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# Seasonal Accommodation and the Financial Crises of the Great Depression: Did the Fed “Furnish an Elastic Currency?”

*It was not by accident that most of the money panics in this country occurred in the fall of the year; it was in the fall that the usual seasonal strain, added to an unusual credit and currency stringency, became the last straw that broke the camel's back.*

—W. Randolph Burgess (1936), p. 206.

**B**EGINNING WITH THE stock market crash in October 1929, the United States suffered a series of financial crises that mark the Great Depression. In each crisis, the number of bank failures and the declines in bank reserves, the money stock and economic activity were greater than in the preceding episodes. Many researchers investigating the causes of financial crises during the Great Depression have blamed the Federal Reserve, for either pursuing policies that led to crises or for failing to respond to them appropriately.<sup>1</sup>

This article investigates a recent claim by Miron (1986) that the reappearance of financial crises in 1929 was caused by a reduction in the Fed's accommodation of seasonal currency and credit demands.<sup>2</sup> The following three types of evidence are examined: the Fed's procedures for supplying currency and bank reserves across seasons, the stability of the seasonal behavior of the Fed's policy tools and the seasonal behavior of market interest rates. The Fed's accommodation of seasonal demands was passive, suggesting that a deliberate change in seasonal policy

<sup>1</sup>See, for example, Friedman and Schwartz (1963), Chandler (1971), Miron (1986) and Wicker (1966). The continuing debate about the role of Federal Reserve policy during the Great Depression generally is reviewed by Wheelock (1992).

<sup>2</sup>Miron (1986, p. 136) argues that “the Fed accommodated the seasonal demands in financial markets to a lesser extent during the 1929-33 period than it had previously. This means that the frequency of panics *should* have increased, as it did” (Miron's emphasis).

was unlikely. Statistical analysis of the seasonal patterns of the Fed's policy tools and of market outcomes suggests further that no change in seasonal policy occurred. The Federal Reserve may rightly be criticized for failing to offset dramatic nonseasonal increases in currency and reserve demand during the Depression. It appears unlikely, however, that the financial crises were caused by a change in the System's seasonal policies.

The first sections of this article discuss the objectives of the Fed's founders, particularly with regard to seasonal accommodation, and describe how Fed officials implemented those objectives. A review of how the Fed's presence affected the seasonal pattern of interest rates and the frequency of financial crises follows. Finally the article examines whether a change in seasonal policy was a likely cause of the reappearance of crises in 1929, first focusing on the Fed's procedures and then on statistical evidence pertaining to the seasonal patterns of Fed tools and market outcomes.

### FINANCIAL CRISES AND THE FOUNDING OF THE FEDERAL RESERVE SYSTEM

The Federal Reserve was founded to correct banking system flaws that reformers believed contributed to financial crises. The National Banking era, which began with the National Bank Act of 1863 and ended with the opening of the Federal Reserve Banks in November 1914, was marked by recurrent crises. Often a crisis was touched off by a sudden international gold outflow or the failure of a major financial institution. Occasionally such an event triggered a general run by bank depositors seeking to convert deposits into currency. In extreme cases, banks were forced to suspend currency payments and call loans to protect their reserves. National Banking era crises were generally characterized by high interest rates, many bank failures, and a slowing of economic activity.<sup>3</sup>

Studies of financial crises during the National Banking era noted that crises generally occurred at times of the year when demands for currency and credit reached seasonal peaks. In his study for the National Monetary Commission, Kemmerer (1910, pp. 222-23) wrote the following:

It has been found that the two periods of the year in which the money market is most likely to be strained are the periods of the 'spring revival,' about March, April, and early May, and that of the crop-moving demand in the fall; and that the two periods of easiest money market are the 'readjustment' period, extending from about the middle of January to nearly the 1st of March, and the period of the summer depression, extending through the three summer months. Of the eight panics [of the era], four occurred in the fall or early winter ... and these four included two of the three really severe panics of the period (i.e., those of 1873 and 1907); three occurred in May ... and one, ... probably the least important, ... extended from March until well along in November.

The evidence accordingly points to a tendency for panics to occur during the seasons normally characterized by stringent money markets. This does not mean that the seasonal stringencies are the causes of the panics; it does mean that the months in which they occur are the weakest links in the seasonal chain, and that in periods of extraordinary tension the chain breaks at these links.

Reformers attributed the crises of the National Banking era to inelasticity in the nation's currency supply. National bank notes, U.S. government currency issued during the Civil War (Greenbacks), silver certificates and specie (gold coin) were the principal currency forms during the National Banking era. Federally chartered (national) banks were permitted to issue notes valued at up to 90% (later 100%) of the face value of U.S. government bonds they pledged with the Comptroller of the Currency. The supply of national bank notes was thus tied to the volume of government bonds outstanding and the profits national banks could earn issuing notes using these bonds as security. The sup-

<sup>3</sup>There is no generally accepted definition of financial crisis. Rather than defining the term, researchers often list characteristics of financial crises (for example, Bordo, 1986). According to Schwartz (1986, p. 11), "A financial crisis is fueled by fears that means of payment will be unobtainable at any price and, in a fractional-reserve banking system, leads to a scramble for high-powered money. It is precipitated by actions of the public that suddenly squeeze the reserves of the banking system. In a futile attempt to restore reserves, the banks may call loans, refuse to roll over existing loans, or resort to selling assets." Schwartz

distinguishes between real crises, in which financial distress leads to a sudden decline in the money supply, and pseudo-crises, which do not have money supply consequences. Kindleberger (1989), however, argues against such a distinction. This article uses the terms *crisis* and *panic* interchangeably. See Sprague (1910) for an overview of financial crises during the National Banking era and Dwyer and Gilbert (1989) for a study of the effects of banking panics in this era.

plies of Greenbacks and silver certificates were fixed, as was the supply of specie for short periods. The currency supply was thus relatively inflexible and could not be increased sufficiently to accommodate a sudden large-scale attempt by depositors to convert funds into cash. A means of supplying large amounts of currency rapidly was key to most banking reform proposals.<sup>4</sup> Reformers proposed a system in which the supplies of currency and credit fluctuated with the needs of trade. The theoretical justification for such a system became known as the Real Bills Doctrine, and that doctrine was implemented with passage of the Federal Reserve Act.<sup>5</sup>

### SEASONAL ACCOMMODATION BY THE FEDERAL RESERVE

The title of the Federal Reserve Act states that one purpose of the Federal Reserve System is "to furnish an elastic currency."<sup>6</sup> Member commercial banks were required to hold reserve deposits with the Federal Reserve Banks instead of holding specie or deposits with Central Reserve City and Reserve City banks, as they had under the National Banking System. The Federal Reserve Act also provided for a new currency form—the Federal Reserve note. W. Randolph Burgess (1936, p. 150), a long-time official at the Federal Reserve Bank of New York, argued the following:

The fundamental change which the Federal Reserve System has made ... is to shift much of the burden of meeting the fluctuations in the demand for credit from the reserves of the member banks in New York City to the twelve Reserve Banks, which through the strength of their holding of pooled reserves and through their power of note issue and deposit expansion can provide almost any extra funds required.

A member commercial bank could accommodate an increase in loan demand or currency withdrawals by rediscounting eligible commercial paper with its Federal Reserve Bank. The Federal Reserve Bank would provide the commercial bank with reserves or currency and charge its discount rate.<sup>7</sup>

The provision of currency and reserves by the Federal Reserve Banks was intended to be largely automatic and self-regulating. Proponents of the Real Bills Doctrine believed that the quantities of currency and reserves provided by the Fed would be sufficient but not inflationary if supplied on the basis of short-term commercial loans.<sup>8</sup> The Federal Reserve Banks were authorized to rediscount commercial, agricultural and industrial paper, bankers acceptances used to finance foreign trade, and U.S. government securities with maturities of up to three months. Consistent with the Real Bills Doctrine, Federal Reserve Banks were not authorized to rediscount loans used to support purely financial activity, such as stock market call loans, because they were believed to be inflationary or speculative.<sup>9</sup> The Federal Reserve Banks set discount rates, subject to approval by the Federal Reserve Board, and generally supplied currency and reserves elastically through the discount window. The Federal Reserve Banks also supplied reserves by purchasing bankers acceptances outright. They set buying rates and purchased all acceptances that met minimum quality standards, thus supplying reserves freely at the buying rates.

Besides setting discount and acceptance buying rates, the Federal Reserve Banks were permitted to buy and sell U.S. government securities. The Fed's founders did not envision use of this authorization to conduct monetary policy as we

<sup>4</sup>A variety of currency substitutes were used during the banking panics of the National Banking era. Loan certificates issued by clearinghouses have been the most studied (see Dewald [1972], Timberlake [1984], Gorton [1985], and Dwyer and Gilbert [1989]). The Aldrich-Vreeland Act of 1908 permitted bank associations to issue "emergency currency" during panics, which in essence made legal the earlier practice of issuing clearinghouse certificates.

<sup>5</sup>See Friedman and Schwartz (1963, pp. 168-73), West (1977) or Timberlake (1978, pp. 186-206) for discussions of the reform movement and analysis of various proposals.

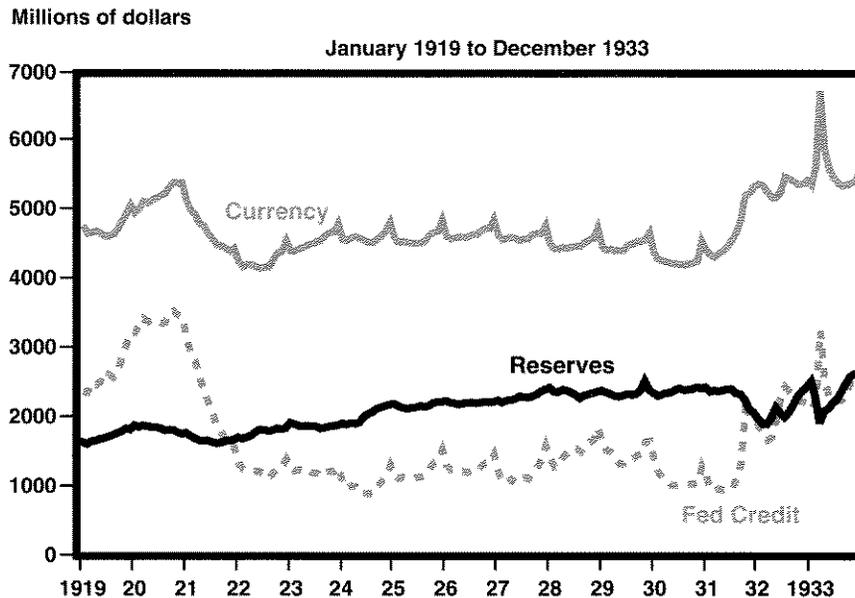
<sup>6</sup>The title of The Federal Reserve Act reads, "An Act to provide for the establishment of Federal Reserve Banks, to furnish an elastic currency, to afford means of rediscounting commercial paper, to establish a more effective supervision of banking in the United States, and for other purposes."

<sup>7</sup>This action was originally known as rediscounting because commercial bank loans were often made on a discount basis; hence when they were endorsed by a commercial bank and sent to a Federal Reserve Bank, they were rediscounted by the Fed.

<sup>8</sup>Because the Fed was required to maintain gold reserves equal to a fraction of its deposit and note liabilities, the gold standard ultimately constrained the growth of reserves and currency. In practice, however, the Fed maintained excess gold reserves, so the reserve requirement had little effect on its operations before 1931.

<sup>9</sup>Eligibility requirements were somewhat broadened in 1916 to include acceptances arising from domestic trade, and Federal Reserve Banks were authorized to lend directly to member banks on their own notes secured by eligible paper. See Board of Governors of the Federal Reserve System (1943, pp. 325-26) for a summary of the types of paper eligible for rediscount and for significant changes in eligibility rules from 1914 to 1933.

**Figure 1**  
**The Accommodation of Currency Demand**



know it today, however, but rather to provide the Federal Reserve Banks with an additional means of generating revenue. The use of monetary policy to influence economic activity and the price level and for other general purposes evolved slowly, and open market operations were not important until the mid-1920s.<sup>10</sup>

In accommodating the demands of commercial banks, Federal Reserve credit tended to increase in the spring and autumn months, when commercial loan demand peaked, and again in December, with increased holiday demand for currency. After the holidays, currency returned to banks and credit demand declined as it did during the summer. Federal Reserve credit tended to decline in winter and summer months.

After the Fed's establishment, the behavior of short-term interest rates changed dramatically. Before 1914, rates had a distinct seasonal pattern—high in the autumn and spring and low during the winter and summer. According to Burgess (1936, p. 204):

(M)oney rates fluctuated much more rapidly and widely before the Federal Reserve System was established. . . . In January and February money tended to be easy. In the early spring rates rose, as the demand for funds increased with the planting of crops and spring trade. Towards summer rates fell, but rose again to the year's high point in the autumn with harvesting and autumn trade. They continued generally high throughout the holiday period with its heavy currency requirements. . . . Since the establishment of the Reserve System, such seasonal swings of interest rates have been almost though not quite eliminated.

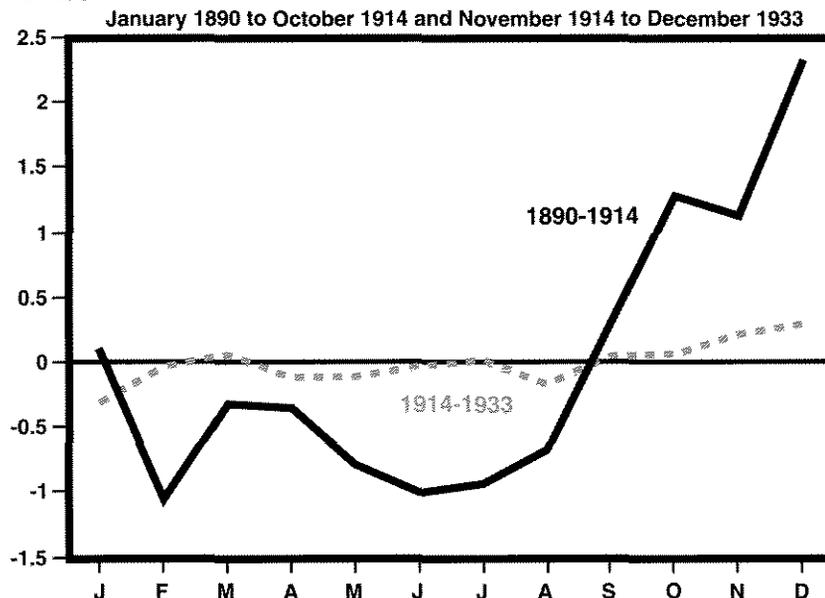
Burgess (p. 206) goes on to write, "The explanation of the change which has taken place is found largely in the credit elasticity provided by the Reserve System." Other writers have recognized the Fed's influence on the pattern of rates. Friedman and Schwartz (1963, pp. 292–93), for example, conclude the following:

The Federal Reserve 'sterilized,' as it were, seasonal withdrawals and returns of currency and thereby kept deposits of member banks at

<sup>10</sup>See Chandler (1958), Friedman and Schwartz (1963), Wickler (1966) and Wheelock (1991, 1992) for discussion of the evolution of monetary policy and the Fed's objectives during the 1920s and early 1930s.

Figure 2  
The Seasonal Pattern of the Call Loan Rate

Monthly Deviations from Annual Mean  
Percent



the Reserve Banks largely, though not entirely, free of seasonal movements. The effect was to change the pre-1914 seasonal patterns notably. The seasonal pattern in currency outside the Treasury was widened, the seasonal pattern in call money rates narrowed. The System was almost entirely successful in the stated objective of eliminating seasonal strain.

The contribution the Federal Reserve made to accommodating seasonal (and nonseasonal) currency demands is illustrated in figure 1.<sup>11</sup> Federal Reserve credit and currency in circulation tended to move together. Federal Reserve credit is a source of bank reserves, so by extending Fed credit when currency was withdrawn from

banks, the Fed reduced fluctuations in member bank reserves.<sup>12</sup>

The seasonal pattern of interest rates changed after the Fed opened in November 1914. Figure 2 shows the estimated seasonal patterns of the call loan renewal interest rate between January 1890 and October 1914 and between November 1914 and December 1933.<sup>13</sup> In the earlier period the interest rate fluctuated much more widely during the year than it did after the Fed's founding. Many studies, using a variety of statistical techniques, confirm the apparent decrease in seasonal amplitude illustrated here.<sup>14</sup> Scholars debate whether the Federal Reserve was respon-

<sup>11</sup>The data plotted in figure 1 are monthly averages of daily figures. The source for these data is the Board of Governors of the Federal Reserve System (1943, pp. 369-71).

<sup>12</sup>As discussed later, this study begins its analysis in 1919 because there is controversy about the Fed's effects in its early years and because of the disruptions caused by the Fed's contribution to financing World War I.

<sup>13</sup>The plotted seasonal patterns are simply the monthly averages of the rate less the annual mean, after subtracting a time trend. The patterns are calculated from a linear regression of the interest rate on monthly dummy variables and a time trend, which included an AR(2) error process

and was estimated using maximum likelihood. It might be argued that it would be more appropriate to examine the behavior of real interest rates because the underlying sources of seasonal credit and currency demands are real phenomena. Miron (1986) argues, however, that nominal rates should reflect the extent of the Fed's seasonal accommodation, and most studies have focused exclusively on the behavior of nominal rates.

<sup>14</sup>See Shiller (1980), Clark (1986), Miron (1986), Mankiw, Miron, and Weil (1987), Fishe and Wohar (1990), Canova (1991), Fishe (1991), and Holland and Toma (1991).

sible for this change, particularly before the end of World War I.<sup>15</sup> Researchers generally agree, however, that the evidence for a significant Fed role after World War I is strong. Clearly the Fed intended to accommodate seasonal currency and credit demands, as the following statement of Reserve Bank policy in the first *Annual Report of the Federal Reserve Board* (1914, p. 17) indicates: "The more complete adaptation of the credit mechanism and facilities of the country to the needs of industry, commerce, and agriculture—with all their seasonal fluctuations and contingencies—should be the constant aim of a Reserve Bank's management."<sup>16</sup>

### SEASONAL ACCOMMODATION AND FINANCIAL CRISES

The elasticity of currency and reserves supplied by the Fed and the near elimination of seasonal fluctuations in interest rates successfully eliminated financial crises — or so it appeared until 1929. From the Fed's founding until the stock market crash, no crises or banking panics occurred despite a significant recession in 1921, minor recessions in 1924 and 1927, and 5,700 bank failures during the 1920s.

In the following passage Burgess (1927, p. 122) noted that Fed operations apparently eliminated financial panics:

In the old days there were rigid and not far distant limits to the reserves available; now the mechanism of the Reserve System provides for a much larger possible expansion. It gives much greater elasticity . . . . This elasticity results in much more stability of rates and practically eliminates the fear of money panic . . . .

Burgess argued further that, "The presence of

the Reserve System gives greater elasticity to the supply of funds and stability to the money market and removes the fear of money panics" (p. 125).<sup>17</sup> Miron (1986, p. 136) also concludes "that the Fed successfully eliminated financial panics from 1915 to 1928." Based on historical experience, he calculates that the probability of there being no financial crises in a 14-year period (for example, from 1915 to 1928) is .005.

Like Miron (1986), other researchers have concluded that the crises of the Great Depression resulted from a distinct change in Federal Reserve policy. Following Friedman and Schwartz (1963), Miron attributes the change in policy to the death of Benjamin Strong, governor of the Federal Reserve Bank of New York and the Fed's leading policymaker, in October 1928. Other researchers, such as Trescott (1982) and Hamilton (1987), also conclude that monetary policy changed significantly with, or just before, the onset of the Depression.<sup>18</sup> The remainder of this article examines whether there was a change in Federal Reserve accommodation of seasonal currency and credit demands that could explain the reappearance of financial crises beginning in October 1929.

### FEDERAL RESERVE METHODS OF SEASONAL ACCOMMODATION

How did the Federal Reserve accommodate seasonal currency and credit demands during the Great Depression? A review of the Fed's methods indicates that the Fed was largely passive in this accommodation, suggesting that any apparent change in the seasonal pattern of Federal Reserve credit was more likely due to changes in demand than to a deliberate policy decision.

<sup>15</sup>Miron (1986) and Mankiw, Miron and Weil (1987) argue strongly that Federal Reserve operations caused the seasonal fluctuations in short-term nominal interest rates to decline after 1914. Clark (1986), however, contends that a lowering of reserve requirements, which occurred simultaneously with the Fed's opening, and gold inflows accompanying the start of World War I are more likely causes of the reduced seasonal pattern of interest rates in the United States between 1914 and 1917. Fishe (1991) also reaches this conclusion, finding little seasonal behavior before 1917 in any variable under the Fed's control. Holland and Toma (1991) argue, however, that the Fed's presence as lender of last resort may have made banks more willing to lend in seasons during which credit demand was high and thus might have caused a reduction in interest rate seasonality even though there was little seasonal behavior in Federal Reserve credit until the 1920s.

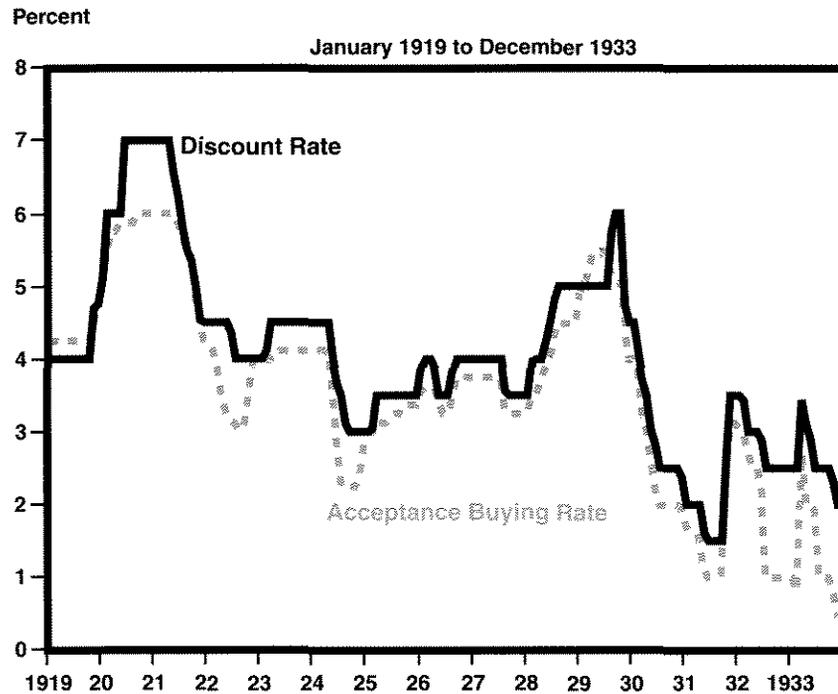
<sup>16</sup>The Federal Reserve continues to accommodate seasonal variation in money and credit demands. The Fed uses open market operations to remove seasonal changes in the

money stock, and its seasonal borrowing program permits special discount window access to banks that experience large seasonal fluctuations in loan demand. See Clark (1992) for a discussion of this program.

<sup>17</sup>In the second edition of Burgess' book (1936, p. 156), published after the financial crises of the Great Depression, both of these sections were changed. The latter was modified to read "The presence of the Reserve System gives greater elasticity to the supply of funds — and the control of that elasticity is the central problem of Federal Reserve policy."

<sup>18</sup>Specifically, Trescott dates the change in policy to early 1930, when the Fed's open market committee was reorganized; Hamilton dates the policy change to December 1927, when the Fed adopted a restrictive policy to combat stock market speculation. Other studies, however, have concluded that there was no fundamental change in Federal Reserve policy at this time. This debate is examined in Wheelock (1991, 1992).

Figure 3  
Federal Reserve Discount and Acceptance Buying Rates



The Fed had the following three main policy tools during the 1920s and early 1930s: the discount rate, the acceptance buying rate and open market operations in U.S. government securities.<sup>19</sup> The Fed was established to provide currency and bank reserves to accommodate the needs of commerce. By specifying eligibility requirements for the paper that could be rediscounted or purchased, the Fed's founders intended to limit policymakers' discretion, as well as to accommodate currency and credit demands without fueling inflation or speculation.

Only in open market operations in government securities did the Fed determine the specific volume of its operations. The Fed was generally passive in supplying currency and bank reserves through the discount window

and by purchasing acceptances.<sup>20</sup> The Federal Reserve could of course affect the volume of discount loans and acceptance purchases by altering the discount and acceptance buying rates, but neither rate had a seasonal pattern (see figure 3).<sup>21</sup> Apparently the Fed did not alter its rates to influence seasonal changes in discount-window borrowing or in its acceptance holdings, although it may have altered rates for other reasons. The three panels of figure 4 plot Federal Reserve credit outstanding and its principal components. Each component had a statistically significant seasonal pattern, but changes in the Fed's acceptance portfolio and in discount loans were the principal causes of seasonal variation in total Fed credit outstanding. The only component whose volume the Fed controlled directly—the government security

<sup>19</sup>The Fed did not have the power to alter reserve requirements until 1933.

<sup>20</sup>Burgess (1936, p. 42).

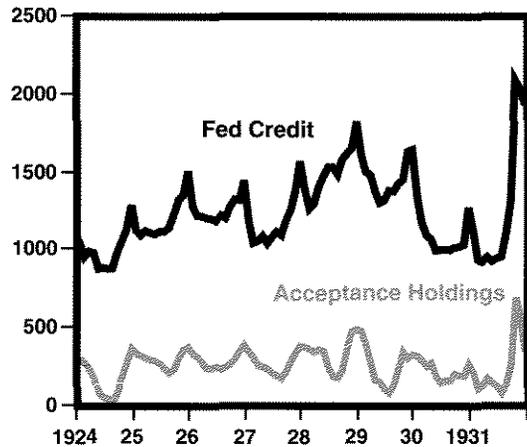
<sup>21</sup>I regressed each rate on a time trend and monthly dummy variables, and each regression included an AR(2) error process. Neither rate nor its first difference had a statistically significant seasonal pattern. An F-test of the null

hypothesis that the coefficients on the monthly dummies equal zero cannot be rejected for either rate or its first difference. The source of these data is Board of Governors of the Federal Reserve System (1943, pp. 439-45). For months in which a rate changed, I computed a monthly average by weighting the rate by the number of days it was in effect.

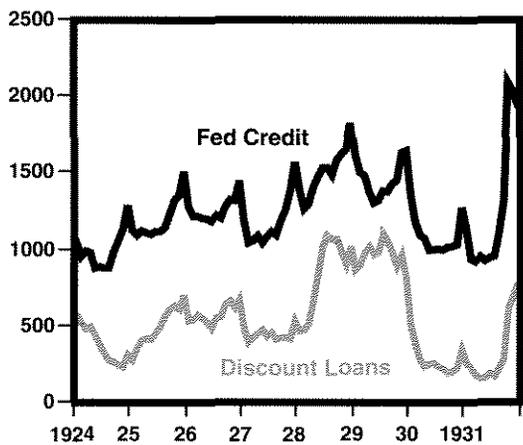
Figure 4  
**Fed Credit Outstanding and Its Principal Components**

January 1924 to December 1931

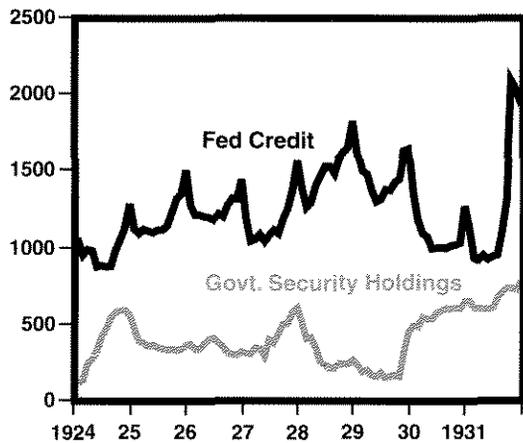
Millions of dollars



Millions of dollars



Millions of dollars



portfolio—had the least seasonal pattern. The absence of seasonal changes in the discount and acceptance buying rates and the minimal contribution of open market operations in government securities to the seasonal pattern of Federal Reserve credit indicate that the Fed's accommodation of seasonal currency and credit demands was largely passive. It seems likely therefore that a shift in demand, rather than a deliberate policy action affecting supply, explains any change in the seasonal behavior of Federal Reserve credit outstanding.<sup>22</sup>

### EMPIRICAL EVIDENCE ON THE STABILITY OF SEASONAL PATTERNS

The reappearance of financial crises in 1929 at times of the year when credit and currency demands reached seasonal peaks suggests that the Fed might have reduced its accommodation of seasonal demands. Miron (1986) contends that this was true because he finds that the seasonal fluctuations of Federal Reserve credit were somewhat less pronounced between 1929 and 1933 than they had been between 1922 and 1928.

Miron estimates the seasonal pattern of Federal Reserve credit by calculating the unconditional mean of Fed credit in each month after subtracting a time trend. A convenient way of doing this is to regress the series on monthly dummy variables and a time trend. Miron finds that the range and standard deviation of the estimated dummy variable coefficients are smaller in the 1929–33 period than in the 1922–28 period and infers that Federal Reserve credit had less seasonal variation during the Depression than it had previously.<sup>23</sup> He concludes therefore that the Fed was less accommodative of seasonal demands after 1928 than it was before 1928.

Using Miron's methodology but estimating the pre-Depression seasonal pattern over a somewhat longer period (1919–28), I find that Federal Reserve credit actually had greater seasonal amplitude during the Depression years. Figure 5 plots the seasonal patterns of Federal Reserve

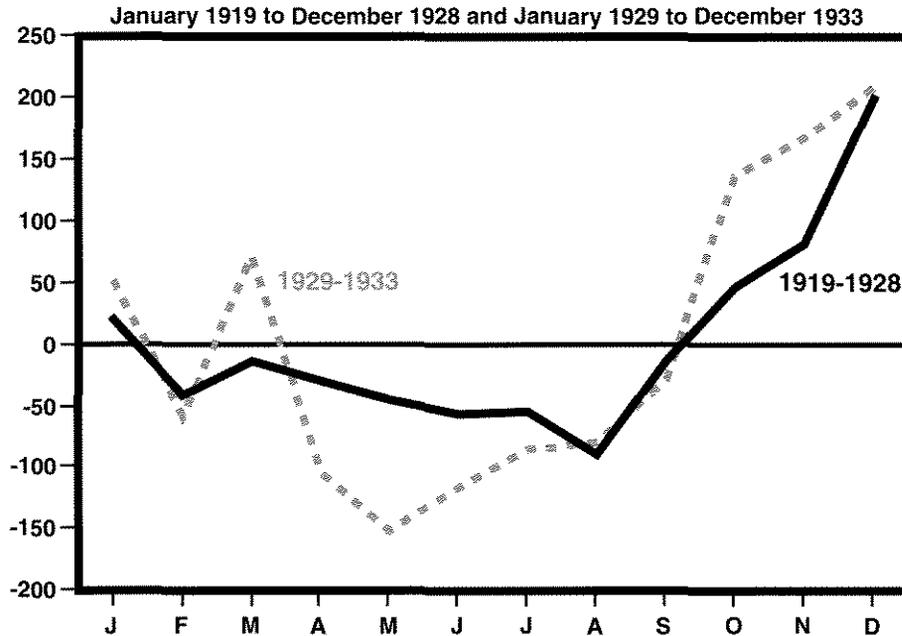
<sup>22</sup>Federal Reserve credit also included a miscellaneous component that was mainly float, which averaged about 4 percent of total Fed credit outstanding. This component was also somewhat seasonal and, like discount loans and acceptances, was influenced more by the level of economic activity than by Fed policy.

<sup>23</sup>Miron does not test whether the changes are statistically significant.

Figure 5  
The Seasonal Pattern of Federal Reserve Credit

Monthly Deviations from Annual Mean

Millions of dollars



credit between 1919 and 1928 and between 1929 and 1933.<sup>24</sup> These data do not suggest a decline in Fed accommodation after 1928.

Table 1 presents evidence on the statistical significance of the seasonal patterns of Federal Reserve credit and its chief components—the Fed's acceptance holdings, discount window loans and government security holdings. Continuing with Miron's methodology, I estimate the seasonal patterns of each series and the change (first difference) of each series as the average values for each month after removing any time trend. These averages are simply the estimated coefficients from a regression of each variable on monthly dummy variables and, for the non-differenced data, a time trend.<sup>25</sup> The seasonal pattern is statistically significant if the

null hypothesis that the estimated monthly dummy coefficients equal zero can be rejected. Table 1 reports the test statistics for this hypothesis. Between 1919 and 1928, Federal Reserve credit and each component had statistically significant seasonal patterns.<sup>26</sup> Between 1929 and 1933, however, only the Fed's government security portfolio had a statistically significant seasonal pattern. These tests appear to suggest that the Fed was less accommodative of seasonal demands during the Depression. The smaller F-statistic values for Fed accommodation of seasonal demands during the Depression are not, however, necessarily evidence of less seasonality because with fewer observations the seasonal patterns are estimated less precisely. Thus the conclusions drawn from them are less certain.

<sup>24</sup>The figure plots the estimated dummy coefficient for each month less the average of the 12 estimated coefficients. In addition to the dummy variables, the model includes a time trend and an AR(2) error process (which was suggested by standard model selection criterion) and was estimated using maximum likelihood.

<sup>25</sup>Model selection criterion suggested the use of an AR(2) error process in modeling Federal Reserve credit and an AR(3) process for each component. I used AR(1) for the change in Federal Reserve credit and AR(2) for the

changes in each component. I also estimated models for the difference in the logs of each variable. The results for these models are identical to those of the first-difference models.

<sup>26</sup>Because researchers who argue that Fed policy changed do not agree on the date of this change, I chose to follow Miron (1986) and break the sample at December 1928. Breaking the sample at December 1927, however, does not qualitatively change the results.

Table 1

### Significance of Seasonal Patterns in Federal Reserve Credit and its Components (F-Test Statistics)

|                                  | January 1919–<br>December 1928 | January 1929–<br>December 1933 | January 1929–<br>September 1931 |
|----------------------------------|--------------------------------|--------------------------------|---------------------------------|
| Federal Reserve credit           | 23.48**                        | 0.99                           | 3.47**                          |
| Acceptances                      | 4.10**                         | 1.79                           | 1.90                            |
| Discount loans                   | 5.42**                         | 1.04                           | 1.24                            |
| Government securities            | 4.02**                         | 2.02*                          | 2.54*                           |
| Change in Federal Reserve credit | 25.00**                        | 1.15                           | 4.59**                          |
| Change in acceptances            | 4.26**                         | 1.47                           | 2.29                            |
| Change in discount loans         | 5.70**                         | 0.90                           | 1.55                            |
| Change in government securities  | 3.08**                         | 1.71                           | 2.07                            |

\* Statistically significant at the .05 level.

\*\* Statistically significant at the .01 level.

Data source: Board of Governors of the Federal Reserve System (1943), pp. 369-71. The data are monthly averages of daily figures.

Table 2

### Stability of Seasonal Patterns in Federal Reserve Credit and its Components, December 1928 Breakpoint (F-Test Statistics)

|                                  | January 1919–<br>December 1933 | January 1919–<br>September 1931 |
|----------------------------------|--------------------------------|---------------------------------|
| Federal Reserve credit           | 1.02                           | 1.55                            |
| Acceptances                      | 1.68                           | 2.61**                          |
| Discount loans                   | 1.24                           | 1.02                            |
| Government securities            | 0.70                           | 0.79                            |
| Change in Federal Reserve credit | 1.17                           | 1.53                            |
| Change in acceptances            | 2.04*                          | 2.84**                          |
| Change in discount loans         | 1.33                           | 0.92                            |
| Change in government securities  | 1.13                           | 0.98                            |

\* Statistically significant at the .05 level.

\*\* Statistically significant at the .01 level.

Table 3

**Stability of Seasonal Patterns in Federal Reserve Credit and its Components (Standard Deviations of Monthly Dummy Coefficients)**

|                                  | January 1919–<br>December 1928 | January 1929–<br>December 1933 | January 1929–<br>September 1931 |
|----------------------------------|--------------------------------|--------------------------------|---------------------------------|
| Federal Reserve credit           | 75.41                          | 116.69                         | 139.02                          |
| Acceptances                      | 47.52                          | 65.38                          | 72.74                           |
| Discount loans                   | 34.58                          | 47.91                          | 64.39                           |
| Government securities            | 10.88                          | 47.94                          | 41.34                           |
| Change in Federal Reserve credit | 50.19                          | 90.84                          | 78.63                           |
| Change in acceptances            | 27.79                          | 47.01                          | 48.62                           |
| Change in discount loans         | 22.13                          | 56.16                          | 24.95                           |
| Change in government securities  | 16.04                          | 29.97                          | 33.17                           |

The results of further tests for a change in the Fed's seasonal accommodation are presented in table 2 and table 3. Table 2 summarizes tests to determine whether seasonal patterns of Fed credit and its components before December 1928 were significantly different from seasonal patterns after December 1928. Except for the change in the Fed's acceptance holdings, these tests indicate no change in seasonal patterns.<sup>27</sup>

Table 3 reports the standard deviations of the monthly dummy coefficients for each variable in each period.<sup>28</sup> Miron (1986) concluded that the Fed was less accommodative during the Depression in part because the standard deviation of the seasonal pattern of Fed credit was smaller between 1929 and 1933 than it had been between 1922 and 1928. Although comparing the standard deviations of the seasonal patterns is not a statistically rigorous test, it does provide evidence that the seasonal variability of each series increased or decreased over time. The standard deviation of the seasonal coefficients for Fed credit and each component is larger for the Depression years than it had been between 1919 and 1928. The differences

are, however, not statistically significant.<sup>29</sup> Thus these data do not support the hypothesis that the Fed was less concerned with seasonal credit and currency demands during the Depression than it had been earlier.

Federal Reserve credit outstanding was subject to large and erratic fluctuations during the Great Depression (see figure 1). In particular, a pronounced change in its behavior appears to have occurred in late 1931, suggesting that inferences drawn from analysis of Fed credit over the entire 1929-33 period might be misleading.

On September 21, 1931, Great Britain stopped converting pounds sterling into gold. Fears that the United States would soon follow Britain off the gold standard led to a large withdrawal of foreign deposits from U.S. banks and a consequent gold outflow. The U.S. monetary gold stock declined 15 percent in the six weeks after Britain's action.<sup>30</sup> Domestic depositors also panicked and converted deposits into currency. Member banks partially offset the reserve drains caused by the gold and currency outflows by selling acceptances to the Fed and by borrowing at the discount window. Federal

<sup>27</sup>If December 1927 is used as the breakpoint, the results are identical to those reported in table 2, except that the first difference of the Fed's acceptance holdings had a stable seasonal pattern.

<sup>28</sup>These are simply the standard deviations of the point estimates of the seasonal dummy coefficients and should not be confused with the standard errors of the coefficient estimates.

<sup>29</sup>The standard deviations for 1928-33 are also larger than those for 1919-27, but the differences are again not statistically significant. The specific test employed is a Wald test of the equality of the variances of the monthly dummy coefficients across the two periods. I thank Joe Ritter for suggesting this test.

<sup>30</sup>Board of Governors of the Federal Reserve System (1943, p. 386).

Reserve credit outstanding rose \$959 million (75 percent) between September 16 and October 21.<sup>31</sup> The increase in Fed credit outstanding was not enough, however, to prevent a substantial decline in bank reserves.<sup>32</sup>

Federal Reserve credit outstanding declined somewhat in early 1932 but began to rise in March 1932 with what was then the Fed's largest program of open-market purchases of government securities.<sup>33</sup> From March 1932 to August 1932 the Fed bought more than \$1 billion of securities, and these purchases probably explain the atypical mid-year rise in Federal Reserve credit in 1932.

The events of late 1931 and 1932 appear to have altered the pattern of Federal Reserve credit. The evidence reported in table 1 indicates that although Fed credit did not have a statistically significant seasonal pattern between 1929 and 1933 as a whole, it did have one between January 1929 and September 1931. Thus if a change in the seasonal behavior of Federal Reserve credit occurred during the Depression, it was more likely to have occurred after September 1931 than before September 1931. This is important because three of the five financial crises of the Depression occurred before this date and thus cannot be attributed to a possible change in Federal Reserve seasonal policy in September 1931.

Statistical tests to determine whether the seasonal patterns of Federal Reserve credit and its components changed between the January 1919–December 1928 and January 1929–September 1931 periods also suggest no shift in seasonal policy before September 1931. Only in the case of the Fed's acceptance holdings is it possible to reject the null hypothesis that no change in seasonal patterns occurred (see table 2). Comparison of the standard deviations of the seasonal patterns also casts doubt on the view that the Fed was less accommodative of seasonal demands before late 1931 (see table 3).<sup>34</sup>

The period from September 1931 to December 1933 is too short and was too volatile to determine seasonal monetary policy, and the data after 1933 contain no information about accommodation of seasonal demands. The crisis following Britain's departure from the gold standard, the Fed's large open-market purchases in 1932, the collapse of the banking system and the bank holiday in March 1933 all had unusually large effects on Federal Reserve credit. After 1933 gold and currency inflows allowed banks to accumulate large excess reserve holdings, which virtually eliminated the demand for Fed credit. Accordingly, Federal Reserve credit and its components varied little from 1934 until World War II.

### THE SEASONAL BEHAVIOR OF INTEREST RATES

This section examines the extent of change in the seasonal behavior of short-term interest rates before and during the Great Depression. By supplying currency and reserves in response to seasonal demands, the Federal Reserve, at least by 1919, had substantially reduced the seasonal amplitude of interest rates. If the Fed reduced its accommodation of seasonal demands during the Depression, it seems likely that interest rates would have become more seasonal.

Table 4 summarizes tests to determine whether three short-term interest rates had statistically significant seasonal patterns.<sup>35</sup> The commercial paper rate had a statistically significant seasonal pattern between 1919 and 1928. The bankers acceptance and call loan rates, however, did not have statistically significant seasonal patterns. None of the rates had a statistically significant seasonal pattern during the Depression, neither during the January 1929–December 1933 period nor during the January 1929–September 1931 period.<sup>36</sup>

Table 5 reports tests of the stability of the seasonal patterns of each interest rate. Although

<sup>31</sup>Board of Governors of the Federal Reserve System (1943, p. 386).

<sup>32</sup>The Fed argued that it lacked sufficient gold reserves to purchase government securities in sufficient quantities to prevent reserves from declining. Friedman and Schwartz (1963) contend that the Fed did have sufficient reserves and in any event had the authority to suspend its reserve requirement temporarily. Wicker (1966), however, argues that Fed officials feared that security purchases would indicate an unwillingness to defend the dollar's value and exacerbate the gold outflow. See Wheelock (1991, 1992) for further discussion.

<sup>33</sup>The Fed's gold reserve requirement was relaxed significantly by the Glass-Steagall Act of 1932, which permitted

the Fed to use government securities to partially back its liabilities.

<sup>34</sup>The differences in the standard deviations between the January 1919–December 1928 and January 1929–September 1931 periods are not statistically significant. The findings are not affected if December 1927 is used as the break point.

<sup>35</sup>Specifically, I test the null hypothesis that the coefficients on the monthly dummy variables all equal zero.

<sup>36</sup>The call loan rate did have a statistically significant seasonal pattern between January 1919 and December 1927. The regressions for the level of each rate included an AR(2) error process, and those for the first difference of each rate included an AR(1) error process.

Table 4

**Significance of Seasonal Patterns in Short-Term Interest Rates (F-Test Statistics)**

|                                   | January 1919–<br>December 1928 | January 1929–<br>December 1933 | January 1929–<br>September 1931 |
|-----------------------------------|--------------------------------|--------------------------------|---------------------------------|
| Commercial paper rate             | 2.94**                         | 1.29                           | 1.23                            |
| Call loan rate                    | 1.44                           | 1.35                           | 1.16                            |
| Bankers acceptance rate           | 1.19                           | 1.46                           | 1.29                            |
| Change in commercial paper rate   | 2.78**                         | 0.82                           | 0.88                            |
| Change in call loan rate          | 1.33                           | 1.16                           | 1.01                            |
| Change in bankers acceptance rate | 0.86                           | 1.10                           | 0.96                            |

\* Statistically significant at the .05 level.

\*\* Statistically significant at the .01 level.

Data source: Board of Governors of the Federal Reserve System (1943), pp. 450-51. The data are monthly averages of daily figures.

Table 5

**Stability of Seasonal Patterns in Short-Term Interest Rates, December 1928 Breakpoint (F-Test Statistics)**

|                                   | January 1919–<br>December 1933 | January 1919–<br>September 1931 |
|-----------------------------------|--------------------------------|---------------------------------|
| Commercial paper rate             | 0.92                           | 1.47                            |
| Call loan rate                    | 1.46                           | 1.23                            |
| Bankers acceptance rate           | 1.21                           | 1.20                            |
| Change in commercial paper rate   | 1.05                           | 1.73                            |
| Change in call loan rate          | 1.64                           | 1.68                            |
| Change in bankers acceptance rate | 1.41                           | 1.47                            |

\* Statistically significant at the .05 level.

\*\* Statistically significant at the .01 level.

Table 6

**Stability of Seasonal Patterns in Short-Term Interest Rates  
(Standard Deviations of Monthly Dummy Coefficients)**

|                                   | January 1919–<br>December 1928 | January 1929–<br>December 1933 | January 1929–<br>September 1931 |
|-----------------------------------|--------------------------------|--------------------------------|---------------------------------|
| Commercial paper                  | 0.06                           | 0.16                           | 0.12                            |
| Call loan rate                    | 0.24                           | 0.26                           | 0.47                            |
| Bankers acceptance rate           | 0.09                           | 0.26                           | 0.13                            |
| Change in commercial paper rate   | 0.08                           | 0.14                           | 0.12                            |
| Change in call loan rate          | 0.20                           | 0.32                           | 0.43                            |
| Change in bankers acceptance rate | 0.06                           | 0.22                           | 0.15                            |

no rate had a statistically significant seasonal pattern during the Depression, the null hypothesis that the seasonal pattern was stable is accepted in all cases at conventional levels of significance. Finally table 6 reports the standard deviations of the seasonal dummy coefficients from each regression. For each rate and the change in each rate, the standard deviations are larger for the 1929–33 period than for the 1919–28 period. The standard deviations of the seasonal dummy coefficients are also higher during the January 1929–September 1931 period than during the January 1919–December 1928 period. Thus, as with Federal Reserve credit and its components, comparison of the standard deviations suggests that the interest rates might have fluctuated somewhat more widely across seasons during the Depression than before it. However, none of the changes in the standard deviations is statistically significant.

To put the possible increase in the seasonal pattern of interest rates during the Depression in perspective, figure 6 plots the estimated coefficients on the monthly dummy variables for the call loan renewal rate between 1919 and 1928 and between 1929 and 1933. I use the same scale as in figure 2, where these coefficients are plotted for the 1890–1914 and 1914–33 periods. Comparison of the two figures shows that the increase in the seasonal amplitude of the call loan rate during the Depression

was small relative to the decline in amplitude in 1914.<sup>37</sup> For comparison, the standard deviation of the seasonal pattern of the call loan rate between January 1890 and October 1914 is 1.02 (0.67 for the first difference of the call loan rate). For the November 1914–December 1933 period the standard deviation is 0.16 (0.13 for the first difference). The increases in the standard deviations after December 1928 are thus quite small in comparison with the size of the changes in November 1914. The levels of the standard deviations during the Depression are also small in comparison with those in the pre-November 1914 period.<sup>38</sup> The various evidence that interest rates were more seasonal during the Depression is ambiguous. The possible increase in the seasonal pattern of interest rates after 1929, however, seems too small to conclude that unaccommodated seasonal currency and credit demands caused the return of financial crises during the Depression.

## CONCLUSION

Proponents of banking reform in the United States in the early 20th century noted that financial crises tended to occur in months when currency and credit demands reached seasonal peaks. Eliminating crises was a principal goal of the founders of the Federal Reserve System, and they designed methods of accommodating

<sup>37</sup>The months in which the call loan rate reached seasonal peaks between 1929 and 1933 do not coincide with those between 1919 and 1928. The behavior of the call loan rate probably changed markedly after the stock market crash in 1929. Similar plots for the commercial paper and bankers acceptance rates show that the seasonal high and low months for these rates remained the same across periods.

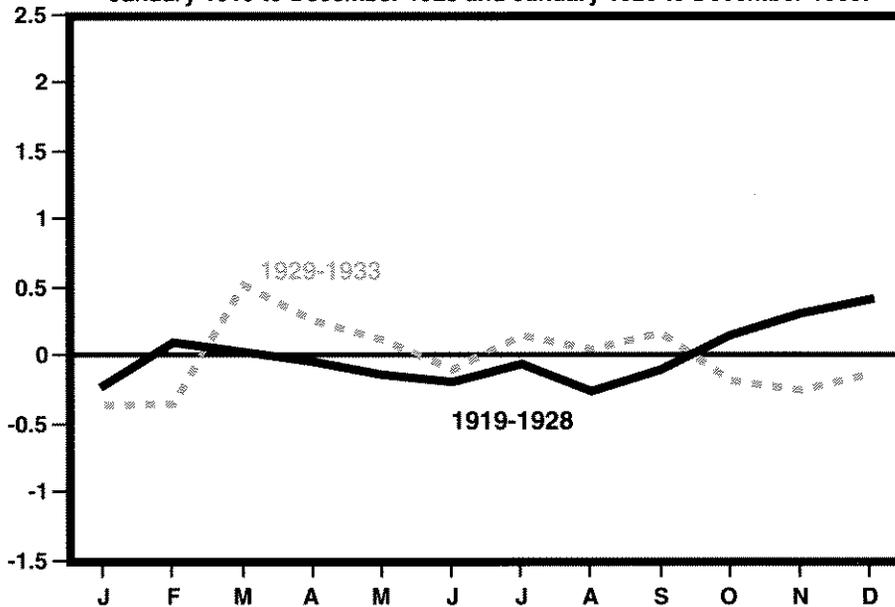
<sup>38</sup>Because the United States did not have an active bankers acceptance market before 1914, it is impossible to make a similar comparison for the bankers acceptance rate.

Figure 6  
The Seasonal Pattern of the Call Loan Rate

Monthly Deviations from Annual Mean

Percent

January 1919 to December 1928 and January 1929 to December 1933.



currency and credit demands to accomplish that objective. Federal Reserve credit outstanding rose and fell with fluctuations in currency and loan demands, and the Fed's presence appears to have substantially reduced seasonal fluctuations in bank reserves and interest rates. Most important, until 1929 it appeared that the Fed's presence had eliminated financial crises.

The reappearance of financial crises during the Great Depression suggests the possibility that the Fed accommodated seasonal currency and credit demands less in those years than it had between 1914 and 1928. This article shows, however, that the Fed's accommodation of seasonal demands was generally passive, occurring mainly through discount loans and acceptance purchases. There was no seasonal pattern in the Fed's discount and acceptance buying rates. Commercial banks initiated most seasonal extensions of Fed credit, suggesting that changes in demand, rather than deliberate policy decisions, caused any apparent changes in the seasonal pattern of Fed credit. In addition, Federal Reserve credit and its components do not appear to have been less seasonal during the Depression, at least not before September 1931,

than they had been during the 1920s. And although the seasonal pattern of interest rates during the Great Depression may have increased slightly, the seasonal fluctuations remained trivial compared with those that occurred before 1914. The Fed's failure to prevent banking panics and declines in bank reserves and the money supply during the Great Depression was a serious error. It appears unlikely, however, that the financial crises of the Great Depression were caused by a change in the seasonal policies of the Federal Reserve System.

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