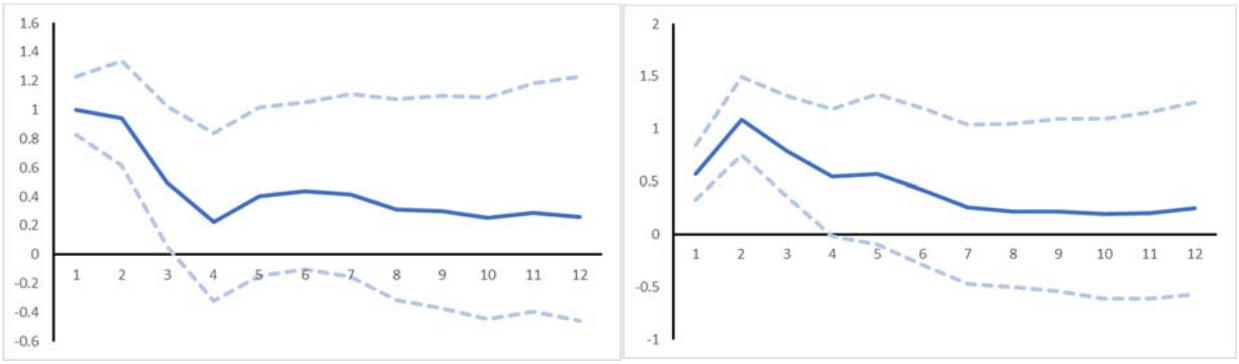
Note: Data are quarterly.

Figure 3: Impulse Response Functions

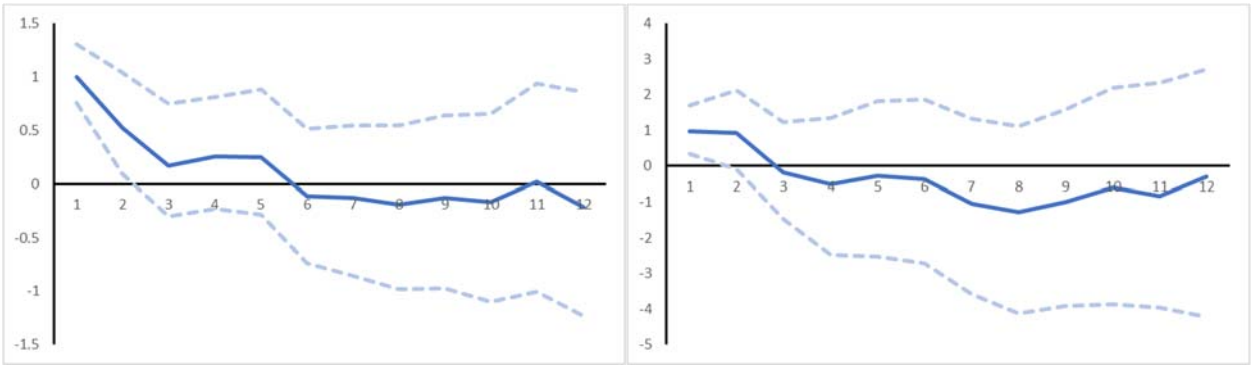
(Response to 1 pp shock to the AAA bond rate)

AAA bond rate | Loan rate

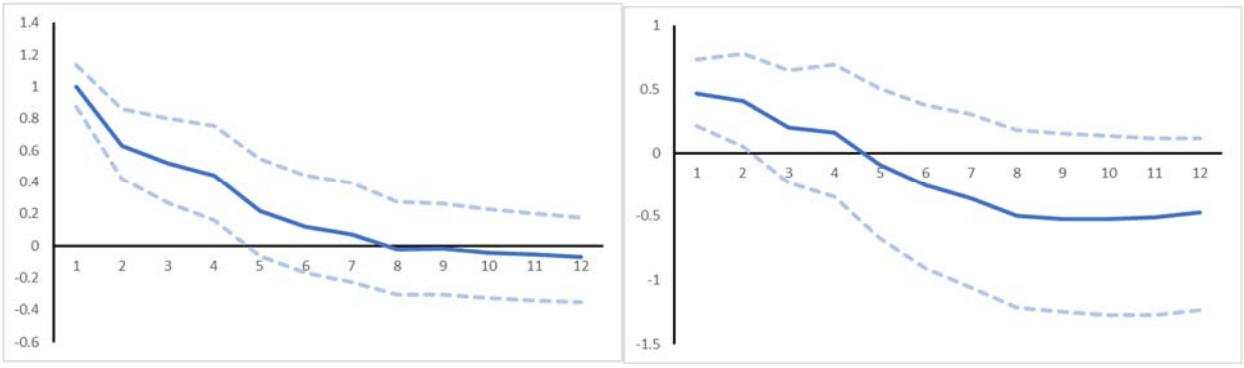
1955-1969



1969-1979



1982-2007



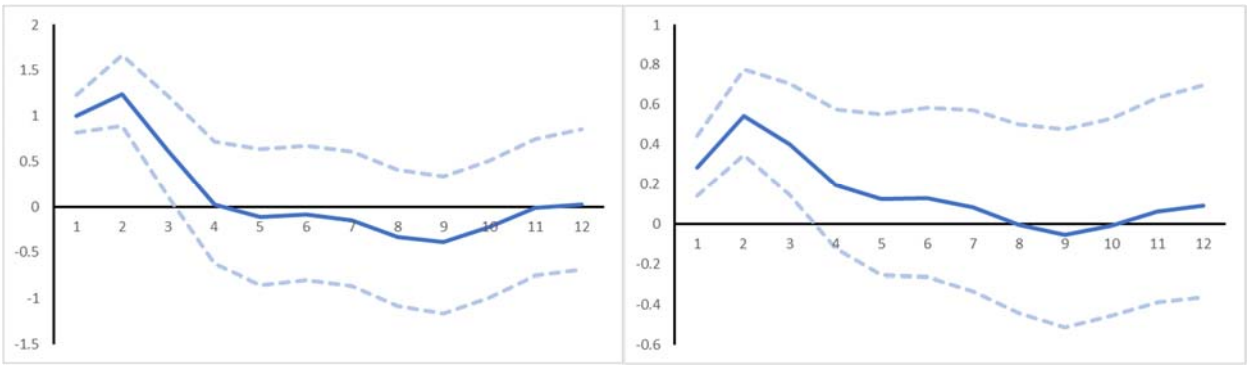
Notes: Data are quarterly. Responses in percentage points. Outer lines show 90 percent confidence interval.

Figure 4: Impulse Response Functions

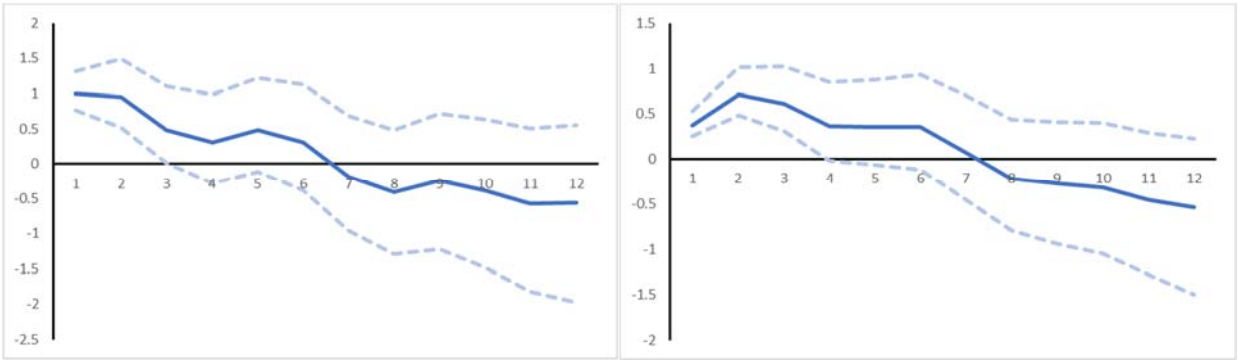
(Response to 1 pp shock to the commercial paper rate)

Commercial paper rate | Loan rate

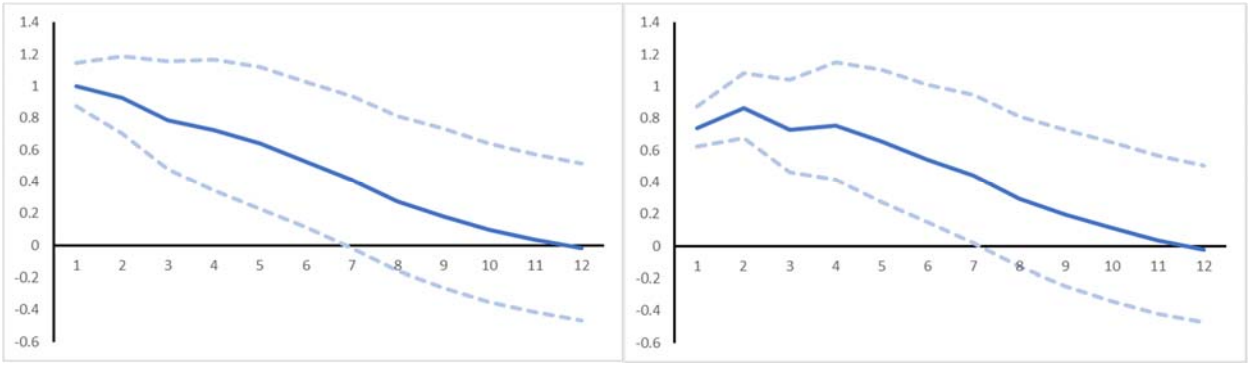
1955-1969



1969-1979



1982-2007



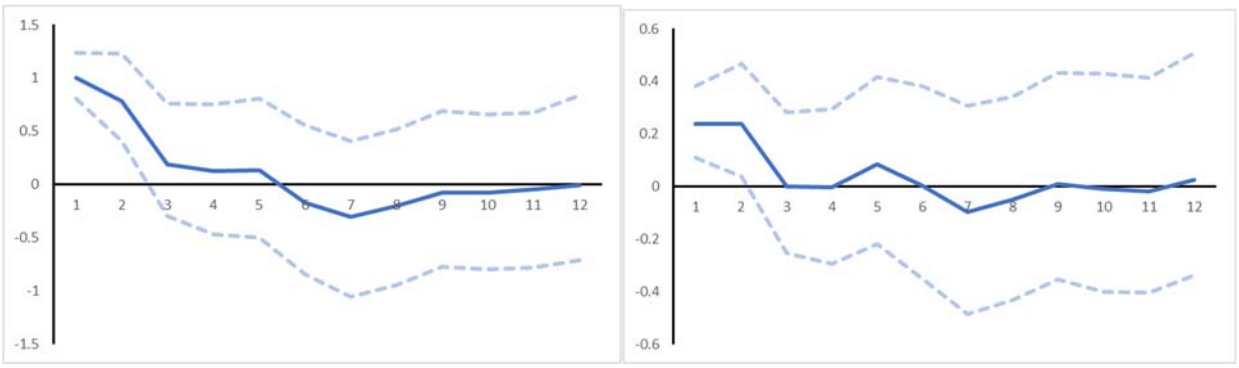
Notes: Data are quarterly. Responses in percentage points. Outer lines show 90 percent confidence interval.

Figure 5: Impulse Response Functions

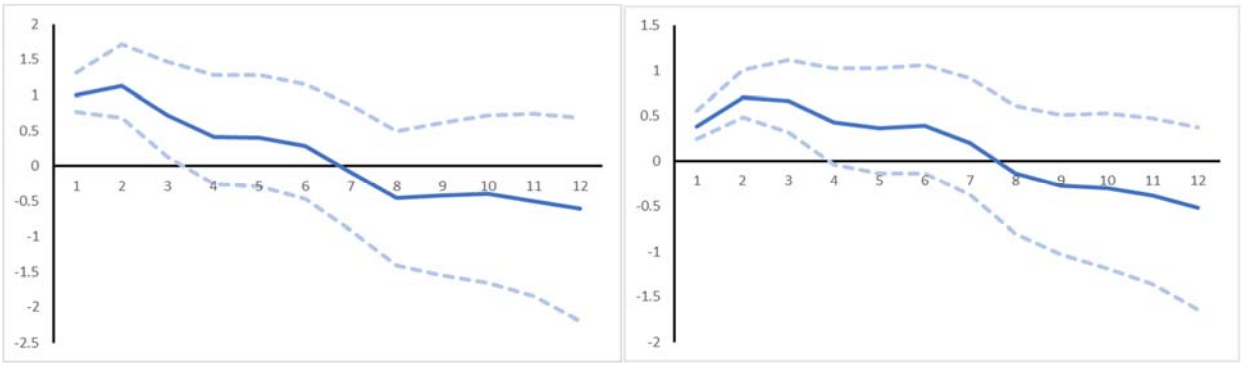
(Response to 1 pp shock to the federal funds rate)

Federal funds rate | Loan rate

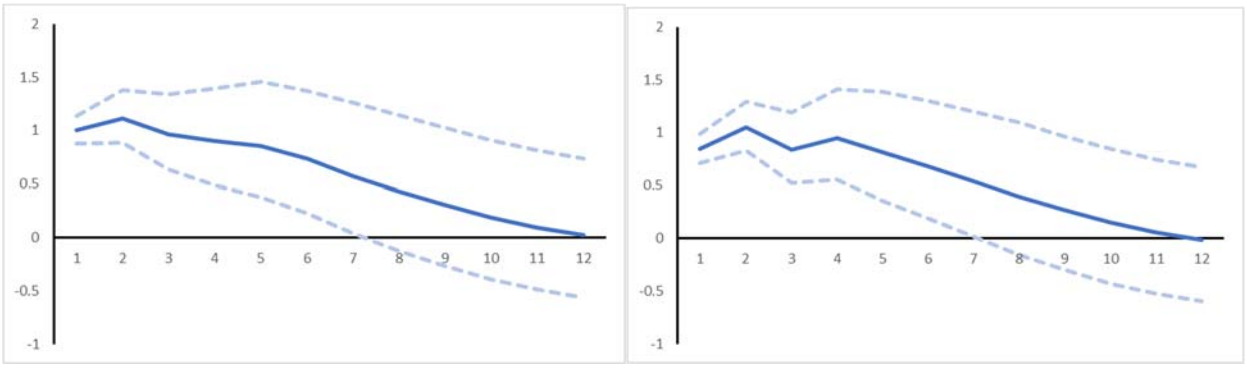
1955-1969



1969-1979

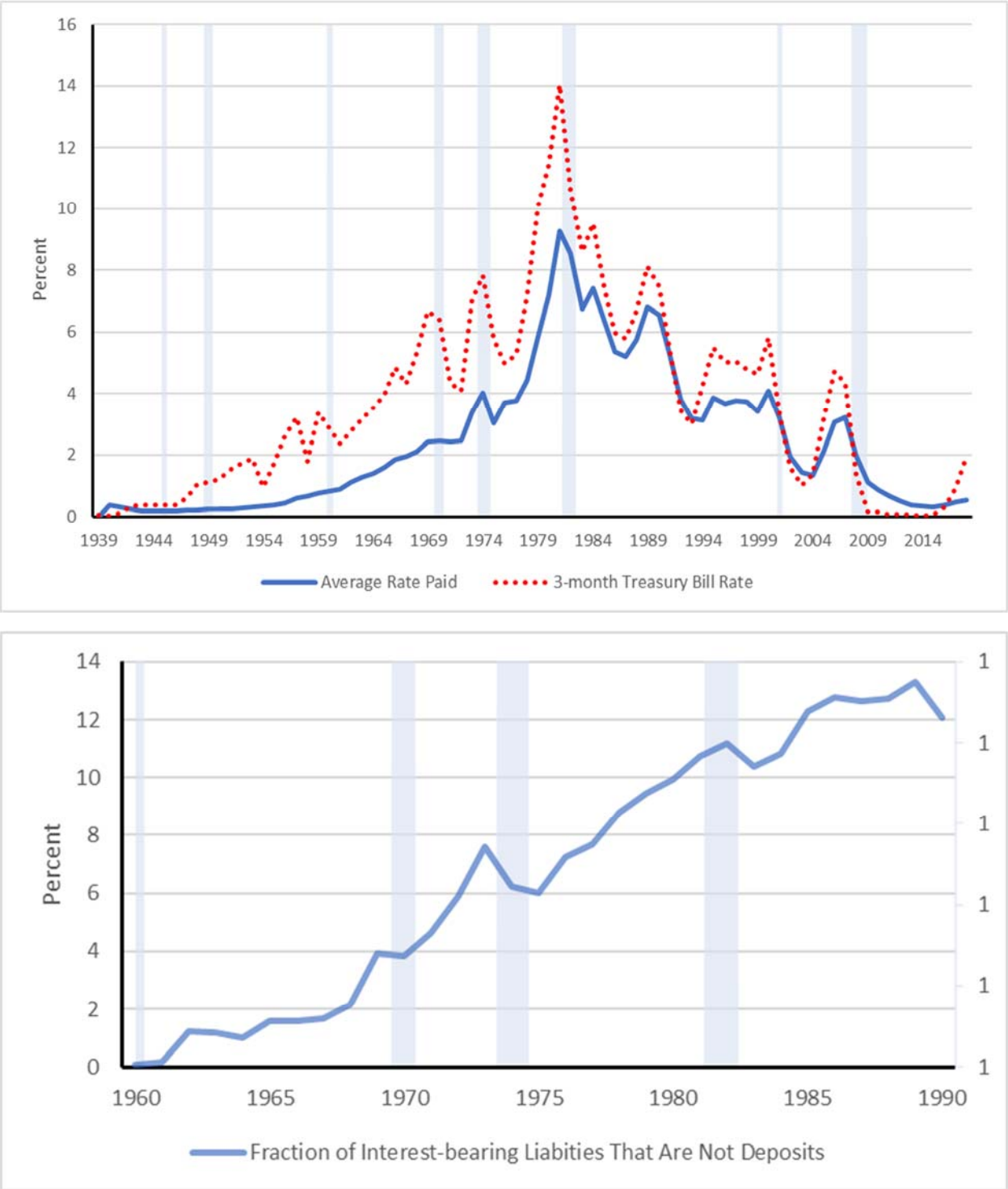


1982-2007



Notes: Data are quarterly. Responses in percentage points. Outer lines show 90 percent confidence interval.

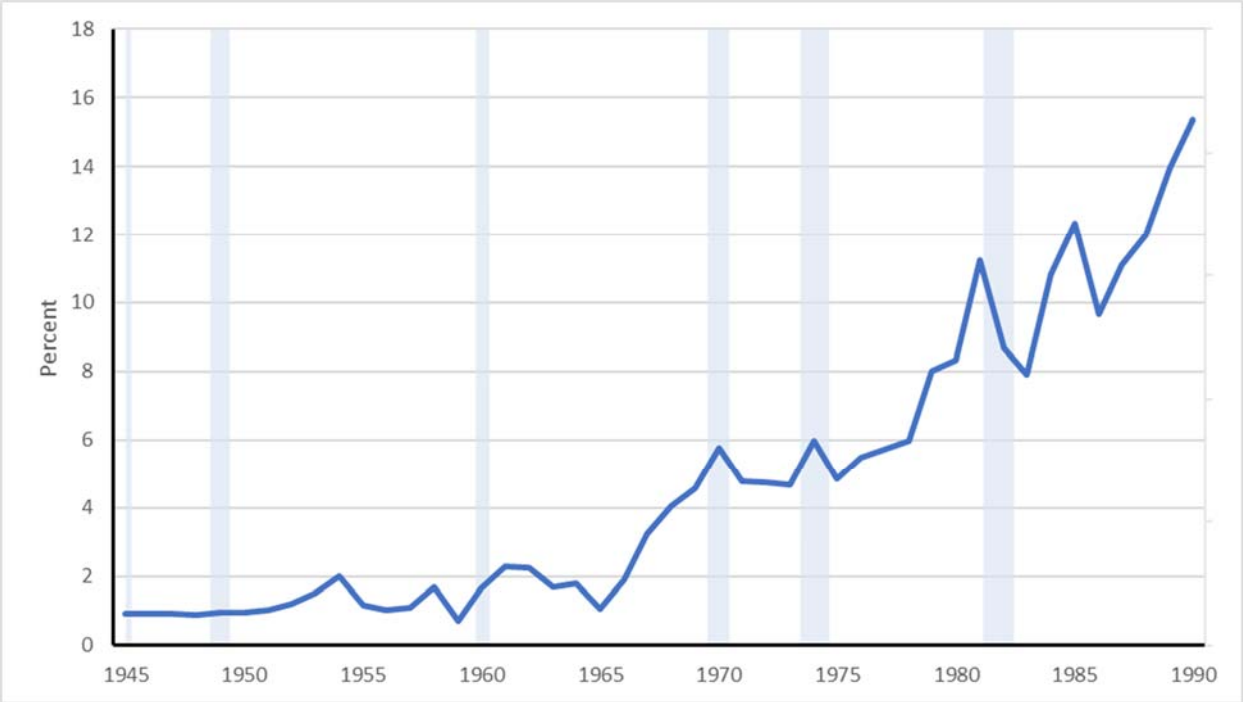
Figure 6: Changes in Rates on and Composition of Bank Liabilities



Source: FDIC Historical Banking Data.

Note: Data are annual.

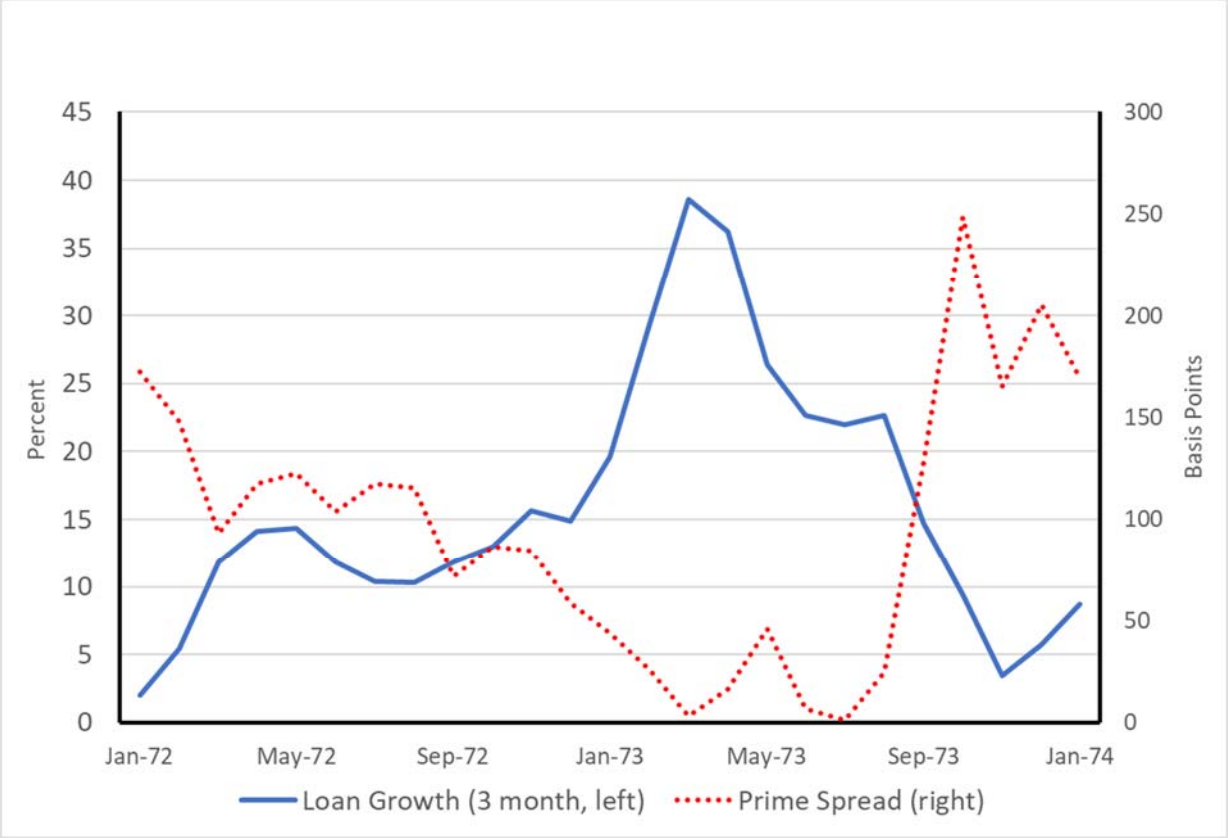
Figure 7: Commercial Paper of Nonfinancial Corporations as a Share of Bank Loans



Source: Flow of Funds.

Note: Data are annual.

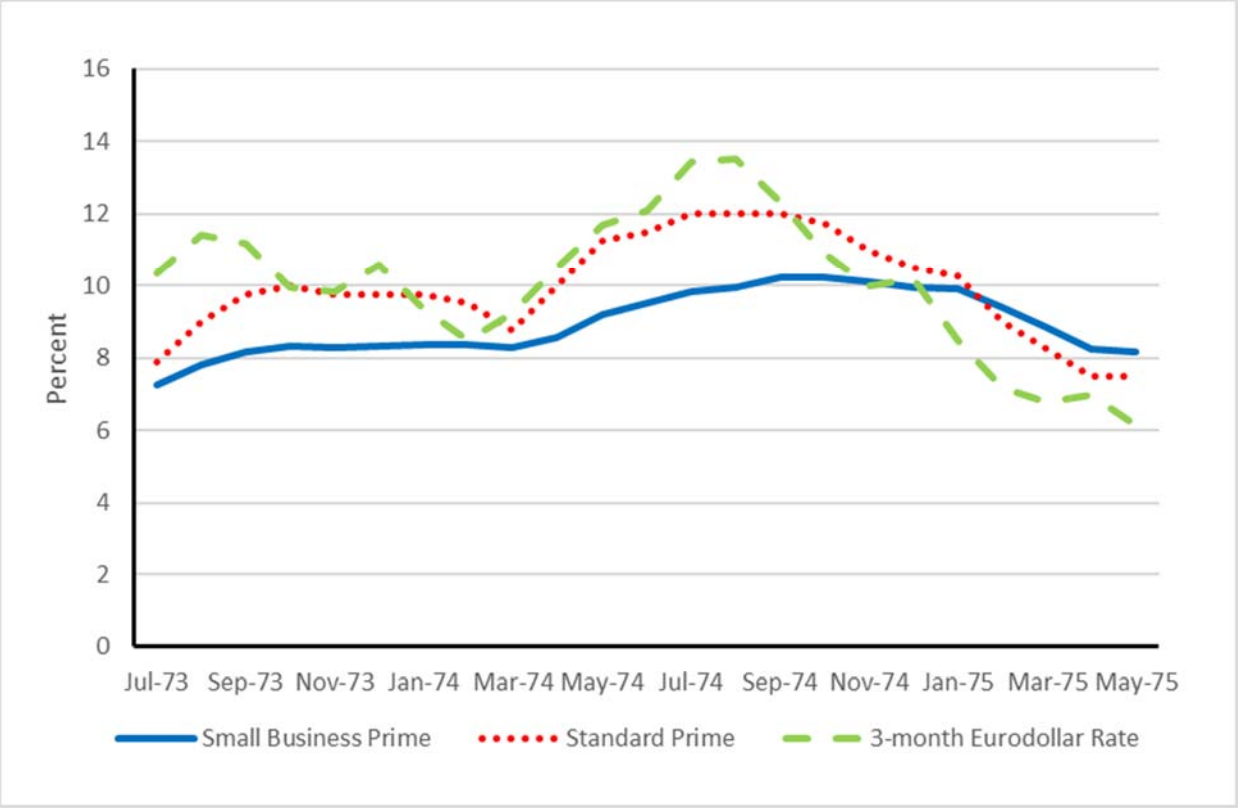
Figure 8: Prime Rate Spread and Bank Business Loan Growth



Source: Federal Reserve Statistical Releases H.8 and H.15.

Notes: Prime spread is the spread of the prime rate over the three-month Treasury bill rate. Loan growth is over three months, annualized. Data are monthly.

Figure 9: The Dual Prime Rate



Source: Federal Reserve Statistical Release G.10, "Interest Rates Charged on Selected Types of Bank Loans;" BIS database.

Note: Data are monthly.