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A New Daily Federal Funds Rate Series and History of the Federal Funds Market, 1928-1954

Sriya Anbil, Mark Carlson, Christopher Hanes, and David C. Wheelock

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This article describes the origins and development of the federal funds market from its inception in the 1920s to the early 1950s. We present a newly digitized daily data series on the federal funds rate from April 1928 through June 1954. We compare the behavior of the funds rate with other money market interest rates and the Federal Reserve discount rate. Our federal funds rate series will enhance the ability of researchers to study an eventful period in U.S. financial history and to better understand how monetary policy was transmitted to banking and financial markets. For the 1920s and 1930s, our series is the best available measure of the overnight risk-free interest rate, better than the call money rate which many studies have used for that purpose. For the 1940s-1950s, our series provides new information about the transition away from wartime interest-rate pegs culminating in the 1951 Treasury-Federal Reserve Accord.

Keywords: federal funds rate, call loan rate, money market, Federal Reserve System

JEL Codes: E43, E44, E52, G21, N22

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1 INTRODUCTION

The federal funds rate is the interest rate charged on unsecured, mostly overnight loans of funds held by depository institutions and other entities in accounts at the Federal Reserve.¹ Since the late 1980s, the Federal Reserve has implemented monetary policy primarily by targeting the federal funds rate.² The Federal Reserve publishes the standard daily-frequency time series for the federal funds rate, which begins in July 1954.³ However, the federal funds market came into being long before that, in the 1920s. This article introduces a new daily series for the federal funds rate that begins at the earliest possible date, April 1928, and continues to the start of the Federal Reserve's series. It is the first published time series of the federal funds rate at any frequency for any period prior to July 1954.⁴ Our series spans the 1929 stock market boom and crash; the Great Depression; the years of recovery from the Great Depression during which, it is generally believed, short-term rates were at a zero lower bound; the period of interest-rate ceilings imposed during World War II; and the lifting of the ceilings with the Treasury-Federal Reserve Accord of 1951. We believe that our series will prove useful for future research on American financial history, monetary policy and macroeconomics.

The federal funds rate series published by the Federal Reserve is constructed from reports of federal funds transactions provided to the Federal Reserve. Our data come from New York City newspapers which reported on conditions and rates in American money markets. The *New York Herald Tribune* began regular daily publication of federal funds rate quotes in April 1928, observing that “many

¹ In general, a federal funds transaction is an unsecured loan of U.S. dollars to a depository institution borrower (or “purchaser”) from a lender (or “seller”) that is another depository institution, foreign bank, government-sponsored enterprise or other eligible entity (<https://www.newyorkfed.org/aboutthefed/fedpoint/fed15.html>).

² Since 2008, the Federal Reserve has also used forward guidance and large-scale asset purchases in the conduct of monetary policy, particularly in periods when the federal funds rate target has been at the effective lower bound. In the 1970s and 1980s, the FOMC set targets for various measures of reserves and monetary aggregates as well as for the funds rate, though with the exception of 1979-82, the federal funds rate target range was a primary component of the Committee’s operating strategy. See Kliesen and Wheelock (2020) for more discussion about the FOMC’s operating targets and methods in the 1970s and early 1980s.

³ These data are available from Federal Reserve Economic Data (FRED) (<https://fred.stlouisfed.org/series/FEDFUNDS>). Current values of the Federal Reserve series on the “effective federal funds rate” are reported in the Fed’s H.15 statistical release (<https://www.federalreserve.gov/releases/h15/>), and calculated as a volume-weighted median of overnight federal funds transactions reported by funds market brokers to the Federal Reserve (<https://apps.newyorkfed.org/markets/autorates/fed%20funds>). Data reported by the Federal Reserve for 1954-70 are described in Board of Governors of the Federal Reserve System (1976, pp. 640-41) as follows: “The ‘effective’ rate on Federal funds is estimated each day by the Federal Reserve Bank of New York. It is not a statistical calculation, such as an average, of the rates paid on all transactions in Federal funds. Rather, it represents a consensus of major market participants in New York City as to the rate at which most transactions in these funds were executed during the day, after taking into account reports from active participants in the market. The data begin with the week ending July 14, 1954, when the Federal Reserve Bank of New York began to estimate the daily figure.”

⁴ Willis (1957) includes a chart of a weekly federal funds rate series for the period we cover, based on data from one of the same sources, but the underlying data were not published.

students of the day-to-day fluctuations of money rates have turned to the current quotation for Federal Reserve funds as an indicator of the easiness or tightness of money... it has become a most important rate to be scanned for the information it reveals.” (“Federal Funds’ Rate Index of Credit Status,” *New York Herald Tribune* April 5, 1928, p. 30.) The *Wall Street Journal* began to publish daily federal funds rate quotes in June 1932. Our series relies on reports from both newspapers.⁵

The appendix describes the construction of our series in detail. In the body of the article we present figures showing weekly average values of our series. We compare the federal funds rate with other money-market rates and Federal Reserve discount rates, era by era. To aid interpretation of our series we describe developments in the federal funds market from its origins through the 1950s and point out a few events apparent in our series that have largely escaped the attention of existing literature, including an upward move in the overnight rate off of the lower bound in 1937 and a peculiar relationship between the federal funds rate and Treasury bill rates shortly after the end of World War II. We argue that our series is a better measure of the overnight, virtually risk-free interest rate than other series that have been used for that purpose for pre-1954 periods, such as the stock exchange call loan rate, which has been widely used for the 1920s and early 1930s.

Section 2 describes the overnight lending market in the United States before the founding of the Federal Reserve and origins of the federal funds market. Section 3 presents a weekly average of our daily funds rate series for 1928-33 and describes the evolution of the market in the context of the stock market boom of 1928-29 and early years of the Great Depression. Section 4 presents these data for 1933-39, a period that encompassed the recovery from the Depression, and Section 5 presents the data for 1940-54, which includes World War II and the early post-war years. Section 6 concludes. The appendix describes the sources from which we collected daily observations on the federal funds rate and how we calculated the weekly average series presented in the article.

2 ORIGINS OF THE FEDERAL FUNDS MARKET

Prior to the founding of the Federal Reserve System, the United States already had an active overnight lending market in the form of “call money” (or “brokers”) loans in New York City (see, e.g., Myers 1931, pp. 126-148, 265-287). Call money loans were collateralized by debt and equity securities, renewed day after day until the borrower repaid the loan or the lender “called” it (requested repayment).⁶ Borrowers were mainly securities brokers and dealers in New York City who borrowed funds to finance inventories of securities or their customers’ purchases of securities on margin. The immediate lenders were New York City banks but the market was continental in scope as New York banks often acted as

⁵ The *New York Times* also reported federal funds rates on many but not all days.

⁶ Legally, lenders could call a loan at any time of day; customarily they did so only in the morning. Usually the collateral was a basket of several stocks and/or bonds. In a renewed loan a borrower could swap out securities in the basket of collateral, subject to the lender’s approval.

agents for other banks, businesses, and private individuals located elsewhere in the U.S. and Canada. Banks outside of New York also supplied funds to the call money market indirectly through the deposits they held in New York correspondent banks. Most call money loans were arranged on the floor of the New York Stock Exchange (NYSE), which at the time handled bonds as well as equities. Rates for call money loans on the NYSE floor were widely reported in newspapers and taken by contemporaries to be the best indicator of conditions in short-term money markets.⁷ Much economic research has relied on NYSE call money rate series to represent the safe short-term open-market interest rate in the United States from the mid-nineteenth century through the early 1930s (e.g., Sylla 1969; Officer 1989; Rappoport and White 1993; Odell and Weidenmier 2004; Fohlin 2020).

In many ways, call money loans were similar to some of today's overnight lending instruments, such as "general collateral" repo.⁸ Relative to those instruments, however, call money loans were peculiar in two ways. First, starting in 1914, the NYSE call money rate was set by stock exchange officials rather than in a competitive market, and sometimes the rate was deliberately set higher than a market-clearing rate.⁹ Second, the timing of call money loans was different. For today's overnight loans the interest rates negotiated on a given day, and reported as prevailing on that day in financial publications and datasets, are paid on funds delivered by the close of that day to be repaid the following morning. In a call money loan, by contrast, the interest rate negotiated and reported to prevail on a given day was for funds to be delivered on the *following* day and repaid *the day after that*. The one-day lag occurred because call money loans were in "clearing house funds," that is, funds to be paid through the New York Clearing House, which settled on a lagged schedule.¹⁰

⁷ Two types of overnight rates were reported: rates for "new" loans and "renewal rates." New loans were those beginning on a given day; renewal rates were for loans carried over from the previous day (that is, not called by the lender). Lenders allowing their loans to run another day were not obliged to accept the renewal rate, but nearly always did.

⁸ General collateral repurchase agreements (repos) are short-term loans secured by collateral of a general type, such as Treasury or agency securities. See Federal Reserve Bank of New York (<https://www.newyorkfed.org/markets/treasury-repo-reference-rates>).

⁹ See Beckhart (1932, pp. 38-64). In 1914, the NYSE replaced "competitive bidding about a money post" (Beckhart 1932, p. 43) with a "money desk." The "money clerk" at the desk took orders for new loans from brokers and offers of new funds from lenders and set a new loan rate "such as to bring about an equilibrium between supply and demand. However, the actual establishment of the rate does not always result simply from a balancing of forces of supply and demand. An equilibrium...is frequently reached through the control exercised by Stock Exchange officials over the supply of funds." Thus, if the amount of new funds demanded by brokers exceeded the amount offered, "the officials of the Stock Exchange Clearing Corporation might communicate with the larger banks in New York, requesting that funds be placed on the Exchange to meet the shortage in order to avoid an increase in rates...." (p. 45)

¹⁰ Checks and other payment orders sent to the clearinghouse over the course of a day were cleared on the following day, in a session that began at 10 am and ended at about 11:30, at which time a bank received its clearing balance. Soon after the founding of the Fed, banks began paying off clearinghouse net debits, or receiving net credits, with immediately-effected transfers out of (into) their reserve accounts at the Federal Reserve Bank of New York (Spahr, 1926, pp. 393-404; Meeker, 1930, p. 287, 295, 362-401). Thus, a bank that made a new call money loan on Tuesday

The Federal Reserve System began to operate in November 1914. It soon developed a telegraphic network through which a bank with a Federal Reserve account could order an immediate transfer of funds to the Federal Reserve account of another bank anywhere in the system (Spahr 1926, pp. 208-209). This made it possible to lend “federal funds,” that is, funds on deposit at Federal Reserve Banks, nationwide on an overnight schedule.

The first federal funds loans were made between New York City banks in the summer of 1921, as banks anticipating shortfalls in their Federal Reserve accounts entered into agreements to acquire funds from banks with surplus balances in their Fed accounts.¹¹ Most of these transactions were overnight loans, in which the lending bank either provided a draft on its Federal Reserve account to the borrowing bank or arranged with the Federal Reserve Bank of New York to transfer funds from its account to the account of the borrowing bank. Either way the funds would be in the borrower’s account by the end of the same day. In return, the borrowing bank would issue a cashier’s check for principal and interest to the lender drawn on clearinghouse funds. The lender sent the check to the clearinghouse by the end of that day and received payment in the following day’s clearinghouse settlement (Turner 1931, pp. 1-7).¹²

By 1925 banks outside New York City were lending federal funds locally. Lending between banks in different Federal Reserve districts was common by the end of the 1920s (Willis 1957, pp. 2, 5-7). Other participants in the market were dealers in bankers’ acceptances and government securities (known in the 1920s as “discount houses”) (Board of Governors of the Federal Reserve System 1959, pp. 23-24). These firms received payments in federal funds when they sold acceptances or government securities to Federal Reserve Banks and needed to make payments in federal funds for some of their purchases. Some firms maintained “nonmember clearing accounts” at the Federal Reserve and transferred federal funds through reserve accounts of Fed member banks with which they had relationships. Several discount houses became active borrowers and lenders of federal funds, and some became federal funds brokers, facilitating loans between others. In April 1928, the *New York Herald Tribune* reported that the

and called the loan as early as possible, on Wednesday morning, actually delivered the funds out of its Federal Reserve account around noon on Wednesday and was repaid principal and interest on Thursday.

¹¹ Banks maintain deposits with the Federal Reserve -- “reserves” -- to satisfy statutory reserve requirements and for making payments. Throughout the 1920s, such deposits were the only assets that a Federal Reserve member bank could use to satisfy its statutory reserve requirement. Banks also placed deposits with correspondent commercial banks for making payments, investing in securities markets, and other purposes (see Watkins 1929). Whereas the Federal Reserve did not pay interest on reserve deposits, interest was usually paid on interbank balances. The actual (or in some cases imputed) interest rates paid on interbank deposits in New York City were usually set by the New York Clearing House and adjusted with changes in the discount rate set by the Federal Reserve Bank of New York (see New York Clearing House Association, 1920, page 16).

¹² The Federal Reserve Board ruled in 1928 and 1930 that loans of federal funds constituted borrowed money rather than deposits, and thus were not subject to reserve requirements (see *Federal Reserve Bulletin* September 1928, p. 656, and *Federal Reserve Bulletin* February 1930, p. 81).

leading brokers were “four or five of the larger discount houses,” and that “For the nominal charge of $\frac{1}{4}$ of one percent ... these houses locate banks which are in need of the excess balances of other institutions. Conversely they locate prospective borrowers for banks which are faced with a plethora of excess deposits at the [Federal] Reserve Bank” (*Herald Tribune*, April 5, 1928, p. 30). Federal funds trading grew from a daily volume that rarely exceeded \$20 million in 1921 to average \$40-\$80 million by 1925, and after 1925 “ranged upward from \$100 million, reaching \$250 million at times” (Willis 1957, p. 3).

Although the federal funds market grew in size over time, market volume remained small relative to other money market instruments throughout the 1920s.¹³ Federal Reserve policymakers appear to have paid little attention to the federal funds market, or perhaps took it for granted. Two of the Fed’s leading economists at the time (Burgess 1936; Riefler 1930) hardly mention the federal funds market in their discussions of the money market and Federal Reserve Policy. Nonetheless, the market was an important source of liquidity and a barometer of overall money market conditions. According to Willis (1970, pp. 12-13), “The chief function of the funds market was refining the reserve adjustment process of the unit banking system.... It improved the fluidity of the money market by bringing demand and supply into more rapid adjustment....” The market was also acutely sensitive to Federal Reserve policy rates and actions. Differences in the discount rates among the 12 Reserve Banks, which generated interregional flows of funds, could affect trading in the market (Turner 1931, p. 83). The Fed’s open-market operations directly affected the supply of bank reserves and thus affected the funds rate. According to Willis (1970, p. 13), the funds rate “tended to be more sensitive [than other money market rates] and anticipate changes in bank reserve positions and factors affecting them because the use of funds offered an alternative to borrowing at the Reserve Banks.” The Federal Reserve’s monetary policy strategy at the time and how it relates to supply of reserves is described in the **box**.

BOX

Federal Reserve Monetary Policy Strategy in the 1920s-30s.

The origins of Federal Reserve monetary policy trace back to the “discovery” of open-market operations in the early 1920s when Fed officials observed that their purchases of Treasury securities in the open market tended to ease money market conditions, lower interest rates and increase bank lending (Chandler 1958; Friedman and Schwartz 1963; Meltzer 2003). By the early 1920s, operations for the System were carried out by the Federal Reserve Bank of New York as directed by a committee headed by that Reserve Bank’s Governor, Benjamin Strong. Strong explained the Fed’s policy strategy as follows:¹⁴

¹³ According to Willis (1970, p. 12, Table 1), in 1928, outstanding volumes of i) brokers’ loans ranged from \$3,900 million to \$5,100 million for call loans and \$390 million to \$1,120 million for time loans, ii) bankers acceptances ranged from \$1,100 million to \$1,300 million, iii) commercial paper totaled some \$500 million, and iv) short-term government securities ranged from \$2,500 million to \$3,000 million.

¹⁴ “Testimony before the Banking Committee,” United States House of Representatives 1926, p. 307.

The influence that the Reserve System exercises in the money market may be described ... in this way: If speculation arises, prices are rising, and possibly other considerations move the Reserve Banks to tighten up a bit on the use of their credit, ... it is a more effective program ... to begin to sell our government securities. It lays the foundation for an advance in our discount rate.... If the reverse conditions appear ... then the purchase of securities eases the money market and permits the reduction of our discount rate.

Strong's description of the Fed's influence on money markets and bank lending was expanded upon by long-time Fed officials Winfield Riefler (1930) and W. Randolph Burgess (1936), which Meltzer (2003) refers to as the Riefler-Burgess Doctrine. Burgess (1936, p. 235) describes the impact of Federal Reserve open-market operations as follows: "The Reserve Bank purchasing the securities pays for them with Federal Reserve funds. The seller of the securities deposits the funds in his own bank, and that bank in turn deposits the funds in the Federal Reserve Bank and thus finds itself in the possession of additional [non-borrowed] reserves...." The increase in bank reserves, reflected in a greater volume of deposits held in Federal Reserve accounts, increased banks' willingness to lend in the federal funds and call loan markets, as well as to purchase securities and make longer-term loans.

Fed officials viewed the impact of open-market operations on money markets as being heavily determined by level of borrowing from the Fed's discount window (i.e., borrowed reserves). According to Burgess (p. 239), "Purchases of securities by Reserve Banks tend to relieve member banks from debt to the Reserve Banks, and lead them to adopt a more liberal lending and investing policy. Money rates become easier.... Conversely, sales of securities by the Reserve Banks increase member bank borrowing.... Money rates grow firmer." Thus, by regulating the relative stocks of non-borrowed and borrowed reserves, open-market operations could influence market interest rates and banks' willingness to make loans even if they did not alter total reserves. However, when banks are out of debt to the Fed, "The effects of operations ... are more direct. At such times Federal Reserve purchases of securities increase [total] bank reserves." Similarly, Riefler (1930, p. 27) argues that "The volume of member bank indebtedness at the Reserve Banks... is one of the most important single monetary factors in the level of money rates, and that the prospect of increase or decrease in that indebtedness is one of the most important single factors in the rate outlook.... It is this relationship apparently which has given to Reserve Bank operations in the open markets that peculiar efficacy for control over the money markets...." Moreover, he writes (p. 125), "The whole open-market policy of the Reserve Banks... assumes... that Reserve Bank funds paid out in buying securities will be used by member banks to repay borrowing at the Reserve Banks or to meet demands for funds which would otherwise be met by increased borrowing." The supposed reluctance of banks to borrow at the discount window was a key assumption behind the Fed's theory of how its open-market operations affected money markets and one that Fed officials sought to reinforce through their administration of the Discount Window. By discouraging banks from borrowing

at the discount window, either by increasing the discount rate or by refusing loans to continuous borrowers, the Fed could reinforce the impact of its open-market operations and discount rate changes on the money markets. **END BOX**

3 THE FEDERAL FUNDS RATE 1928-33

Our new federal funds rate series is based on daily market quotations published in the *New York Herald Tribune* and *Wall Street Journal*. The appendix describes how we used the published quotes to produce daily and weekly average (ending on Saturdays) series for comparison with previously published weekly average rates for other money market instruments. The appendix also provides source information for the other series plotted in the article's figures.

Figure 1 plots the weekly average values of our federal funds rate series, the NYSE call money rate on new loans and the discount rate of the Federal Reserve Bank of New York, from April 1928 (the start of our series) through April 1933, a month after the trough of the Great Depression according to the business-cycle chronology of the National Bureau of Economic Research. The figure shows that the federal funds rate was nearly always below the call loan rate, presumably reflecting some combination of differences in default risk, transactions costs and timing that made call money relatively undesirable for lenders active in both markets.¹⁵

Figure 2 plots 4-week rolling standard deviations of our weekly federal funds series and the call money rate on new loans. The figure shows that the call money rate was much more volatile than the federal funds rate before the 1929 stock market crash, suggesting that the call money rate behaved less like a virtually risk-free rate than the federal funds rate, especially during a period when the perceived risk on call loan collateral was high (White 1990).

Figure 1 also shows the relationship between the federal funds rate and the Federal Reserve Bank of New York discount rate. Normally, the federal funds rate was at or below the discount rate, but the funds rate sometimes rose above the discount rate, especially when market conditions tightened. A

¹⁵Transactions costs may have been higher for call money lending because it took time and effort to manage the security collateral (Griffiss 1923 pp. 7, 16, 49). New York banks charged 1/2 percent to make call money loans for out-of-town banks (Turner 1931, 68). That was bigger than the 1/4 percent spread charged by federal funds brokers in the 1920s. Although so-called "money brokers" charged just 1/32 percent for call loans, according to Beckhart (1932, p. 49), "Money brokers do not... take care of the collateral; this is handled by the lending bank." Contemporaries generally described call money loans as practically risk-free, despite the possibility of a day-to-day drop in prices of collateral securities, because lenders were protected by "haircuts" (margins between current collateral prices and loan amounts). Moreover, at times when securities' prices were believed to be precariously high, as in the summer of 1929, haircuts were increased accordingly (Meeker 1930, p. 294, 297). Up to 1929, "even in the long memory of the oldest lending institutions in Wall Street, there is no record of any unpreventable loss by a lender on call loans made to a Stock Exchange member on listed collateral," and the 1929 crash itself took place "without the loss of a penny to a single lender" (Meeker 1930, p. 298). On the other hand, White (1990) suggests that investors likely demanded higher rates on call money in 1928-29 because of the unwillingness of taking possession of riskier collateral during this period.

borrower might be willing to pay more for federal funds than the discount rate because Federal Reserve Banks lent only to their member banks and only on specific types of collateral, i.e., “eligible paper.”¹⁶ Thus, some institutions active in the federal funds market, such as nonmember banks and discount houses, did not have access to the Fed’s discount window, while member banks might lack eligible paper (Board of Governors of the Federal Reserve System 1959, p. 28). Perhaps more importantly, the Federal Reserve did not lend freely even to member banks with eligible paper. In the 1920s, as in most of its later history, the Federal Reserve tried to dissuade banks from making continuous use of discount credit. According to Friedman and Schwartz (1963, pp. 268-69) this policy discouraged borrowing by “making discounting seem a source of weakness in banks.”¹⁷ The *Herald Tribune* (April 5, 1928, p. 30) reported that the federal funds rate was “usually about one-fourth percent below the Federal Reserve discount rate” but could exceed the discount rate because “member banks are disinclined to borrow at the Reserve Bank, continuous exercise of this privilege over extended periods being looked upon as an indication of weakness.” The federal funds rate was especially high relative to the discount rate from February through August 1929, likely reflecting a Federal Reserve Board directive to the Reserve Banks to deny discount window loans to banks that were making call money loans. The Board issued the directive in an effort to prevent the use of Federal Reserve credit to finance stock market speculation (Friedman and Schwartz 1963, pp. 254-65; Board of Governors of the Federal Reserve System 1959, p. 98).

Rates on both federal funds and call money fell after the October 1929 stock market crash when the Federal Reserve purchased Treasury securities in open-market operations, cut its discount rate, and allowed gold inflows from abroad to boost bank reserves. Whereas changes in the supply and demand for reserves caused the federal funds rate to fluctuate during 1930-31, as shown in Figure 1, the call money rate remained absolutely fixed across long spans of weeks. Further, the NYSE deliberately pegged the call money rate above the market-clearing rate (e.g. Beckhart 1932, pp. 55, 58). Thus, the federal funds rate is almost certainly a better indicator of the true market overnight rate over these important years during the Great Depression.

The federal funds rate was at or close to the zero lower bound by mid-1931, but increased sharply in late 1931 after Great Britain left the gold standard and the Federal Reserve raised its discount rate in an effort to discourage gold from flowing out of the United States. The funds rate then declined to the lower bound in early 1932 when the Federal Reserve boosted reserve supply substantially through purchases of

¹⁶ Eligible paper included bankers’ acceptances, federal government debt and certain types of bank loans: short-term (original maturity ninety days or less) and “for producing, purchasing, carrying or marketing goods in one or more of the steps of the process of production, manufacture or distribution.” A loan was not eligible if it financed purchases of stocks or bonds, or “for permanent or fixed investments of any kind, such as land, buildings or machinery” (Steiner 1926).

¹⁷ Dewey and Shugrue (1922) report that investors viewed borrowing by banks in any form other than deposits as evidence of weakness.

Treasury securities (Friedman and Schwartz 1963; Hsieh and Romer 2006; Bordo and Sinha 2016). The call loan rate remained fixed at the crisis level until July, however, again reflecting the artificial setting of the rate. Both the federal funds and call loan rates spiked again during a banking crisis in March 1933 that culminated in a national bank holiday declared by President Roosevelt on March 6, 1933. Markets were closed for several days, resulting in gaps in both the federal funds and call loan rate series.

Commercial Paper and Bankers Acceptance Markets

Figure 3 adds the prevailing interest rates on commercial paper and bankers acceptances to the data shown in Figure 1 (omitting the Federal Reserve Bank of New York discount rate for clarity). Along with the call loan and federal funds markets, commercial paper and bankers' acceptances were the major private money market instruments of the 1920s and early 1930s. Whereas federal funds and call loans had a maturity of one day (though call loans were often rolled over), commercial paper and bankers acceptances had longer maturities, typically from 90 days to six months.

In the 1920s-30s, the commercial paper market comprised short-term unsecured loans to moderately sized non-financial firms (most sources provide quotes for paper with either 90-day or four-to-six months maturity, suggesting they represented typical maturities). Commercial paper dealers purchased short-term notes from issuing firms and then sold the paper to investors throughout the country. Banks were important buyers of commercial paper (Beckhart 1932). In the secondary market, commercial paper interest rates reflected the credit quality of the firm issuing the paper. "Prime" commercial paper reflected paper considered by the National Credit Office (a private firm affiliated with the R. G. Dun credit rating agency) to be of the highest quality, and the secondary market interest rates on prime paper were used to construct the widely-reported commercial paper rate. The commercial paper market was reasonably deep throughout much of the 1920s, but was fading by the end of the decade in part because other money market instruments had become more appealing to investors. Like all money markets, the commercial paper market largely dried up in the Great Depression.¹⁸ As Figure 3 shows, the commercial paper rate was typically higher than other money market rates, reflecting the longer average maturity of commercial paper and the absence of collateral backing. However, the commercial paper rate remained well below the call loan rate during the stock market boom in 1928-29.

Bankers' acceptances are private commercial payment contracts that are guaranteed by a bank; once guaranteed, the contract can be sold on the open market. A substantial portion of bankers'

¹⁸ The commercial paper market experienced various changes in subsequent decades. Non-bank financial companies—such as the finance companies associated with automotive companies—found commercial paper to be an attractive source of funding and began to issue commercial paper (Hurley 1977). Investors in commercial paper also began to shift, with nonbank investors, such as insurance companies, becoming increasingly important. Consequently, when the market revived in the 1950s, it was quite different than it had been in the 1920s.

acceptances finance international trade. The bankers' acceptance market was very new in the United States in the 1920s, but had been significant in other countries for many years.¹⁹

From its inception, the Federal Reserve strongly supported the acceptance market. The Fed purchased acceptances (also referred to as "bills") at a rate that was advantageous to banks relative to borrowing from the discount window. The favorable terms resulted in the Fed holding 50 percent of outstanding acceptances at times during the 1920s. With this support, the market expanded rapidly. Given the importance of Federal Reserve support, market rates on acceptances tended to track the buying rates set by the Federal Reserve Bank of New York.²⁰ As shown in Figure 3, the market rate on bankers' acceptances was consistently below the commercial paper rate. During 1928-29, the acceptance rate was also often below the federal funds rate. This likely reflected the Fed's tightening of monetary policy and attempts to discourage banks from using discount window loans to finance stock market speculation. Beginning in 1928, the Fed used open-market sales to drain reserves from the banking system and increased its discount and bill buying rates. However, because policymakers continued to offer more favorable terms for purchases of acceptances, the interest rates on acceptances did not increase as much as those for call loans and federal funds. As with commercial paper, bankers' acceptance volume fell sharply during the Depression. The market rate on acceptances remained close to the Fed's buying rate, which remained at or above 1 percent throughout the Depression, even as the overnight rate on federal funds fell to less than ¼ percent.²¹

4 THE FEDERAL FUNDS RATE IN THE RECOVERY 1933-1939

Figure 4 plots federal funds, NYSE call money (new loans), and Federal Reserve Bank of New York discount rates from May 1933 through December 1939. After the Bank Holiday, the New York Fed lowered its discount rate in a series of steps from 3.5 percent to 1.5 percent in February 1934, and kept the rate at that level until 1937. The call money rate remained fixed at exactly 1 percent except for September-November 1933, when it was set at ¾ percent, and several months in 1935-36 when the rate setting committee, controlled by New York banks, experimented with rates of 1/4 and 3/4 percent. The lower rates "did not call forth any significant demand for funds" (Turner, 1938, p. 89) and, according to the banks, did not cover costs of handling the loans.²² In November 1935, the *Wall Street Journal*

¹⁹ U.S. commercial banks with federal charters, i.e., national banks, were not permitted to issue bankers acceptances before the Federal Reserve Act of 1913.

²⁰ For information on the bill buying rates of the Federal Reserve Bank of New York, see Board of Governors (1943a, pp. 443-45).

²¹ Bankers' acceptances played a key part in transmitting the financial crises in Germany and the United Kingdom in 1931 (Accominotti 2012). The market never fully recovered; as other funding markets expanded in the 1950s, the bankers' acceptance market remained a niche market.

²² See the following *New York Times* articles: "Pegged Call-Money Rate of 1% is Ended," April 14, 1935; "Money Rates Stay 5th Month at Lows," October 1, 1935; "Call Money Rates Raised by Banks," October 30, 1935,

observed: “Just how artificial this rate was is indicated by the fact that three months’ money cost less than demand money all through this period. So long as the call money rate means nothing, the most interesting figures to watch in the short term money situation are the rates at which weekly Treasury bill issues are sold and the rates of inter-bank borrowings, or so-called Federal funds” (“Call Loan Market is Now Pegged at New 3/4% Rate,” November 7 1935, p. 9).

As suggested by the *Wall Street Journal* article, the federal funds rate behaved very differently than the call money rate. Between May 1933 and February 1934, the funds rate fluctuated between 1/8 and 1/2 percent. In late February 1934 it settled at 1/8 percent, where it remained for the next three years. On some days, newspapers reported that federal funds lending had occurred (see, e.g., “Comment in Wall Street,” *New York Herald Tribune*, April 11 1935, p. 25, and “Loans to Brokers Down \$64,000,000,” *New York Times*, August 30, 1935). But the *Wall Street Journal* report for February 23, 1934, was more typical: “Federal funds offered by all banks, with no takers, at 1/8%” (“Money Rates,” February 24, 1934, p. 4). In November 1935, a *Journal* article observed that “With all the banks plentifully supplied with reserves, there is naturally no lending of reserve funds from bank to bank. The real condition of the money market is shown by the fact that the federal funds rate has been absolutely motionless since February 1934” (“Call Loan Market now Pegged at New 3/4% Rate,” November 7, 1935). In January 1937, the *New York Herald Tribune* observed that “Federal funds have been available at 1/8 percent for so long that hardly a man now exists in Wall Street who can remember when the rate was otherwise” (“Rise in Reserve Needs to Alter Money Rates,” January 10, 1937, p. C1).

Demand for federal funds increased in March 1937 when the Fed imposed the second of a series of three increases in reserve requirements on member banks. At first a few, then most transactions took place at a higher rate of 1/4 percent. By May, when the third increase in reserve requirements took effect, some transactions were at 1/2 percent, which drew funds from banks outside New York.²³ Through August 1937 the funds rate ranged between 1/4 and 1/2 percent.²⁴ Thereafter the reported rate was constant at 1/4 percent through 1939. Newspapers continued daily publication of the federal funds rate but ceased to mention market activity apart from rare reports that borrowing had taken place.²⁵

“Changes in Money Rates,” October 31st 1935; “Banks Here Double Call-Money Rate,” January 23, 1936; *Wall Street Journal* articles include “Money Rates Firm as Bankers Seek ‘Living Wage’ ”, October 30, 1935, and “Call and Time Money Rate Advance of 1/4% Expected Next Week”, May 9, 1936.

²³ See: “Higher Rate on Federal Funds Are Likely,” *Wall Street Journal* March 12, 1937, p. 1; “Comment in Wall Street,” *New York Herald Tribune* March 13, 1937, p. 23; “Commercial Borrowing Gains Expand,” *Wall Street Journal* March 16, 1937, p. 1; “Higher Reserves are Met by Banks,” *New York Times* May 2, 1937; “Topics in Wall Street,” *New York Times* May 4, 1937.

²⁴ See: “Member Banks’ Excess Reserves Touch New Low,” *Wall Street Journal* August 6, 1937 p. 9; “Comment in Wall Street” *New York Herald Tribune* August 11, 1937, p. 27.

²⁵ See: “Bank Credit Here Continues to Rise,” *New York Times* December 17, 1937; “Bank Credit Here Gains \$465,000,000,” *New York Times* June 10, 1938.

The combination of a flat rate with only occasional transactions from February 1934 to March 1937, and again after September 1937, suggests that the federal funds rate was at its lower bound most of the time. That is to say, the rate was so low that the interest payment on a loan minus the transactions costs to the lender was just marginally greater than the zero return to holding reserve balances. At a rate of 1/8 percent, the interest payment on an overnight loan of \$1 million, a typical transaction in the 1920s, was only about \$3.50. We have found no discussions dating from the 1930s about lenders' transactions costs. But in the 1950s, Minsky (1957, p. 175) observed that they include "the time of an officer, phone calls, etc." In a Federal Reserve study some banks reported that even at interest rate of 1/2 percent, "costs absorb most of the return" (Federal Reserve Board of Governors 1959, p. 70). We have no explanation for why the lower bound was 1/8 percent before 1937, then 1/4 percent after.²⁶

Standard models used to analyze overnight-rate determination and monetary policy implementation (e.g. Poole 1968, Whitesell 2006, Ennis and Keister 2008) can explain why the overnight rate was on the floor at these times. In those models the rate of return to holding excess reserves establishes a floor for the market overnight rate. The rate is driven to this floor when the supply of free reserves (i.e., nonborrowed reserves less required reserves, or equivalently, excess less borrowed reserves) is large enough to eliminate accidental reserve deficiencies. While this condition holds, banks largely cease to borrow from the discount window or in the federal funds market. Figure 5 plots free reserves and outstanding discount window credit from 1928 through 1939. The shock of the banking panic of March 1933 is evident in a sharp decline in free reserves that triggered a spike in borrowing at the discount window. Borrowing at the window fell to almost zero as the supply of free reserves rose from late 1934 through 1936, and again after 1937. A decline in free reserves in 1937 resulted in small increases in discount borrowing and the fed funds rate. The path of free reserves over time reflected interactions between Federal Reserve and Treasury policies on reserve requirements, open-market operations, and international gold flows.²⁷

5 THE FEDERAL FUNDS RATE IN THE 1940S AND EARLY 1950S

Figure 6 plots the federal funds rate, the three-month Treasury bill rate, and the Federal Reserve of New York discount rate from January 1940 to June 1954. The call money market did not revive after the war in the same form as it had existed before the war, and hence we do not include a call loan rate on

²⁶ Interestingly, rates on some other money market instruments, in particular commercial paper and bankers' acceptances, also rose around this time.

²⁷ Hanes (2006, 2019) studies the behavior of overnight rates in the 1930s in terms of modern models and provides details about the timing of Federal Reserve and Treasury policies, changes in reserve supply and interest-rate movements in the 1930s.

the figure.²⁸ From 1940 through March 1942, the Treasury bill rate fluctuated but the federal funds rate remained 1/4 percent. According to Willis (1970, p.15) a considerable volume of federal funds lending, “probably” \$75-\$125 million per day, was taking place in early 1941.

In April 1942, the Treasury and Fed agreed to keep interest rates on government securities low to finance the war. The Federal Reserve Board pledged to buy securities as needed to keep long-term Treasury yields from rising above 2 1/2 percent and yields on shorter-term bonds, notes and certificates below lower ceilings. The Federal Reserve maintained ceilings on these securities' yields throughout the war and afterward until the Treasury-Federal Reserve Accord of March 1951 (Friedman and Schwartz 1963, pp. 562-63, 623-24).

Federal Reserve policy with respect to Treasury bills is especially important as it had unique features that are key for understanding developments in money markets. In April 1942, the Board announced that it would buy bills at prices corresponding to an annual discount rate of 3/8 percent. In August 1942, the Board gave anyone selling bills to the Fed the option to buy back “Treasury bills of a like amount and maturity” at the same 3/8 percent rate. This “enables banks and others, who have bought Treasury bills and encounter a temporary need for cash, to sell Treasury bills to a Reserve Bank with assurance that they will be able to repurchase the bills later at the same rate of discount” (Federal Reserve Bank of New York *Monthly Review*, September 1942, p. 67). In September 1942, the Board announced that payments associated with these transactions would be settled on the same day, rather than on the following day as previously, “to make the bills the equivalent of cash” (Board of Governors of the Federal Reserve System 1943b, p. 108).

In the words of a contemporary, “The net result of these various provisions was to render Treasury bills absolutely liquid. They became practically equivalent to excess reserves and were so called and so treated by many bankers, even though legally they were not reserves at all” (Whittlesby 1945, p. 67). The policies “had the effect, in substance, of enabling banks to earn interest on their excess reserves without undergoing the slightest sacrifice of liquidity” (p. 80). In modern terms, it was as if the Fed were paying 3/8 percent interest on excess reserves (IOER). For nonbanks, bills had become equivalent to riskless overnight loans to the Fed, similar to transactions in the Fed’s current Overnight Reverse Repurchase Program (ONRRP).²⁹

²⁸ After the war, loans to securities dealers were still referred to as call money but “in current practice such loans are rarely called” (Miller 1952, p. 31). Call money loans had become relationship loans between a dealer and a bank, and “the formal arrangements of an impersonal market no longer exist” (p.27). The call money desk on the New York Stock Exchange floor was eliminated in 1946.

²⁹ For information about the Fed’s Overnight Reverse Repurchase Agreement Facility, see: <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200615b.htm>.

The Federal Reserve abandoned the Treasury bill program before it lifted ceilings on longer-term Treasuries after the 1951 Fed-Treasury Accord. In July 1947, the Federal Open Market Committee (FOMC) announced the “‘unpegging’ of the Treasury bill rate... [I]t had directed the Federal Reserve Banks to terminate the policy of buying all Treasury bills offered to them at a fixed rate of $3/8$ per cent per annum and to terminate the option given the sellers to repurchase bills... The new policy was made applicable to new bills issued on or after July 10.” (Federal Reserve Bank of New York *Monthly Review*, August 1947, p. 77) The pegging and unpegging of the Treasury bill rate is apparent in Figure 6.

The figure also shows that the quoted federal funds rate remained $1/4$ percent for the duration of the war, but that the rate began to rise before the Fed removed the Treasury bill peg in 1947. Newspaper reports indicate that federal funds borrowing was extremely rare during the war.³⁰ In May 1945 the funds rate rose above $1/4$ percent for the first time since August 1937. Remarkably, the rate immediately exceeded the $3/8$ percent Treasury bill rate, and it continued to exceed the bill rate in all but three weeks between May 1945 and July 1947 when the bill rate peg was ended. Thereafter, the bill rate sometimes exceeded the funds rate.

The patterns in rates suggest that before July 1947, the ability of lenders to earn a riskless overnight return of $3/8$ percent on bills prevented federal funds lending at a lower rate except in rare circumstances. The return of interest rate risk to the Treasury bill market and its impact on spreads between market rates on bills and the federal funds rate would have affected the preferences of banks for holding Treasury bills, especially as an instrument for managing their liquid reserves. The Fed noted this effect: “The spread between bid and asked quotations and the risk of price change make the Treasury bill and other short-term securities unsuitable for very short-term reserve adjustments” (Board of Governors of the Federal Reserve System 1959, p. 10). “The increased fluctuation in bill rates in recent years has probably been more important than the comparative levels of rates in influencing choice between the bill and Federal funds markets. With day-to-day fluctuations in fluctuations in bill rates, a ‘misguessed market’ trend can lead to a principal loss on a quick bill turnaround -- a loss which management can readily observe. An analogous error in the Federal funds market would simply mean a smaller return.” (p. 71).

The revived federal funds market of the early postwar era was in some ways similar to the market of the 1920s. Loans between New York banks still involved an exchange in which the lender issued a draft on its Federal Reserve account and received a clearinghouse check from the borrower, while loans between banks in different cities went through the Federal Reserve's wire transfer service (Federal

³⁰ We located only two newspaper reports of trading between October 1942 and May 1945 (“Excess Reserves at a 5-Year Low,” *New York Times* October 2, 1942, p. 33; “Member Banks Again Show Excess Reserves,” *New York Times* May 19, 1944, p. 24).

Reserve Bank of New York *Monthly Review* March 1950, pp. 27-28). The difference between the timing of federal funds settlement and the lagged settlement of clearing house funds was still important and motivated much federal funds market activity by nonbanks (Board of Governors of the Federal Reserve System 1959, pp. 17, 46, 48).³¹

Nonetheless, there were also many differences between how the federal funds market operated in the post-war era and the 1920s. As shown in Figure 6, the federal funds rate did not rise above the discount rate as it had at times in the earlier era. To explain this, contemporaries noted that banks now held large amounts of federal government debt, and hence were never short of collateral for discount window loans. Moreover, discount borrowing was no longer hindered by a Federal Reserve policy to discourage call money lending as it had been in 1929 (Federal Reserve Bank of New York *Monthly Review*, March 1950, p. 29; Board of Governors of the Federal Reserve System 1959, p. 98).³²

After World War II, middlemen in the federal funds market also operated differently than they had before the war. Garvin Bantel Corporation was the only firm brokering federal funds from 1948 to 1958. It handled some 80 percent of all transactions through 1953 and 50 percent in 1957 (Willis 1970, p. 54-55). Many financial publications reported the rates quoted by Garvin Bantel as market rates (Board of Governors of the Federal Reserve System 1959, p. 93). Garvin Bantel did not charge a commission on federal funds transactions for banks that gave it some of their stock brokerage business. "A small percentage of the banks prefer to pay a flat fee, usually a commission of 1/16 of 1 percent" (p. 5). If both the borrower and lender preferred to pay the flat fee then Garvin Bantel earned 1/8 percent (Minsky 1957, p. 175), which was less than the typical 1/4 percent spread charged for federal funds brokerage in the 1920s.

Aside from Garvin Bantel, government securities dealers helped banks place or obtain federal funds after the war (Federal Reserve Bank of New York 1950). By convention, most transactions in Treasury securities were settled in federal funds (Board of Governors 1959) so developments at government securities dealers had a notable influence on the federal funds market. Security dealers commonly financed their inventories using overnight repurchase agreements, which were considered to

³¹ The timing difference created opportunities for arbitrage and regulatory avoidance (see, e.g., Coats 1981). It did not disappear until 1981, when the Federal Reserve Bank of New York agreed to integrate the New York Clearing House interbank payments system (which had become "CHIPS") into the Federal Reserve's transfer system (which had become "Fedwire") (Stigum, 1990, pp. 206, 894, 898).

³² The federal funds rate did not rise above the discount rate until October 1964. According to Stigum (1990, pp. 544-45), this was because a stigma had developed against borrowing fed funds at rates above the discount rate: "bankers feared that any bank that was willing to pay more than the discount rate for Fed funds would be subject to the accusation that for some reason it could not borrow at the window... Finally, in 1964, Morgan [the New York commercial bank Morgan Guaranty Trust Company] decided that if any bank could get away with paying more than the discount rate for Fed funds, it could."

be a segment of the federal funds market, not a separate instrument as they are today (Board of Governors 1959, pp. 5-6).³³ Uncollateralized federal funds loans were then referred to as “straight” federal funds.

Several major banks also began to deal in federal funds, primarily by engaging in bilateral transactions with their respondents, which drew more small banks into the market. A second broker entered the market in December 1958, and by 1964, four firms acted as brokers in federal funds (Willis 1970). As more brokers and trading banks entered the market, the minimum trade size declined, which allowed smaller banks to participate in the market (Meek 1972), and volumes increased. The volume of transactions handled by brokers rose from a daily average of \$100-\$150 million in 1949 to \$375-\$425 million in 1960, and \$1,700-\$2,800 million in 1969 (Willis 1970, p. 56). The high volatility of the federal funds rate clearly apparent in Figure 6 fell as market volume rose.³⁴

6 CONCLUSION

Money markets are a vital part of the financial sector. Pricing and conditions in these markets provide a key indicator of liquidity in banking and financial markets generally. Money markets are also strongly influenced by monetary policy, and observing how these markets respond to changes in central bank policies are important for understanding how monetary policy is being transmitted to financial markets and the broader economy. The federal funds market is particularly valuable in both regards given its intimate connection to the Federal Reserve and the banking system. By extending the rate data available for the federal funds market backwards in time, we are providing valuable new information that researchers can use to understand monetary policy and banking sector liquidity in notable periods in U.S. financial history.

The federal funds market originated in the early 1920s and developed as the Federal Reserve was learning to use the policy levers at its disposal in pursuit of macroeconomic, international, and financial stabilization goals. When our series begins in 1928, the Fed was moving to tighten monetary policy, first by conventional means and later by direct controls on discount window lending, in an effort to check stock market speculation. The federal funds rate reflected the impact of the Fed’s actions on the money market, but without the confounding problems of trying to assess market conditions from the call loan rate. The federal funds rate (and other market rates) fell sharply after the October 1929 stock market crash, and the rate fell close to zero, well below the Fed’s administered rates and the artificially-set call loan rate. Market volume likely remained low throughout the Depression and World War II, but market rates rose with increased demand for reserves in banking crises in 1931 and 1933, and again in early 1937. Federal funds trading revived after World War II, even before the Fed ended its peg of Treasury bill

³³ See also Roosa (1956) regarding the linkages between the federal funds market and the government securities dealers.

³⁴ Shown in Appendix Figure 1, the volatility of our new series on the funds rate is similar to the Board’s series in 1954.

rates in 1947. Our data reveal the impacts of the pegging and its end on money markets. Further, we show that, unlike the 1920s, the funds rate remained consistently at or below the Federal Reserve discount rate, possibly reflecting a change in the Fed's administration of the discount window.

Our new series on the federal funds rate ends in 1954 where a series reported by the Federal Reserve begins. The similar volatilities of our series and the Board's series in 1954 suggest that our series can be linked to the Board series, and therefore provide researchers with a longer time series of high-frequency observations on the U.S. overnight interest rate. This article showcases these data over a pivotal era in U.S. monetary history, but leaves for future research more formal analyses of the data and key episodes.

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APPENDIX

FEDERAL FUNDS RATE DATA

Daily observations on the federal funds rate first appeared in the *New York Herald Tribune* on April 5, 1928, and in the *Wall Street Journal* on June 1, 1932.³⁵ We digitized the daily rates quoted in these publications from their first appearance through 1938 (*Herald Tribune*) and 1954 (*Wall Street Journal*), when daily federal funds rate observations become available from the Federal Reserve. These data are available in [Federal Reserve Economic Data \(FRED\)](https://fred.stlouisfed.org/categories/33951).³⁶ This section describes these data and how we used them to construct the weekly average series shown in the article's figures.

Both the *Herald Tribune* and *Wall Street Journal* published either a single rate or a range of rates for federal funds on each business day. The *Herald Tribune* reported rates for Monday-Saturday, beginning with April 4, 1928 (reported in the paper on April 5). However, the *Wall Street Journal* only reported rates for Monday-Friday. The *Herald Tribune* reported the prevailing rates for April 4, 1928 as “3^{3/4}@4”, and indicated that the number to the left of @ was a bid rate and that to the right an offered rate.³⁷ The *Herald Tribune* reported that the rates it published reflected quotes “by several of the largest discount houses.” It continued to publish the rate in the same format in a table labeled “Money and Credit” throughout the 1930s.

With very few exceptions, through mid-1931, the bid and offered rates published in the *Herald Tribune* always differed by ¼ point. Larger spreads were reported on a handful of dates, and negative spreads (i.e., a bid rate higher than the offered rate) were reported for four dates.³⁸ We suspect that the negative spreads, and probably some of the larger positive spreads, reflected printing errors. The dataset accompanying this article reproduces faithfully the rates as reported in the *Herald Tribune*. However, in constructing charts for the article we omit observations with negative or implausible bid-offered spreads because we are unsure whether they reflected printing errors or something else.³⁹

³⁵ Federal funds rate quotations and other market information were also occasionally published in the *New York Times*.

³⁶ <https://fred.stlouisfed.org/categories/33951>

³⁷ The *Herald Tribune* (p. 30) explained that “For the nominal charge of one-fourth of 1 percent ... [dealers] locate banks which are in need [of funds]. Conversely they locate prospective borrowers for banks which are faced with a plethora of excess deposits at the Reserve Bank.... Thus the rate was 3^{3/4} bid, 4 percent asked, yesterday [April 4]. The discount house purchases the funds at 3^{3/4} and sells them at 4 percent.” The explanation of the funds rate in the *Herald Tribune* is consistent with Turner's (1931, p. 8) description of the market: “Federal funds are usually quoted with a quarter of a point spread in rates; hence, when ‘Funds are 3^{3/4}—4’ the bid rate is 3^{3/4} % and the asked rate is 4%.” Turner (p. 21) also reports that dealers in federal funds typically earned a quarter point spread: “they would buy from the bank having a surplus [of funds] at say 3^{1/20}% and sell to the bank that was short in its reserves at 3^{3/40}%.”

³⁸ January 25, 1929; November 4, 1929; February 21, 1930; and April 20, 1931.

³⁹ In the accompanying dataset, observations for some dates are missing either because we were unable to locate the edition of the *Herald Tribune* in which the quotes appeared or because the reported rates were illegible. Implausible observations include February 6, 1931 and June 20, 1931.

Beginning in mid-1931, the rates reported in the *Herald Tribune* often differed by only $1/8^{\text{th}}$ point. These were always on days when the low and high rates were reported as $1/8^{\text{th}}$ and $1/4^{\text{th}}$. We are uncertain whether the smaller range reflects a narrowing of the bid-offered spread or a change in how the *Herald Tribune* reported the data. Turner (1931) reports that business was sometimes done on a $1/8^{\text{th}}$ spread. However, on the first date that the *Wall Street Journal* reported funds rate information (June 2, 1932), it reported that “Federal funds are in supply at $1/8$ to $1/4$ of 1%” (p. 7). We presume that this quote refers to the range of rates that prevailed on June 1, which matches the range reported for that day in the *Herald Tribune*. Therefore, it seems plausible that by that date, *Herald Tribune* was similarly reporting a range of rates that prevailed during the day rather than bid and offered rates. By early 1933, the *Wall Street Journal* started more clearly describing the price quotes as bid and offered rates. For example, on February 11, 1933 the *Journal* reported “Federal funds firmer at $1/8\%$ bid, $1/4\%$ asked, with most transactions at $1/8\%$.”⁴⁰ The range of daily rates reported in the *Wall Street Journal* usually matched the range reported for the same days in the *Herald Tribune*. Occasionally the rates reported in the two publications differed, but almost never by more than one-quarter point.

Whereas the *Herald Tribune* continued to report a range of rates on most days through the 1930s, the *Wall Street Journal* often published only a single rate, which it usually referred to as an offered rate. For example, on September 10, 1935 the *Wall Street Journal* reported that “Federal funds were freely offered and unchanged at $1/8\%$.” Usually when the *Journal* reported just one rate, it was $1/8^{\text{th}}$. For most such days, the *Herald Tribune* reported a spread of $1/8^{\text{th}}$ to $1/4^{\text{th}}$. Based on information about market conditions reported in the *New York Times* for many of those dates, we believe that the rate reported in the *Wall Street Journal* likely reflected the rate at which the preponderance of transactions occurred on the given day, if there were any transactions, whereas the rates reported in the *Herald Tribune* may have been rates quoted by dealers but not necessarily reflective of actual transactions. It seems likely that a rate of $1/8^{\text{th}}$ reflected the effective lower bound on offered rates due to transactions costs. We have no concrete information about the extent to which transactions occurred on days when the *Wall Street Journal* reported the rate at $1/8^{\text{th}}$, though the *New York Times* sometimes indicates that funds were offered at $1/8^{\text{th}}$ but there was no demand.

Certainly, on some days the reported range of rates was not the bid-ask spread from dealers but rather the range of rates at which transactions took place that day. On May 4, 1937 a news article in the *Herald Tribune* reported that “As on Saturday ... there was a split rate for Federal funds, with some funds placed at the old rate of $1/4$ of 1 percent and some at the firmer rate of $1/2$ of 1 percent. Banks in Chicago, Philadelphia and Boston were offering federal funds in this market [New York], for the most part at $1/4$ of

⁴⁰ From June 1932 to February 1933, the *Wall Street Journal* reported rates in a manner that looks like bid and asked rates such as “Federal funds $1/2\%$ @ $3/4\%$ [Wednesday], against $3/4\%$ @ 1% Tuesday.”

1 per cent for the other principal money centers were a little more comfortably situated than the local market was” (“Excess reserves of Local Banks Reduced to \$150,000,000 Level,” May 4, 1937, p. 31). The daily rate reported for these days, from which our series are constructed, was “1/4 @ 1/2.”

There was likely little trading in federal funds from mid-1933 through most of the remainder of the 1930s. With few exceptions, the *Wall Street Journal* reported the funds rate at 1/8th and the *Herald Tribune* reported a spread of 1/8th to 1/4th until March 1937, when market conditions tightened slightly following an increase in reserve requirements on Federal Reserve member banks. The *Journal* subsequently reported a rate of 1/4th, and the *Herald Tribune* reported either a single rate of 1/4th or a spread of 1/4th to 1/2. With only a couple of exceptions, both the *Journal* and *Herald Tribune* reported a constant rate of 1/4th throughout the remainder of the 1930s.⁴¹

The *Wall Street Journal* continued to report the funds rate at 1/4 percent through mid-1945 after which there were signs of some pickup in activity.⁴² On May 21, 1945, the *Journal* reported an offered range of 3/8 percent to 1/2 percent. This reporting convention appears to have continued for several years; thus in this period, the reported high/low range reflects a different concept than the bid-offered rates from other dates. It is not until March 1948 that we observe the *Wall Street Journal* providing quotes for bids; and when bids are reported, they were reported as being within a range where there were no offers.

Starting in June 1948, the *Wall Street Journal* no longer reported ranges for bid and offered rates, but rather listed single bid and offered rates. Nevertheless, both rates were not reported on some days. Indeed, even into the 1950s, there were days when the demand for funds appears to have fallen so much that the *Wall Street Journal* reported an offered rate but not a bid rate (and occasionally there were days when only a bid rate was reported). In these cases, we have left as missing the rate that is not reported.

Weekly average funds rate

Using our daily data, we constructed weekly averages of the federal funds rate for comparison with other market rates which are available in published sources as weekly averages. To calculate that weekly rate, we used the following procedure:

1. For days when both newspapers reported a high and a low rate, we calculate a daily average using observations from both newspapers as the simple average of the midpoints of the high and low

⁴¹ We recorded fed funds rate quotation from every issue of the *Herald Tribune* from April 5, 1928 through March 1, 1934 that we could locate, but because the reported rate rarely changed, we checked every third issue to verify the rate, focusing on periods when the rate was more likely to have changed. The rate reported in the *Wall Street Journal* was static from March 1934 through the end of 1944. We checked every third issue to verify the constant rate, focusing on periods when the rate was more likely to have changed.

⁴² From May 1937 until mid-July 1944, the *Wall Street Journal* reported “Federal funds offered at 1/4 of 1%.” On July 18, 1944, the *Journal* reported “Federal funds offered at 1/4 o 1%” (sic) and on the next day “Federal funds offered at 1/4 to 1%.” That phrase was repeated until May 1945. We believe that the shift from “of”, which would reflect a point rate, to “to”, which would reflect a range, is a typo, especially since there were no changes in any other money markets.

rates reported in the *Herald Tribune* (HT) and *Wall Street Journal* (WSJ). High and low were not necessarily bid and offered rates; on dates when the WSJ provided an offer range, our calculated rate is the midpoint of that range.

2. For days when one newspaper reported only a single rate, we take that rate as that newspaper's rate for the market and average it with the midpoint of the high and low provided by the other newspaper.
3. If only one newspaper provided data, we use the midpoint of rates or the single rate provided by that newspaper.
4. We omit dates when the spread between bid (low) and offered (high) rates reported in the HT or WSJ are negative (i.e., bid higher than offered) and omit dates with implausible spreads (i.e., February 6, 1931, and June 20, 1931). The *Wall Street Journal* reported a rate of 1 percent on January 21 and January 24, 1938, when the rate reported for surrounding days was $\frac{1}{4}$ percent. Because the *Journal* also reported that the rate for January 21 was "unchanged", for purposes of calculating the weekly average, we assumed a rate of $\frac{1}{4}$ percent for January 21 and January 24.
5. We use this daily series to calculate weekly average rates (Monday-Saturday) for the figures in this article.

Linking our federal funds rate series with the Board series

As part of understanding the quality of our federal funds rate series, it is informative to compare it with the first few months of the federal funds rate series published by the Federal Reserve. Appendix Figure 1 plots the federal funds rate minus the Federal Reserve Bank of New York discount rate for 1954. Data for January-June are based on our newly-constructed federal funds rate, and the data for July-December are based on the Board's published rate data. The figure shows there is not an obvious discontinuity where our series links to the Board series. Both spreads fluctuate between 50 and 100 basis points throughout 1954. Further, the volatility of the two series is roughly comparable around the transition point. The standard deviation of our series in the first half of 1954 is very similar to the standard deviation of the Federal Reserve series in second half of 1954. Considering that the Federal Reserve began publishing the federal funds rate after the market revived, we consider the smooth transition between our series and the Federal Reserve series, with respect to both the level and standard deviation, as evidence of the validity of our series.

OTHER DATA

Except as noted, Board of Governors of the Federal Reserve System (1943) is the source for all data series other than the federal funds rate shown in the figures of this article, with the specific page numbers given below:

Bankers acceptance rate (prime, 90 days), pp. 452-59

Call loan rate (average rate on new stock exchange loans): pp. 452-59

Commercial paper rate (prime, 4 to 6 months), pp. 452-59

3-month Treasury bill rate, pp. 461-62 (1934-41), Board of Governors of the Federal Reserve System (1976), pp. 697-700 (1942-54)

Federal Reserve Bank of New York discount rate, pp. 439-42 (1928-41), Board of Governors of the Federal Reserve System (1976), pp. 667 (1942-54)

Free reserves (excess reserves – borrowed reserves)⁴³, pp. 378-94

⁴³ Note that borrowed reserves refers to the outstanding stock of Federal Reserve discount window loans and is referred to as “bills discounted” in the source.

Figure 1: Fed Funds Rate, Call Money Loan Rate, and Federal Reserve Discount Rate,
April 1928 - April 1933

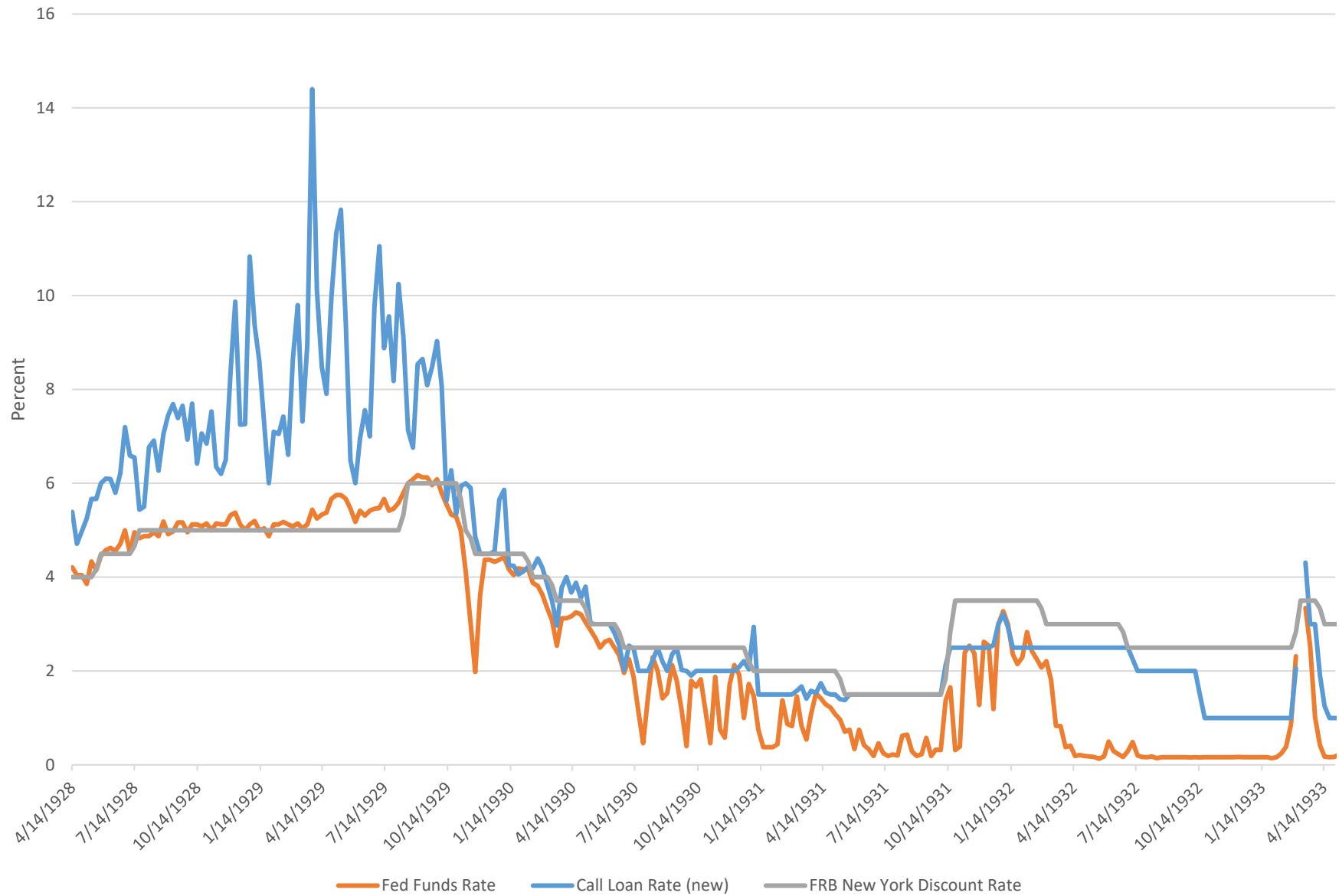


Figure 2: Four-Week Rolling Standard Deviations of Fed Funds and Call Loan Rates

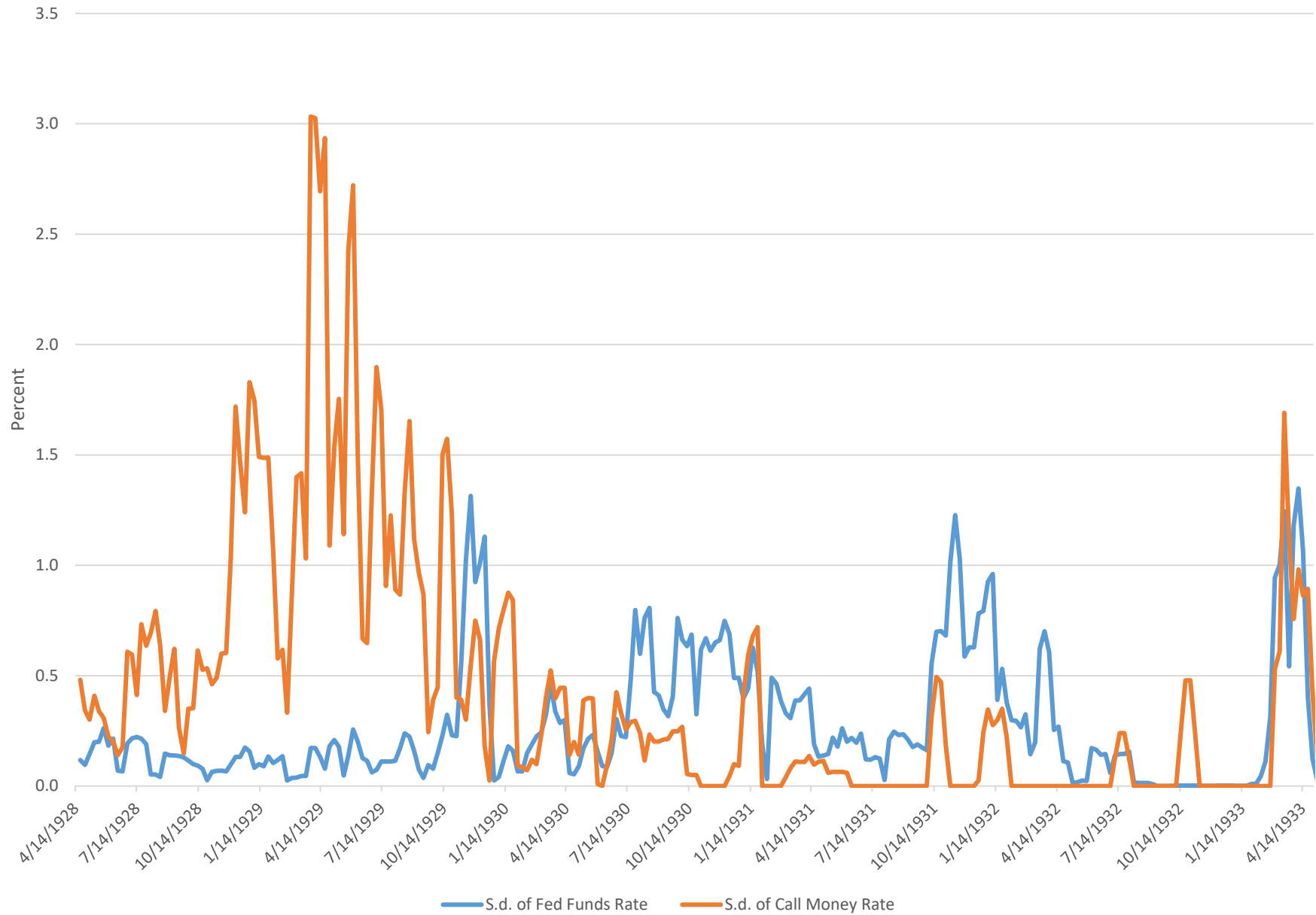


Figure 3: Fed Funds, Call Loan, Commercial Paper, and Bankers Acceptance Rates

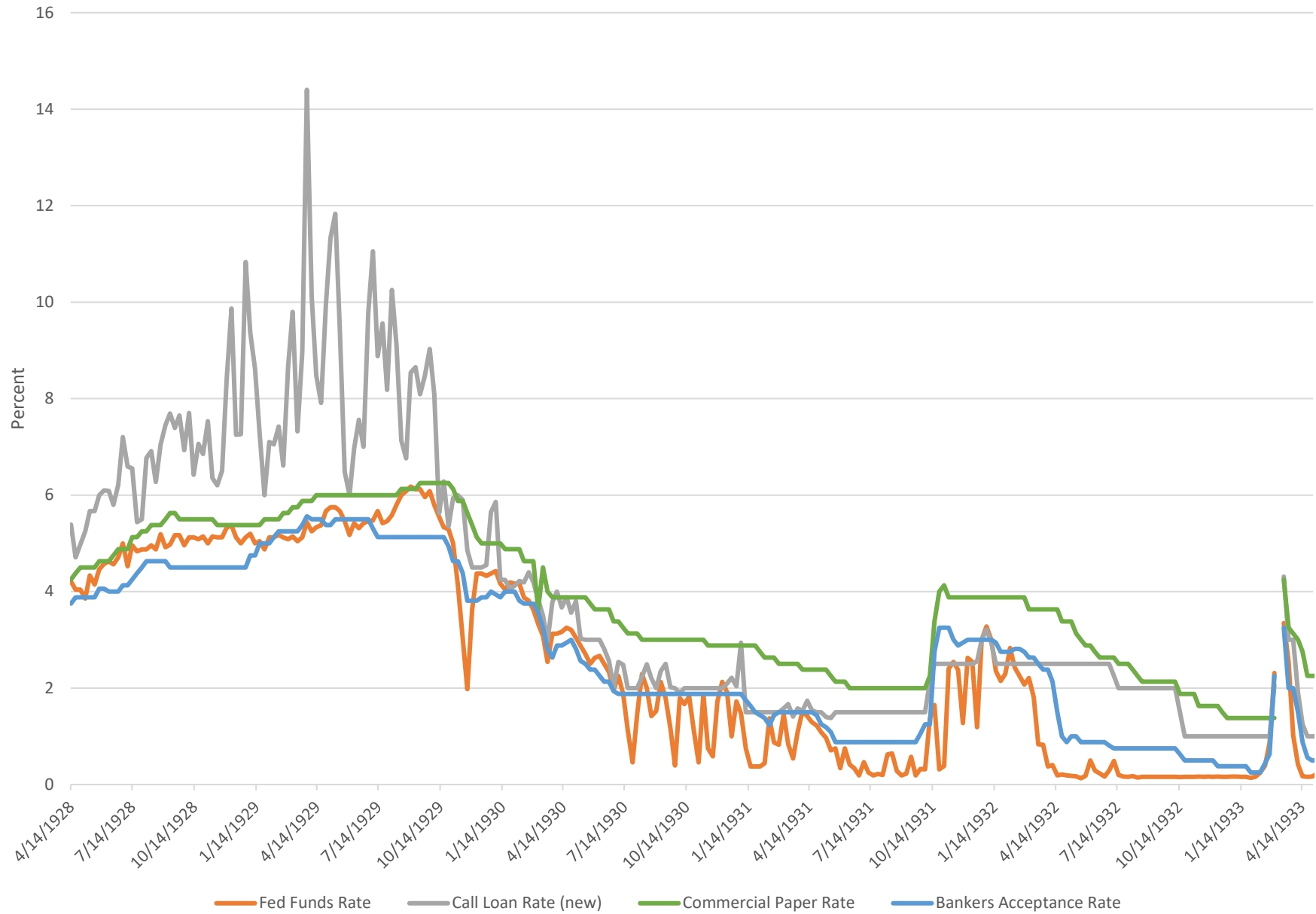


Figure 4: Fed Funds Rate, Call Money Rate, and Discount Rate (May 1933 - December 1939)

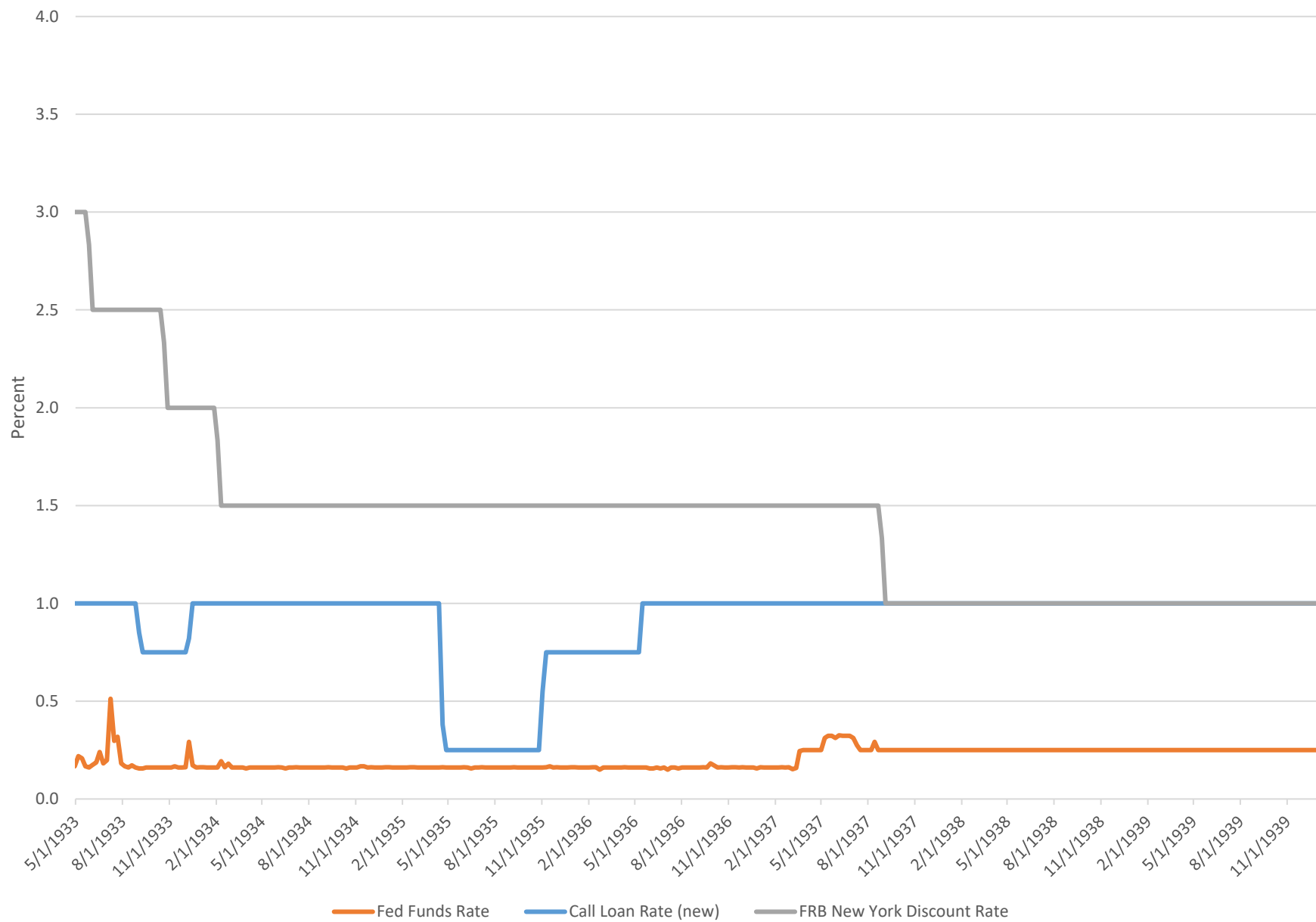


Figure 5: Free Reserves and Discount Window Loans Outstanding

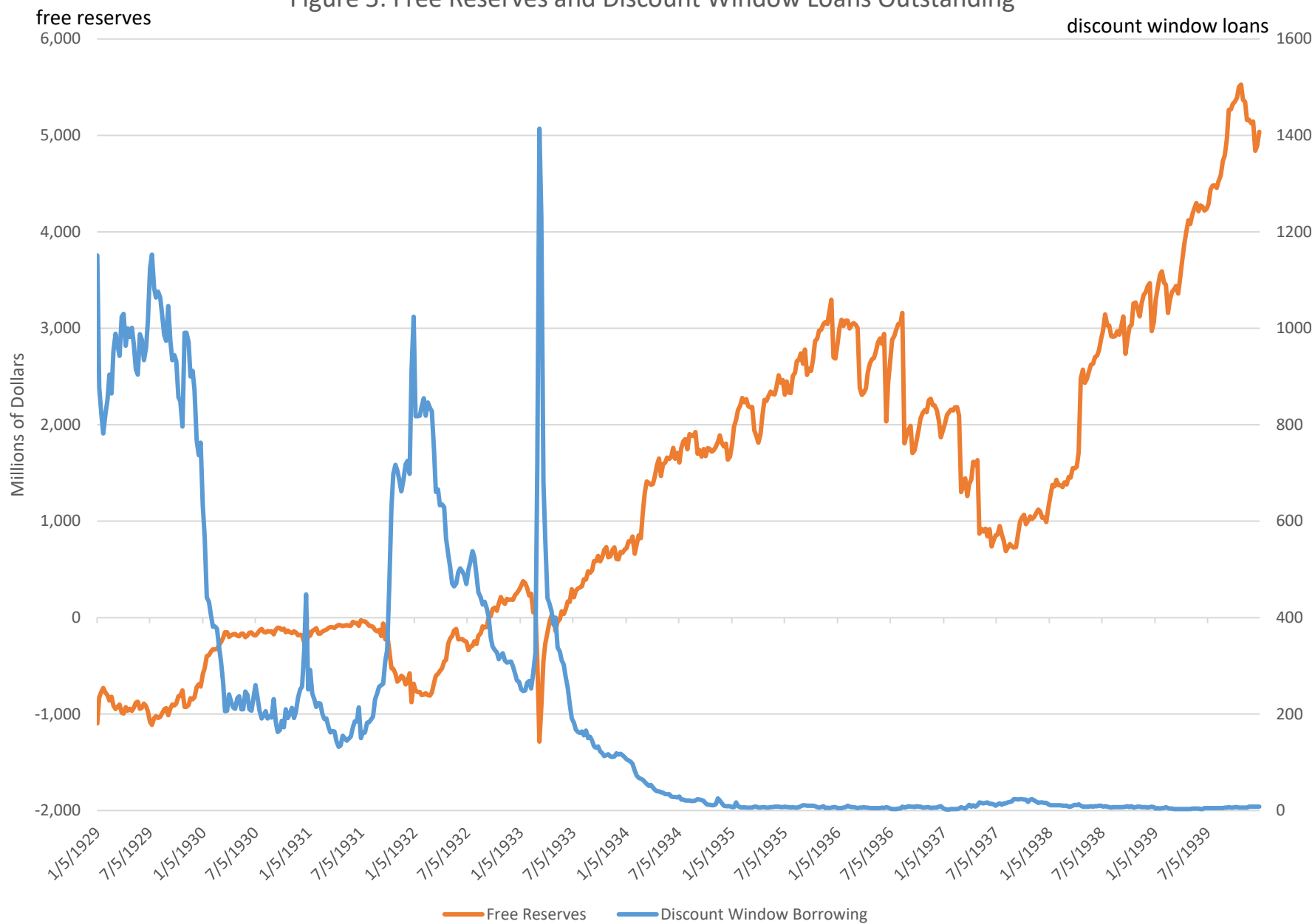
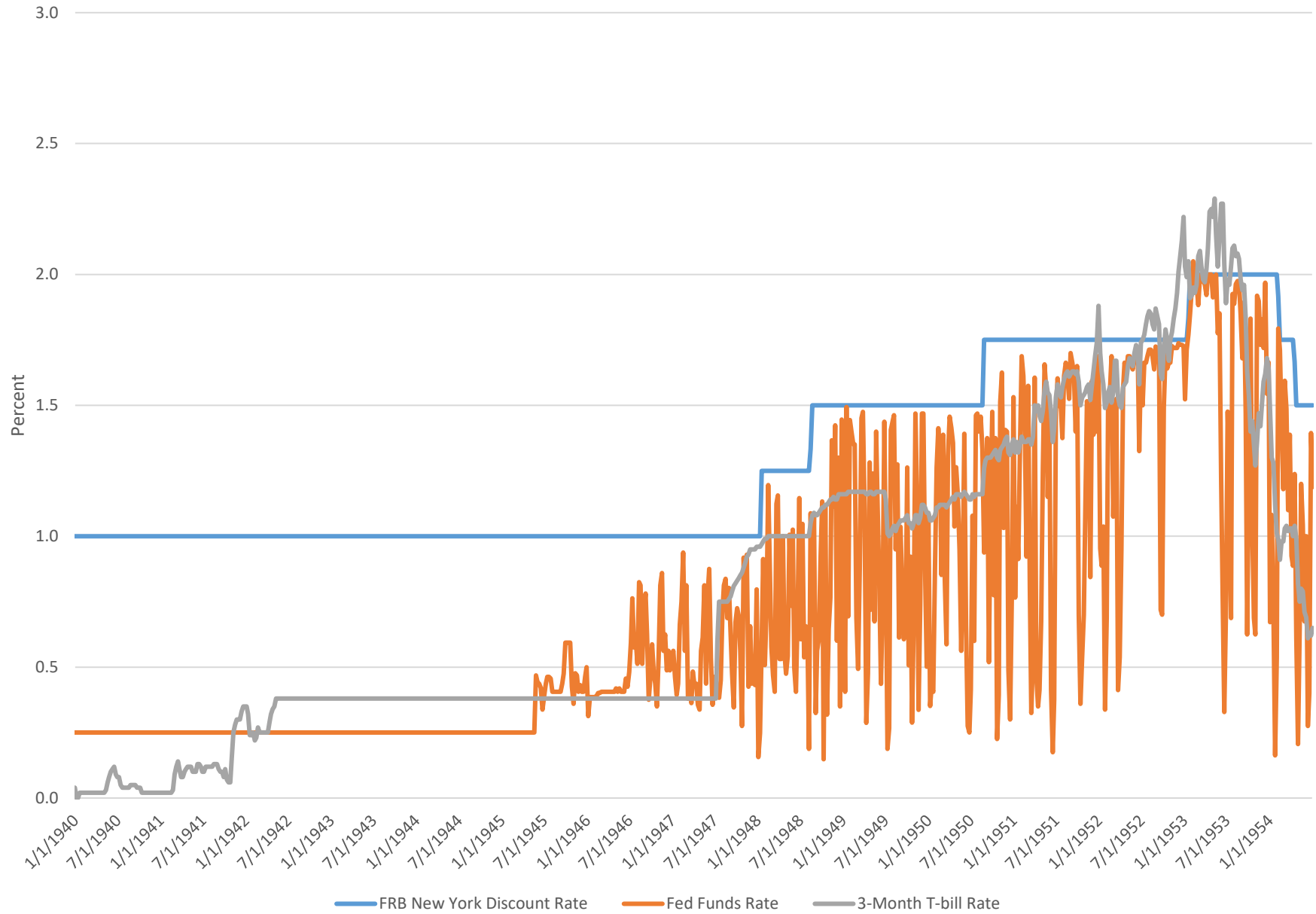


Figure 6: Fed Funds Rate, 3-Month Treasury Bill Rate, and Discount Rate (1940-54)



Appendix Figure 1: Spread between Fed Funds Rate and New York Fed Discount Rate, 1954

