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Considerations regarding the use of the discount window to support economic activity through a funding for lending program

Mark Carlson and Rebecca Zarutskie¹

This paper considers the use of the Federal Reserve's ability to provide loans to depository institutions under its discount window lending authority in support of achieving its monetary policy objectives through a funding for lending program. Broadly, a funding for lending program could be structured as one in which the Federal Reserve makes ample low-cost funding available to banks or a program in which the Federal Reserve only provides low-cost funding conditional on the banks meeting certain lending targets. We provide a general description of how a funding for lending program could be structured along each of these lines and review important considerations, costs, and benefits of any such program. We also review the literature regarding various lending programs implemented previously in the United States by a variety of agencies and abroad by foreign central banks that shed light on the potential effectiveness of funding for lending programs.

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Like many other central banks, one of the tools possessed by the Federal Reserve is its ability to lend funds (reserves) to commercial banks and similar institutions, which it does through the discount window. Typically, funds provided by the Federal Reserve through the discount window are overnight and used by banks to deal with short-term liquidity pressures; doing so promotes the smooth operation of the banking system. Moreover, the discount window supports the implementation of monetary policy. By providing ready access to liquidity at a fixed rate, the discount window helps to damp upward pressures on the federal funds rate and other short-term bank funding rates and helps ensure that the federal funds rate does not exceed the target set for it by policymakers (Federal Reserve, 2021).

This paper discusses how the discount window and the Federal Reserve's ability to provide loans to banks could be used in a more substantial way to support achieving monetary policy objectives of maximum employment and stable prices, particularly in extraordinary situations such as when the target for the federal funds rate is at or near the effective lower bound (ELB). The uses of the discount window we consider could be broadly viewed as "funding for lending" (FFL) programs. Such programs could be used in conjunction with other tools, such as forward guidance, large-scale asset purchases, or adjustments to the maturity composition of securities holdings (see, for instance, discussions in Campbell et. al, 2020; and Carlson et. al, 2020).

Commercial banks, savings banks, credit unions and similar institutions are important loan providers for many households and for businesses, generally smaller businesses, that are unable to raise funds from market sources (such as equity or bond markets). To the extent that these borrowers are dependent on commercial banks for obtaining credit, FFL programs are potentially a tool for encouraging financial institutions to maintain or ease access to credit for these borrowers. If these borrowers might be especially hard hit during an economic downturn, or if access to credit to these borrowers might be especially important in supporting the recovery, then promoting access to credit for these borrowers could be helpful in enabling the Federal Reserve to meet its monetary policy goals of maximum employment and stable prices.

Rather than focus on a particular design for a FFL program, we discuss a range of possible ways of structuring such programs. These options can be broadly grouped into two types of programs. The first type consists of programs that focus on providing significant amounts of low-cost funding for banks. If banks paid less on their liabilities, they may reduce the rates charged on the loans that they extend or find it more profitable to expand their balance sheets and engage in more lending. Consequently, the low-cost funding provided through such a program would imply an easing of financial conditions that would help the Federal Reserve provide monetary stimulus. Such programs might be most effective when bank funding costs, either for particular banks or for the entire banking industry, are especially elevated. We

provide some evidence on periods when bank funding costs have historically been elevated and on the segments of the banking industry that tend to have higher liability costs; this evidence in turn indicates which banks might particularly benefit from this type of FFL program.

This first type of program does not include any specific requirements that the banks must increase lending, hence this type of program strongly emphasizes the “funding” aspect of funding for lending programs. Programs of this type are relatively more straightforward to design and involve fewer design choices. The main design choices relate to the use of auction programs versus bi-lateral funding programs as well as the length of time that the program might be in place. In making choices on these design features, policymakers trade off providing certainty to banks regarding funding cost and availability, which might encourage them to make loans, and committing themselves to policies that may make less sense as the economic environment changes.

The second general type of program that we consider does include a specific requirement that banks increase lending. The linkage between the bank lending requirement and the availability of funding makes these programs relatively more complex to design but also creates more opportunities to design the programs to incentivize bank lending. Such incentives may be particularly important if there is a particular set of borrowers that the FFL is targeting. Presumably, such a lending target would only be necessary if the central bank is seeking to encourage more lending to a particular group of borrowers than banks would lend to by choice (potentially because such borrowers represent riskier credits or would require involve higher costs to the banks to acquire information about such borrowers). Stronger incentives may be needed to encourage the increased bank lending in such circumstances.

In discussing the design features that would provide greater incentives to lend, we consider two approaches. The first approach is a program design that offers multiple dollars of funding for each dollar lent. This approach allows the bank to replace other higher-cost funding and earn more on its other operations; that increases the benefits of lending more. The second approach involves providing lower rates on funding when more lending occurs. Because lending an additional dollar reduces the interest rate expense associated with all the dollars of funding that the bank obtains, the bank has strong incentives to lend that extra dollar. We discuss both of these approaches in depth and provide examples that illustrate how they influence the banks’ incentives.

Linkages between funding provided and loans extended also raise operational challenges. For instance, policymakers would need to decide how much lending needs to occur in order to gain the benefits and how to measure the amount of lending that has occurred. We provide a discussion of these and other operational issues.

There are a variety of examples of programs offered by central banks and other government agencies that either were explicitly FFL programs or were quite similar to FFL programs. Reviewing the evidence of these examples provides insights into the importance of certain design features and about the overall effectiveness of such programs. Some of these programs are based on experiences in the United States. For instance, the establishment by the Federal Reserve of the Term Auction Facility (TAF) provides an example of the type of program that focuses on providing low-cost funding; this program was found to be successful in supporting bank lending (Berger, Black, Bouwman, and Dlugosz, 2017). Examples of programs in the United States that link funding to lending include the Federal Reserve's Seasonal Credit and the Small Business Lending Fund as established by the 2010 Small Business Jobs Act (Kandrac, 2021; and Amel and Mach, 2017). The evidence on the effectiveness of these latter two programs is more mixed and points to the importance of the sizes of the incentives offered and the program eligibility requirements. In addition, the programs established by foreign central banks, such as the Bank of England's Term Funding Scheme and the European Central Bank's Targeted Long-term Refinancing Operations (TLTROs) facilities, also provide support for the idea that funding for lending programs can support bank lending and economic activity.

Using a FFL program to ease monetary policy differs from monetary policy implemented through open market operations in that it allows the monetary policy impetus to be targeted at particular economic actors. Such targeting has both advantages and disadvantages that may, moreover, differ depending on the economic circumstances. For instance, it might be the case that the economic environment that resulted in monetary policy rates being lowered to the ELB is associated with that particular financial institution being unable to attract sufficient depositors or other funding providers or that certain types of financial intermediation are impaired. It may be easier to design a discount window policy to target those disruptions than it would be to address them through the general provision of liquidity that would be provided by large scale asset purchases (LSAPs). However, targeting particular institutions or markets is clearly "credit policy," and can result in economic distortions and potentially poses considerable risk to the Federal Reserve (Goodfriend, 2011). Private lenders exist, at least in part, because they able to gather private information about borrowers and make decisions about which ones are creditworthy; having the central bank be more involved in deciding who receives credit creates more concerns about adverse selection and asymmetric information issues (English and Liang, 2020). Concerns about economic distortions would be decidedly more prevalent for programs with a particular lending target chosen by the Federal Reserve than a program offering low-cost funding for banks where the banks are able to choose how to allocate those funds. Weighing the merits of providing economic support through a FFL program versus the costs associated with the resulting economic distortions would be an important consideration

for policymakers, and balancing the advantages and disadvantages would presumably depend on the facts and circumstances of the economic situation confronting policymakers.

The remainder of this paper is organized as follows. Section 2 provides background on the discount window including the legal framework and various operational details. Section 3 presents our discussion of programs that focus on providing low-cost funding for banks. Section 4 describes considerations related to programs that would link access to low-cost funding to the amount of lending that occurs. Section 5 concludes.

Section 2. Background on the discount window

This section provides a brief background on the Federal Reserve's discount window lending authority. We consider mainly ordinary operations of the discount window and only briefly mention emergency lending authority.

Section 2.1 Overview of the discount window and description of current lending programs

The authority to extend credit to depository institutions is described in Section 10B of the Federal Reserve Act with additional implementation details articulated in Regulation A.² Depository institutions are a set of financial institutions that include commercial banks, thrifts, credit unions, as well as branches and agencies of foreign banks whose parent company are depository institutions.³ These institutions carry out many traditional aspects of banking: extending loans to households and businesses, providing checking and savings deposits, and providing payment services (through checks or debit cards). For ease of reference, and to add a little variety, we use the terms depository institution and banks interchangeably.

The purpose of the discount window is to serve as a backstop source of liquidity to banks. As part of their liquidity management, banks maintain balances in their accounts at the Federal Reserve. These balances may be used to send payments to other banks for instance as checks are paid or as customers use debit cards or electronic payments to send funds to others. The balances that banks maintain at the Federal Reserve are also known as reserves and these funds can be lent to, or borrowed from, other banks depending on whether a bank finds it has surplus funds or a deficit of funds in its

² The Federal Reserve Act is available at: <https://www.federalreserve.gov/aboutthefed/fract.htm>. Regulation A is available at: <https://www.ecfr.gov/current/title-12/chapter-II/subchapter-A/part-201#201.4>.

³ The particular types of deposits that make an institution a depository institutions are reservable transaction accounts and nonpersonal time deposits. It should also be noted that certain types of financial institutions, such as broker-dealers and mutual funds, do not have access to the discount window.

account at the Federal Reserve. In some cases, a bank may find itself with a lower balance at the Federal Reserve than it would prefer and may be unable to obtain funds from another bank. That may occur because it is late in the day, because there is a shortage of funds generally, or because there has been a disruption to the interbank market. In that case, the bank may borrow funds from the Federal Reserve through the discount window. The Federal Reserve lends simply by placing funds in the bank's account at the Federal Reserve. The interest rate, and other terms, on discount window credit extensions can thus affect the amount of cash balances banks prefer to hold, the maximum interest rate at which they will borrow from other banks, and money market conditions generally.

The interest rate at the discount window also supports the implementation of monetary policy. If pressures in bank funding markets are pushing up interest rates, especially the federal funds rate, then at some point it will become more attractive for a bank to borrow from the Federal Reserve through the discount window than to borrow in the market. By acting as a safety valve in this way, the discount window helps keep the federal funds rate in line with the target set by Federal Reserve and funding market conditions generally from becoming severely strained.

Typically credit extensions provided through the discount window are for a fairly short time period to help an institution meet unexpected cash flows or unusual circumstances that leaves it with inadequate liquidity. However, in periods of financial market stresses, such as during the onset of the Covid-19 pandemic, banks have been encouraged to borrow from the discount window for longer periods in order to support their liquidity positions. There are also some discount window lending programs that provide longer-term funds for smaller depository institutions that have more structural liquidity challenges associated with seasonal factors (see the discussion of seasonal credit below).

Discount window loans must be secured to the satisfaction of the lending reserve bank. Quite a variety of assets, including both loans and securities, are eligible to serve as collateral. Indeed, most performing or investment grade assets held by banks are acceptable as collateral; however, depending on the credit quality of the assets, the haircut or “lendable value” associated with the collateral may be different. For very high quality assets, such as US Treasury securities, the margins are generally quite small and serve only to protect the lending Reserve Bank against fluctuations in the prices. Other assets, such as commercial real estate loans, have higher haircuts, especially for longer maturities, and the lendable value may end up being only one-third of the (market) value of the loan.⁴

⁴ The Federal Reserve must be able to establish a first priority perfected security interest in collateral pledged so that the Federal Reserve will have a clear claim on the collateral in the event that the borrowing bank defaults. Establishing such claims depends on the assets. For US Treasuries that are traded through the Federal Reserve's book entry system, that process can be completed the same day. It is also fairly straightforward for the Federal

There are currently three lending programs under which loans are provided to depository institutions. The main lending program is primary credit. Under this program, the Federal Reserve extends loans to depository institutions that are in sound financial condition, typically as indicated by capital adequacy and supervisory assessments. Loan extensions are short-term, typically overnight though on occasion, loans may be extended for a longer period. For instance, in March 2020, amid the onset of the Covid pandemic, the Federal Reserve announced that primary credit loans would be available for periods of up to 90 days in order to “further enhance the role of the discount window as a tool for banks in addressing potential funding pressures.”⁵ However, there is a limit to the extension of maturity; the Federal Reserve Act establishes four months as the maximum maturity for loans extended under ordinary discount window lending authority.⁶ Primary credit loans may be used for any purpose and are intended to involve minimal administrative burden both on the part of the lending Reserve Bank and the borrowing depository institution (i.e. there is no requirement that the borrowers be asked to provide any information about the use of the funds received).

The second lending program is secondary credit. This is a lending program that is available to institutions that are not in sufficiently sound condition to be eligible for primary credit. Such loans are extended at a higher interest rate than are primary credit loans. Loans extended under the secondary credit program also involve a higher level of administration and oversight; institutions using secondary credit are expected to be able to return to a reliance on market sources of funding on a timely basis and the lending Reserve Bank must have sufficient information to judge that the credit extension is consistent with such an outcome. The expectation that lending under the secondary credit program will only be for a limited amount of time is intended to mitigate the likelihood that funding from the Federal Reserve will be used to allow uninsured depositors at a troubled bank to have an extended timeframe over which to withdraw their funds in such a way as to increase the costs to the Federal Deposit Insurance Corporation (FDIC). Indeed, there is a limitation in the Federal Reserve Act about the length of time the Federal Reserve can lend to an undercapitalized FDIC-insured bank without incurring a potential liability to the FDIC.

The third, and final, current lending program is seasonal credit. This lending program is available to smaller depository institutions that have sizeable, seasonal swings in their loans and deposits such as might be the case in areas with seasonal economic activity such as agriculture. The seasonal credit

Reserve to establish claims on other securities that are handled by selected settlement companies, such as Depository Trust Company, Euroclear, or Clearstream. The process for loans is more involved and takes longer as the Federal Reserve may have to conduct legal searches to ensure that there are no other claims on the loans.

⁵ The press release is available here:

<https://www.federalreserve.gov/news-events/pressreleases/monetary20200315b.htm>.

⁶ It would be possible for these loans to be rolled over, but there is no guarantee that they would be.

program is intended to assist eligible depository institutions in meeting these seasonal swings in a non-disruptive manner. Loans extended under the seasonal credit program have longer maturities that are aligned with the seasonal needs. The interest rates on seasonal is a floating rate, reset every two weeks, based on the average of the federal funds rate and the rate on three-month certificates of deposit.

As part of its implementation of monetary policy, the Federal Reserve targets the rate at which banks will borrow or lend reserves. That rate is known as the federal funds rate. Other money market rates, such as on repurchase agreements involving government securities and the rate at which non-financial businesses can borrow short-term in the commercial paper market, tend to be very close to the federal funds rate. The rate at which banks may borrow through the primary credit program has historically been set a bit higher than the federal funds rate; from 2010 to early 2020 that rate was set at 50 basis points (0.50 percentage points) above the top of the range the Federal Reserve set for the federal funds rate. By setting the rate at this level, the Federal Reserve discouraged depository institutions from relying on the discount window for ongoing support.

During stress events, however, this rate may be lowered. For instance, amid the turbulence in financial markets associated with the Covid-19 pandemic and efforts to contain its spread, there was a reduction in the interest rate for borrowing from the Federal Reserve's main discount window program to be at the top of the target range for the federal funds rate. By lowering the rate, the Federal Reserve makes it more attractive for banks to obtain liquidity from the discount window and, hopefully, more willing to provide liquidity to others.

Section 2.2 Some history of the discount window

The Federal Reserve has had the authority to provide funds to banks through the discount window since it was established. Indeed, when the Federal Reserve was established, discount window lending was intended to be the primary policy tool. Over the past 100+ years, the discount window has been configured in various ways and it is helpful to review at least a few of the different configurations. Understanding the range of historical configurations puts in perspective some of the programs discussed below and aids our discussion of how the discount window could be configured in the future as part of a funding for lending program.

One aspect of the discount window that has been adjusted over time is the approach to setting the rate on loans relative to prevailing market rates or to monetary policy targets. When primary credit was introduced in 2003, the rate was set as at a spread of 100 basis points above the Federal Reserve's target for the federal funds rate. Prior to the introduction of primary credit, the rate on the main discount

window lending facility, known as adjustment credit, was set below the target for the federal funds rate (the main monetary policy target) and was correspondingly below the effective federal funds rate. Rather than being dissuaded by the price of borrowing, banks were dissuaded from borrowing through administrative pressures such as being asked by Federal Reserve discount window officials whether they had exhausted other sources of funding and similar hurdles (Madigan and Nelson, 2002). Bank examiners might also ask banks about their use of the discount window. These non-pecuniary costs resulted in an increased reluctance to use the discount window outside of clear market wide distress situations; it was typically only during clear distress situations arising outside the banking system—September 11, 2001 was a clear example of such a shock—that resulted in a surge in borrowing.

The adoption of primary credit involved a switch to an above market rate and a reduction in the administrative burden on banks. This shift represented an effort by the Federal Reserve to shift the thinking about the discount window. The above market rate was expected to deter excessive use of the discount window by itself so that there would be no need to question banks about why they were using the discount window or no need to use other administrative barriers (Madigan and Nelson, 2002). Instead, it was expected that when money market rates spiked banks would naturally have an incentive to turn to the discount window. In addition, adopting a framework where banks had an incentive to borrow when money rates tightened was expected to enhance the control of the Federal Reserve over the federal funds market and to improve the ability of the discount window to serve as a backup source of liquidity for the banking system.

As noted above, the rate on primary credit has subsequently been adjusted. During the global financial crisis, the rate was reduced to so that the spread was at first 50 basis points above the target range for the federal funds rate and then 25 basis points above the top of the target range once the effective lower bound of the target range of 0 to $\frac{1}{4}$ percent was reached. Once the financial crisis had abated, the primary credit rate was moved back up to a spread of 50 basis points above the top of the target range. At the onset of the Covid crisis, the rate was reduced to be at the top of the target range.

Part of the reluctance of banks to use the discount window reflects some “stigma” associated with doing so. By stigma, we mean a reluctance to use the discount window because banks are concerned that the use might be negatively perceived by others (see for instance the discussion in Carlson and Rose 2017). In situations where many banks used the discount window, concerns about negative perceptions would diminish since it would be more apparent that there was not a problem unique to any particular bank. During the period in which adjustment credit was the main lending program, the Federal Reserve might help coordinate on use by announcing that the window was open and expected to be used, such as on September 11, 2001 or during the 1987 stock market crash. Part of the thinking regarding the switch

to primary credit and an above market rate was that upward spikes in interest rates would themselves signal disruptions to the market that would prompt borrowing without the Federal Reserve needing to provide a signal. Nevertheless, stigma persists despite the switch to an above market rate. Statements from Federal Reserve officials that it is appropriate to use the discount window remain key for encouraging institutions to be comfortable borrowing; the statement made by the Federal Reserve in March 2020 that it was appropriate for banks to use the discount window to meet the needs of their customers in the early days of the Covid disruption is a prominent example.⁷ This statement does appear to have shifted perceptions of the discount window as respondents to the September 2020 Senior Financial Officer Survey indicated that it was quite important in increasing the likelihood that they would use the discount window to help meet their liquidity needs.

A second notable aspect of the discount window lending program that has evolved is the practice of allowing rates to differ based on the collateral being pledged. Prior to 1980, one rate applied to discount window loans secured by US Treasury securities and selected short-term instruments and a rate 50 basis points higher was applied to discount window loans secured by other collateral (see Hackley, 1973 for details). This practice was the result of the way that amendments to the Federal Reserve Act over time had modified the ability of the Federal Reserve to lend against different types of collateral (at first against only very short-term assets and subsequently to longer-term assets). The differences in rates applied to different collateral raised concerns about biasing banks towards offering shorter-term loans. With the change in the rules on discount window lending that were part of the Monetary Control Act of 1980, the Federal Reserve shifted to offering a single discount window rate. However there is nothing in the Federal Reserve Act that prohibits the Board of Governors from creating lending programs that would have different rates depending on the collateral pledged.

A special discount window lending program associated with the global financial crisis of 2008 is worth noting. During this period, the Federal Reserve established the Term Auction Facility, or TAF. With the TAF, the Federal Reserve announced that it would provide a specified amount of discount window credit at a price determined through an auction. Institutions could bid the amount of credit they wanted and the price they were willing to pay (subject to a minimum bid rate). Bids were ordered by price, and bids were accepted until the amount of credit demanded totaled the amount of credit that the Federal Reserve specified that it would supply. All successful bids paid the lowest rate accepted at the auction. In that way, the rate established at the auction was essentially a “market price” for Federal Reserve discount window credit. By changing the amount of credit it supplied, the Federal Reserve could

⁷ The statement points to the value of the discount window in promoting the ability of banks to provide loans to businesses and households. See <https://www.federalreserve.gov/news-events/pressreleases/monetary20200315b.htm>.

affect the price at which the auction cleared.⁸ Studies of the TAF found that it played an important role in supporting bank funding, especially by easing conditions in money markets (McAndrews, Sarkar, and Wang, 2017; and Wu, 2011).

The discount window lending programs described here are all ordinary lending facilities in the sense that they use the Federal Reserve's standard discount window lending authority (from Section 10B of the Federal Reserve Act) and the borrowers are depository institutions, which are the Federal Reserve's traditional discount window counterparties. All these programs are intended to ensure that banks have access to liquidity to allow them to carry out the normal business of banking. They are distinct from the emergency lending programs created under Section 13(3) of the Federal Reserve Act that may be available for non-depository institutions and are intended to provide support to the financial system during unusual and exigent circumstances. Those facilities have very different rules, which are described under the Federal Reserve Act.⁹

Section 3. Programs to promote lending by offering cheap funding

In this section, we discuss how a central bank funding program that offers low-cost funding might support commercial bank lending even if there is not a requirement that commercial banks increase their lending in order to obtain that cheap funding. (For ease of terminology, we refer to this as a “low-cost funding program”.) We start by describing the intuition for why such a program might be effective and then describe in broad terms ways that such a program could be structured in the United States in accordance with the requirements of the Federal Reserve Act. A variety of central bank lending programs, both in the U.S. and in other countries, represent variations on low-cost funding programs and we review the evidence on the effectiveness of these programs.

Section 3.1 How a central bank low-cost funding program might support bank lending

A low-cost funding program provided by a central bank can encourage banks to make loans by making it more profitable to do so. At their simplest, the expected profits on a loan are equal to the expected earnings from interest and fees of originating and maintaining the loan, adjusting for the risk of the

⁸ The TAF also had several other features that made it successful and helped reduce any stigma associated with using this facility. Successful bids at the auction were not distributed until a few days later so use of the TAF was not associated with a signal of having an immediate financial need. In addition, borrowers were limited in the share of the auction that they could win; that feature ensured that there were a larger number of winners and prevented any institutions from being singled out.

⁹ For an overview of the Federal Reserve's emergency lending authority see, for instance, Sablik (2020).

loan, minus the expected interest costs associated with obtaining the resources to fund the loan.¹⁰ If the central bank offers low-cost funding that reduces the expected costs of resources to fund the loan, then the expected profitability of lending will increase. When those expected profits from lending are higher, the commercial bank is more likely to extend a loan (assuming capital and leverage requirements do not constrain the bank).

One can get a sense of the funding costs faced by banks by looking at the rate they pay on savings deposits, an important source of funding for many banks.¹¹ We construct a measure of the interest rate on savings deposits using information from the quarterly reports of income and condition filed by banks (also known as the Call Report). The calculated savings deposit interest rate is the total interest expense that an individual bank incurred on its saving deposits divided by the average quarterly volume of such deposits, which we plot at an annualized rate in Figure 1A. The black line plots the median savings deposit rate across banks in a given quarter, and the dashed blue and dashed red lines plot the 25th and 75th percentiles of banks' savings deposit rates in a given quarter, respectively. The figure highlights the significant heterogeneity in the interest rates banks' pay on their savings deposit rates even as deposit rates banks pay move together over time.

What matters for banks is not just the absolute level of the interest rate they pay on savings deposits funding, but how that rate compares to other interest rates at which banks may be able to borrow. In Figure 1B we plot the effective federal funds rate (EFFR) in purple as well as the difference, or spread, between the EFFR and the savings deposit rate percentiles each quarter. The federal funds rate is the overnight rate that banks pay to borrow or lend reserves, and provides a useful indicator of the marginal interest rate cost that banks pay for short-term funds. When the interest rate a bank pays on savings deposits is lower relative to the federal funds rate, so that the spread is more negative, that indicates that it is more profitable for the banks to accumulate savings deposits and make loans.¹² When the savings deposit rate is higher relative to the federal funds rate, it becomes less profitable for banks to accumulate deposits to lend.

¹⁰ Of course, there are a variety of other factors that affect the expected profitability of loan such as any expected losses should the borrower default, costs associated with monitoring the borrower, etc.

¹¹ Savings deposits are one of the largest categories of deposit funding for most banks. Savings deposit accounts are typically interest bearing, and depositors can generally withdraw savings deposits at will. As such, the interest rates banks pay on savings deposits are best compared to very short-term funding rates such as the federal funds rate or other overnight funding rates. Other deposit types, such as time deposits, which make up a significant share of deposit funding for smaller banks typically pay higher interest rates in exchange for depositors committing to keep their money invested over a defined period (e.g., one year).

¹² The interest rate banks earn on loans are often a spread over a short-term rate that tracks the federal funds rate, such as the secured overnight funding rate (SOFR) or the prime rate. Some loans carry a fixed rate of interest which is normally related to Treasury securities of a similar maturity as the loan itself plus a credit risk spread.

As can be seen in the figure, the savings deposit rate tends to be higher relative to the federal funds rate in recessions and immediately following them, and when the EFFR declines, than in times when the economy is expanding robustly. In general banks' deposit rates do not adjust one-for-one with changes in the federal funds rate, especially when monetary policy is tightening (e.g., Driscoll and Judd, 2013; and Dreschler, Savov, and Schnabl, 2017). This can be explained in part by the fact that many depositors, especially retail depositors, are not very price sensitive in their decisions on where to hold their deposits. By only adjusting deposit rates gradually to increases in the EFFR, banks are able to increase their profit margins on lending. When the federal funds rate falls deposit rates adjust downward as well, but the spread between deposit rates and the federal funds rate becomes narrower. That indicates that it is during recessions, precisely when the Federal Reserve is seeking to stimulate the economy, that use of low-cost funding program might be most helpful as bank deposits rates are more expensive relative to the federal funds rate. Indeed, the savings deposit rate was highest relative to the federal funds rate in the period following the global financial crisis, when the Federal Reserve was using other extraordinary policy measures to support the economy. Hence, it appears that a discount window program that offered funds to banks at a rate fairly close to the Federal Reserve's target for the federal funds rate would likely provide a relatively attractive source of funding during economic downturns.

As noted above, there is significant heterogeneity in the rates that banks pay on savings deposits at any point in time. The differences between these quartiles is quite notable, averaging around 70 basis points and widening to as much as 150 basis points in some quarters in the time period depicted in Figures 1A and 1B, and indicates that there will be some banks within the industry that would find a low-cost funding program particularly advantageous. If those banks were important lenders to certain parts of the economy—either for specific sectors or regions—then this lending program would be especially helpful.¹³ Using Call Report data, we find that banks in the upper quartile of the savings deposit rate distribution—the banks that might find low-cost funding from a FFLP most attractive—tend to be smaller, tend to have higher loan-to-asset and loan-to-deposit ratios, make relatively more small business loans, and are more likely to be minority-owned. For example, over the 8-year period 2012 to 2019, banks in the upper quartile of the savings deposit rate distribution (i.e., those banks with the highest cost of savings deposits funding) had on average 40 percent fewer total assets, had loan-to-asset ratio that were on average 8 percent higher, and were more than 3 times as likely to be minority-owned, compared to banks in the bottom quartile of the savings deposit rate distribution (i.e., those banks with the lowest cost of savings deposits funding).

¹³ By contrast, if deposit flows were such that low-cost funding was widely available to most banks, then this program might not provide much economic stimulus.

A low-cost funding program might provide additional support for the economy through other channels as well. Access to lower-cost, and especially term funding might encourage depository institutions to reduce the rates on the credit that they themselves extend. A study by Illes, Lombardi, and Mizen (2019) found that bank funding costs are key drivers of short-term lending rates at banks in the Banking Union and that changes in bank funding costs pass through to changes in lending rates more than the changes in the monetary policy rate of the European Central Bank. Reductions in funding costs might also have the same effect in the U.S. While it is possible that some banks might simply replace higher cost funding with lower cost funding and retain the cost savings from participating in a low-cost funding program as profits, there would be a clear incentive for a bank to also expand lending that could be financed by additional low-cost funding from the central bank program. Expanding lending would increase the overall level of profits a bank could earn in addition to profits that could be gained by simply replacing high cost funding with low cost funding.

The benefits of offering low-cost funding program to banks might be more pronounced if the program was able to ensure that low-cost funding would be available for some time. Making predictable low-cost funding available could reduce term funding costs for banks. In addition, the certainty about their funding costs over longer periods would reduce the interest rate risk that banks face. As a result, banks might be more willing to extend term loans which would in turn benefit households and businesses.

Section 3.2 Illustrative framework for how a low-cost funding program could be structured

There are several ways that a low-cost funding program could be designed. One design would be very similar to the lending facilities currently in place where the Federal Reserve stands by to provide funds at the commercial bank's discretion.¹⁴ A second design would be an auction facility that would provide a certain amount of funds, though potentially a fairly large amount of funds, at specified points in time. In considering how the programs might be designed, it is important to remember that discount window credit originated under the Federal Reserve's ordinary lending authority may have a maximum maturity of 4 months. At the same time, as noted above, the program is likely to have more substantial benefits if it is able to reduce term funding costs or provides banks assurance that low-cost funding will be available for some time.

A program designed to be similar to one of the Federal Reserve's current lending facilities would look like the primary credit program only with a lower rate and extended maturity. (Indeed, rather than establish a new lending program, the Federal Reserve could simply adjust the terms on primary credit.)

¹⁴ Subject to the approval of the lending reserve bank.

The rate at which banks could obtain funds could be set at the target rate for the federal funds rate, or, if a range for the target rate is specified, the rate at the program could be at or below the top of that range.

Banks could be allowed to borrow for extended maturities of up to four months and borrowing could be rolled-over as long as the bank was in good standing (see below). To ensure that this lending program reduces term rates, the Federal Reserve could specify that the low-cost funding would be available for a particular length of time or until certain economic conditions had been met.¹⁵ Because banks often make loans that have maturities of at least several years, announcing that access to low-cost funding would be available for an extended period roughly in line with typical loan maturities might be key for incentivizing banks to increase lending.

An alternative approach would be for the Federal Reserve to set up a series of auctions where banks could borrow funds. Successful bidders at the auction might be able to borrow funds for a relatively long period of time, such as three or four months. Such a facility might look very much like the Term Auction Facility (TAF) established in 2007. If fairly large amounts of credit were provided at the auctions, then the rate would likely be quite low, and close to whatever minimum bid rate was set. If the minimum bid rate were in turn set at or near the target for the federal funds rate, that would effectively ensure that banks would have access to cheap funds.¹⁶ If the Federal Reserve announced that the auctions would occur on a predictable schedule until a certain calendar date or until certain economic conditions were met, then that might have a significant impact on term funding costs.

Even as the Federal Reserve would be seeking to bolster the amount of credit provided by the banking system, it would be important for the Federal Reserve to be careful to manage its own risk when providing funds to banks and to avoid having the facility used to prop up troubled banks. Because of the potential for access to longer term funds, financial health requirements could be stricter than those for primary credit.¹⁷ In addition, to further manage the risk of lending for longer maturities, the Federal Reserve might impose higher haircuts on the collateral used to secure funds provided through this program.

One final, and important, consideration is that banks have access to a variety of other funding sources. For instance, many, though not all, depository institutions already have access to funding from

¹⁵ Such language could be similar to time-based or outcome-based forward guidance often used in policy announcements regarding the federal funds rate or other monetary policy tools. See Campbell, King, Orlik, and Zarutskie (2020) for a discussion of the use of forward guidance in communicating monetary policy.

¹⁶ It would likely be important for banks to feel comfortable that their bids at this auction would be successful. If there was uncertainty about the likelihood of obtaining funding, that might reduce the willingness of banks to extend longer-term loans to households and businesses.

¹⁷ On one hand, stricter eligibility requirements might reduce the number of banks eligible to participate. However, to the extent that banks were in some way able to signal participation in the program, that might also signal their credit quality.

the Federal Home Loan Banks (FHLBs). Since the FHLBs already make dependable, fairly low-cost, term funding available to depository institutions, if the loans from the Fed are simply replacing loans from the FHLBs at only a slightly lower rate, that would reduce the amount of stimulus being provided through the FFL Program.¹⁸ In addition, it is important to remember that deposits have attributes beyond their interest rates that shape banks' preferences for using them as a funding source. For instance, deposits have important relationship benefits for banks so that banks may be reluctant to shift toward other funding sources.

Section 3.3 Evidence regarding the effectiveness of low-cost funding programs

There is a variety of evidence that low-cost funding programs established by central banks can be important in supporting bank lending. Some evidence comes from March 2020 when considerable uncertainties about the Covid-19 coronavirus and efforts to contain it. At this time there was a substantial demand for liquidity and many businesses sought to draw on their lines of credit. To help enable banks to meet that demand, the Federal Reserve communicated that it would be appropriate for banks to use the discount window to meet customer needs, lowered the rate for borrowing from the discount window, extended the maturity for which banks were allowed to borrow, and enhanced the ability of banks to roll over their borrowing.¹⁹ Amid this communication and easing of borrowing terms, as well as the fact that the shock originated well outside the banking sector, banks drew relatively extensively on the discount window, with over 900 banks borrowing under the primary credit program between mid-March and mid-August of 2020.²⁰ Small banks with assets less than \$10 billion were the most frequent borrowers, while mid-sized banks with assets ranging from \$50 to \$250 billion borrowed the most in aggregate. This support of bank liquidity appeared to support loan growth during this period. According to the Federal Reserve's H.8 statistical release, loan growth in March and April 2020 surged.²¹ That surge occurred as

¹⁸ Ashcraft, Bech, and Frame (2010) find that pricing had strong effects on decisions by banks to borrow from the FHLBs versus the Federal Reserve during the 2008 financial crisis.

¹⁹ See Federal Reserve, "Federal Reserve Actions to Support the Flow of Credit to Households and Businesses," press release, March 15, 2020, at <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200315b.htm>. On March 16, 2020, the other federal banking regulators also encouraged banks under their supervision to use the discount window

²⁰ See Federal Reserve, "Quarterly Report on Federal Reserve Balance Sheet Developments," August 2020, at <https://www.federalreserve.gov/monetarypolicy/quarterly-balance-sheet-developments-report.htm>

²¹ The H.8 release can be found at <https://www.federalreserve.gov/releases/h8/current/default.htm>. See, also, Federal Reserve, June 2020 Monetary Policy Report at https://www.federalreserve.gov/monetarypolicy/mpr_default.htm.

many firms drew down their commercial credit loans at the start of the pandemic to enhance their precautionary liquidity positions.

When the TAF was being used particularly heavily in 2008, it was being offered at rates below those for which banks would have been able to obtain funding in the private market. In this way, the TAF was also serving as a low-cost funding program. Studies of the TAF have found that it was successful in promoting access to credit. In particular, Berger, Black, Bouwman, and Dlugosz (2017) find that recipient banks increased their lending overall and that there were no significant changes in loan quality or loan contract terms by either large or small banks.

The European Central Bank (ECB) implemented Long-term Refinancing Operations (LTROs) between 2008 and 2012, offering low-cost funding to banks with maturities ranging between six months and three years. Studies have found mixed evidence in terms of how much lending to businesses and households these operations encouraged, although most do find a positive effect on credit provision to the real economy. Carpinelli and Crosigniani (2018) and Crosigniani, Faria-e-Castro, and Fonseca (2019) found that the ECB's LTROs encouraged banks to buy government debt, but that lending did also increase. Jossova, Mendicino and Supera (2018) find evidence in that LTROs encouraged banks in Portugal to lend to businesses and had positive effects on real economic activity.

Section 3.4 Other considerations

Providing additional funding to depository institutions and seeking to lower their funding costs is a one form of credit policy in that the Federal Reserve would be promoting credit intermediation provided by banks relative to other forms of credit intermediation. However, the distortionary effects are likely to be fairly limited. First, an important aspect of the way that monetary policy traditionally operates is by affecting the marginal cost of bank funding by affecting their cost of borrowing in the federal funds market. Hence a program to affect bank funding costs represents only a modest expansion of federal reserve footprint in bank funding. Second, banks are still making the choice about where to allocate credit. Depository institutions currently provide credit to many parts of the economy and this program does not seem likely to result in a substantial shift into a particular class of credit. Third, banks are already fairly heavily regulated institutions and the bank supervisors are likely to discourage banks from using any funds received from the Federal Reserve to engage in excessive risk taking.

Programs that provide low-cost funding to banks might be particularly effective if the need for monetary policy stimulus arises at least in part because of stress in the financial sector. In such situations, bank funding costs are likely to especially elevated so that more banks would find such a lending program

to be attractive while for other banks, the potential boost to profitability from using the facility to extent loans could be increased. Moreover, the enhanced access of banks to predictable low-cost funding may also calm financial markets and reassure investors that might otherwise view these financial intermediaries as vulnerable to lack of stable funding. In such situations, however, it would be particularly important for the Federal Reserve to ensure that it is providing funds to financially healthy depository institutions.²²

Another advantageous feature of a low-cost lending program is that it would be relatively straightforward to wind down especially because the funds provided by the Federal Reserve would have a defined maturity date. In the case that funds had been provided through an auction facility, as the end of an announced series of auctions nears, the Federal Reserve could simply announce auctions of diminishing size and increasing minimum bid rates. In the case of a discount window program with easier pricing and longer than usual allowed maturities, the Federal Reserve could begin to slowly normalize these terms.

Section 4. Programs that link access to low-cost funding to lending by banks

Rather than simply providing low-cost funding, there may be situations in which the Federal Reserve might want to encourage banks to extend credit to finance particular activities or to particular categories of borrowers (or to extend more loans generally rather than have the funds used, for example, to invest in securities). That might be the case if certain types of activities or categories of borrowers were viewed as particularly important for the economic recovery or if there were concerns that other disruptions to credit markets were disproportionately affecting certain borrowers or generally holding back bank lending. For example, the Federal Reserve might want to support lending to small businesses or support household purchases of durable goods, such as automobiles. In this case, the Federal Reserve could design a discount window lending program for banks that would offer low-cost funding conditional on particular outcomes, such as making loans to the targeted group. Such programs are often referred to as funding for lending programs. Both the ECB and the Bank of England have used funding for lending programs (as discussed below).

²² Providing term funding might also support the ability of institutions to comply with liquidity regulation, such as the liquidity coverage ratio (LCR). The LCR requires banks to hold high-quality liquid assets (HQLA) in fixed proportions to liabilities that mature within 30 days. If the Federal Reserve was lending reserves—a form of HQLA—through loans with a maturity of more than 30 days, then these loans would support a borrowing institution’s LCR. Enhancing the ability of banks to meet this liquidity regulation, might make the banks more willing to hold fewer liquid assets and to extend more loans. Providing this support might be especially valuable if the need for additional monetary policy stimulus is associated with financial stress.

The Federal Reserve might want to provide extra incentives for banks to extend credit if policymakers are concerned about the availability of credit to some borrowers. It has traditionally been the case that banks tend to tighten lending standards during economic downturns. Evidence of this can be seen in the Senior Loan Officer Opinion Survey (SLOOS). In the survey, loan officers are asked whether they have tightened or eased lending standards or lending terms for particular types of customers over the past three months. As shown in Figures 2A and 2B, during recessions, banks report tightening lending standards for business customers (Figure 2A) and increasing loan rates relative to their cost of funds (Figure 2B).

Consistent with tighter lending standards and terms for business customers, commercial and industrial loans on banks' books tend to fall during recessions (as shown in Figure 3A). To be sure, some of this decline in loans outstanding represents a fall in the demand for credit. Nevertheless, research has found that lending supply by banks does play a significant role in both lending volumes and economic outcomes (Lown and Morgan, 2006; Bassett, Chosak, Driscoll, and Zakrajsek, 2014). To the extent that a FFL program could incentivize banks to continue to extend credit, then that might help push back against some of the effects of tighter credit supply during economic downturns.

Of course, one of the reasons that banks tighten lending standards and terms in recessions is out of concerns about borrower credit quality. In the SLOOS, one of the most common reasons for tightening lending standards is a "less favorable or more uncertain economic outlook." Delinquency rates and charge-off rates on bank loans tend to rise following the onset of a recession (Figure 4). The tightening of lending standards and terms reflects the efforts by banks to avoid incurring even larger losses. As noted by English and Liang (2020), these legitimate concerns about credit quality also have implications for the design of a funding for lending program. If banks are tightening lending standards for the targeted group of borrowers out of expectations that lending to those borrowers will result in an increase in the losses that they will experience, then the funding incentive offered to the banks will have to be sufficiently large to offset those expected losses. Otherwise, banks would likely decline to participate in the FFL program.

Section 4.2 Illustrative framework for how a funding for lending program could be structured

Designing a FFL program that would attract bank participation is a bit more complicated than a low-cost funding program, but there are ways that it could still be done under normal (Section 10B) discount window lending authority. One essential feature of the program would be to set up a linkage between access to low-cost funding provided by the central bank and the lending that each bank does to the target group. In this section, we outline a few possible ways of structuring a funding for lending

program and highlight a few design parameters that could be adjusted to affect the incentives of banks to lend. These are meant to be illustrative of some of the options available to policymakers; there are other ways of structuring such programs. In these examples, it is most straightforward to discuss them in terms of bilateral lending programs, but it would also be possible to use an auction-based program.²³

One basic FFL program would be to offer the banks one dollar of low-cost funding for each dollar of new lending done by the bank. Many of the same issues that were relevant for the low-cost funding programs discussed above would also be relevant here. For instance, the rate and other terms at which banks could obtain funding through a FFL would have to be attractive. That would need to be true relative to the other Federal Reserve liquidity programs such as primary credit, to funding available from the FHLBs, and relative to the interest rates that banks pay on their deposits.²⁴

In addition, there are issues associated with encouraging lending to the targeted group that would need to be considered. As noted above, lending to the targeted groups may well involve lending to groups in which credit risk issues may be a concern. The possibility of losses may limit the amount of additional loans that a bank would want to make even if doing so would allow the bank more access to low-cost funding. An example of some tradeoffs associated with participating in this simple funding for lending program are illustrated in Table 1A; similar tables will be used below to illustrate the implications of changes to various parameters of program design.²⁵

Example lending amounts that might be extended by the commercial bank are shown in column 1; depending on the size of the bank, these dollar amounts could represent thousands of dollars, millions of dollars, or hundreds of millions of dollars. As indicated in column (2), each row of the Table represents an increase in loans made of \$50. We refer to these additional loans as an additional tranche of loans. The rate at which the bank borrows from the central bank is shown in column (3). In this simple FFL program, the commercial bank is always able to obtain funding from the central bank at an interest rate of 0.20 percent. The expected loss rate on each new tranche of loans made is shown in column (4). We assume that the bank would make loans to the highest quality borrowers first, the second highest

²³ For instance, one approach would be to structure the program such that meeting the lending target would allow an institution access to an auction facility. However, the lack of certainty about access to funding even if the lending target were met would likely strongly disincentivize participation.

²⁴ The importance of these other interest rates, as well as relationship benefits that deposits provide, would depend on whether the FFL program would be expected to replace existing funding or would be expected to expand total funding.

²⁵ For simplicity, the example abstracts from a wide range of issues that would be important in the real world. For instance, neither capital requirements nor customer relationships are considered. Working through those, and other, issues would be important when designing an actual FFL program.

quality borrowers next, etc. so that the loss rates get higher and higher as the bank lends to increasingly risky borrowers.²⁶

The interest earnings on the loans made is shown in column (5). For simplicity and to provide tangible numbers, we assume that the interest rate on all loans extended by the commercial bank is 5 percent and that all new loans are funded using the FFL program. Thus, the earnings of the bank will reflect the amount of loans extended (column 1) multiplied by the interest rate it earns on those loans (5%) minus the cost of funding those loans through the program (0.2%). Hence in the third row of column (5), the earnings of the bank are: $\$150 * (0.05 - 0.002) = \7.2 . Presumably in a more realistic setting, the bank would charge higher rates on riskier loans to account for the additional credit risk. Allowing for that behavior significantly complicates the example without adding to the intuition about the implications of the program design adjustments we illustrate below.

The losses the bank might expect to incur are shown in column (6). The loss rates noted in column (4) apply to the additional tranche of loans made as indicated in column (2). Thus to compute the total losses on the \$150 loans in the third row, one would look at the loss rate from the first row of 0.1% on the first \$50 loan tranche, plus the loss rate of 0.4% from the second row on the second \$50 loans made, plus the 0.9% loss rate on the third tranche of \$50 in loans made. That provides the loss of -\$0.70 shown in column (6).

Total net earnings from lending are shown in column (8) and represent the earnings from net interest income minus loan losses. (In this example, there are no gains from replacing expansive funding used to back other loans so column (7) is zero; this column will be used more below.)

The total net earnings shown in column (8) provide an indication about how many loans that the commercial bank might prefer to make. A profit maximizing bank might, for instance, seek to maximize net earnings. In the example shown in Table 1A, the highest total net earnings are in the sixth row in which the bank extends \$300 in loans, highlighted in blue. At lesser amounts of loans extended, the prospect of higher interest earnings would make the bank want to extend more loans. At higher amounts of loans extended, the losses on lending to riskier borrowers would outweigh the gains made from increases in interest income.

As this example indicates, the possibility of losses on additional loans extended would restrain the amount of loans that banks would be willing to lend to the targeted group. It might be possible however to adjust the program parameters to provide an additional incentive to lend more.

²⁶ Note that we have assumed that the expected loss rate increases at an increasing rate. Having the loss rate increase at a faster than linear pace is helpful in our stylized example.

Alternative approach: providing unlimited funds

One approach that would affect the incentives of banks to lend to a targeted group would be to increase the quantity of fund offered under the FFL program and offer an unlimited amount of low-cost funding for banks that reached a particular lending target. In this case, the bank would have a very strong incentive to reach that target. However, the bank would not have any incentive to lend more once that target was reached. Moreover, banks that were concerned that they were unlikely to lend to enough of the targeted borrowers to reach the target, might not have much incentive to participate in the funding for lending program at all. As a consequence, this approach likely would have a very stark impact – either banks increase lending by exactly the targeted amount or they provide no additional loans. Hence setting the target so that it would be feasible for many banks, but would sufficiently incent them relative to what they might have done anyway would be particularly important.

Alternative approach: multiple dollars of funding for each dollar loaned

Another approach that would be more incremental, would be to offer multiple dollars of low-cost funding for each dollar of loans made to the targeted group. The additional amounts of low-cost funding could be used to substitute for higher-cost funding that the bank uses to fund its other operations. Being able to replace that funding would enhance the benefits of participating in the FFL program and of making loans to the targeted group. Because the amount of cheap funding provided by the Federal Reserve is linked to the amount of loans to the targeted group made by the bank, there is an additional incentive for the bank to make more small business loans. Hence, central bank is now setting two levers to incent banks to lend to small businesses: first, the cost of the funds it provides and second the amount of funds that it provides that could be used to replace more expensive funding that the bank had been using to support other lending activities.

For concreteness and to illustrate the incentive provided by this approach, we modify the example presented in Table 1A so that the FFL program provides \$2 of funding for each \$1 of new loans originated to the targeted group. (This multiplier could easily be set higher in order to provide an even stronger incentive.)

As before, we assume that all funds provided under the FFL program carry the same cost as before of 0.20 percent. Since the bank now obtains more funds than it needs to fund the loans to the targeted group, we assume that the bank uses these additional funds to replace existing higher-cost funding that support other loans (or other assets) of the bank which boosts the earnings of the bank on those assets. For simplicity, we assume that the bank pays 0.50 percent on all funds that are replaced.

The more cheap funding the bank can obtain from the Federal Reserve to replace higher costs deposits the more it can increase earnings. We show how this affects the earnings of the bank and incentives to participate in the FFL program in Table 1B. The only change in the table relative to Table 1A is that now column 7 reports the amount to which earnings increase because the commercial bank now can replace higher cost funds with lower-cost funds from the Federal Reserve. For instance, in line 3, the bank has made \$150 in new loans and so receives \$300 in funding; \$150 of that funding goes to the targeted group and \$150 can be used to replace existing funding. The gain on replacing existing funding is that \$150 multiplied by the difference between the rate previously paid on existing funding (0.50 percent) with the rate paid on funding from the central bank (0.20 percent) which in this case is \$0.45, the amount shown in column 7.

Comparing Tables 1A and 1B, we observe that the bank now has higher net earnings for each dollar amount of loans to the targeted group that it extends. As shown in our example, the additional earnings that the bank makes by replacing existing expansive funding make it worthwhile for the bank to extend loans to more loans than before, even though the credit quality on these additional loans is lower. In Table 1B, the bank has the greatest net earnings when it makes \$350 in loans, the seventh row of the Table, to the targeted group.

Alternative approach: lower interest rate on funding when the bank lends more

An alternative incentive scheme would be one in which the interest rate on the funding provided to the bank declines depending on how many loans to the targeted group that the bank originates. Moreover, program could be structured so that the bank would pay the lower rate on all the funding that at receives under the FFL program not just on each additional dollar of funding obtained. In this case, the lever is again the interest rate on funding, but the lever is set up to be more potent; because each additional dollar of lending lowers the rate not only on that dollar, but on all previous dollars of lending, the bank has an extra incentive to lend that additional dollar (see Arseneau and Rappoport (2022) for a detailed discussion of the incentive provided by this structure).

For illustrative purposes, we consider the following concrete example very similar to the previous examples and shown in Table 1C. The bank can borrow one dollar from the central bank for each dollar of additional loans to the target group that the bank originates (similar to our original illustrative programs). If the bank originates between \$1 and \$50 dollars, corresponding to the first tranche of lending and shown in Row 1 of the table, then the bank pays a rate of 50 basis points on all the funding it receives under the FFL program. If the bank originates between \$51 and \$100 in new loans to the target

group, the second tranche in Row 2, then the bank pays 45 basis points on all the funding it receives under the FFL program. Continuing that pattern, in this example, the rate at which the bank obtains funds under the FFL program decreases by 5 basis points for each additional 50 dollars of loans to the targeted group that the bank makes. The resulting relationship between the amount lent and the interest rate at which the bank can obtain funds under the FFL program, also referred to as the z-curve, so named because a graphical representation of the bank's funding cost as a function of its lending amount looks like the letter "z".

How this affects the bank in our simple example is shown in Table 1C. Here the benefits to the bank from being able to reduce the interest rate it pays on funds obtained under the FFL program lead it to make more loans than under the simple program. This incentive occurs because the more funding that the bank has obtained under the FFL program, the greater the gain from extending an extra dollar of small business lending to lower the rate paid on all funds obtained. This can be seen by comparing column 5 in Table 1A to column 5 in Table 1C. In Table 1A, for each additional 50 dollars that the bank lends that generates the same additional amount of earnings; the earnings go up by \$2.4 each time the bank moves down one row in the Table regardless of how much the bank lends. By contrast, from Table 1C, under the z-curve, the amount that the bank earns increases by more the further down the table it goes because the lower rates apply to progressively more and more funding. For instance, increasing lending from 50 dollars to 100 dollars increases earnings by 2.33 dollars while increasing lending from 300 dollars to 350 dollars increases earnings by 2.58 dollars.²⁷ These greater increases in earnings are important for offsetting the accelerating deterioration in credit quality as the bank makes more loans. As a result, the bank has the greatest net earnings when it makes \$350 in loans, the seventh row of Table 1C, to the targeted group.

To construct our example and to allow comparisons to the other examples, it was more straightforward to discuss the z-curve approach in terms of dollars. However, to structure such a program to be able to apply it to a wide range of bank sizes, it would likely be more appropriate to frame the z-curve in terms of the percent by which a bank increased its lending to the target group relative to amount of loans that a bank had on its books to the target group at some point in time, for instance the time the program was announced. Figure 5 shows an illustrative example of such a z-curve. In this case, the bank may borrow at the primary credit rate if its loans contract 3 percent. For loan growth between -3 percent

²⁷ The reason for the larger increase is that the resulting lower interest rate applies to a larger amount of funding. When moving from making \$50 of loans to \$100 of loans the interest rate declines from 0.45 percent to 0.40 percent so that the bank pays 0.05 percent less on that first \$50 of funding than it would have otherwise. When the bank increases lending from \$300 to \$350 the interest rate moves from 0.20 percent to 0.15 percent so that the bank pays 0.05 percent less on \$300 of funding than it would have otherwise.

to +3 percent, the bank may borrow at an ever declining rate, which reaches zero basis points once loan growth hit +3 percent. Such z-curve structure might be appropriate in a low-rate environment in which economic activity and lending has slowed. Such a z-curve may provide an incentive for banks to not deleverage or to deleverage by less than otherwise absent the FFL program.

General design aspects

These are illustrative examples of how the pricing of funds provided in a FFL program and the quantity of funds provided can be used as levers to create potent incentives to encourage banks to increase their lending. Of course these are not the only possible designs for these levers. Moreover, policymakers could combine these approaches and use both quantity and price levers. For instance, it would be straightforward to offer multiple dollars of funding for each dollar of loans made to the target group while using a z-curve approach to determine the interest rate on that funding.

There are however a variety of other aspects of program design that would need to be taken into account. For instance, one aspect is the time over which credit from the Federal Reserve is extended to the bank and over which lending by the bank to the targeted set of borrowers is measured. The Federal Reserve faces an important constraint here in that it is only allowed to extend loans to depository institutions for a maximum of four months. As with the low-cost funding program described above, one approach would be to allow banks to roll over funds as long as they fulfilled some program terms and remained in good condition. Providing term funding to banks might be especially beneficial as bank customers may need financing for an extended period before the economy normalizes. A longer term for funds provided to the bank could make the program more attractive to banks and also encourage them to extend longer-term credit to their own customers

The program design would also have to consider the timing of when the lending is expected to occur versus when the loan rate is set. One approach would be to provide access to low-cost funds for a specific period of time for lending that been done previously. For example, if a bank had grown their loan book over the past 4 months by a particular amount, then the bank would have access to low-cost funding for the next four months. Another approach might be to provide access to the low-cost funds at the start, but only allow renewals at that low rate if the bank met certain lending benchmarks.

The requirements regarding the amount of loans that banks would need to provide in order to obtain the benefits provided under the FFL program would need to be carefully set. These requirements would need to be low enough to achieve so that banks would be willing to participate, but also sufficiently high so that banks would be motivated to make more loans than they would in the absence of

the program. As noted above, this would be especially important if there are certain thresholds built into the program where there are stark changes in program benefits depending on whether that threshold has been achieved.

It is worth noting that, while any funding provided by the central bank under the program must be collateralized, that collateral need not be loans to the targeted group. Any collateral normally accepted at the discount window might be used. Indeed, if the program is offering multiple dollars of funding for each dollar of lending to a targeted group, then it would be necessary for a wide variety of collateral to be used as collateral for the program.

Section 4.3 Evidence regarding the effectiveness of low-cost funding programs

There are a variety of programs that provide insights into how effective a funding for lending program might be. One example is the seasonal credit program of provided by the Federal Reserve. This program, established in the 1970s, makes modest amounts of low-cost funding available to smaller depository institutions that experience considerable seasonal swings in their balance sheets with the intention that the funds obtained from the Federal Reserve better enable the banks to meet those seasonal demands. This program is structured as a backward-looking program in that eligibility for low-cost funding in the current year depends on the seasonality of the bank's balance sheet in previous years; but the business model of many of these institutions is such that they will experience the same seasonal change in loan demand each year. The interest rates that the Federal Reserve charges on this funding are broadly in line with money market rates but are typically below the rates that these depository institutions are able to obtain funds. Recent research by Kandrac (2021) finds that the establishment of the seasonal credit program was indeed valuable in supporting banks' ability to lend and that there were improvements in economic outcomes, such as higher rates of small business formation and more rapid employment growth in communities in which eligible institutions were located.²⁸ Part of the success of the program may reflect the size of the subsidy being provided. Kandrac (2021) reports that the interest rate on loans from the seasonal credit program averaged about 2.75 percentage points below the rate banks would pay to borrow funds in the federal funds market, which suggest that the funding subsidy at that time was fairly substantial.

²⁸ In many ways, this evidence blurs the lines between a program in which funding is offered for engaging in particular lending and a program that offers low-cost funding. Especially at first, when eligibility was dependent on lending occurred prior to the inception of the program, it may have more resembled a program simply involving access to low-cost funding. Once it became clear that access to funding over time would depend on continued lending behaviors, it would become more like a program in which access to low-cost funds depends on those lending behaviors.

Another example is the Small Business Lending Fund (SBLF) was established by the 2010 Small Business Jobs Act and administered by the Treasury Department. This fund provided preferred equity to banks with the rate charged on that equity a function of the growth rates of the banks' small business lending. The program was structured so that the initial rate on the resources provided to banks by the SBLF was 5 percent. That rate fell to 1 percent if a bank's small business lending increased by 10 percent or more, but the rate could rise to 7 percent if the bank's lending did not increase in the first two years. Amel and Mach (2017) find that the SBLF was only used by banks that were already growing their small business lending quite quickly; they speculate that only those banks that were confident enough that they would be able to expand lending sufficiently to receive the lower cost of funds participated in the program. Consequently, they do not find this this program had a meaningful effect in supporting small business lending.

The Paycheck Protection Program Liquidity Facility (PPPLF) could be considered as a funding for lending program in a very broad sense, although one possessing unique characteristics given the attributes of the Paycheck Protection Program (PPP) loans that it supports. PPP loans were made by financial institutions such as commercial banks, FinTech firms, and small business lending companies, to eligible small businesses. Financial institutions were incentivized to participate because the Small Business Administration guarantees of both principal and interest of the PPP loans, so the lender incurred no credit risk, and the SBA provided an origination fee. Small businesses had an incentive to participate because the interest rate on PPP loans was set at low level, 1 percent, and the principal could be forgiven if the small business spent the money on certain items, such as payroll. The Federal Reserve established the PPPLF to bolster the ability of financial institutions to extend PPP loans. The PPPLF might be thought of as a FFL program because it offers low-cost funding (the rate on PPPLF funds is 0.35 percent) for amounts and maturities that match those of the PPP loans, but only the PPP loans can be used as collateral so financial institutions must originate PPP loans in order to obtain funds from the PPPLF. Anbil, Carlson, and Styzinski (2021) find that banks that were more familiar with process of pledging loan collateral to the Federal Reserve were more likely to participate in the PPPLF and, in turn, tended to originate more PPP loans than other banks. That finding suggest that the PPPLF was successful in encouraging banks to originate more PPP loans.

The Bank of England tried a couple different approaches for funding for lending programs. The first approach, the Funding for Lending Scheme (FLS), was established in 2012. Under this scheme, banks could borrow short-dated government securities from the Bank of England when pledging eligible collateral; banks could then pledge those securities to borrow in the repo market. The fee that banks paid to borrow government securities depended on the extent to which they had expanded their lending. A

modification to this program in 2013 allowed banks to borrow more government securities from the Bank of England if they had expanded their lending to small businesses. Assessments of the FLS are mixed. Churm (2021) finds evidence that the program reduced bank funding costs and boosted lending. However, Havrylchyk (2016), who looks for changes in behavior associated with the 2013 program modification, does not find any evidence that that the program meaningfully changed behaviors.

A second program by the Bank of England launched in 2016, the Term Funding Scheme, provided reserves to banks where the rate for obtaining those funds was again a function of overall loan growth (without a focus on a particular market segment. In this case, the base rate for loans provided by the Bank of England was equal to their normal lending rate (25 basis points when the program was started) and would increase by 5 basis points for each 1 percentage point decline in lending to households and business by the banks. A Bank of England study of the effects of this lending program suggests that it was successful in reducing rates banks charged on loans, especially on residential mortgages (Dinelli Nardi and Nwankwo, 2018).²⁹

In 2014 and 2016, the European Central Bank implemented Targeted Long-term Refinancing Operations (TLTROs) facilities that provided term funding of up to four years to banks at terms that were favorable relative to market rates conditional on sufficient loan growth at the participating banks. In particular, the 2016 TLTRO program allowed banks to borrow at rates as low as the minus 0.40 deposit rate. Recent research suggests that these facilities served to reduce borrowing costs and had a positive effect on loan growth (Bennetton and Fantino, 2018; Vergote, 2018, and Desislava and Garcia-Posada, 2019). In response to the economic disruptions associated with the pandemic, the ECB also indicated that it would make the rates on its targeted longer-term financing operations more attractive. These lower rates should support the ability of banks to keep lending to small businesses. (Effort to support lending to businesses by offering banks low cost loans from the central bank would be similar to the above noted proposals that the Federal Reserve restart the TAF or lower the primary credit rate.)

²⁹ The Bank of Japan also established a funding for lending program, called the Loan Support Program. (See the description of the Bank of Japan's Loan Support Program at https://www.boj.or.jp/en/mopo/measures/mkt_ope/len_b/index.htm/) One part of that program, the Growth-Supporting Funding Facility (GFF) extended collateralized funds to financial institutions at a low fixed interest rate conditional on the financial institution providing loans with a maturity of at least one year to pre-determined sectors that were expected to support Japan's long-term economic growth. A second part of that program, the Stimulating Bank Lending Facility, on the other hand, provided long-term funds at a low interest rate to financial institutions that increased their lending up to an amount equivalent to the net increase in their lending with a view to encouraging them to take more aggressive action and helping stimulate the proactive credit demand of firms and households (Ishida, 2013).

Section 4.4 Other considerations

A funding for lending program involves the Federal Reserve much more in the credit allocation decisions of financial institutions. As such, an important consideration would be the targeted set of borrowers and the reasons for targeting those borrowers. For instance, some analysts have suggested that small and medium-sized enterprises (SMEs) might be especially affected amid economic downturns and obtaining financing to support new business formation, which can be an important component of recovery, can be especially challenging during these periods (Duygan-Bump, Levkov, and Montoriol-Garriga, 2015; Fort, Haliwanger, Jarmin, and Miranda, 2013; Hancock and Wilcox, 1998). Household borrowers might also need additional access to credit amid higher levels of unemployment. Consequently, these borrowers might be more likely to benefit from a targeted lending facility.

Alternatively, a funding for lending program could simply seek to support lending generally and be based on a broad expansion of lending (or on the prevention of a contraction of lending). As noted in Section 4, banks tend to tighten lending standards and terms in economic downturns in ways that contribute to contractions in loans on their books. A funding for lending program that leaned against that tendency could be helpful in promoting credit availability and would mitigate concerns that the Federal Reserve was engaging in credit allocation.

There are also more practical concerns associated with challenges in determining whether the banks using the program are actually increasing their lending. For instance, the program would have to articulate whether the rolling over of a maturing loan would count as a new loan. Not accounting for such activity might bias the program against a bank supporting existing known customers; that could be counterproductive if some of these customers needed a new loan but now actually found that loan slightly more difficult to obtain because the bank was targeting a different set of clients. On the other hand, a program that simply incentivizes a bank to refinance existing loans may not generate much support for the targeted group.³⁰ Relatedly, a funding for lending program that focuses on the loans on banks' balance sheets might provide an incentive for financial institutions to keep on their balance sheet loans that they might otherwise have securitized. That would be especially be the case if the categories of loans included in the target for loan growth included loans that are often securitized (such as residential real estate loans). Hence it might be more effective to implement a funding for lending program to target particular types of

³⁰ Concerns about measuring compliance or success would likely be magnified if the program needed to be launched quickly. In that case, the method of assessing compliance would have to be very simple, such as whether total loans outstanding to the targeted borrowers were increasing or at least holding constant. Further, the types of borrowers that could be targeted would likely be limited to types of borrowers that the banks are asked to identify on regulatory filings. (For instance, banks are asked to track business loans with "original amounts of \$1,000,000 or less" for the call report; these are presumed to be to small businesses. Categories of loans to households that are tracked on the call report include credit card loans, automobile loans, and other revolving credit plans).

borrowers where this concern is minimized or to at least exclude loan categories where this concern is particularly prominent.

Section 5. Conclusion

The provision of low-cost funding by the central bank as a tool to support bank lending in challenging economic situations has been used effectively by foreign central banks and to a limited extent by the Federal Reserve and other public sector institutions in the United States. This paper describes a variety of program design choices that would need to be considered should policymakers decide that such a program is warranted.

One of the key design choices is whether bank access to low-cost funding would be contingent on providing loans to a targeted group of borrowers. Simply providing low-cost funding without requiring a bank to meet a lending target minimizes the role of central banks in credit allocation and is broadly similar to how monetary policy works generally. However, there may be borrowers who are both particularly important for economic activity and who might face particular challenges in accessing credit during economic downturns. If that is the case, then promoting access by these borrowers to bank credit might be an important goal of the program and making access to low-cost funding conditional on providing credit to these borrowers through the funding for lending program would be useful.

As described in this paper, there are several mechanisms that can be used to incentivize banks to lend to a targeted group. One incentive mechanism is a quantity-based incentive program where banks are offered multiple dollars of low-cost funding for each dollar of lending to the targeted group. A second mechanism is price-based where the central bank offers funding at lower rates the more lending to the targeted group that the bank does.

In addition to these broad design choices, this paper has highlighted a variety of practical considerations that would affect how a FFL program would need to be structured. Banks have access to a variety of funding options and, to provide any incentive for banks to participate, the funding provided by the central bank would need to be attractively priced relative to these other options. Measuring lending to the targeted group, in the case that such lending is required for participation in a the program, also pose challenges. Any FFL program in the United States would have to follow the rules set forth in the Federal Reserve Act for how the discount window may operate.

The Federal Reserve's discount window is a versatile tool. In normal times, it functions primarily as a liquidity backstop to prevent disruptions in payment system and helps depository institutions manage their liquidity risks efficiently. In times of stress, it can be an important for ensuring that banks have

access to funding to support their customers and are not forced to withdraw credit due to liquidity issues. The seasonal credit program has been important for helping banks accommodate large seasonal swings in the need for credit on their part of their customers. As described in this paper, it is also possible that a funding for lending program utilizing the discount window could be a useful tool in situations where the Federal Reserve has need of extra-ordinary tools to support the economy and achieve its goals of maximum employment and price stability.

References

Amel, Dean and Traci Mach (2017). “The Impact of the Small Business Lending Fund on Community Bank Lending to Small Businesses,” *Economic Notes*, vol. 46: 307-327.

Arseneau, David and David Rappaport (2022). “Optimal Design of Funding for Lending Programs,” *Board of Governors of the Federal Reserve System* mimeo.

Ashcraft, Adam, Morten Bech, and W. Scott Frame (2010). “The Federal Home Lona Bank system: The Lender of Next-to-Last Resort?,” *Journal of Money, Credit, and Banking*, vol. 42(4): 551-583.

Bassett, William F., Mary Beth Chosak, John C. Driscoll, and Egon Zakajsek (2014). “Changes in Bank Lending Standards and the Macroeconomy,” *Journal of Monetary Economics* vol. 62:23-40.

Bennetton, Matteo and Davide Fantino (2018). “Competition and The Pass-Through of Unconventional Monetary Policy: Evidence from TLTROs,” *Bank of Italy Working Paper* 1187.

Berger, Allen, Lamont Black, Christa Bouwman, and Jennifer Dlugosz (2017). “Bank Loan supply Responses to Federal Reserve Emergency Liquidity Facilities,” *Journal of Financial Intermediation*, vol. 32: 1-15.

Campbell, Jeffrey, Thomas B. King, Anna Orlik, and Rebecca Zarutskie (2020). “Issues regarding the Use of the Policy Rate Tool,” *Federal Reserve Finance and Economics Discussion Series* 2020-070, Washington: Board of Governors of the Federal Reserve System.

Carlson, Mark, Stefania D’Amico, Cristina Fuentes-Albero, Bernd Schlusche, and Paul Wood (2020). “Issues in the Use of the Balance Sheet Tool,” *Federal Reserve Finance and Economics Discussion Series* 2020-071, Washington: Board of Governors of the Federal Reserve System

Carlson, Mark and Jonathan Rose (2017). “Stigma and the Discount Window,” FEDS Notes No. 2017-12-19, <https://doi.org/10.17016/2380-7172.2108>, Washington: Board of Governors of the Federal Reserve System.

Carpinelli Luisa and Matteo Crosigniani (2018). “The Design and Transmission of Central Bank Liquidity Provisions,” working paper.

Churm, Rohan, Michael Joyce, George Kapetanios, and Konstantinos Theodoridis (2021).

“Unconventional monetary policies and the macroeconomy: The impact of the UK’s QE2 and funding for lending scheme,” *Quarterly Review of Economics and Finance*, vol. 80: 721-4736.

Crosigniani, Matteo, Miguel Faria-e-Castro and Luis Fonseca (2019). “The (Unintended?) Consequences of the Largest Liquidity Injection Ever,” *Journal of Monetary Economics*, vol. 112: 97-112.

Desislava C. Andreeva and Miguel García-Posada, (2019). “The Impact of the ECB’s Targeted Long-term Refinancing Operations on Banks’ Lending Policies: The Role of Competition,” *Banco de España Working Papers* 1903.

Dinelli Nardi, Bianca and Chukwuma Nwankwo (2018). “The Term Funding Scheme: design, operation, and impact,” *Bank of England Quarterly Bulletin*, Q4, pp. 1-8.

Dreschler, Itamar, Alexi Savov, and Philipp Schnabl (2017). “The Deposits Channel of Monetary Policy,” *Quarterly Journal of Economics*, vol. 132(4): 1819-1876.

Duygan-Bump, Burcu, Alexey Levkov, and Judit Montoriol-Garriga (2015). “Financing Constraints and Unemployment: Evidence from the Great Recession,” *Journal of Monetary Economics* vol. 75: 89-105.

English, William and J. Nellie Liang (2020). “Designing the Main Street Lending Program: Challenges and Options,” *Hutchins Center Working Paper* 64.

Federal Reserve (2021). *The Fed Explained: What the Central Bank Does*, Federal Reserve System: Washington, DC.

Fort, Teresa, John Haltiwanger, Ron S Jarmin, and Javier Miranda (2013). “How Firms Respond to Business Cycles: The Role of the Firm Age and Firm Size,” *IMF Economic Review* vol. 61 (3): 520-59.

Goodfriend, Marvin (2011). “Central Banking in the Credit Turmoil: An Assessment of Federal Reserve Practice,” *Journal of Monetary Economics*, vol. 58: 1-12.

Hackley, Howard (1973). *Lending Functions of the Federal Reserve Banks: A History*. Board of Governors of the Federal Reserve, Washington DC.

Hancock, Diana, and James A. Wilcox (1998). “The ‘Credit Crunch’ and the Availability of Credit to Small Businesses,” *Journal of Banking and Finance* vol. 22: 983-1014.

Havrylchyk, Olena (2016). "Incentivising Lending to SMEs with the Funding for Lending Scheme: Some Evidence from Bank-level Data in the United Kingdom," OECD Economics Department Working Papers, No. 1365.

Illes, Anamaria, Marco Lombardi, and Paul Mizen (2019). "The Divergence of Bank Lending Rates from Policy Rates after the Financial Crisis: The Role of Bank Funding Costs," *Journal of International Money and Finance*, vol. 93: 117-141.

Ishida, Koji (2013). "Economic activity and prices in Japan and monetary policy," *BIS speech summary* <https://www.bis.org/review/r131016b.pdf>.

Jossova, Martina, Caterina Mendicino and Dominik Supera (2018). "Rollover Risk and Bank Lending Behavior: Evidence from Unconventional Central Bank Liquidity," unpublished working paper.

Judson, Ruth and John C. Driscoll (2013). "Sticky Deposits," *Federal Reserve Finance and Economics Discussion Series* 2013-080, Washington: Board of Governors of the Federal Reserve System.

Kandrac, John (2021). "Can the Federal Reserve Effectively Target Main Street? Evidence from the 1970s Recession," *Finance and Economics Discussion Series*, 2021-61.

Lown, Cara, and Donald P. Morgan (2006). "The Credit Cycle and the Business Cycle: New Findings Using the Loan Officer Opinion Survey." *Journal of Money, Credit & Banking*, vol. 38: 1575-1597.

McAndrews, James; Sarkar, Asani; Wang, Zhenyu (2017). The Effect of the Term Auction Facility on the London Interbank Offered Rate," *Journal of Banking and Finance*, October, vol. 83: 135-152.

Madigan, Brian and William Nelson (2002). "Proposed Revision to the Federal Reserve's Discount Window Lending Programs," *Federal Reserve Bulletin*, July, pp. 313-319.

Sablik, Tim (2020). "The Fed's emergency lending evolves," *Econ Focus*, Federal Reserve Bank of Richmond, second/third quarter, pp. 14-17.

Vergote, Olivier (2018). "Who Takes the ECB's Targeted Funding?" unpublished working paper.

Wu, Tao (2011). "The U.S. Money Market and the Term Auction Facility in the Financial Crisis of 2007-2009," *The Review of Economics and Statistics*, May, vol. 93(2): 617-631.

Table 1A. Earnings under the “simple” funding for lending program

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total loans extended (\$)	Additional tranche of loans (\$)	Rate bank borrows from the Fed (%)	Expected loss rate on new tranche of loans (%)	Earnings on loans to targeted group (\$)	Losses on loans to the targeted group (\$)	Gains from replacing expensive funding for other loans (\$)	Total net earnings (\$)
50	50	0.2	0.1	2.4	-0.05	0	2.35
100	50	0.2	0.4	4.8	-0.25	0	4.55
150	50	0.2	0.9	7.2	-0.70	0	6.50
200	50	0.2	1.6	9.6	-1.50	0	8.10
250	50	0.2	2.5	12.0	-2.75	0	9.25
300	50	0.2	3.6	14.4	-4.55	0	9.85
350	50	0.2	4.9	16.8	-7.00	0	9.80
400	50	0.2	6.4	19.2	-10.20	0	9.00
450	50	0.2	8.1	21.6	-14.25	0	7.35
500	50	0.2	10.0	24.0	-19.25	0	4.75

Note. Column (1) shows total lending amounts extended by the commercial bank. Column (2) shows the amount of additional loans in the tranche. Column (3) shows the rate at which the bank borrows from the central bank. Column (4) shows the expected loss rate on each new tranche of loans. Column (5) shows expected net interest earnings on total loans made in column (1) assuming a rate of 5 percent on loans and funding costs as indicated in column (2). Column (6) shows expected losses. Column (7) shows gains from replacing other funding with funding from the central bank at the rate in column (2); in this table no funds are replaced. Column (8) shows total net earnings equal to the sum of columns (5), (6), and (7).

Table 1B. Earnings under the “multiple dollars” funding for lending program

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total loans extended (\$)	Additional tranche of loans (\$)	Rate bank borrows from the Fed (%)	Expected loss rate on new tranche of loans (%)	Earnings on loans to targeted group (\$)	Losses on loans to the targeted group (\$)	Gains from replacing expensive funding for other loans (\$)	Total net earnings (\$)
50	50	0.2	0.1	2.4	-0.05	0.15	2.50
100	50	0.2	0.4	4.8	-0.25	0.30	4.85
150	50	0.2	0.9	7.2	-0.70	0.45	6.95
200	50	0.2	1.6	9.6	-1.50	0.60	8.70
250	50	0.2	2.5	12.0	-2.75	0.75	10.00
300	50	0.2	3.6	14.4	-4.55	0.90	10.75
350	50	0.2	4.9	16.8	-7.00	1.05	10.85
400	50	0.2	6.4	19.2	-10.20	1.20	10.20
450	50	0.2	8.1	21.6	-14.25	1.35	8.70
500	50	0.2	10.0	24.0	-19.25	1.50	6.25

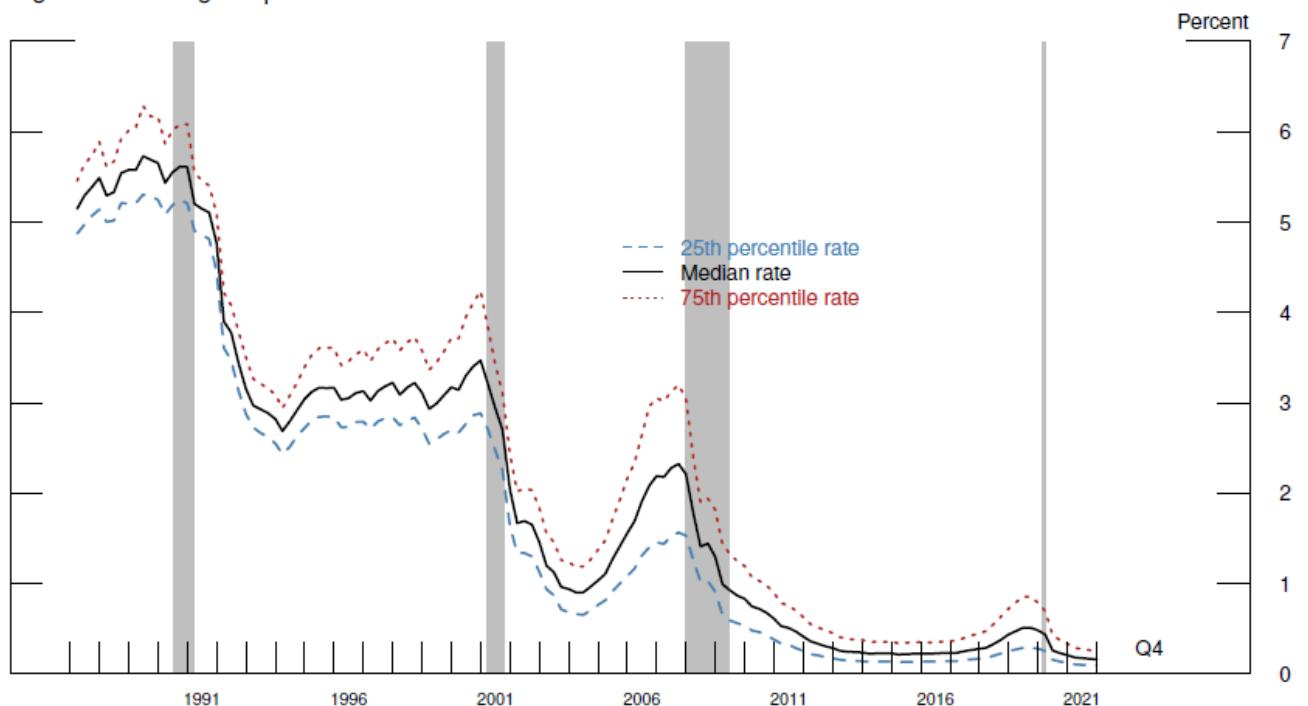
Note. Column (1) shows total lending amounts extended by the commercial bank. Column (2) shows the amount of additional loans in the tranche. Column (3) shows the rate at which the bank borrows from the central bank. Column (4) shows the expected loss rate on each new tranche of loans. Column (5) shows expected net interest earnings on total loans made in column (1) assuming a rate of 5 percent on loans and funding costs as indicated in column (2). Column (6) shows expected losses. Column (7) shows gains from replacing other funding that costs 0.05 percent with funding from the central bank at the rate in column (2). Column (8) shows total net earnings equal to the sum of columns (5), (6), and (7).

Table 1C. Earnings under the Z-curve lending program

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total loans extended	Additional tranche of loans	Rate bank borrows from the Fed	Expected loss rate on new tranche of loans	Earnings on loans to targeted group (\$)	Losses on loans to the targeted group (\$)	Gains from replacing expensive funding for other loans (\$)	Total net earnings (\$)
(\\$)	(\\$)	(%)	(%)	(\\$)	(\\$)	(\\$)	(\\$)
50	50	0.45	0.1	2.28	-0.05	0	2.23
100	50	0.40	0.4	4.60	-0.25	0	4.35
150	50	0.35	0.9	6.98	-0.70	0	6.28
200	50	0.30	1.6	9.40	-1.50	0	7.90
250	50	0.25	2.5	11.88	-2.75	0	9.13
300	50	0.20	3.6	14.40	-4.55	0	9.85
350	50	0.15	4.9	16.98	-7.00	0	9.98
400	50	0.10	6.4	19.60	-10.20	0	9.40
450	50	0.05	8.1	22.28	-14.25	0	8.03
500	50	0.00	10.0	25.00	-19.25	0	5.75

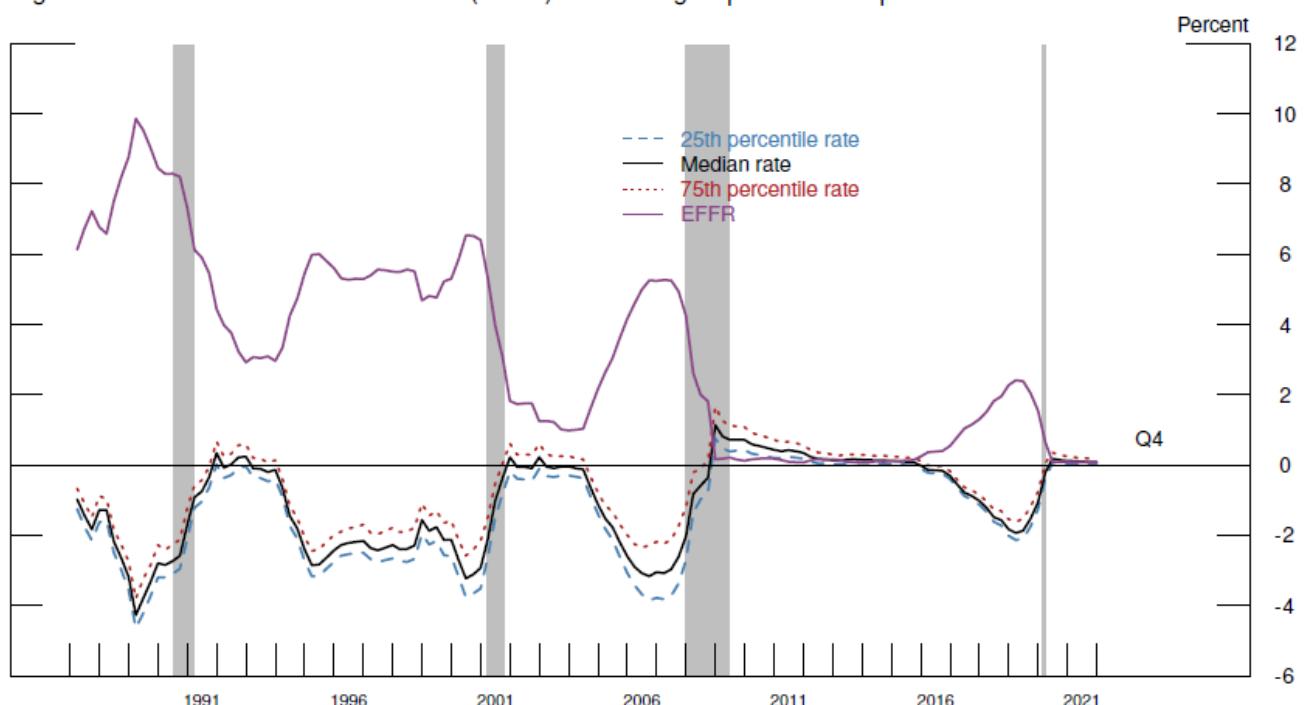
Note. Column (1) shows total lending amounts extended by the commercial bank. Column (2) shows the amount of additional loans in the tranche. Column (3) shows the rate at which the bank borrows from the central bank. Column (4) shows the expected loss rate on each new tranche of loans. Column (5) shows expected net interest earnings on total loans made in column (1) assuming a rate of 5 percent on loans and funding costs as indicated in column (2). Column (6) shows expected losses. Column (7) shows gains from replacing other funding with funding from the central bank at the rate in column (2); in this table no funds are replaced. Column (8) shows total net earnings equal to the sum of columns (5), (6), and (7).

Figure 1A. Savings Deposit Rates at U.S. Commercial Banks



Source: Federal Reserve Board Staff calculations; Consolidated Reports of Condition and Income, FFIEC 031/041/051. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.

Figure 1B. Effective Federal Funds Rate (EFFR) and Saving Deposit-EFFR Spread



Source: Federal Reserve Board Staff calculations; Consolidated Reports of Condition and Income, FFIEC 031/041/051; H.15 statistical release, Federal Reserve Board. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.

Figure 2A. Net Percentage of Banks Tightening Standards on C&I Loans

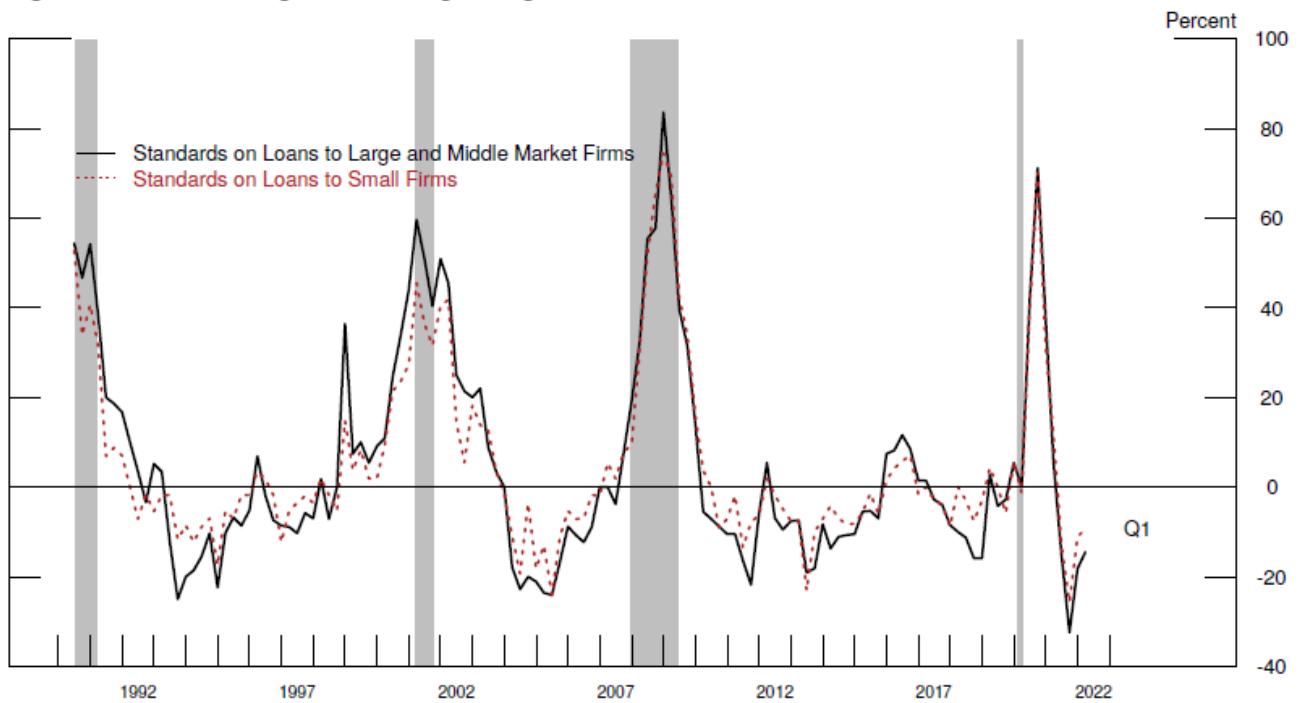


Figure 2B. Net Percentage of Banks Increasing Loan Spreads over Bank's Cost of Funds

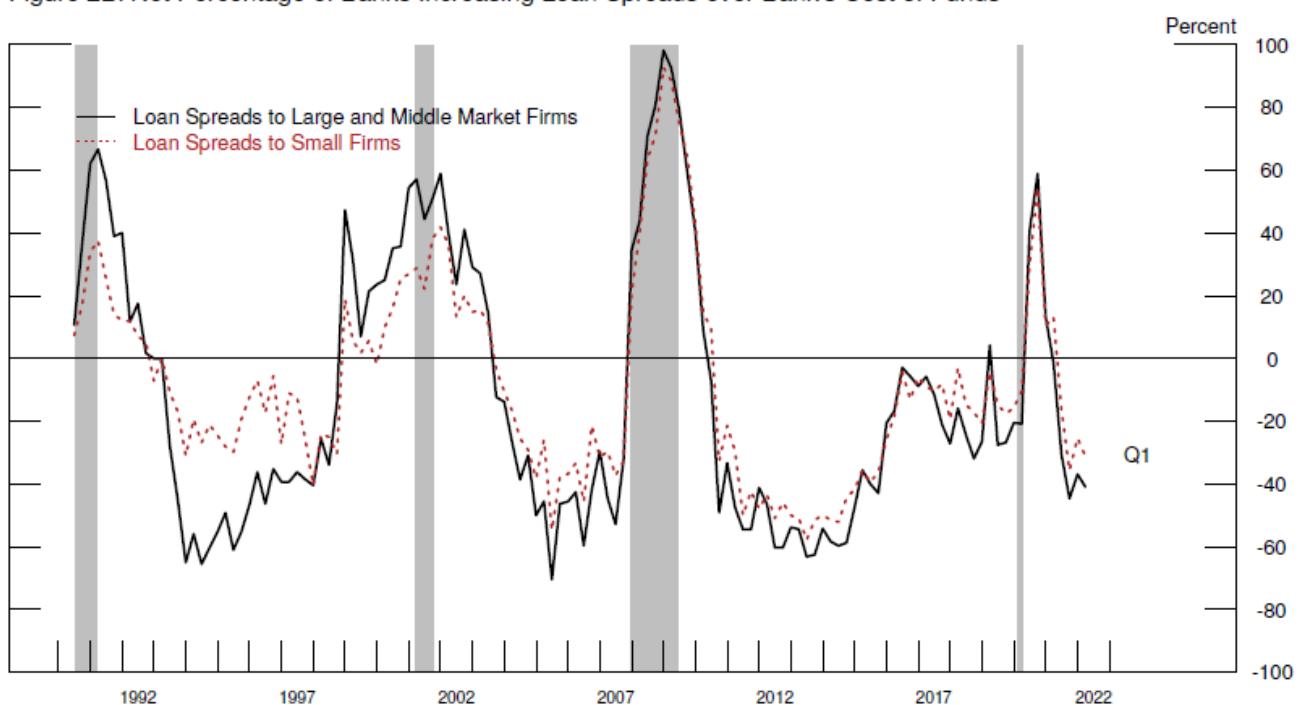
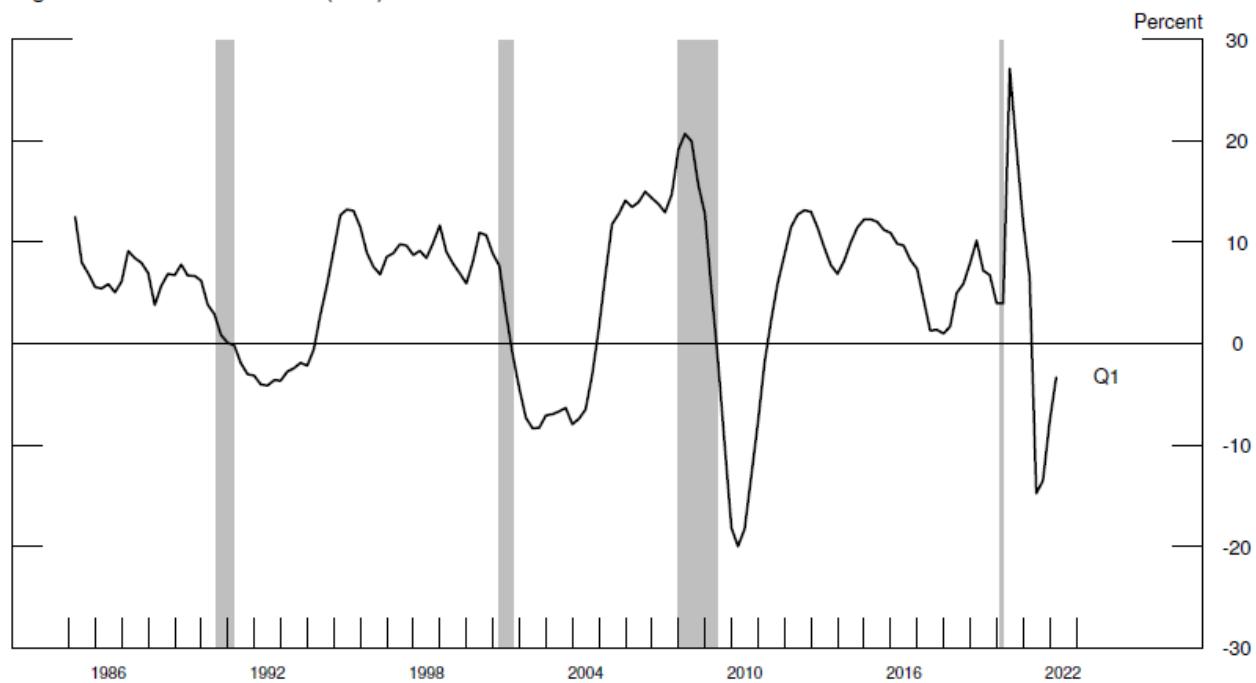
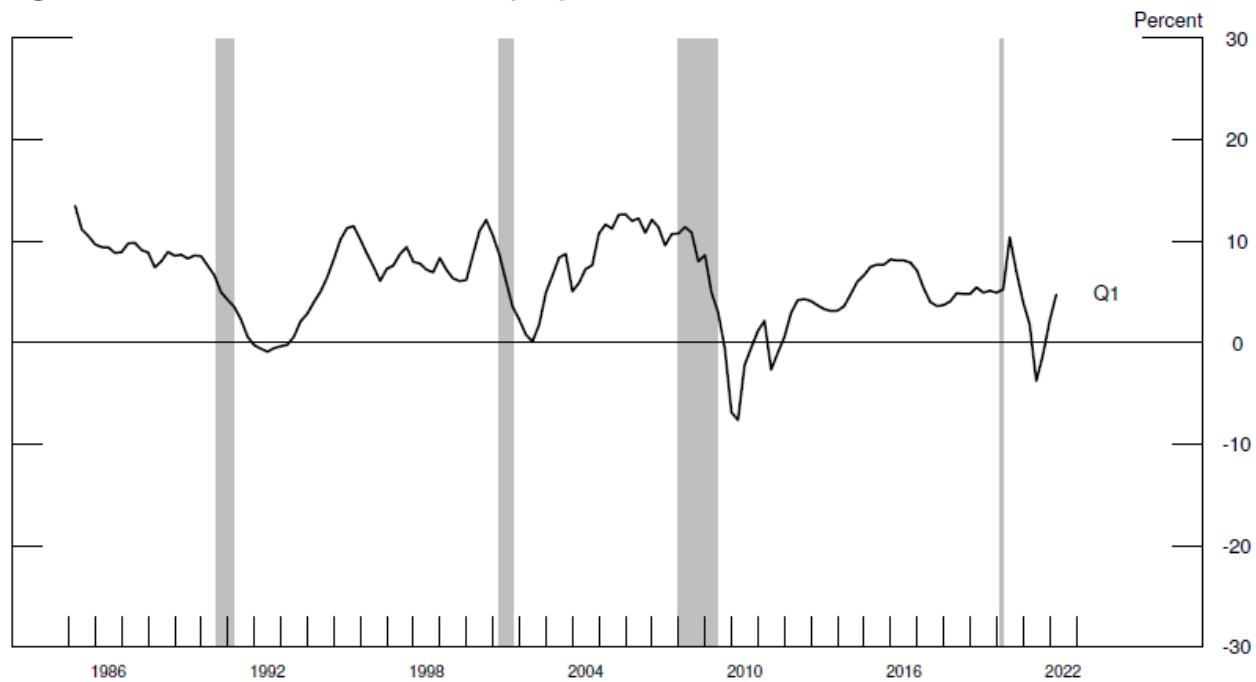


Figure 3A. C&I Loan Growth (YoY) at Commercial Banks



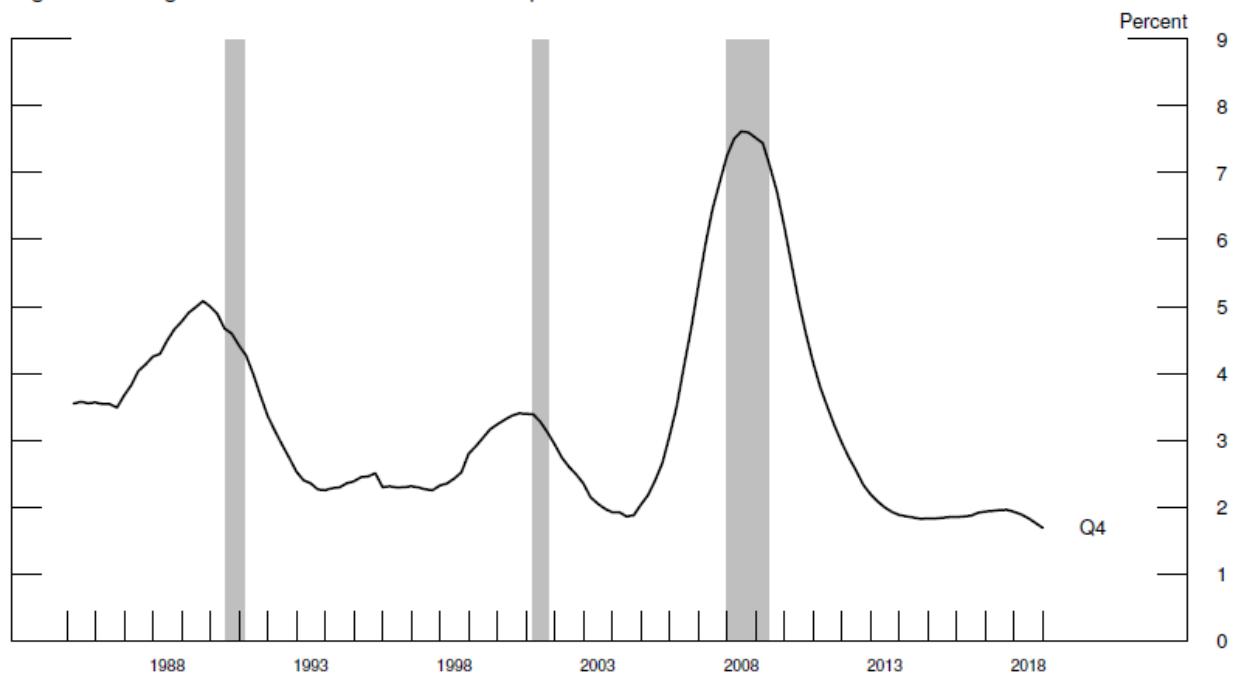
Source: H.8. statistical release, Federal Reserve Board; Federal Reserve Board staff calculations. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.

Figure 3B. Growth in Total Loans and Leases (YoY) at Commercial banks



Source: H.8. statistical release, Federal Reserve Board; Federal Reserve Board staff calculations. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.

Figure 4. Chargeoff Rates on All Loans over 12 quarter horizon



Source: Federal Reserve Board Staff calculations; Consolidated Reports of Condition and Income, FFIEC 031/041/051. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.

Figure 5. Funding For Lending (FFL) Z-Curve
(Illustrative example)

