

Assessing the 1921–1922 federal financial rescue: the War Finance Corporation Bank lending program

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The 1920–1 recession did not transpire entirely without federal intervention, as commonly believed. Following lending by several Federal Reserve banks, the federally chartered War Finance Corporation (WFC) lent to support exports and shortly after the recession, it lent aggressively to assist banks in agricultural regions, as numerous bank suspensions resulted from the agricultural depression of the early 1920s. Bank suspensions decreased markedly in 1922 to the lowest annual total during the 1921–33 period. This article assesses the impact of WFC lending on bank suspensions, and to what extent the WFC's provision of liquidity helped to resolve the existing difficulties.

Keywords: War Finance Corporation, bank suspensions, agricultural depression

JEL classification: E31, E65, N22, N52

I

Beginning in 1920 through 1921, the US economy suffered a second, more severe post-war economic contraction, lasting 18 months.¹ The unemployment rate jumped from 1.4 in 1919 to 11.7 percent in 1921.² Consumer prices, which had more than doubled since the beginning of the war in 1914, fell by almost 21 percent.³ The agricultural sector that had expanded significantly in the preceding decade suffered a sizable deflation. The resulting agricultural distress was a potential cause of problems for the banking system.

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¹ The NBER dates the contraction beginning in January 1920 and ending in July 1921. All data sources are listed in the Data Appendix.

² Data from Lebergott. United States Bureau of Economic Analysis 1973.

³ CPI data from Federal Reserve Economic Data (FRED).

Federal Reserve policy moves contributed to this cyclical fluctuation. Following the war, the Fed kept interest rates low to support Treasury bond prices. The ensuing inflation resulted in a loss of gold reserves, forcing the Fed to increase interest rates. The New York Fed increased its benchmark discount rate three times from November 1919 through June 1920, from 4 to 7 percent, and then cut, from May through November 1921, to 4.5 percent. The other reserve banks adjusted their rates similarly during this time frame, but the timing and magnitude of the rate changes sometimes differed.⁴ Friedman and Schwartz (1963, p. 234) note that the collapse of prices followed the final June rate increase.

Other than changes in Federal Reserve policy, this particular cycle is reputed to have taken its natural course with no governmental involvement. Eichengreen notes that this cyclical episode led some Federal Reserve leaders to conclude that a policy of liquidation was desirable, as a strong recovery quickly followed the contraction (Eichengreen 1992, p. 122). Grant describes the episode as a period of 'instructive inaction' (Grant 2014, p. 8).

However, this perception of the episode is not entirely accurate. Early in the recession, Federal Reserve banks in agricultural regions made loans to banks to support the farm economy. Also, a little-known federal agency, the War Finance Corporation (WFC), actively provided financial assistance, first by providing financing for exports of US products, and shortly after the cyclical trough, lending to banks in troubled agricultural regions. The WFC's lending was channeled to farmers indirectly, by lending to banks, cooperative marketing associations and live-stock loan companies to then lend to farmers. If WFC lending provided relief to farmers, it also would mitigate banking difficulties that otherwise would have resulted from agricultural distress.

This article reports the results of an assessment of the WFC's lending program. Using a regression discontinuity in time design and archival data for bank suspensions, estimates are obtained for the impact of the WFC lending program on bank suspensions. The estimates provide support for the view that the lending program reduced bank suspensions.

The article is organized as follows. Section II discusses the economic impacts of the recession, focusing on the agricultural recession and resulting banking problems. The next section recounts the activities of the War Finance Corporation, including the 1921–2 lending program. The fourth section reports the results of the econometric evaluation of WFC lending on bank suspensions. Section V concludes.

II

WFC lending to banks was designed to assist farmers, by providing credit to allow farmers to carry their inventories for longer periods of time. Federal Reserve discount

⁴ Friedman and Schwartz (1963, pp. 321–39) discuss Federal Reserve policy during this period. Data for discount rates are available in Board of Governors of the Federal Reserve System 1943, pp. 439–43.



Figure 1. *Farm economy: overview*

Sources: Index of farm prices – NBER Macrohistory database, farm value, exports, and mortgage debt – United States Department of Agriculture 1942.

loans for agricultural purposes were limited to six months' maturity. However, changes in the pattern of sales necessitated loans for longer periods. WFC lending was intended to fulfill farmers' credit needs, while simultaneously relieving pressure on country banks.

The agricultural sector prospered during the 1910–20 decade, with a significant increase in land under cultivation. As World War I disrupted European agricultural production, US exports soared, adding to the prosperity. In 1920, agricultural output contributed over 12 percent of GDP and by one estimate, farm workers comprised 15.3 percent of the total labor force.⁵

While the recession affected both industry and agriculture, the farm economy was hit particularly hard. Industrial production contracted 31.6 percent.⁶ An index of prices received by farmers fell 52.5 percent during the downturn. The prices of

⁵ Agriculture contributed 12.3 percent of GDP by the NBER estimate and 12.1 percent by the BEA data. Employment data are from Lebergott. US Bureau of Economic Analysis 1973, pp. 185, 199.

⁶ Board of Governors of the Federal Reserve System 1940.

two major crops, cotton and wheat, fell 72.2 and 64.4 percent respectively, from their cyclical high to low values.⁷

Key indicators of the health of the farm economy, indices of prices received, land value per acre, farm exports and farm-mortgage debt, are depicted in [Figure 1](#).⁸ All measures rose dramatically during the war years, and then fell, perhaps even more dramatically, except for mortgage debt that was not easily liquidated. Farm exports peaked in 1919, and output prices and land values peaked in 1920. Mortgage debt continued to accumulate, peaking in 1923. The recession of 1920–1 and accompanying deflation caused severe economic problems for farmers.

The drop in exports, price deflation and concomitant decline in farm income were certainly the primary problems. An underlying source of difficulty was likely increased indebtedness incurred during the war-time boom (Rajan and Ramcharan 2015). Shifts in the demand for and supply of farm credit may have combined to increase farm debt. On the demand side, optimism resulting from the 1917–20 boom led farmers to undertake excessive commitments (Johnson 1973–4).

The increase in the supply of credit to farmers resulted from the creation of the Federal Farm Land Bank system in 1916, providing mortgage loans to farmers (O'Hara 1983). The system consisted of 12 regional federal farm land banks with member local cooperative associations, and private joint stock land banks. Both could issue tax-exempt bonds to raise funds for mortgage lending to farmers. The dramatic increase in income tax rates and the number of brackets enacted to help finance the war made the tax-exempt bonds issued by the land bank system especially attractive (Kang and Rockoff 2015). As a result, funds were available to farmers at subsidized rates and farm debt increased commensurately, especially following the war.

Then, the collapse of prices and foreign trade greatly increased the burden of agricultural debts. Also, the pattern of exports changed. Before the war, exports were sold in large quantities, but following the war, Europeans bought in small amounts, requiring producers to carry stocks longer, increasing their credit needs. Those farmers who had increased their debt loads during the boom years were subsequently hard pressed to service their loans. The resulting agricultural distress was severe.

As the banking system at this juncture in US history was primarily a unit banking system, especially in agricultural states, problems on the farm led to banking problems. The fortunes of unit banks in rural areas were inexorably intertwined with the fortunes of farmers.

The Federal Reserve's preferred measure of banking distress during this period is bank suspensions. The data on state bank failures are fragmentary, and the suspensions data beginning in 1921 are considered to be the most reliable measure of banking

⁷ All farm price data are from the National Bureau of Economic Research Macrohistory database.

⁸ Index of Farm Prices Received is the above cited series. Other data are from United States Department of Agriculture 1942. The index numbers for exports and farm-mortgage debt were constructed by the authors.

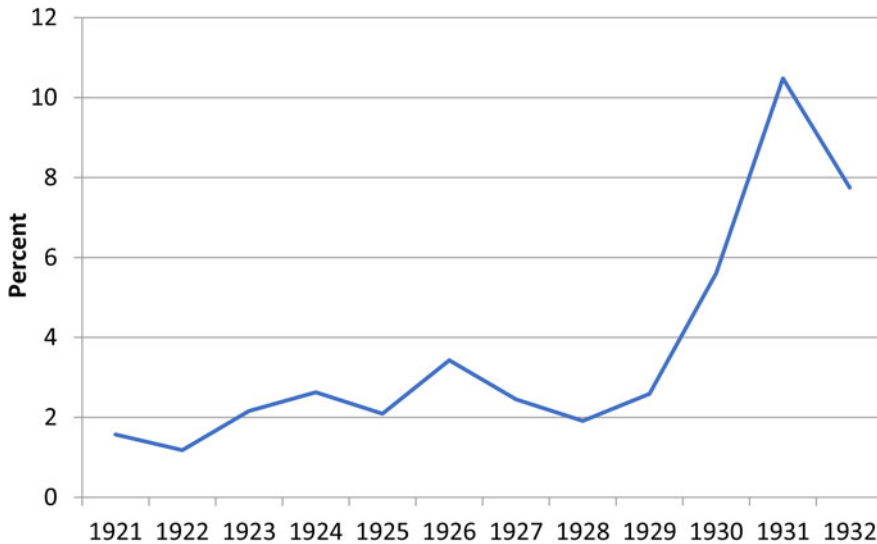


Figure 2. *Suspensions per 100 active banks, 1921–32*

Source: Board of Governors of the Federal Reserve System (1932), p. 5.

problems (Board of Governors of the Federal Reserve System 1943, p. 281). Bank suspensions from 1921 through 1929 averaged 635 per year. Since most suspensions occurred in agricultural states, the high average level of suspensions is often blamed on farming difficulties. Figure 2 depicts the combined annual number of national and state bank suspensions each year, 1921–32, per 100 active banks as of 30 June of each year.⁹

One study finds that agricultural problems were the primary determinant of bank suspensions during the 1920s, and that the existence of state deposit insurance systems that likely increased moral hazard also contributed to higher suspension rates (Alston, Grove and Wheelock 1994). White (1984), focusing on national bank failures in 1930, found that agricultural problems, along with unit banking, declining bond prices and tight monetary policy explain failures.¹⁰

Alternatively, a Federal Reserve internal study (Board of Governors of the Federal Reserve System 1932) attributed banking difficulties during the 1921–31 period to overbanking. A table in this study compares bank suspensions per 100 banks in operation in 1920 (Suspensions) to the growth in the number of banks from 1900 to 1920 (Growth) and population per bank in 1920 (Pop).¹¹ An ordinary least squares estimate

⁹ The data are from Board of Governors of the Federal Reserve System 1932.

¹⁰ Temin (1976) examines bank suspensions in 1929, 1930 and 1931. Using a limited set of explanatory variables, Temin finds a correlation between some measures of farm income and bank suspensions, especially for 1930 and 1931.

¹¹ Board of Governors of the Federal Reserve System 1932. The bank suspensions data used in the Fed's study exclude private and mutual savings banks.

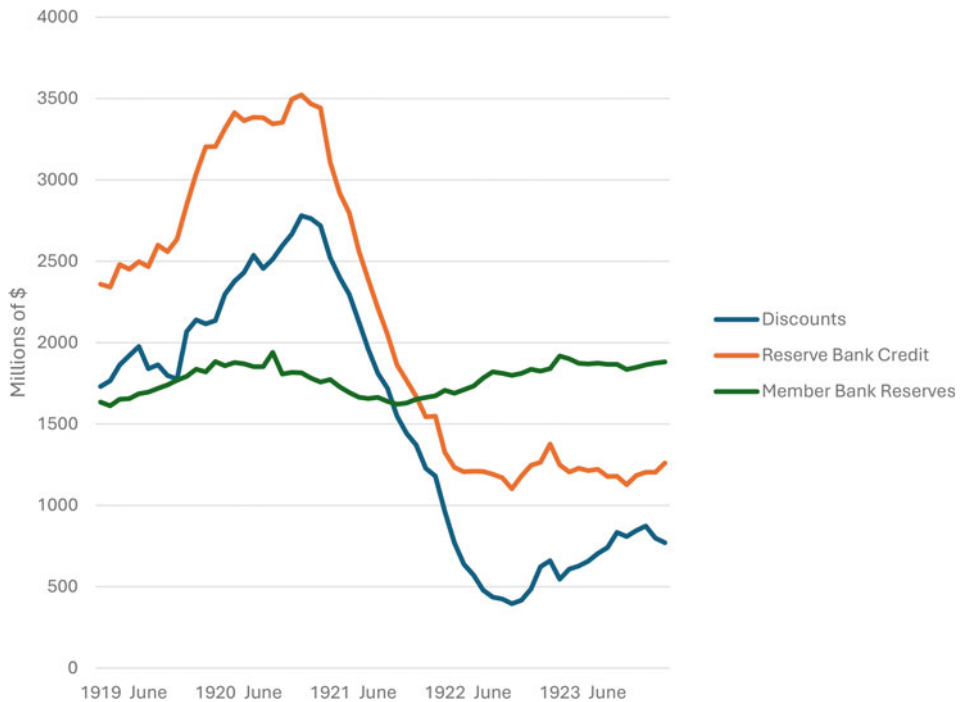


Figure 3. *Discount lending, Federal Reserve credit and bank reserves*
 Source: Board of Governors of the Federal Reserve System (1943).

with Huber-White-Hinkley heteroskedasticity consistent standard errors and covariance obtains the following result, with t-statistics in parentheses:

$$\text{Suspensions} = 23.8 + 0.051\text{Growth} - 0.0013\text{Pop}$$

(4.09) (3.28) (2.02)

These results support the Fed's 'overbanking' hypothesis.

Initially, Federal Reserve banks in agricultural districts attempted to provide relief to farmers by lending to member banks. Tallman and White (2019) document that early in the 1920–1 downturn, Federal Reserve banks in agricultural regions lent aggressively. However, the lending to assist banks in agricultural regions, particularly by the Atlanta Fed which had been an especially active lender, was criticized within the system, and the Atlanta Fed was pressured to decrease its discount lending in 1921 (White 2017; White and Roberds 2020). Total Federal Reserve credit fell steadily beginning in January 1921 until the final months of 1922, as discount lending at this time was the primary source of Federal Reserve credit available to banks to serve as reserves, as seen in Figure 3.

Correspondingly, with the decline in Federal Reserve Credit, available data show that member bank lending declined steadily from late 1919 through mid 1922. Following substantial wartime deficits, federal revenue exceeded federal expenditures in every fiscal year from 1920 through 1930, with an accompanying yearly decrease in gross debt. Fiscal policy focused on repaying war-related debt. Nominal interest rates did fall from 1920 through 1922. Lower rates certainly helped, but what farmers needed most was longer-term, and possibly renewable credit (Board of Governors of the Federal Reserve System 1943, pp. 72, 513 and 450).

With the decline in Federal Reserve lending, the ability of banks to fulfill the credit needs of the agricultural economy declined. As both monetary and fiscal policy were contractionary, pressure increased on both farmers and their banks. Attempting to provide relief for farmers, Eugene Meyer, managing director of the WFC, obtained authority to lend to banks, at maturities longer than allowed by the Fed's discount lending. While WFC lending was directed to farmers, this lending would relieve financial distress and likely reduce bank suspensions.

III

The WFC was created to help finance the war effort, not to assist banks. The United States' entry into World War I placed a huge burden on federal finances. Gross federal debt increased from \$2,976 million in June 1917 to \$25,834 million by December 1919.¹² Treasury Secretary William Gibbs McAdoo worried that debt financing of the war diverted capital from private industry and strained the financial system (McAdoo 1931, p. 441). To address the war financing issue, McAdoo recommended and in April 1918 Congress legislated the creation of the War Finance Corporation as an off-budget federal agency.¹³

To assist private-sector industries deemed essential to the war effort, the WFC was given lending power. The Treasury provided \$500 million of capital and the WFC was authorized to issue bonds up to \$3,000 million.¹⁴ However, as the war ended shortly after it began operations, WFC lending to industry was limited to only \$301.5 million. Of this total, \$204.8 million consisted of 1919 loans to railroads to assist the United States Railroad Administration, financed in large part by the WFC's sole bond issue of \$200 million (War Finance Corporation 1919).

¹² Board of Governors of the Federal Reserve System 1943.

¹³ Previously, in January 1918, McAdoo had formed the Capital Issues Committee comprised of three members of the Federal Reserve Board to evaluate new security issues. The committee could recommend against an issue deemed unnecessary to the war effort, but its recommendations were advisory, not binding, although its existence did discourage some issues. McAdoo wanted to formalize the committee and make its recommendations binding. The WFC legislation formalized an expanded, seven-member Capital Issues Committee, but Congress determined that its recommendations remain voluntary (Willoughby 1934).

¹⁴ Willoughby 1934 and Butkiewicz and Solcan 2016 discuss the WFC's wartime operations.

Legislation for the third Liberty bond issue was in process at the same time as the WFC legislation. The first two Liberty bond issues, which had been marketed to the public through appeals to patriotism, were trading at discounts, arousing public discontent. The Third Liberty Bond Act contained a provision creating a sinking fund to repurchase Liberty bonds, to stabilize their prices. The Treasury delegated the war bond purchases to the WFC, and for a two-year period the WFC actively repurchased Liberty bonds and later Victory notes that it resold to the Treasury, until Treasury Secretary David F. Houston suspended the regular repurchase program in 1920.¹⁵

The original WFC legislation authorized the corporation to operate for ten years, but its activities were to cease, except for the processing of loans and winding up its activities, six months after the end of the war. Thus, in late 1918 the WFC prepared to end its active operations. However, managing director Eugene Meyer, who believed that temporary government intervention was at times warranted and necessary, proposed WFC lending to support US exports.¹⁶ Congress enacted authorizing legislation in March 1919, and the WFC lent \$46 million to support exports until Treasury Secretary Houston suspended this lending in May 1920.

Frustrated with Houston's decisions, Meyer resigned from the corporation but pressed for a resumption of WFC lending. A Congressional resolution passed in December 1920 authorized renewed lending. Houston wrote ailing President Wilson's veto message, which Congress overrode in January 1921 (Meyer 1974, box 180). The WFC subsequently lent an additional \$38.7 million to finance exports.

As the domestic agricultural economy deteriorated in 1921, Meyer believed that export financing was inadequate and pressed for expanded lending powers. On 24 August 1921, Congress amended the WFC legislation with the Agricultural Credits Act, authorizing lending not only for exports and to banks and financial institutions, but also to cooperative marketing associations and newly created livestock loan companies.

The WFC's expanded powers received strong governmental support. President Harding proposed the legislation to Congress with the support of Treasury Secretary Mellon and Commerce Secretary Hoover.¹⁷ The WFC legislation was proposed as an alternative to a proposal for a new farm credit agency proposed by Senator Norris of Nebraska. The senate ultimately supported the WFC proposal without a record vote, and the house approved the bill by a vote of 314–21.¹⁸

The WFC began lending in late October 1921 and lent extensively during the next several months, providing relief for farmers and their banks. The WFC's

¹⁵ For details and analysis of the WFC war-time security purchases, see Butkiewicz and Solcan 2016.

¹⁶ Butkiewicz 2015 examines Meyer's advocacy of government intervention.

¹⁷ 'Harding will urge 3 big tasks be put on finance board', *New York Times*, 26 July 1921, p. 1.

¹⁸ 'New substitute farm bill', *New York Times*, 29 July 1921, p. 2; 'Farm credits bill passed by senate', *New York Times*, 5 August 1921, p. 2; and 'Passes farm relief bill', *New York Times*, 23 August 1921, p. 23.

Fourth Annual Report (1922a) provides the agency's rationale for expanded lending powers:

Not only was the market abroad slow, but it was demonstrated, after careful inquiry, that our own merchants and manufacturers were operating on the basis of the lowest possible stocks, and were buying only to meet current demands. This naturally resulted in forcing large quantities of raw materials, which normally are carried by mills, wholesalers, jobbers, and retailers, back upon the original producers and the banks which do their financing. The producers were unable to market their products as rapidly as formerly, large numbers of them were unable to liquidate their loans, and an unusually heavy burden was imposed upon local banking institutions, seriously straining their resources and facilities. A condition of acute distress developed in the agricultural sections of the country, and if disaster was to be averted extraordinary action was needed to meet the situation. (p. 6)

Slow sales abroad were attributed to losses incurred from fluctuating exchange rates, as the gold standard was not yet restored (War Finance Corporation 1922a, pp. 5–6). The need to carry inventories for longer periods highlighted another concern of farmers, the need for intermediate credit.

The Federal Reserve Act authorized discount lending for 90 days but allowed lending for agriculture for six months. The Federal Land Banks made mortgage loans to farmers. However, there was a gap for credit of intermediate term. Meyer consistently argued that loans for livestock should be of a term of two years. Loans of this maturity would not be eligible for discounting or as collateral for advances from the Federal Reserve.

One contemporary author (Benner 1926, pp. 50–1) felt the Fed's credit provisions to agriculture had worked well until the 1920–1 contraction. Due to the collapse of prices, farmers were unwilling and unable to repay their loans. Loans to farmers had been made with the expectation that they would be extended, but many country banks were overextended, and their correspondents and the Fed wanted loans to be liquidated (Benner 1926, pp. 72–3). The lending powers Meyer obtained for the WFC were designed to fill this gap.

The 1921 Agricultural Credits Act authorized the WFC to make loans to exporters, banks, cooperative marketing associations and livestock loan companies to carry stocks.¹⁹ The loans were collateralized and had an initial maturity of one year but could be extended for up to three years from the date of the initial advance. Total outstanding balances were limited to \$1 billion. The interest on loans was between 5½ and 6 percent, with the rate on most loans being 5½ percent.²⁰ Banks could add a margin of up to 2 percent above the rate charged

¹⁹ Most loans for exports were approved prior to the passage of the Agricultural Credit Act (War Finance Corporation 1922b, p. 2).

²⁰ 'Farm loan extortion charges stir Harding', *New York Times*, 28 January 1922, p. 3.

by the WFC.²¹ The initial authority to lend was to end on 1 July 1922, but this authority was extended three times to 31 December 1924. Liquidation of the WFC began on 1 January 1925.²²

The WFC opened 33 loan agencies in 31 states that were deemed to be important agricultural and livestock districts.²³ Volunteer committees received and reviewed applications. These committees made recommendations to the board of directors in Washington, DC, for final determination.²⁴

Using its new powers, the WFC lent aggressively attempting to relieve the agricultural distress. The majority of WFC lending occurred between November 1921 and April 1922. From late October 1921 through December 1924 the WFC lent \$269 million, of which 93 percent of financial institution loans and 82 percent of all loans were advanced by June 1922.²⁵ Lending through December 1922 totaled 96 percent of loans to financial institutions and 90 percent of total lending. A total of \$298.7 million was advanced to banks and other agricultural financial organizations during the life of the lending program, with all loans after 31 December 1924 being expense advances (Acting Secretary of the Treasury 1943, pp. 18–19).

Total lending of \$298.7 million was small relative to total agricultural credit and agricultural product. A United States Department of Agriculture study in 1920 estimated that bank loans to farmers totaled \$3,879 million, or 18 percent of total bank credit (Benner 1926, p. 55). Total WFC lending was 3.1 percent of the NBER estimate of gross farm product and 2.9 percent of the BEA estimate of gross farm product.²⁶ While total lending was relatively small, it was not necessarily ineffective. Also, as federal reserve bank credit was declining, WFC lending was the only important source of assistance during this period.

Bank suspensions, which were low in the middle months of 1921, spiked up in the final three months of the year, just as WFC lending began.²⁷ Bank suspensions began a decline in February 1922 and the total for the year was the lowest of any year in the decade and much lower than the yearly average for the decade (366 compared to 635).

²¹ The 4- to 6-month prime commercial paper rate was 5.5 percent in November 1921, but declined in subsequent months to a low of 4.13 percent by July 1922 and then increased at the end of the year (Board of Governors of the Federal Reserve System 1943, p. 450).

²² The Agricultural Credit Act of 1923 created a system of intermediate credit banks, making the WFC redundant.

²³ Two loan offices were opened in each of California and Missouri.

²⁴ War Finance Corporation 1922a details the establishment of the lending program.

²⁵ The total includes approximately \$20 million of advances approved under the WFC's export powers that were withdrawn and reapproved under powers of the agricultural credits act (War Finance Corporation 1922a, pp. 10–11).

²⁶ Estimates of nominal gross farm product were computed by deflating real gross farm product in 1958 dollars using the respective GDP deflators computed from the ratio of nominal to real GDP for NBER and BEA data (US Bureau of Economic Analysis 1973, pp. 183, 185).

²⁷ As noted by a referee, the estimates discussed below may be affected by anticipation effects. This issue is addressed in Section IV below.

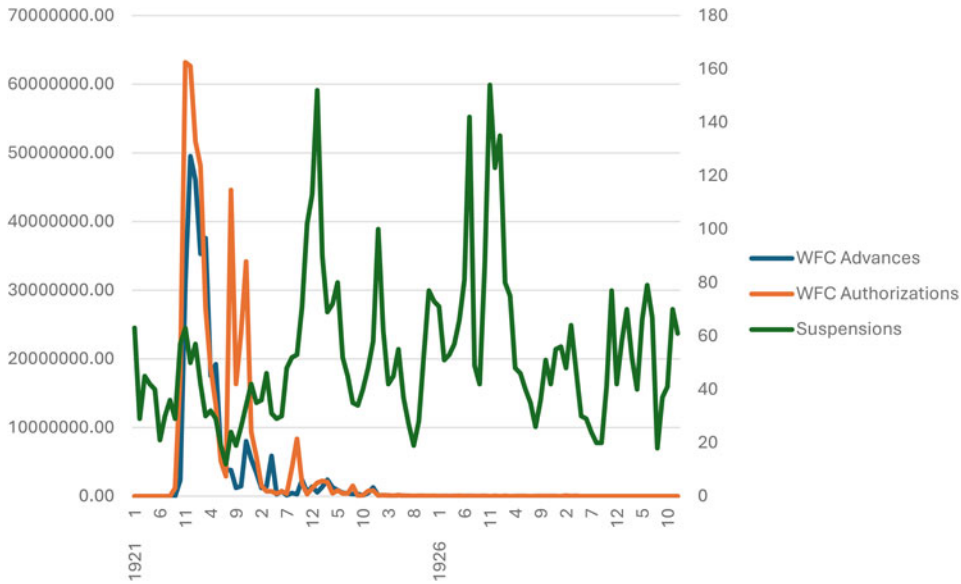


Figure 4. *WFC advances, authorizations and bank suspensions*

Sources: Acting Secretary of the Treasury, *Liquidation of the War Finance Corporation*, and Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin*, September 1937.

Figure 4 depicts monthly WFC authorizations and advances to financial institutions, co-ops and livestock loan companies, and bank suspensions for the years 1921 through 1929.

WFC officials reported that the new lending authority was successful, providing needed relief to farmers and the financial system.²⁸ They maintained that their loans not only helped weak banks, but also strong banks that had not received WFC funding, as with WFC loans helping weak banks, the strong banks were more willing to function normally. They also asserted that just authorizing loans, regardless of whether the funds were advanced, provided relief as banks knew funds were available (War Finance Corporation 1922a, p.14):

In many cases advances authorized by the Corporation have not been consummated because the applicants, strengthened by the assurance of aid from the Corporation, have been able to obtain in other ways the credit facilities they required. In fact, the experience of the Corporation has been that wherever it has lent, or agreed to lend, a dollar, it has produced confidence to such an extent that others were willing to advance many dollars.

²⁸ In support of their belief in the success of their new lending authority, the 1922 annual report (War Finance Corporation 1922b, pp. 21–37) contains excerpts from 86 letters attesting to the benefits and relief provided by WFC lending.

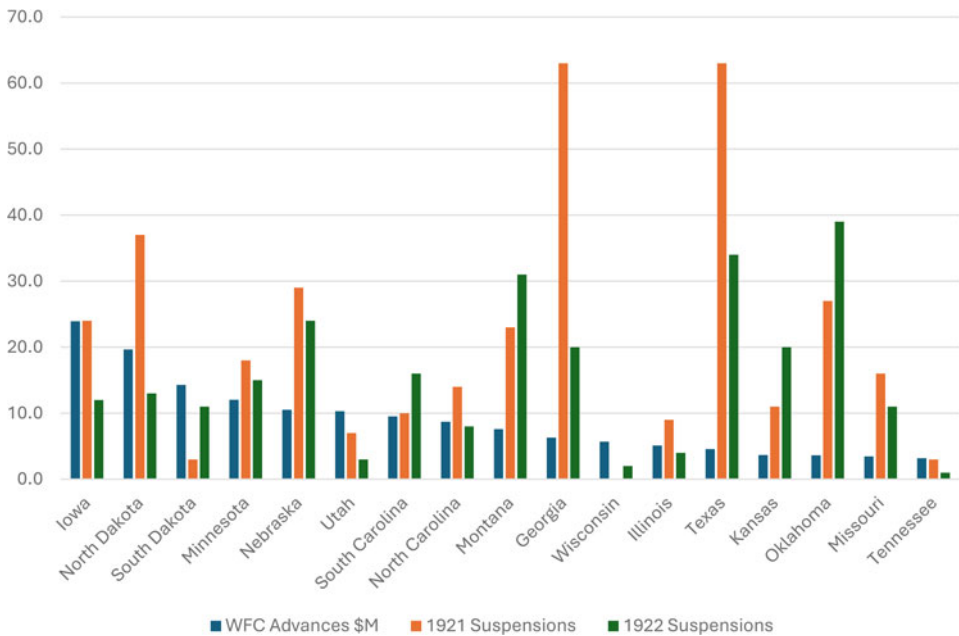


Figure 5. *WFC advances and bank suspensions*

Sources: WFC advances and authorizations – *Records of the War Finance Corporation*. National Archives Record Administration II. Record Group 154. Bank suspensions by state by month – *Records of the Federal Reserve System*. National Archives Record Administration II. Record Group 82.

The WFC's Fifth Annual Report stated that lending was especially important for nonmember banks.²⁹ If WFC loans ended forced liquidation that would force weak banks to suspend operations and possibly fail, then WFC lending could be a reason, at least in part, for the drop in suspensions in 1922.

Loan applications peaked in December 1921, and the Fifth Annual Report also states that the results of its lending began to have an effect in January 1922. WFC loans 'strengthened the banking situation in the country districts and relieved the necessity of forced liquidation' (War Finance Corporation 1922b, p. 3). Figure 5 depicts the raw data for several states on WFC advances and bank suspensions in 1921 and 1922. The first bar ranks each state by WFC advances in millions of dollars, for total advances greater than \$3 million.³⁰ The second and third bars are the number of suspensions in each state for 1921 and 1922 respectively. In most states the number of suspensions decreased, but the positive impact was not universal.

²⁹ War Finance Corporation 1922b, p. 5. The report further claimed that the authorization of the WFC's new lending authority improved national confidence. Eugene Meyer attributed great importance to psychological effects.

³⁰ Most states receiving less than \$3 million in total advances had a small number of suspensions.

In five states, Kansas, Oklahoma, Montana, South Carolina and South Dakota, suspensions increased in 1922 compared to 1921. In three of these states, Kansas, Montana and South Dakota, total bank debits were lower in 1922 than in 1921, indicating that the economies of these states remained weak in 1922. Combined suspensions for the states in [Figure 5](#) decreased from 357 in 1921 to 264 in 1922.

IV

The analysis in this section explores whether the introduction of the WFC lending program in November 1921 caused a reduction in bank suspensions. Given the relatively short period of sizable WFC lending, the analysis should be conducted by state by month. Monthly data for bank suspension by state are available in the Federal Reserve archives (*Records of the Federal Reserve System*, box 1851, National Archives and Records Administration II, Record Group 82). Bank debits are used as a measure of economic activity. Monthly bank debits data by reporting center are summed to obtain monthly data by state (Federal Reserve Board 1924). Only debits from centers having complete data for both years are used. Also, New York City debits were excluded from the New York state data. Bank debits data are not available for the state of Vermont, which was dropped from the sample. The District of Columbia is also excluded as it had no measured agricultural sector. Wheat prices are a national variable, the same for all states (National Bureau of Economic Research, Series 04001a).

Published WFC data do not include monthly lending by state. A search of the WFC archives found monthly data by state for the number and value of advances and authorizations only beginning in June 1922, after most of WFC loans were extended (*Records of the War Finance Corporation*, National Archives and Record Association II, Record Group 154).³¹ The June 1922 data are cumulative totals of authorizations and advances by state. Data by state for the individual months of November 1921 through May 1922 could not be found.

Because of this data limitation, we take advantage of a sharp discontinuity in WFC lending from no lending prior to November 1921 to WFC support during the period from November 1921 to December 1922.³² Since there is no available cross-sectional variation in the implementation of the WFC lending, a difference-in-difference framework is not possible.³³ Thus, this regression discontinuity in time design compares two groups of bank suspensions that are very similar except for the treatment, which depends discontinuously on the WFC lending cutoff. On the other hand, a

³¹ Box 257 contains three bound ledgers of onion-skin copies of monthly reports. The ledgers are dated 1922, 1923 and 1924. There is no 1921 ledger. The sheets in the 1922 ledger begin with cumulative totals as of June 1922. No earlier reports could be found.

³² A very small dollar value of loans was advanced in late October. Significant lending began in November 1921.

³³ Testing a parallel time trend assumption in this context is therefore not possible.

different approach would compare two groups that could have some pre-existing differences on top of treatment, but the effect of that treatment is assumed to be constant over time.

Furthermore, there are many potential time-varying confounding factors. The estimates include measures to control for the level of economic activity (bank debits), the farm economy recovery (wheat prices), and seasonal and state fixed effects. Other less important factors are assumed to change smoothly across the date of the implementation of WFC lending. It is also reasonable to assume that the start date of WFC lending is not randomly assigned. Thus, our regression discontinuity in time framework can be thought of as the ‘discontinuity at a threshold’ interpretation of regression discontinuity and not as local randomization (Hausman and Rapson 2018). While the regression discontinuity requires different assumptions and less data compared to a difference in difference design, its estimates capture a more local effect around the WFC lending cutoff.

We estimated a regression-discontinuity in time (RDiT) design, in which time is the running variable that determines whether US banks are exposed to WFC lending or not. More specifically, we use the following regression:³⁴

$$\begin{aligned} Suspensions_{it} = & \alpha + \beta_0 WFC_t + \beta_1 Debits_{it} + \beta_2 Wheat\ Prices_t \\ & + \sum_{k=2}^{47} \mu_k(\pi_i) + \sum_{m=2}^{12} \omega_m(Q_m) + \varepsilon_{it} \end{aligned}$$

where $Suspensions_{it}$ is the number of bank suspensions in state i and month t . Because the outcome variable is a count process adopting only positive integer values, the regression is estimated using a negative binomial model.³⁵

The variable WFC is a dummy variable taking the value 1 for all the months after WFC lending started in November 1921, and zero otherwise. The variable $Debits_{it}$ contains the annualized change in the log of monthly bank debits by state. These represent the turnover of bank deposits, which vary with the business cycle. This variable is intended to capture state-specific business cycle dynamics. The variable $Wheat\ Prices_t$ is the annualized change in the log of monthly wheat prices, as the recovery of prices increased farm income. Finally, we control for monthly and state fixed effects, $\{Q_m\}$ and $\{\pi_i\}$, respectively, to account for seasonality in bank suspensions, as well as socioeconomic differences across the 47 states included in our analysis.

³⁴ The dummy variable WFC acts as a time-indicator, or as an alternative time trend and thus, model specifications that include linear time trends have statistically insignificant WFC coefficients. In this regression discontinuity in time design, the comparison group involves bank suspensions that took place before WFC lending began.

³⁵ The negative binomial model is more flexible than Poisson, another count model, as it relaxes the assumption of equality between the conditional mean and variance.

Table 1. *Descriptive statistics (monthly average suspensions by state)*

	Before WFC lending	During WFC lending	Diff absolute	Diff %
	January 1921 – October 1921 Mean (Sd)	November 1921 – December 1922 Mean (Sd)		
All states	0.83 (1.67)	0.72 (1.41)	-0.11***	-13.0%
Group of states 1 ^a	1.83 (2.44)	1.45 (1.73)	-0.38	-21%
Group of states 2 ^a	1.62 (2.40)	1.45 (1.99)	-0.17	-11%

Notes: Statistical significance based on the Van der Waerden non-parametric test. *** difference is statistically significant at the 1% level. ^a difference in variances is statistically significant at the 1% level, based on the Bartlett test.

Group 1: Iowa, Montana, North and South Dakota

Group 2: Georgia, Illinois, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Wisconsin

WFC lending was concentrated in those states having experienced significant banking suspensions. Banks in 11 New England and northeastern states and the District of Columbia received no WFC loans.³⁶ A single bank in New York received one WFC loan. Thus, an entire section of the country, where agriculture was less important and banking troubles and suspensions were rare, received no WFC loans. WFC lending was highest in those states having a large number of bank suspensions.

Table 1 displays descriptive statistics on US bank suspensions before and after WFC lending. The monthly average rate of suspensions for all states decreased by a statistically significant 13 percent once WFC lending began. Four states, Iowa, Montana, North Dakota and South Dakota, received 25 percent of WFC lending. For this group of states, the rate of suspensions dropped 25 percent, although the decrease is not statistically significant. Similarly, for the 11 states in Figure 5, the decrease in means is 11 percent, but not statistically significant. However, for both groups of states, the decrease in the variance is significant.

Table 2 presents estimates of the regression model described above for the WFC lending program using different specifications. Column 1 presents estimates from a model that controls only for seasonality, state fixed effects, and the regression discontinuity dummy variable for the WFC lending program. Column 2 adds to the specification in column 1 a control for state business cycles, namely the change in the log of bank debits. Our baseline specification in column 3 adds the change in the log of wheat prices. The coefficient of interest, β_0 , captures the causal effect of WFC lending on the number of

³⁶ The 11 states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, Pennsylvania, Rhode Island, Vermont and West Virginia.

Table 2. *Regression estimates (RDiT) of the WFC lending on bank suspensions*

<i>Model:</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
<i>Dep. var:</i>	<i>Suspensions</i>	<i>Suspensions</i>	<i>Suspensions</i>
<i>C</i>	-1.60 (0.58)***	-1.40 (0.57)**	-1.43 (0.55)**
<i>WFC</i>	-0.29 (0.12)**	-0.32 (0.12)***	-0.28 (0.11)***
<i>Debts^a</i>		-0.0008 (0.00)*	-0.0008 (0.00)*
<i>Wheat prices^a</i>			-0.0006 (0.00)
<i>Observations:</i>	1128	1081	1081
<i>Sample:</i>	01/1921–12/1922	01/1921–12/1922	01/1921–12/1922

^a*Debts* and *wheat prices* are modeled as annual percentage changes to capture the impact of changes in the business cycle.

Notes: The unit of observation is state-month. Standard errors (in parentheses) are clustered at month level. The symbols ***, **, * indicate that coefficients are statistically significant at the 1%, 5%, 10% level, respectively. All the models include state and seasonal fixed effects.

Table 3. *Negative binomial regression results from Model 3 as incidence rate ratios*

	Coefficient	IRR ^a	Impact on suspensions (percentage)
<i>WFC</i>	-0.28	0.76	-24.4%
<i>Debts</i>	-0.0008	0.99	-0.08%
<i>Wheat prices</i>	-0.0006	0.99	-0.06%

^aIncidence rate ratios (IRR) are obtained by taking the exponent of the coefficient estimates.

bank suspensions. A negative and statistically significant coefficient would provide evidence that the WFC's lending program decreased the number of bank suspensions.³⁷

Overall, the monthly estimates provide support that WFC lending reduced bank suspensions. The WFC variable is statistically significant in all specifications. The magnitude of the effect of WFC lending is presented in terms of incidence rate ratios (IRR). According to the estimates in Model 3, WFC lending reduced US bank

³⁷ The WFC variable does not distinguish between actual funds advanced or authorizations, that is, approval of loans. Monthly totals of advances and authorizations were included in other estimates, but multicollinearity with the WFC measure was a problem, and the advances and authorizations variables were insignificant.

Table 4. Regression estimates of the WFC lending on bank suspensions

The ‘donut’ model is estimated on truncated data, where observations around the date of the start of WFC lending, September–November 1921, were removed to mitigate concerns about short-run anticipation effects.

Model:	Model 3 ‘Donut’ RDiT	Model 3 RDiT
Dep. var:	Suspensions	Suspensions
C	-1.32 (0.62)**	-1.43 (0.55)**
WFC	-0.29 (0.14)**	-0.28 (0.11)***
Debits ^a	-0.0007 (0.003)	-0.0008 (0.00)*
Wheat prices ^a	0.005 (0.013)	-0.0006 (0.00)
Observations:	987	1081
Sample:	01~08/1921 12/1921–12/1922	01/1921–12/1922

^aDebits and wheat prices are modeled as annual percentage changes to capture the impact of changes in the business cycle.

Notes: The unit of observation is state-month. Standard errors (in parentheses) are clustered at month level. The symbols ***, **, * indicate that coefficients are statistically significant at the 1%, 5%, 10% level, respectively. All the models include state and seasonal fixed effects.

suspensions by 24 percent ($\sim e^{-0.28} - 1$) between November 1921 and December 1922. The incidence rate ratios for the model three estimates are reported in Table 3.

The bank debits variable is a proxy for the business cycle and is a state by month measure. This variable is also statistically significant at the 10 percent level, indicating that as state economies recovered from the recession, bank suspensions fell, although the magnitude of the effect (IRR) is small.³⁸

Wheat prices is a month only variable, so it is the same for all states. One quarter of the total funds advanced went to four states – Iowa, Montana, North Dakota and South Dakota – and several other states receiving substantial WFC funding were important wheat producers. Increased wheat prices enabled more profitable sales, providing farmers with the funds needed to repay their loans. The estimates in Model 3 are supportive, as the wheat prices variable has a negative but insignificant impact on suspensions. The estimated IRR is only -0.06 percent, but wheat prices fell substantially, 64.4 percent from their high to low, indicating that the fall in wheat prices may have contributed to bank suspensions.

³⁸ Aggregate bank debits increased 4.2 percent from 1921 to 1922.

As noted above, anticipation effects may affect the RDiT estimates. Hausman and Rapson (2018) recommend estimating a ‘donut’ RDiT, removing the observations around the threshold to determine if anticipation effects bias the results. Model 3 is re-estimated deleting the months of September, October and November of 1921, the months around the threshold. The results, reported in Table 4, are essentially unchanged compared to the results for Model 3. Thus, anticipation effects appear not to matter.

In sum, the estimates support the hypothesis that WFC lending did contribute to the reduction of bank suspensions. Increased economic activity, as proxied by bank debits, also provided relief. Wheat prices increased slightly from January 1922 through the end of the year but remained low relative to previous years. The estimates support the view that WFC lending did reduce bank suspensions during the period of aggressive lending.

V

The 1920–1 recession was a severe downturn coupled with a significant deflation. The deflation of farm prices was much greater than the consumer price deflation. Farm debt had expanded significantly in the previous decade. The increase in nominal debt, combined with the fall in farm prices and the change in buying patterns for farm output imposed serious financial burdens on the agricultural sector and the banks with which farmers dealt. Farmers were forced to carry stocks of output that previously had sold quickly. Financing of these stocks proved difficult, as Federal Reserve rules limited agricultural loans to six months. The methods of financing that had been effective before the recession now proved inadequate.

Federal Reserve banks in agricultural districts lent liberally in 1920, financed by borrowing gold reserves from Reserve banks located in primarily industrial districts. At the end of 1920, discount lending began a steady decline. Eugene Meyer, managing director of the War Finance Corporation, requested lending authority to assist farmers and their banks. Congress passed the Agricultural Credits Act of 1921, approving the requested authority.

The WFC quickly established a lending program, providing funding to banks, marketing coops, and livestock loan companies that in turn would lend to banks. Although lending was largely concentrated in the months of November 1921 through April 1922, WFC authorities felt their lending provided significant relief to farmers and to the banking system.

A quasi-experimental approach is used to study the causal impact of WFC lending at the state level between November 1921 and December 1922 on US bank suspensions. According to regression discontinuity in time estimates, WFC lending decreased the number of bank suspensions by about 24.2 percent. Improved economic activity and possibly increased wheat prices also contributed to reduced banking difficulties.

Although the WFC only redirected existing funds, it did not create new money, its success in limiting bank suspensions demonstrates the positive impact that lender of last resort operations can have on the financial system.

Submitted: 27 November 2023

Revised version submitted: 13 September 2024

Accepted: 20 October 2024

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Data appendix

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