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THE FOUNDING OF THE FED  
AND THE DESTABILIZATION OF THE POST-1914 ECONOMY

Jeffrey A. Miron

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1050 Massachusetts Avenue  
Cambridge, MA 02138  
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ABSTRACT

A standard assumption in the literature on optimal monetary policy is that the proper goal of policy is the reduction of the variation in output around its natural rate level. The stabilization of output has not always been accepted as the primary goal of policy, however. This paper argues that neither the founders of the Federal Reserve System nor the central bankers in charge during the first twenty-five years of the Fed's existence viewed the elimination of short term movements in output as an important objective for policy. Instead, the framers of the Federal Reserve System and the early practitioners of central banking in the United States apparently thought that "stabilization" of asset markets was the crucial task for the monetary authority. The paper compares the performance of the United States economy during the twenty-five year periods before and after 1914 and shows that after the founding of the Fed the variance of both the rate of growth of output and of the inflation rate increased significantly, while the average rate of growth of output fell, and real stock prices became substantially more volatile. The remainder of the paper then suggests that the deterioration in the performance of the economy after 1914 can be attributed directly to the actions of the Fed.

Jeffrey A. Miron  
NBER  
1050 Massachusetts Avenue  
Cambridge, MA 02138

## 1. Introduction

A standard assumption in the literature on optimal monetary policy is that the proper goal of policy is the reduction of the variation in output around its natural rate level (e.g., Friedman (1953), Brainaird (1967), Fischer (1977), Taylor (1980)).<sup>1</sup> Indeed, one of the apparent triumphs of Keynesian economics is the fact that fluctuations in real activity have been smaller since World War II than they were prior to 1930 (e.g., Burns (1960), Modigliani (1977), Mayer (1978)). Although recent research by Romer (1986a, 1986b) suggests that the degree of stabilization is smaller than previously believed, there is still widespread agreement that such a stabilization would be desirable if it could be achieved.<sup>2</sup>

The stabilization of output has not always been accepted as the primary goal of policy, however. This paper argues that neither the founders of the Fed nor the central bankers in charge during the first twenty-five years of the Fed's existence viewed the elimination of short term movements in output as an important objective for policy. Instead, the framers of the Federal Reserve System and the early practitioners of central banking in the United States apparently thought that "stabilization" of asset markets was the crucial task for the monetary authority (along with maintenance of the gold standard). Of course, the policy makers of that period presumably believed that calming financial markets led, in some longer term sense, to better performance of the economy. This improved performance, however, did not include the elimination or reduction of the short term, "business cycle" swings in output. As a result, the Fed pursued policies that destabilized output in several important instances.

The paper begins in Section 2 by comparing the performance of the United States economy during the twenty-five year periods before and after 1914. I show that after the founding of the Fed

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<sup>1</sup> Much of this literature also considers the tradeoff between output stabilization and other goals, particularly price stability. See especially Friedman (1968).

<sup>2</sup> Two recent papers that adopt this perspective are Basu, Kimball, Mankiw and Weil (1987) and McCallum (1988).

the variance of both the rate of growth of output and of the inflation rate increased significantly, while the average rate of growth of output fell, and real stock prices became substantially more volatile. At the same time, nominal interest rates, which had exhibited significant seasonal and other mean reverting variation prior to 1914, became close to a random walk. All of these conclusions hold even when one excludes the Great Depression from the post-Fed sample period, although they are generally made much stronger by inclusion of these sample points.

The fact that the economy was less stable after the founding of the Fed does not necessarily imply, of course, that the Fed was responsible for the increased volatility. There were a number of other important changes in the United States and world economies, including World War I and the suspension of the international gold standard in the United States and Europe. In order to make plausible the hypothesis that the change in the behavior of the economy was the result of Federal Reserve policies, rather than the result of other exogenous factors, it is necessary to explain why the Fed might have pursued policies that destabilized the economy and to present direct evidence that the Fed's actions were responsible for the increased volatility of economic variables.

The remainder of this paper shows that the deterioration in the performance of the economy after 1914 can be attributed directly to the actions of the Fed. Section 3 reviews the structure and behavior of the monetary system in the United States during the period preceding the founding of the Federal Reserve System. The dominant institutional feature of the National Banking System was the absence of a central bank, and the noteworthy characteristic of the performance of the economy was the recurrence of financial panics, involving bank runs and stock market crashes. These economic ills of the pre-1914 period shaped directly the kinds of policies that the Fed pursued during the early years of its existence, particularly the desire to "provide an elastic currency."

In Section 4 of the paper I examine the monetary policies advocated by the founders of the Fed, discuss possible justifications for these policies, and consider the likely effects of the policies on the

economy. The dominant theory of central banking of the early 20th century, the real bills doctrine, suggested that central bank lending should make the money stock elastic with respect to shifts in the level of economic activity, thereby smoothing nominal interest rates.<sup>3</sup> The analysis of Poole (1970), however, shows that smoothing interest rates in the face of *IS* shocks destabilizes output, so it is hard to rationalize the real bills doctrine from this perspective. Instead, contemporary observers appear to have believed that by maintaining orderly credit markets they would eliminate the tendency for financial panics, thereby preventing truly violent swings in output, even if this caused some increased short term instability.

An additional concern of contemporary bankers and academics, however, was the high incidence of stock market speculation during the pre-1914 period. Since most stock was purchased on credit, central bankers worried that a policy of increased lending in response to higher interest rates (the "accommodation of business") might also fuel speculation. This meant that they did not believe in adhering strictly to the real bills doctrine but instead thought it important to restrain the provision of credit if they believed it was being used for speculative purposes. This view of appropriate policy implies that the Fed would restrain credit, drive up interest rates, and moderate or depress output growth on occasions when there was significant evidence of speculative activity in asset markets.

Thus, the founders of the Federal Reserve System believed that the overall objective of monetary policy was the stabilization of asset markets, particularly the elimination of financial panics. At a practical level, this meant that monetary policy was supposed to eliminate the transitory variation in nominal interest rates and reduce the major swings in stock prices. As explained below, these two objectives were not always compatible and may even have been systematically in conflict. The Fed's inability to adequately resolve this conflict provides the key to understanding its policies after 1914.

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<sup>3</sup> Many contemporary observers also felt that the role of a central bank was to act as a lender of last resort. I discuss this issue below.

Section 5 of the paper evaluates quantitatively the Fed's actions during the post-1914 period. The Fed was highly successful in providing an elastic currency and thus in smoothing the process for nominal interest rates. At the same time, on three particular occasions the Fed abandoned its commitment to smoothing rates and deliberately restrained money growth in order to stop speculation in stock or commodity markets. As a result, the Fed appears to have caused output and the price level to become significantly more volatile after 1914 than they were before 1914 and more volatile than they otherwise would have been.

Section 6 concludes the paper by discussing the implications of the findings for the current conduct of monetary policy. The results in the paper do not imply that the founding of the Fed has, on the whole, harmed the economy, nor do they necessarily provide support for a monetary rule as opposed to interest rate stabilization. The results do suggest, however, that sole reliance on interest rate or other asset market targets, without explicit attention to the behavior of output and prices, can have adverse consequences for the performance of the economy.

## **2. The Macroeconomic Performance of the Post-1914 Economy**

This section of the paper evaluates quantitatively the performance of the United States economy before and after 1914. A great deal of research compares the pre-WWII and post-WWII economies, and considerable attention has been directed at the behavior of monetary and financial market variables before and after the founding of the Fed.<sup>4</sup> There has been considerably less effort, however, devoted to examining the behavior of real output before and after 1914, or to relating these results to those on other variables. The thrust of the analysis in Sections 4 and 5 below is that the changes in the behavior of real variables were the result of those in monetary and financial variables, so it is important to consider them jointly.

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<sup>4</sup> On the first topic see Burns (1960), Moore (1961), Modigliani (1977), Mayer (1978), and Romer (1986a, 1986b). On the second, see especially Friedman and Schwartz (1963, 1982), as well as Shiller and Seigel (1977), Shiller (1980), Miron (1986), Barsky (1987), Clark (1986), Canova (1987), Mankiw, Miron and Weil (1987), Goodfriend (1988), and Barsky, Mankiw, Miron and Weil (1988).

I begin by considering the behavior of real output. Figures 1 and 2 present annual data on real GNP and industrial production for the period 1890-1940; the vertical line in each graph is located at 1914. Tables 1 and 2 show the mean, standard deviation and first order autocorrelation of real GNP and industrial production, respectively, for a number of different sample periods.<sup>5</sup>

Both measures of output convey the same message, which is that real activity was much more volatile after 1914 than it was before 1914. This conclusion is partly due to the presence of the Great Depression in the post-1914 sample period, but real output was more volatile after the founding of the Fed even when one excludes the 1930's from consideration. The standard deviation of the growth rate of real GNP increased from 3.19% during the 1891-1914 period to 4.28% during the 1919-1928 period (mainly as the result of the 1921 recession, which was quite severe even though it was short). Similar results obtain for industrial production, with the standard deviation of the growth rate increasing from 8.66% during the 1891-1914 period to 13.72% during the 1919-1928 period. From 1929 to 1940, the variability of output growth was extremely high. The standard deviation of real GNP growth was 7.90% during the 1929-33 sample and 5.40% during the 1934-1940 sample.

These increases in the volatility of output were, in general, accompanied by decreases in the average rate of growth of output. Over the entire 1890-1914 sample the mean rate of growth of output was 3.41% while during the 1919-1940 period it was only 1.99%. This overall average during the post-1914 sample reflects several periods with very different average growth rates. Average output growth was fairly strong during the 1919-1928 period and quite strong during the 1934-1940 period. During the 1929-1933 period, however, the rate of growth fell to -5.89% for real GNP and -6.98% for industrial production.

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<sup>5</sup> The real GNP series is from Romer (1987); it has been constructed in a consistent way for the entire 1890-1940 sample period, so the kinds of issues raised by Romer (1986a, 1986b) probably do not affect the analysis here. The industrial production index is the Babson Index, from Moore (1961), for the period 1890-1918, and the Fed's Index of Industrial Production for the period 1919-1940. The Babson Index is available through 1938 and matches the Fed's Index closely during the period of overlap. The Data Appendix describes the sources of the data in detail.

In Figures 3 and 4 I present annual data on the implicit price deflator for real GNP and on the wholesale price index; Tables 3 and 4 present summary statistics.<sup>6</sup> The results show that the inflation rate was more variable in every post-1914 sample period than it was during the 1890-1914 period. Between the 1891-1914 and 1919-1928 periods the standard deviation of the inflation rate rose from 2.73% to 7.30% as measured by the implicit price deflator and from 5.04% to 15.82% as measured by the wholesale price index. The average inflation rate was negative until 1896 but then moderate and positive during most of the pre-Fed sample period.<sup>7</sup> In the post-1914 period, the mean inflation rate was highly sample dependent. There was rapid inflation starting in 1914 and continuing for two years past the end of the war, followed by rapid deflation from the middle of 1920 to the end of 1921. The middle 1920's witnessed relative price stability, followed by extreme deflation during the 1929-1933 period.

The next variable that I consider is an index of real stock prices, presented in Figure 5.<sup>8</sup> There were several significant swings in stock prices during the pre-Fed period, the most dramatic being the decline of 1906-1907, when real stock prices fell by over 40% from September, 1906 to November, 1907. The volatility of the stock market during the post-1914 period was much greater than during the pre-1914 period, however. Between the middle of 1922 and the end of 1929, real stock prices rose by a factor of five; they then fell to approximately their 1922 level over the next three years. Even excluding this episode, stock prices moved on several occasions by as much as 30% over the space of a year or less.

Figure 6 shows monthly data on the short term nominal interest rate while Table 5 reports the autocorrelation function for the nominal rate in each of the sample periods considered above.<sup>9</sup> The

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<sup>6</sup> The implicit price deflator is from Romer (1987); the wholesale price index is from the Bureau of Labor Statistics. See data appendix for details.

<sup>7</sup> Barsky (1987) and Barsky and Delong (1988) discuss the properties of inflation during the pre-1914 period.

<sup>8</sup> This is the index for Standard and Poor's 500 companies, deflated by the monthly wholesale price index. The observations for 1914:8-1914:11 are missing because the New York Stock Exchange closed for four months after the outbreak of World War I.

<sup>9</sup> The interest rate considered here is the rate on three month time loans, from the first week of each month, as



stochastic behavior of the nominal rate became systematically different after 1914, displaying more persistence than previously. The sample autocorrelation function for the pre-1914 sample period dampens fairly quickly, indicating that the nominal rate was stationary. In all of the post-1914 sample periods except 1929-1933, the nominal rate was much more persistent and appears to have been close to a random walk.<sup>10</sup> As the tables suggest, and as Mankiw, Miron and Weil (1987) demonstrate more rigorously, this change took place quite rapidly after November of 1914.<sup>11</sup>

The other major change in the behavior of the economy after 1914 was the disappearance of seasonality in nominal interest rates. Figure 7 plots the estimated seasonal patterns in nominal rates for the periods 1890:2-1914:11 and 1914:12-1940:12.<sup>12</sup> The patterns were calculated by regressing monthly observations of the nominal rate on a set of twelve seasonal dummies and then subtracting the mean value of the coefficients. There was a dramatic decline in the importance of seasonality, with the amplitude of the cycle falling from over 160 basis points to fewer than 40 basis points.<sup>13</sup> Seasonal fluctuations, which were one of the most pronounced sources of transitory variation in

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reported in Mankiw and Miron (1985). This series differs from the series on three month time loans reported in Macaulay (1938) for two reasons. First, Macaulay's series is for monthly averages of weekly data while Mankiw and Miron's series is for first week of the month data. Second, there are a few unusual observations that Macaulay treats differently from Mankiw and Miron. In a few weeks, the source of the data (the *Commercial and Financial Chronicle*) reports numbers such as "6+com", which means that the rate on loans was six percent plus commissions, or "6 nom", which means that a rate of 6 was posted but there was little or no trading at this rate. Macaulay adjusts the reported numbers using information from the text of the *Commercial and Financial Chronicle*, whereas Mankiw and Miron simply report a value of "6". Macaulay does not provide a precise explanation of how he adjusts these observations. The characteristics of the data series that are important for the conclusions of this paper and other papers using the data series (Mankiw and Miron (1985), Mankiw, Miron and Weil (1987), and Barsky, Mankiw, Miron and Weil (1988)) are not sensitive to inclusion of the sample points in question. Indeed, since the actual rates paid during panics were at least as high as the rates reported by Mankiw and Miron, there was if anything even more transitory variation in short rates during the pre-1914 period than the estimates presented above suggest.

- <sup>10</sup> Barsky, Mankiw, Miron and Weil (1988) report regressions of the nominal rate on its own lagged value. In the pre-1914 period the coefficient on the lagged rate is about .75 and significantly less than one. During the post-1914 period the estimated coefficient is quite close to one and never significantly different from one. The nominal rate changed from being a stationary process to being close to a random walk after the founding of the Fed.
- <sup>11</sup> Mankiw, Miron and Weil (1987) also demonstrate that the end of 1914, rather than any other date, is the most likely point of the change in the stochastic process for nominal rates.
- <sup>12</sup> The results described in this paragraph are not substantially affected if alternative post-1914 subsamples are employed.
- <sup>13</sup> The discussion above does not address the question of whether the Fed affected the seasonal behavior of real interest rates. Both Shiller (1980) and Barsky, Mankiw, Miron and Weil (1988) find that point estimates of the seasonal pattern in real rates differ after 1914, but there is so much noise in the inflation rate series that one cannot reject any interesting hypothesis.

nominal rates before 1914, were almost entirely absent after 1914.<sup>14</sup>

The results presented in this section demonstrate that the behavior of the United States economy changed significantly after 1914. Output growth, the inflation rate, and real stock prices became more variable, and nominal interest rates became close to a random walk. The fact that these changes occurred after 1914 does not, by itself, mean that the Fed caused the changes. There were other significant changes in the United States and world economies during this period, particularly World War I and the departure of the United States and Europe from the international gold standard.<sup>15</sup> The coincidence of the timing of the changes with the founding of the Fed does suggest the influence of the Fed, however. I turn now to an evaluation of why the Fed might have contributed to the changed behavior of output, inflation, and financial market variables.

### 3. The National Banking System and the Founding of the Fed

As a first step in understanding whether the introduction of the Fed produced the changes in the behavior of the economy documented above, it is important to review the structure and performance of the United States economy during the period prior to the founding of the Fed. In this section I discuss those features of the pre-1914 economy that are useful in understanding the reasons for the creation of the Fed and the kinds of policies it pursued during its early years. There are a number of other features of the National Banking System that have received considerable attention in the literature, particularly the geographical distribution of asset demands and the correspondent banking system. I do not discuss these features of the pre-1914 banking system

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<sup>14</sup> For more detailed analyses of the disappearance of seasonality, see Shiller (1980), Clark (1986), and Miron (1986).

<sup>15</sup> The suspension of the gold standard in 1914 was the direct result of the outbreak of World War I in August, 1914. Within a few months of the outbreak of war (indeed in some cases even before the formal declaration), most countries had suspended gold payments either *de jure* or *de facto* (Brown (1940), pp.7-26). When the war ended, most countries had experienced such rapid inflation during the previous four years that an immediate return to convertibility at anything like the pre-war parities was unthinkable. It was the announced aim of virtually all countries, however, to return to the gold standard quickly, and a great deal of macroeconomic history of the subsequent period can only be understood in this light. See, for example the *First Interim Report of the Cunliffe Committee* (1918) in Britain. Keynes (1923) was an outspoken opponent of the return to gold.

because I do not think they are crucial to an understanding of the facts presented above.

### *3.1 The National Banking System*

The period between 1863 and 1913 is known as the National Banking Period, since the banking and financial structure were determined by the provisions of the National Banking Acts of 1863, 1864 and 1865.<sup>16</sup> The National Banking Acts were both a response to problems of the financial system that existed before the Civil War and a measure designed to raise revenue for the North during the War. The Acts were successful in generating revenue and in curing some pre-War financial ills (notably the multiplicity of note issue). The National Banking System was nevertheless regarded as fundamentally flawed by those in academia, the banking community, and government, and the Federal Reserve System was created in response to those problems that remained despite the many attempts to fix them through repeated revisions of the National Banking Acts.<sup>17</sup>

Before the Civil War the United States banking system consisted of a collection of state banks organized under the laws and chartering systems of the individual states; there were therefore as many different sets of laws governing banks as there were states.<sup>18</sup> A distinctive characteristic of this system was that each bank could issue its own notes. Consequently, there were hundreds of different types of bank notes circulating throughout the country, and the notes of a given bank traded at a premium or discount relative to those of other banks and at a discount relative to gold.<sup>19</sup> The transactions costs involved in determining the quality of a particular note, which were increased by the possibility of unethical note issue, made this system less than satisfactory. There

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<sup>16</sup> The original Act was passed in February, 1863, and amended in June 1864 and February, 1865. The Acts became fully effective on August 1, 1866. See Friedman and Schwartz (1963), pp.18-19.

<sup>17</sup> One of the most important changes in monetary arrangements that occurred during this period was the re-monetization of gold in 1879 (Friedman and Schwartz (1963), pp.44-59). Other changes included adjustments in reserve requirements against national bank notes, minimum reserve/deposit ratios, minimum capital requirements, and the number of greenbacks in circulation.

<sup>18</sup> The legal constraints imposed on banks (such as minimum capital requirements and minimum reserve/deposit ratios) were similar in spirit across states but different in detail. (James (1978), pp.39-44)

<sup>19</sup> The discount on a particular issue was determined by the distance to the issuing bank, the reputation of the bank, and the length of time since the note had been issued. (Myers (1970), pp.70,80,94,121)

was little regulation of the note issue of state banks, and there were instances in which banks attempted to make a quick profit by using their own notes to acquire other assets and then closing down before the notes could be presented for redemption.<sup>20</sup>

The Civil War was the occasion of a major restructuring of this system, motivated more by the North's need to finance the War than by the desire to reform the banking system. The National Banking Acts imposed a tax of 10% on notes issued by state banks and authorized the Federal government to charter national banks that could issue notes backed by government bonds. It was thought at the time that this would lead to the demise of state chartered banks because of the *de facto* loss of the power of note issue.<sup>21</sup> As it turned out, state banks declined only temporarily and eventually became more prominent than national banks. The explanation is that state banks discovered that deposit creation was a good substitute for note issue. Since capital requirements and reserve/deposit ratios were lower for state banks, and since state banks were allowed to lend against real estate collateral while national banks were not, state banks were able to compete successfully with national banks. The United States banking system thus consisted of two sets of banks, one state chartered, the other federally chartered.<sup>22</sup>

The most distinctive feature of the National Banking System, at least by modern standards, was the absence of a central bank.<sup>23</sup> There had been some kind of central bank in the United States

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<sup>20</sup> One of the important causes of the destruction of the Second Bank of the United States (in 1837) was that Nicholas Biddle, its president, made a concerted effort to collect state bank notes and then present them quickly to the bank of issue, thus discouraging overissue. This practice was unpopular with rural banks, where excessive note issue was more prevalent, and they lobbied hard and successfully against the renewal of the Bank's charter. (Beckhart (1972), pp.4-13)

<sup>21</sup> Indeed, the collection of data on state banks stopped in 1863 and did not resume until 1867.

<sup>22</sup> In 1870 there were 261 state banks and 1612 national banks. By 1910 there were roughly 15,000 state banks and 7,000 national banks (James (1978), p.25).

<sup>23</sup> The period after 1879, when the United States resumed specie payments, is also unusual because the world was operating on the international gold standard. As the result of World War I, the international gold standard was suspended in 1914 in most countries, and it returned for only a limited time and in much weakened form. The correct characterization of the system of international monetary arrangements varies considerably over the 1914-1933 period. During the War there were sufficient controls on prices, gold movements, and international capital flows that any attempt to describe the system in simple terms is bound to be inaccurate. The period from 1919-1925 seems to be a relatively clean case of floating rates. From 1926-31, several countries resumed convertibility, so that the world moved back toward an international gold standard. It appears to be the consensus, however, that the operation of the gold standard during this period did not approximate its smooth

during much of the Ante-Bellum period,<sup>24</sup> and by the last quarter of the nineteenth century most important economic powers other than the United States had established central banks.<sup>25</sup> The absence of a central bank left an important void in the workings of financial markets, and a number of agents or institutions attempted to fill this void. The most important were the Independent Treasury and the New York Clearinghouse Association.

The Independent Treasury was created by Congress in 1846 to fill a deficiency in the day-to-day operation of government created by the demise of the Second Bank of the United States.<sup>26</sup> The original Act required that all payments to and from the Federal government be in the form of specie or Treasury notes and that only government strongboxes, not banks, could be the depositories for these funds.<sup>27</sup> These restrictions were weakened by subsequent legislation, but since government fiscal actions had a direct effect on the money stock, there were inadvertent and capricious disruptions of the money market that would have not have occurred had all funds been kept in banks.

Over time the Independent Treasury began to function more as a central bank, making loans and injecting or withdrawing funds with the explicit purpose of stabilizing the money market. The Treasury secretary who pursued these policies most vigorously was Leslie M. Shaw, who served from 1902 to 1907. The most important of Shaw's policies was the deliberate attempt to offset seasonal shifts in asset demands by moving treasury funds into banks, where they could serve as reserves against deposits and loans (Timberlake (1963)). Shaw was successful (or lucky) in preventing any

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operation before 1914 (Hamilton (1988)). Beginning with Britain's devaluation of sterling in the fall of 1931, a number of countries left the gold standard, this time for good. The final blow to the international gold standard was the departure of the United States in 1933 (Eichengreen (1985), pp.19-24).

<sup>24</sup> The First Bank of the United States operated from 1791 to 1811; the Second Bank from 1817 to 1836 (Beckhart (1972), pp.5-11).

<sup>25</sup> These banks included the Bank of England, established in 1694, the Bank of France (1800), the State Bank of Russia (1860), the German Reichsbank (1876), and the Bank of Japan (1882). Bloomfield (1959) counts an additional sixteen countries with central banks or quasi-central banks by 1880 and three more by 1907.

<sup>26</sup> The Independent Treasury Act was originally passed in 1840 but repealed in 1841. The Act was then re-adopted in 1846, with the System becoming operational on January 1, 1847 (Beckhart (1972), p.14).

<sup>27</sup> Taus (1943), pp.49-50.

serious financial panics during his tenure, which ended in March, 1907, six months before the October panic.

Shaw was vilified in both the academic and popular press for his attempts to turn the Treasury into a functioning central bank.<sup>28</sup> The opposition to his actions arose both from those who thought that central banking actions were undesirable, whether carried out by the Treasury or by a true central bank, as well as from those who thought Shaw's actions were unconstitutional, even if they were ultimately desirable.<sup>29</sup> The political opposition to Shaw's actions, the constraints placed on his activities by the normal demands of operating the Treasury, and the modest quantity of funds he had available for stabilizing money markets meant that Shaw only partially eliminated seasonal fluctuations in nominal rates.

A second institution of the National Banking System that engaged in central banking activities was clearinghouse associations. These associations were originally devised as a means of reducing the costs of clearing claims between banks within the same city. The first and prototype clearinghouse, the New York Clearinghouse Association (NYCA), was created in 1854. The member banks appointed a manager who kept track of all inter-bank claims and issued coin certificates (which constituted legal reserves) to account for any net differences. The clearinghouses therefore reduced significantly the movement of specie around the city. The NYCA was sufficiently successful that other cities established their own clearinghouses, and by 1913 there were 162 such associations.<sup>30</sup>

The next step in the development of the clearinghouses, and the one that gave them the appearance of possessing central banking powers, was the use of clearinghouse loan certificates. Clearinghouse members had the right to deposit non-reserve assets (such as stocks or treasury bills) with the clearinghouse and receive in exchange loan certificates with face value equal to 75%

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<sup>28</sup> The *Nation's* was the most vocal attack in the popular press, Andrew's (1907) and Patton's (1907) the most famous in the academic literature. Timberlake (1963) provides an interesting analysis of Andrew's criticisms.

<sup>29</sup> See Timberlake (1978), pp.175-85.

<sup>30</sup> White (1983), pp.74-75.

of the value of the assets deposited and bearing an interest rate of 7 per cent. These loan certificates were accepted by other clearinghouse members in settlement of interbank accounts, although they did not constitute legal reserves.<sup>31</sup> The issuance of these certificates reduced somewhat the need for a central bank to provide liquidity during crises, but there were numerous crises despite the use of the certificates. It should be clear that the loan certificates could, at best, moderate the effects of shifts in asset demands that forced lower reserves ratios on banks. There were costs to the banks of increasing their reserve base by using the loan certificates (the 7% interest), and the loan certificates were not generally accepted for settlement of debts outside of the clearinghouse. Essentially, the arrangements meant that, amongst themselves, the member banks counted non-specie assets as reserves.<sup>32</sup>

### *3.2 Economic Performance Under the National Banking System*

The National Banking Acts were effective in accomplishing their immediate goal of raising revenue for the North, since the requirement that nationally chartered banks hold government securities as backing for their notes created a ready market for these securities. The Acts were also successful in creating a uniform national currency: during this period the notes of different national banks traded at par since they were, by law, backed more than 100% by government securities and therefore virtually without risk.<sup>33</sup> The creation of a uniform currency, however, did not solve all the problems of the banking system. The most important problems that remained were the frequency and severity of the financial panics, which were blamed on the inelasticity of the money stock.

The inelasticity of the money supply referred to the fact that the National Banking System operated, at least in the short run, with a fixed quantity of high-powered money. There was no central bank to provide funds in times of high demand, and the Independent Treasury and the

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<sup>31</sup> White (1983), p.76.

<sup>32</sup> Timberlake (1978,1984) provides a detailed account of the central banking activities of the Clearinghouse Associations.

<sup>33</sup> See Myers (1970), p.163 and James (1978), p.75.

New York Clearinghouse Association were not sufficiently powerful to have major effects on the quantity of reserves. In theory there should have been significant elasticity in the money stock coming from international sources, since between 1879 and 1914 the United States participated in the international gold standard. In practice, however, this source of liquidity was limited by short term frictions in the international capital markets (Friedman and Schwartz (1963), pp.89-90) and by the fact that the other major countries on the gold standard experienced seasonal shifts in asset demands similar to those in the United States (Clark (1986)).<sup>34</sup>

The inelasticity of the money stock was widely blamed for the frequency and severity of the financial panics that occurred in this period, which were combinations of bank failures, bank runs, and stock market crashes. The immediate cause of the panics varied considerably, with some resulting from the failure of specific banks or investment houses in New York, others resulting from rushes of bank failures in the agricultural regions, and one stemming from an external shock (the Baring Crisis of 1890 in England). When an initial shock caused one or a few banks to fail, other banks anticipated the possibility of bank runs and called in some of their loans. Since many of these were stock market call loans, the cumulative effects of loan recall by many banks depressed the stock market. At the same time, the non-bank public increased its desired currency/deposit ratio, and this caused additional bank failures and runs on many banks. The most serious panics (1873, 1893, and 1907) ended only after suspensions of convertibility by the banks.<sup>35</sup>

The inelasticity of the money supply was particularly a problem with respect to *seasonal* shifts in asset demands. In the spring and fall of each year, seasonal increases in loan demand were accompanied by seasonal increases in the demand for currency relative to deposits.<sup>36</sup> With the

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<sup>34</sup> Calomiris and Hubbard (1987) present evidence that the short term frictions in the international capital markets during the 1879-1914 period were too small to be consistent with the large seasonals in United States interest rates unless there were similar seasonals in interest rates in other countries. Clark (1986) documents that these other seasonals were indeed present.

<sup>35</sup> Sprague (1910), pp.1-225.

<sup>36</sup> These seasonal movements in loan and currency demand were attributed to many causes, the principal one being the need for both currency and credit by the agricultural sector of the economy in the spring planting



reserves of the banking system held fixed, these shifts in asset demands meant that interest rates rose sharply and reserve/deposit ratios fell. The likelihood that an event such as a large loan default precipitated a panic therefore increased systematically in the seasons with high loan and currency demand, since the probability that any given size shock caused banks to fail increased when reserve/deposit ratios were low. The seasonal shifts in asset demands did not, by themselves, cause the panics, but they produced the conditions that made panics likely to occur. As Miron (1986) documents, the probability of a panic was much higher in the fall than it was during the rest of the year, consistent with the high interest rates and low reserve/deposit ratios that prevailed during this season.<sup>37</sup>

The major panics during the National Banking Period occurred in 1873, 1884, 1890, 1893, and 1907 (Sprague (1910)). In addition, there were twenty-four other minor panics during the 1873-1909 period (Kemmerer (1910)). The economic costs of these panics are difficult to estimate, but it is plausible that the widespread bank failures and the suspensions of convertibility produced serious disruptions in the provision of financial intermediation services, as Bernanke (1983) emphasizes with respect to the Great Depression. The effects of the panics during the pre-1914 period may not have been as severe as they were during the Depression, since the National Banking System had developed ways of moderating the effects of the crises (suspensions of convertibility, clearinghouse loan certificates).<sup>38</sup> Nevertheless, the considerable attention that the panics received in the popular and academic press, and the amount of energy devoted to preventing them (for example, by setting up a central bank), suggest that the costs were substantial. It is possible, of course, that the

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season and the fall crop-moving season. Additional currency was needed because the volume of transactions was higher in these periods. Credit demand was high because farmers borrowed to finance the planting and harvesting of the crops (Laughlin (1912), pp.309-342). Kemmerer (1910) also mentions holidays, increased rail and barge activity during warm weather, and quarterly interest and dividend settlements as additional reasons for seasonal activity in the financial markets.

<sup>37</sup> It is theoretically possible that the frequency of panics was higher during the fall season because the variance of shocks to the financial system was greater in the fall. Miron (1986) argues that according to this hypothesis there should have been a negative correlation between the seasonal in interest rates and the seasonal in reserve/deposit ratios during the pre-1914 period; in fact, the correlation was strongly positive.

<sup>38</sup> This is a point emphasized by Friedman and Schwartz (1963), pp.328-9.

important effects of the panics were redistributive rather than allocative; this does not necessarily mean that they were a less compelling problem.

### 3.3 The Creation of the Federal Reserve

The recurrent financial panics during the National Banking Period led to extended discussion of reforms of the system, especially the creation of a central bank. Conflicts between competing interest groups, however, prevented agreement on major reform for many years. The agricultural (western) banks were leery of a central bank, partly because they thought it would be controlled by New York banks, partly because of lingering resentment over the actions of the Second Bank of the United States.<sup>39</sup> Although there were numerous modifications of the National Banking System, none of these represented substantial change. Moreover, between 1893 and 1907 the economy did not experience any significant panics, and output growth was quite strong.

The panic of 1907, which coincided with a significant decline in output and a major stock market crash, spawned renewed interest in the creation of a central bank. The immediate result of the 1907 panic was the Aldrich-Vreeland Act of 1908, which granted emergency powers to groups of ten or more national banks and created the National Monetary Commission, a congressional committee assigned to study the United States and foreign banking systems. The Commission's *Report*, published in 1910, laid the basic blueprint for the Federal Reserve System. The *Report* suggested that a central bank patterned directly after the European central banks, with their monolithic structure, would not be suitable for the United States, but a more de-centralized system, with some method for coordination of the component parts, would be acceptable to a sufficiently large constituency. In response to the political demands of the time, the Act created a system consisting of twelve Federal Reserve Banks organized under the umbrella of a Board of Governors.

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<sup>39</sup> After the charter of the Second Bank expired, in 1836, the bank became the United States Bank of Pennsylvania. The president, Nicholas Biddle, engaged in reckless speculation, including an attempt to corner the cotton market. As a result, the Bank failed in 1841, and private stockholders lost everything (Beckhart (1972), p.13).

The Federal Reserve Act became law in December of 1913, and the banks opened for business in November of 1914. The proponents of the System promised a host of benefits from its creation. The Fed was intended to be the guardian of the nation's gold reserve and thus maintain the United States' position in the international gold standard.<sup>40</sup> It was assumed that the Fed would clear all checks at par and thereby eliminate the complicated system of charges associated with transporting checks between distant parts of the country. In addition, the founders expected the Fed to reduce interregional interest rate differentials by transferring funds to the parts of the country where demand was greatest. The primary goal of monetary policy, however, as stated in the Fed's charter, was "to furnish an elastic currency." According to H. Parker Willis (1915,p.75), an expert consultant to the House Banking and Currency Committee in 1912-1913 and a future Secretary of the Federal Reserve Board, the potential benefits of the System were that "there will be no such wide fluctuations of interest rates ... from season to season as now exist ... and no necessity of emergency measures to safeguard the country from the possible results of financial panic or stringency."

#### **4. The Real Bills Doctrine and the Lender of Last Resort**

The discussion in Section 3 above suggests that the Fed was created with one dominant goal in mind: the elimination of financial panics through provision of an elastic currency. Although the goal of eliminating financial panics was widely accepted, the exact means of attaining this goal were not. The controversies centered around the interpretation of the Real Bills Doctrine and the role of a lender of last resort.<sup>41</sup> In this section I review the discussions of monetary policy by the

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<sup>40</sup> The Fed was conceived and created before the outbreak of World War I and the suspension of the gold standard, and the founders expected that it would operate under the gold standard regime that had come to be the accepted system of international monetary arrangements (Friedman and Schwartz (1963), p.191). As events turned out the gold standard was suspended just months before the Fed began operations, and it never returned in full form. The maintenance of a gold reserve for international settlements was therefore never a major issue for the Fed.

<sup>41</sup> An additional issue that receives considerable attention in the literature is whether the Fed should employ open market operations or discounting as a means of affecting credit conditions in the economy. The amount of attention devoted to this topic appears misplaced. First, both notions were widely understood before the

founders and early practitioners at the Fed, and I analyze the likely impact of these policies on the behavior of the economy.

#### 4.1 *The Real Bills Doctrine and the Lender of Last Resort*

The dominant theory of central banking during the 19th and early 20th century was the real bills doctrine. This doctrine held that lending by a central bank should “accommodate the needs of commerce and business” and that central banks should confine their discount and open market operations to “short term, and self-liquidating” paper.<sup>42</sup> In practice, real bills lending meant that the central bank should conduct discount or open market operations only for commercial paper, rather than for stock market call or time loans. Much of the credit extended by commercial banks during this period was to stock market brokers, and stocks were purchased on much thinner margins than they are today (Myers (1931), p.313). Changes in interest rates therefore had enormous effects on stock prices. The predominant worry of central banking practitioners was that increased lending in response to higher loan demand would finance stock market loans and therefore fuel speculation.

The archetypical real bills lending was the accommodation of the seasonal variation in asset demands, and essentially all observers agreed that the sterilization of seasonal fluctuations in interest rates was desirable.<sup>43</sup> To begin with, seasonal movements in asset demands were assumed to result from seasonal variations in business activity, particularly but not exclusively agriculture, so these shifts in asset demands “arose out of business” and “corresponded to the needs of trade.” In addition, seasonal fluctuations are transitory (“self-liquidating”), so accommodating seasonals does not produce any general increase in the price level or in speculation. There are always offsetting decreases in asset demands that approximately cancel out the increases resulting from the

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Fed began operations, and explicit provisions in the Federal Reserve Act made it legal for the Fed to conduct open market operations and to discount private debt. Second, contemporary observers clearly understood that a pure discount policy would not allow the Fed to achieve all conceivable monetary policies; in some cases it would need to use open market operations to “make its discount rate effective.” Third, as a matter of practice, the Fed used both tools, as had the Bank of England in the pre-Fed period (Beckhart (1972)).

<sup>42</sup> See especially the 1923 *Annual Report of the Board of Governors*.

<sup>43</sup> See, for example, Laughlin (1912), Willis (1915), Glass (1927), and Warburg (1930)).

seasonal peak in loan demand. Jevons (1884) argued that the Bank of England should not raise the Bank's discount rate in response to the regular autumnal drains on the Bank's reserves since these replenished themselves in the normal course of business.

The real bills doctrine became controversial when it was applied to non-seasonal variation in the demand for credit.<sup>44</sup> Some proponents did advocate the interest smoothing policies implicit in the doctrine with respect to non-seasonal variation in economic activity. For example, Hardy (1932) wrote that the Fed

... should adapt its policy to the change in cyclical situation just as it does to the changing seasonal situation, curtailing credit when business declines and expanding it when business expands ... This line of analysis points to the conclusion that it is not the business of the Reserve system to stimulate business by making money artificially cheap in periods of depression or dear in periods of boom, but merely to adapt itself to conditions as it finds them.

Many were fearful of such a policy, however, because the non-seasonal variation in demand is not necessarily transitory and because there is no effective way to ensure that the increased credit is used for business rather than speculative purposes. Much discussion of monetary policy during the early years of the Fed focused on ways of channeling credit selectively to the ultimate users. There was not widespread appreciation of the fact that as long as different kinds of assets are substitutable in private agents' portfolios, any attempt to differentially affect interest rates will be only partly successful at best.<sup>45</sup>

The second main reason for the establishment of a central bank in the minds of contemporary observers was the need for a lender of last resort. The idea that the role of a central bank is to moderate financial crises by providing liquidity in times of unusually high demand for currency and reserves dates back at least to Bagehot (1873). He wrote in *Lombard Street* that the Bank

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<sup>44</sup> The *First Interim Report* of the Cunliffe Committee (1918) suggested that the *Bank Rate* be raised in response to permanent but not temporary disturbances in the money market.

<sup>45</sup> The Fed's confusion on the total amount of credit versus the composition of credit is summarized by Warburton, who says, "Flexibility (elasticity) in currency - *not in total bank credit* - was the aim of the founders of the Federal Reserve System, and this flexibility was desired as a means of producing stability in total bank credit by providing stability in bank reserves" (Warburton (1950), pp.154-5). See also Friedman and Schwartz (1962), p.193.

of England had an “inescapable duty” to act as lender of last resort, and that the appropriate response by a central bank to a crisis was “to lend freely, but at a high rate of interest.” This aspect of central banking activity was much more controversial than real bills lending, however. The financial panics of the pre-1914 period were associated with dramatic movements in stock prices, so it was feared that by lending in response to increases in interest rates the central bank would fuel speculation and make the size of the eventual crash larger.

The discussion above suggests the following characterization of the policies that the founders of the Fed expected it to carry out. The Fed would make the money stock elastic with respect to seasonal variations in the needs of business, providing additional credit in high demand seasons and removing it again during the low demand seasons. The Fed would also make the money stock elastic with respect to the non-seasonal variation in business, especially to the extent that these variations appeared transitory, and it would, perhaps, provide additional funds in times of crisis. The Fed was also meant to avoid accommodating the demand for stock market loans, however, and the framers for the most part expected it to exercise restrictive policies in response to any evidence of speculation.

#### *4.2 Interest Smoothing and Output Stabilization*

I turn next to analyzing the likely effects of the policies advocated by the framers and early practitioners of monetary policy. The analysis is based on the Poole (1970) model, in which standard *IS* and *LM* curves are buffeted by shocks that perturb real output from its natural rate level. The monetary authority’s objective is to stabilize output around this level, either by fixing the money stock or by pegging the nominal interest rate. The conclusion of the analysis is that if *LM* shocks are more prevalent than *IS* shocks it is optimal to smooth interest rates, but if *IS* shocks are more prevalent then it is optimal to fix the money stock. A policy of smoothing interest rates in a world dominated by *IS* shocks destabilizes output.

The lending policy implied by the real bills doctrine runs directly counter to this analysis. An increase in the underlying “needs of business” is plausibly interpreted as an exogenous, outward shift in the *IS* curve, and the proper response to such a shift in the Poole framework is a contractionary policy that raises interest rates. According to the real bills doctrine, however, monetary policy should accommodate the needs of trade, implying that the appropriate response to an outward shift in the *IS* curve is an expansionary policy that keeps interest rates from rising and causes the expansion in output to be larger than it otherwise would have been. Application of the real bills doctrine destabilizes output, so any justification for the real bills doctrine must proceed along lines other than those suggested by Poole.

The contemporary justification for the policies implied by the real bills doctrine was, I believe, essentially the following. The founders and early practitioners of the Fed associated financial panics with high interest rates and a scarcity of reserves. They believed that by accommodating the needs of trade they could eliminate the periods of high nominal rates and low reserve/deposit ratios that constituted the conditions necessary for panics. It is not clear whether they adopted this point of view because they believed monetary policy had no effect on real variables (the classical dichotomy), or because they thought that a modest increase in the short term variance of output was a fair price to pay to avoid panics, which were associated with serious recessions.

It is important to note that, if the justification for the real bills doctrine given above was the one accepted by contemporary observers, then they were correct in focusing on nominal rather than real interest rates. Just as it is the nominal rate that determines desired money holdings in the standard Baumol-Tobin framework, it is the nominal interest rate that determines a bank’s desired reserve/deposit ratio so long as the asset that is used as the ultimate means of payment carries a nominal return that is fixed (usually at zero). By smoothing nominal interest rates, the Fed could have eliminated the periods of low reserve/deposit ratios that led to panics, whether or not this

policy affected real rates and output.

The Fed's views concerning stock market speculation are somewhat less at odds with the Poole analysis than is the real bills doctrine. Increases in stock prices raise consumers' wealth, increase consumption, and shift out the *IS* curve, so the proper response in the Poole model is a restrictive policy. This is what the Fed planned to carry out, although its desire to restrain stock prices does not appear to have come from a view that doing so would moderate output fluctuations. Instead, it only desired to restrain stock prices when the increases were thought to be "speculative." The rationalization of this view may be that speculative increases in stock prices are likely to end in collapses and panics, producing costly disruptions of financial markets, with the eventual costs of the panic an increasing function of the size of the speculative increase in stock prices. This view is similar to the Fed's justification for the real bills doctrine: by maintaining stable financial markets, the violent swings in output that accompany financial panics are eliminated.

There is, of course, a potential conflict between the Fed's desire to smooth interest rates and its desire to smooth stock prices. In Blanchard's (1981) model of output, interest rates, and the stock market, an interest rate stabilization policy in the face of *IS* shocks can increase the variance of stock prices. A positive *IS* shock raises both output and interest rates; depending on the relevant elasticities, this may produce an increase or decrease in stock prices. An expansionary monetary policy increases output and lowers interest rates, thereby unambiguously raising stock prices. Thus, if the conditions for a positive *IS* shock to raise stock prices hold, an interest rate stabilization policy increases the volatility of stock prices. A commitment by the Fed to smooth both interest rates and stock prices is therefore guaranteed to fail.

The Fed's desire to act as a lender of last resort is the one of its three major goals that fits most consistently into the Poole analysis. Increases in desired currency/deposit ratios and reserve/deposit ratios, the two key features of financial panics, lead to decreases in the money



multiplier and backward shifts of the LM curve. The appropriate policy response in the Poole model is an expansionary one that keeps interest rates from rising, and this is precisely what the proponents of a lender of last resort expected the Fed to do. In practice, however, the desire to act as lender of last resort was in conflict with the desire to restrain speculation: the periods of high volatility in stock prices were also the ones when panics forced desired reserve/deposit and currency/deposit ratios upward. The manner in which the Fed resolved this conflict is the key to understanding Fed policy during the early years of its history.

## 5. Federal Reserve Policy, 1914-1940

I turn now to a quantitative evaluation of Fed policy during the 1915-1940 period, with two main goals in mind. The first is to see in what ways the policies pursued reflected the economic problems of the pre-Fed banking system and to what degree they matched the description of desirable monetary policy found in the literature of the time. The second is to assess the extent to which the policies pursued by the Fed caused or contributed to the changed behavior of both real and financial market variables after 1914. The conclusions of this section are that the Fed's behavior was consistent with what the founders desired, but that this behavior was also largely responsible for the worsened performance of output and inflation after 1914.

Figure 8 plots monthly data on the monetary base for the 1890:1-1940:12 sample period.<sup>46</sup> There are three features of the data that deserve comment: the seasonality of the monetary base increased substantially after 1914; the non-seasonal variability of the monetary base also increased significantly; and the rate of growth of the base slowed immediately before the three major downturns in economic activity of the 1915-1940 period (1920-21, 1929-33, and 1937-38). I discuss the importance of each of these features of the data in turn.

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<sup>46</sup> In the 1890:1-1914:10 period the base is equal to the stock of currency in circulation. Beginning in 1914:11, the base is equal to currency in circulation plus member bank deposits at Federal Reserve Banks. The numbers for the period 1914:11-1917:5 are not strictly comparable to those for earlier or later periods and should be interpreted with caution; see the data appendix for details.

The increased seasonality of the monetary base is the most easily understood of the three results just described. Figure 9 plots the seasonal in the detrended log level of the base for the 1890-1914 and 1914-1940 sample periods.<sup>47</sup> The base is much more seasonal after 1914, with the standard deviation of the seasonal coefficients increasing from .70% to 1.41% and the amplitude rising from 2% to 4%. In particular, the level of the base is much higher during the fall after 1914, consistent with the Fed's desired to prevent the usual autumn increases in interest rates. The change in the seasonal behavior of the base is thus plausibly the reason for the change in the seasonal behavior of nominal interest rates documented in Figure 7 above.<sup>48</sup>

The second fact about the behavior of the monetary base is that the non-seasonal component was more variable after 1914 than before. There are a number of possible explanations for this increased variability. The Fed may have made the base more variable in order to offset shifts in the money multiplier and thereby cause the money stock itself to grow smoothly. Alternatively, the Fed may have made the base more variable in an attempt to offset velocity shifts, thereby making nominal income grow smoothly. To address these issues, Figures 10 and 11 present data on the nominal money stock (M2) and nominal income for the 1890-1940 sample period. The plots of the money stock are for annual data, since monthly data on the money stock do not begin until 1907. The results in the graphs show that neither "explanation" for the increased volatility of the base is correct: the money stock is much more volatile after the founding of the Fed, and the increase in the volatility of nominal income after 1914 is even more dramatic than that in real income.

The increased volatility of the monetary aggregates does not by itself mean that monetary

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<sup>47</sup> The patterns are calculated by regressing the log level of the base on twelve seasonal dummies, time and time-squared, and plotting the de-measured values of the twelve coefficients on the dummies.

<sup>48</sup> Clark (1986) points out that the increased seasonality of the monetary base does not appear very strongly until the middle of 1917, two and a half years after the founding of the Fed. Clark interprets this result as evidence that the change in the seasonality of interest rates could not have been the result of Fed policy. I do not find this point convincing. As noted above, the statistics on the monetary base are of much worse quality during the 1914:11-1917:5 period than during either the earlier or later period; the Clark result may therefore be an artifact of the data collection procedures. The other fact that Clark presents as evidence against the view that the Fed eliminated interest rates seasonals in the United States is that the seasonals disappeared at the same time in Europe. Barsky, Mankiw, Miron and Weil (1988) and Goodfriend (1988) provide explanations of this fact that are consistent with the hypothesis that the Fed eliminated the seasonals in the United States.

policy was responsible for the increased volatility of output and inflation. If the post-1914 economy was perturbed more by external shocks than the pre-1914 economy, both money and output would have to become more variable even in the absence of the Fed. Further, an optimal policy might well be a more variable one if variation in policy were required to offset shocks to the economy. In order to demonstrate, therefore, that the increased variability of output was in fact due to the actions of the Fed, it is necessary to examine the third fact noted above, namely, that the rate of monetary growth slowed before each of the three major innovations in output during the 1915-1940 period.

The severity of the 1920-21 recession is widely regarded as the direct result of Fed policy (Friedman and Schwartz (1963), pp.231-9).<sup>49</sup> In January of 1920, the Fed raised discount rates from 4.75% to 6%, and in June it raised them an additional 1%. During the first half of 1920 the rate of high-powered money growth fell relative to recent trend, leading to a decline in the money stock between the middle of 1920 and the middle of 1921. The peak of the business cycle is dated to be January, 1920, so the Fed can not be blamed for the onset of this downturn. The extraordinarily large increase in discount rates, however, combined with growth of the base that allowed a decline in the money stock, probably contributed to the severity of the recession and the dramatic deflation. Industrial production declined by 31% from January, 1920 to June, 1921, while the price level fell 45% from May, 1920 to January, 1922.

The reason for the Fed's actions were a desire to slow the rate of inflation and to stop the commodity speculation that had become active.<sup>50</sup> A troubling question is why the Fed waited almost two years after the War to produce a deflation, in the meantime allowing the price level to climb significantly higher than its end of war level. Apparently the Fed felt that an easy money, low interest rate policy was desirable in order to allow the Treasury to service the War debt at low

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<sup>49</sup> For a related analysis, see Huizinga and Mishkin (1986).

<sup>50</sup> See Friedman and Schwartz (1963), pp.221-30.

rates.<sup>51</sup> The sixth *Annual Report of the Board of Governors* (p.3) says "... it is evident that an advance in discount rates while the Government had an unwieldy floating debt and Liberty bonds were still largely unabsorbed would have added to the difficulties of government financing." While it is difficult to assess the benefits of allowing the Treasury to pay off its debt at low (nominal, not necessarily real) interest rates, it seems likely that by delaying the end of the World War I inflation, and then ending it so abruptly, the Fed made output more volatile than necessary.

The second major downturn in output during the 1915-1940 period is the 1929-1933 episode. There are two distinct questions concerning the Fed's role in the Great Depression, the first being whether it caused the initial downturn and the second being whether, whatever the initial cause, the Fed could have prevented the magnitude of the decline. I discuss each of these issues in turn.

In a recent paper, Hamilton (1987) shows that according to every standard measure of the tightness of monetary policy the Fed began a contraction in early 1928.<sup>52</sup> Figure 5 suggests clearly why this might have occurred. During the 1923-1928 period there was an unprecedented increase in stock prices, which many observers of financial markets, including those at the Board, feared represented speculation and should therefore be restrained. There was, of course, strongly dissenting opinion, which argued that any attempt to restrict lending in the stock market would produce a crash. As Friedman and Schwartz (1963) have emphasized, the two points of view corresponded, roughly, to that of the Board of Governors and that of the New York Fed. Benjamin Strong, the president of the New York Bank, was a leading force in the fight to keep policy on an even keel, but Strong suffered from poor health that effectively removed him from power early in 1928 (Chandler (1958)). With Strong absent, the balance of power shifted to the Board and a tighter policy resulted.

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<sup>51</sup> There was also some question as to whether the Fed had the legal authority to raise discount rates without the Treasury's consent. See Friedman and Schwartz (1963,p.228).

<sup>52</sup> See also Miron (1986), who emphasizes that the Fed moderated its accommodation of the seasonals in credit markets beginning in 1928.

There has been much debate over the Fed's role in the severity of the contraction from 1929 to 1933, since, while the nominal money stock declined sharply, the real money stock and both the real and nominal base actually rose.<sup>53</sup> An advocate of the view that monetary policy could have limited the severity of the recession would have to argue that the Fed could have prevented many of the bank failures if it had taken a more aggressive stance, both by pumping in reserves at an even faster rate and by bailing out specific banks that were on the verge of collapse. Friedman and Schwartz (1963) argue that it was crucial for the Fed to take this course of action because the economy's pre-1914 means of moderating the effects of bank runs, suspensions of convertibility, had been outlawed. The resolution of this issue is not crucial to the analysis here, since there is ample evidence of the Fed's role in producing economic instability even when the Depression is excluded from consideration. Suffice it to say that if the Fed bears even partial responsibility for the depth of the Depression, then the case that it destabilized output becomes even stronger.

The circumstances of the 1937-1938 recession were in many ways quite similar to those of 1928. There was an increase in real stock prices during 1936 and 1937 which, although modest in comparison to the increase preceding the Depression, was substantial. As in 1928, the Board became concerned with the possibility of speculation (Friedman and Schwartz (1963,pp.511-34), and between the middle of 1936 and the middle of 1937 it doubled reserve requirements, leading to a temporary but sharp decline in the money stock.<sup>54</sup> The recession from 1937 to 1938 was similarly sharp but brief. Industrial production fell 33% between May, 1937 and May, 1938, while wholesale prices fell 11% from July, 1937 to May, 1938.<sup>55</sup>

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<sup>53</sup> See especially Temin (1976). Cecchetti (1988) disputes Temin's principal conclusion by presenting evidence that the deflation was anticipated. Hamilton (1987) and Dominguez, Fair and Shapiro (1988) conclude, however, that the deflation was probably not anticipated.

<sup>54</sup> The Federal Reserve claimed later that the increase in reserve requirements should have been expected merely to absorb reserves, rather than to produce a decline in the money stock, because banks were holding unusually large excess reserves (Friedman and Schwartz (1963,p.543)). This line of argument obviously ignores the plausible hypothesis that the experiences of 1929-33 lead banks to desire much larger levels of precautionary reserves.

<sup>55</sup> Brown (1956) discusses the stance of fiscal policy in the 1930's. He finds that fiscal policy was expansionary in 1936, contractionary in 1937, and expansionary in 1938. Given plausible lags in the effects of changes fiscal

The general results that emerge from this discussion are as follows. During the period 1915-1940, the Fed usually followed a policy of smoothing interest rates. This had the desired effect of eliminating the seasonal in nominal rates, as well as of removing most of the non-seasonal transitory variation in rates. The Fed deviated significantly from its policy of accommodating shifts in assets demands on three notable occasions. In each case, the Fed was concerned with reducing speculation, and in each case the Fed's policy was sufficiently restrictive that it caused or contributed significantly to major reductions in output and increased variability of prices.

## 6. Conclusions

The analysis of Fed policy presented above is troubling because it suggests that the Fed, perhaps knowingly, destabilized output and the price level. On the one hand, the Fed deliberately accommodated some shifts in interest rates because the cost of the increased output volatility resulting from this policy was lower than the cost of a true panic. On the other hand, in certain instances the Fed deliberately contracted the economy because it thought this was necessary in order to restrain speculation in stock or commodity markets.<sup>56</sup>

One possible objection to the conclusions offered above arises from the fact that the variance of output increased after 1914 in countries that possessed central banks continuously over the entire 1890-1940 period. This fact might be taken to suggest that an increase in the variance of shocks to the world economy after 1914, rather than the actions of the Fed, lead to the deterioration in the performance of the United States and other economies. In fact, it is plausible that the increased variance of output in countries other than the United States resulted from attempts by their central

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policy, it is not clear whether these changes contributed significantly to the decline in output from 1937 to 1938.

<sup>56</sup> An alternative interpretation is that the Fed meant to move the economy in the directions that it did, but not by anything like the amount that occurred. This perspective raises the question of why monetary policy may have been more potent than the Fed expected. One possibility is that the Fed required experience in order to have reasonable estimates of the feedback from its actions to the economy. A second is that the Fed implicitly assumed the conditions of fixed exchange rates, in which case their own policies would have been moderated by international forces. Alternatively, the responsiveness of the economy to contractionary forces may have changed because the institutions that the private economy had developed in order to ameliorate panics, such as suspensions of convertibility and clearinghouse loan certificates, were no longer allowed to operate.

banks to pursue objectives other than output stability. The best example of this phenomenon is Britain, where the desire to return to gold at the pre-war parity required the Bank of England to engineer a major recession and deflation. A proposed reason that these central banks pursued active policies only after 1914 is that the suspension of the gold standard permitted them the freedom to move interest rates without inducing large gold flows (Barsky, Mankiw, Miron and Weil (1988)).

The results in this paper should obviously not be interpreted to suggest that the actions of the Fed have, over its entire history, been bad for the economy. They do suggest that a policy of smoothing interest rates, or of focusing exclusively on asset markets, has the potential to produce undesirable effects on output and prices. The view that maintaining full employment is an important goal for economic policy was acknowledged in 1946 by the *Full Employment Act*, which states that "it is the continuing policy and responsibility of the Federal Government ... to promote maximum employment, production, and purchasing power."<sup>57</sup> Thus, while it is true that the Fed has placed considerable emphasis on the stability of asset markets since 1940, it has apparently learned to give sufficient weight to other objectives (output and the price level) so as to avoid the dramatically undesirable consequences of its actions before 1940.

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<sup>57</sup> The Act also created the Joint Economic Committee of Congress and the Council of Economic Advisors.

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## DATA APPENDIX

Real GNP: 1890-1929, Real GNP in billions of 1982 dollars, from Romer (1987), "The Prewar Business Cycle Reconsidered: New Estimates of Gross National Product, 1869-1908," Table 2. 1930-1940, Real GNP in billions of 1982 dollars, U.S. Department of Commerce (1986), *The National Income and Produce Accounts of the United States, 1929-82*, Table 1.2. Available Annually.

Implicit Price Deflator: 1890-1929, Implicit Price Deflator for GNP, 1982=100, from Romer (1987), "The Prewar Business Cycle Reconsidered: New Estimates of Gross National Product, 1869-1908," Table 2. 1930-1940, Implicit Price Deflator for GNP, 1982=100, from U.S. Department of Commerce (1986), *The National Income and Produce Accounts of the United States, 1929-82*, Table 1.2. Available Annually.

Wholesale Price Index: 1890:1-1912:12, Index of wholesale prices for all commodities (1913=100), from Bureau of Labor Statistics (1928), *Index Numbers of Wholesale Prices on Pre-War Base*, Table 1, pp.2-6. 1913:1-1940:12, Wholesale Price Index for All Commodities (1957-59=100), from Bureau of Labor Statistics (1963), *mimeo of Table*. The pre-1913 numbers have been adjusted to the 1957-59=100 scale. Available monthly, not seasonally adjusted.

Industrial Production: 1890:1-1918:12, Index of Physical Volume of Business Activity (Babson), 1923-27=100, from Moore (1961), *Business Cycle Indicators, Vol. II, Basic Data on Cyclical Indicators*, Table 15.1, p.130. 1919:1-1940:12, Index of Industrial Production, 1977=100, from Board of Governors of the Federal Reserve System (1986), *Industrial Production*, Table A.5, p.171. The Babson numbers have been adjusted so that the average for 1919 equals the average of the Index of Industrial Production in 1919. Available monthly, seasonally adjusted.

Interest Rates: 1890:1-1940:12, Three Month Time Loan Rate, from Mankiw and Miron (1985), "The Changing Behavior of the Term Structure of Interest Rates," Data Appendix. See also footnote 9. Available monthly, not seasonally adjusted.

Money Stock: 1890-1940, M2 for June, in billions of dollars, from Friedman and Schwartz (1970), *Monetary Statistics for the United States*, Table 1, column (9). Available annually, seasonally adjusted.

High-Powered Money: 1890:1-1914:10, Currency in Circulation, end of month figures, in millions of dollars, from NBER files, series # 14,135 (Raw). 1914:11-1940:12, high-powered money is equal to currency in circulation plus member bank deposits at the Fed. The currency in circulation series is from *Banking and Monetary Statistics*, Board of Governors, Table No. 110, pp.409-13, end of month figures, in millions of dollars. For 1917:1-1940:2, the member bank deposit series is from *Banking and Monetary Statistics*, Table No. 102, pp.373-7, end of month figures, in millions of dollars. For 1914:11-1916:12, the member bank deposit series was provided by Robert Barro, from Anna Schwartz. Available monthly, not seasonally adjusted.

Stock Prices: 1890:1-1940:12, S&P's Index of Stock Prices for 500 Companies, monthly averages of daily figures, 1941-1943=10, from *Daily Record of Stock Prices*, Standard and Poor's. Available monthly, not seasonally adjusted.

<b>Table 1: Summary Statistics, Real GNP Annual Data, Log Growth Rates</b>			
<b>Sample Period</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Autocorrelation</b>
1891-1914	3.41	3.19	-.177
1915-1940	2.40	6.63	.416
1919-1940	1.99	7.03	.440
1915-1928	3.42	4.02	.109
1919-1928	2.95	4.28	.217
1929-1940	1.20	8.82	.463
1929-1933	-5.89	7.90	-.166
1934-1940	6.26	5.40	.029

<b>Table 2: Summary Statistics, Industrial Production Annual Data, Log Growth Rates</b>			
<b>Sample Period</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Autocorrelation</b>
1891-1914	3.48	8.66	-.313
1915-1940	3.18	14.72	.007
1919-1940	2.54	15.73	-.017
1915-1928	4.13	12.06	-.238
1919-1928	3.10	13.72	-.328
1929-1940	2.08	17.83	.126
1929-1933	-6.98	19.23	-.190
1934-1940	8.55	14.81	-.220

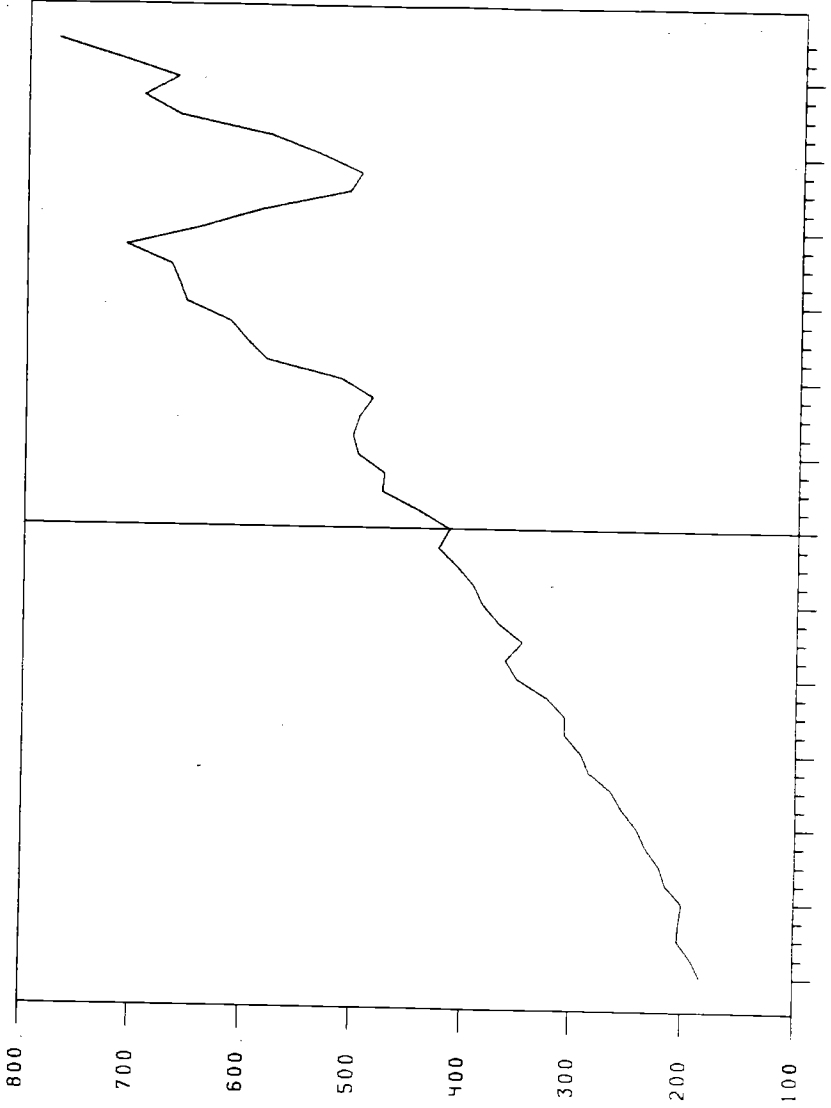
<b>Table 3: Summary Statistics, Implicit Price Deflator Annual Data, Log Growth Rates</b>			
<b>Sample Period</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Autocorrelation</b>
1891-1914	.95	2.73	.128
1915-1940	1.37	8.03	.401
1919-1940	-.71	6.27	.037
1915-1928	3.37	9.39	.329
1919-1928	-.41	7.30	-.235
1929-1940	-.96	5.59	.409
1929-1933	-5.29	5.07	.104
1934-1940	2.13	3.64	-.010

<b>Table 4: Summary Statistics, Wholesale Prices Annual Data, Log Growth Rates</b>			
<b>Sample Period</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Autocorrelation</b>
1891-1914	.77	5.04	-.173
1915-1940	.55	13.81	.228
1919-1940	-2.33	12.13	-.050
1915-1928	2.51	17.15	.152
1919-1928	-3.03	15.82	-.249
1929-1940	-1.74	8.68	.468
1929-1933	-7.68	7.49	.029
1934-1940	2.50	7.10	.118

**Table 5: Summary Statistics, Nominal Interest Rates  
Monthly Data, Levels**

Sample Period	Standard Deviation	Autocorrelations											
1890:2 -1914:11	1.49	.75	.58	.37	.25	.16	.10	.09	.09	.12	.14	.17	.16
1914:12-1940:12	2.24	.98	.96	.94	.92	.90	.88	.85	.83	.80	.78	.75	.73
1919:1 -1940:12	2.37	.98	.96	.94	.92	.90	.87	.85	.82	.79	.76	.74	.71
1914:12-1929:10	1.60	.95	.91	.96	.82	.77	.71	.65	.59	.53	.47	.41	.35
1919:1 -1929:10	1.54	.95	.90	.84	.80	.74	.68	.60	.54	.47	.41	.34	.28
1929:11-1940:12	1.02	.86	.77	.67	.58	.50	.41	.36	.32	.29	.28	.27	.26
1929:11-1933:12	1.35	.81	.69	.56	.43	.33	.21	.13	.07	.04	.05	.04	.02
1934:1 -1940:12	.28	.91	.83	.74	.66	.57	.49	.48	.44	.39	.35	.31	.27

FIGURE 1 REAL GNP (ANNUAL DATA)



1890 1894 1898 1902 1906 1910 1914 1918 1922 1926 1930 1934 1938



FIGURE 2 . INDUSTRIAL PRODUCTION (ANNUAL DATA)

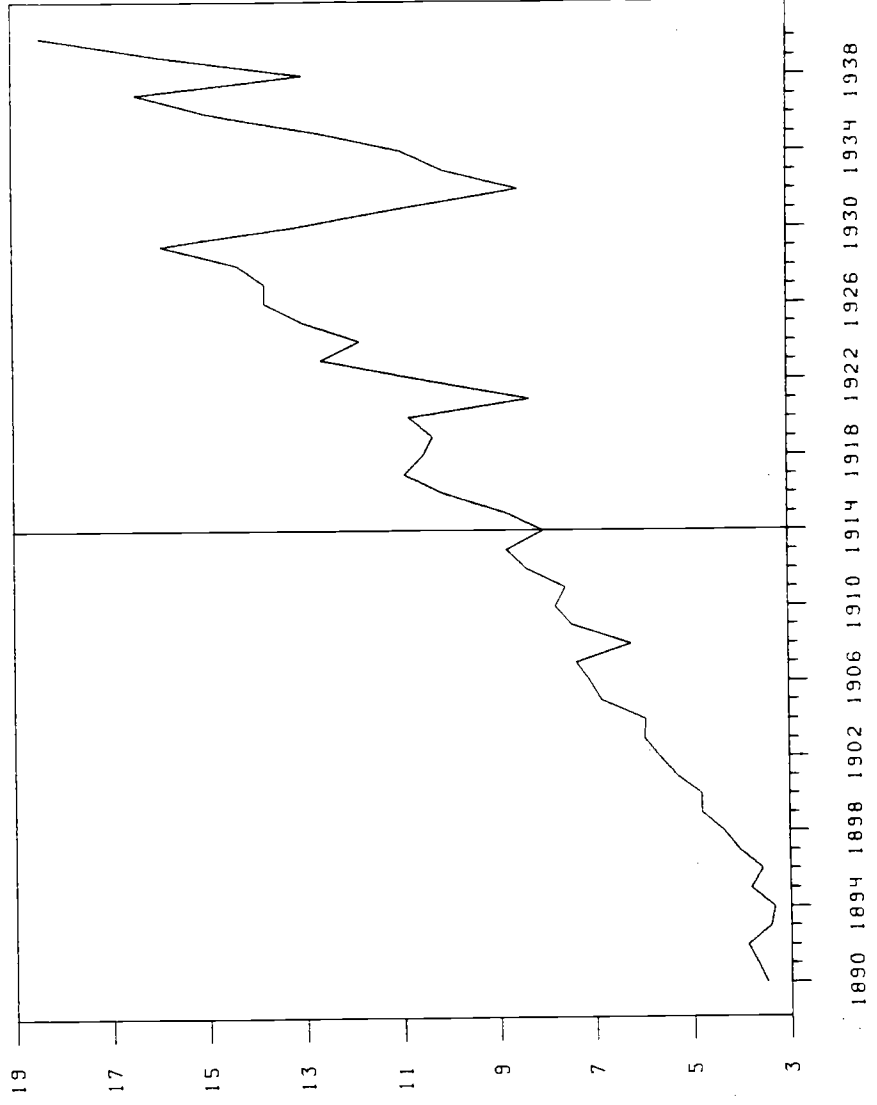
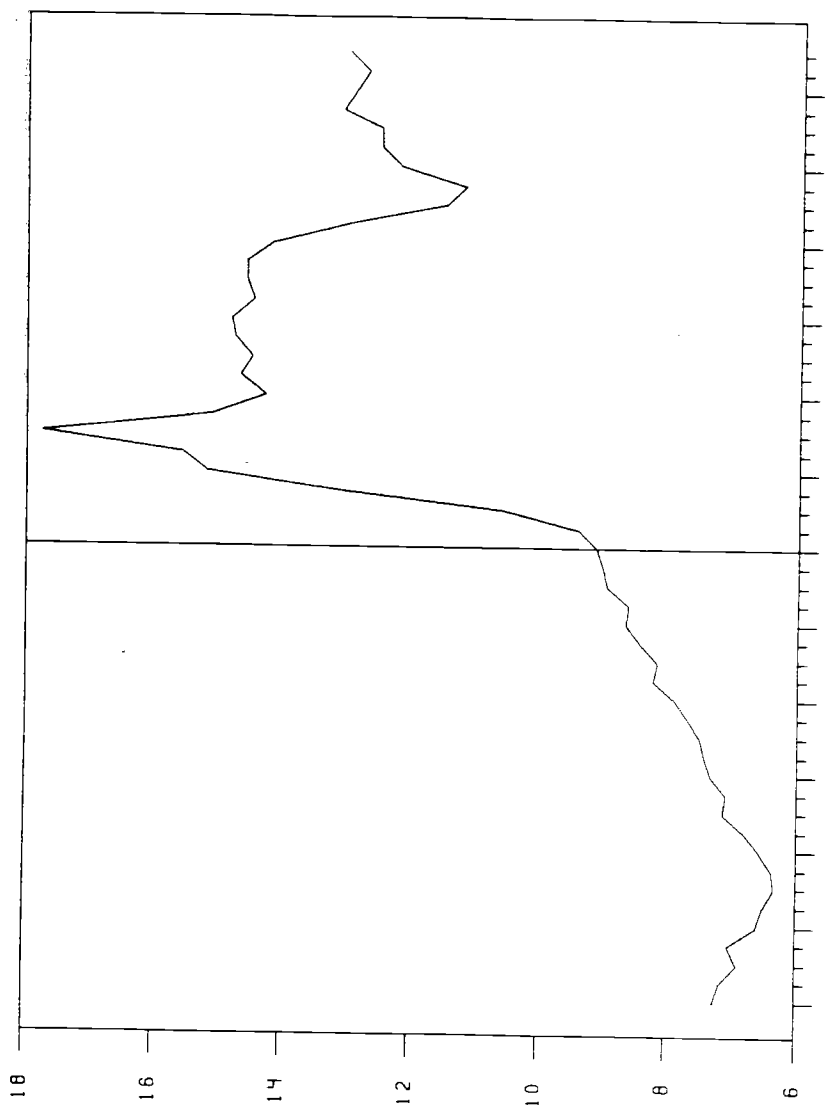


FIGURE 3: IMPLICIT PRICE DEFLATOR (ANNUAL DATA)



1890 1894 1898 1902 1906 1910 1914 1918 1922 1926 1930 1934 1938

FIGURE 4. WHOLESAL E PRICES (ANNUAL DATA)

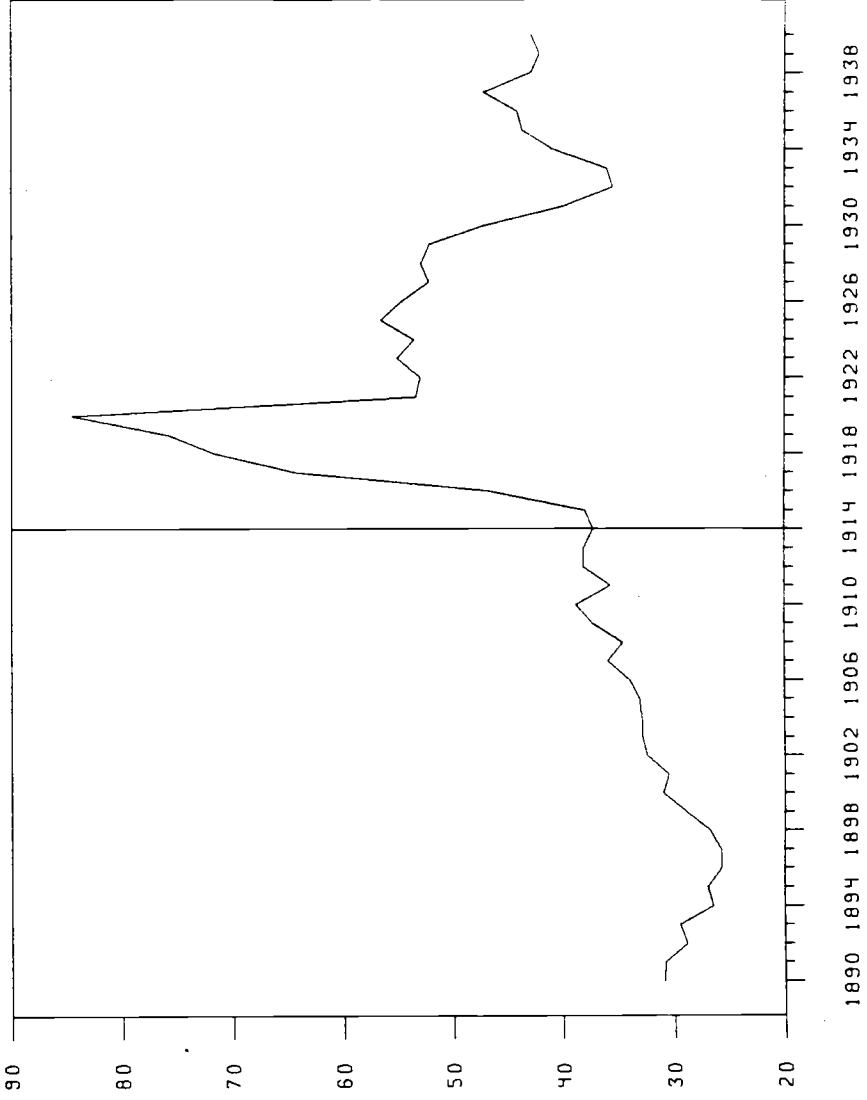
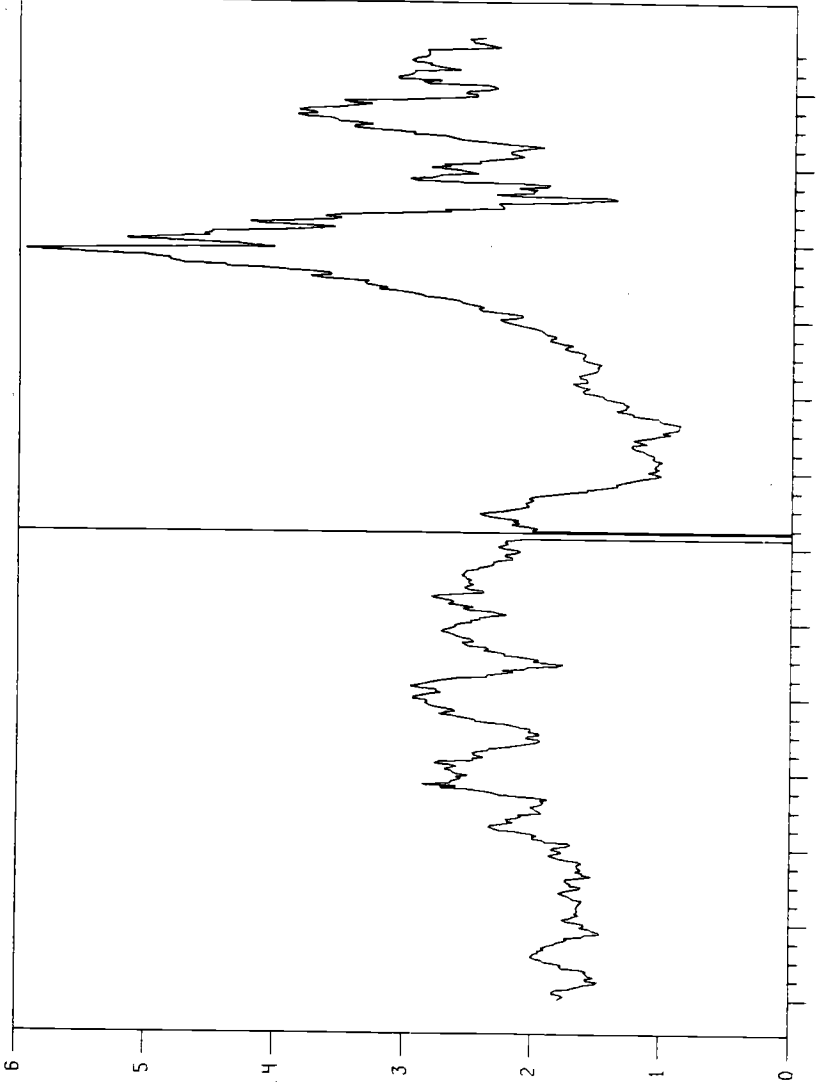
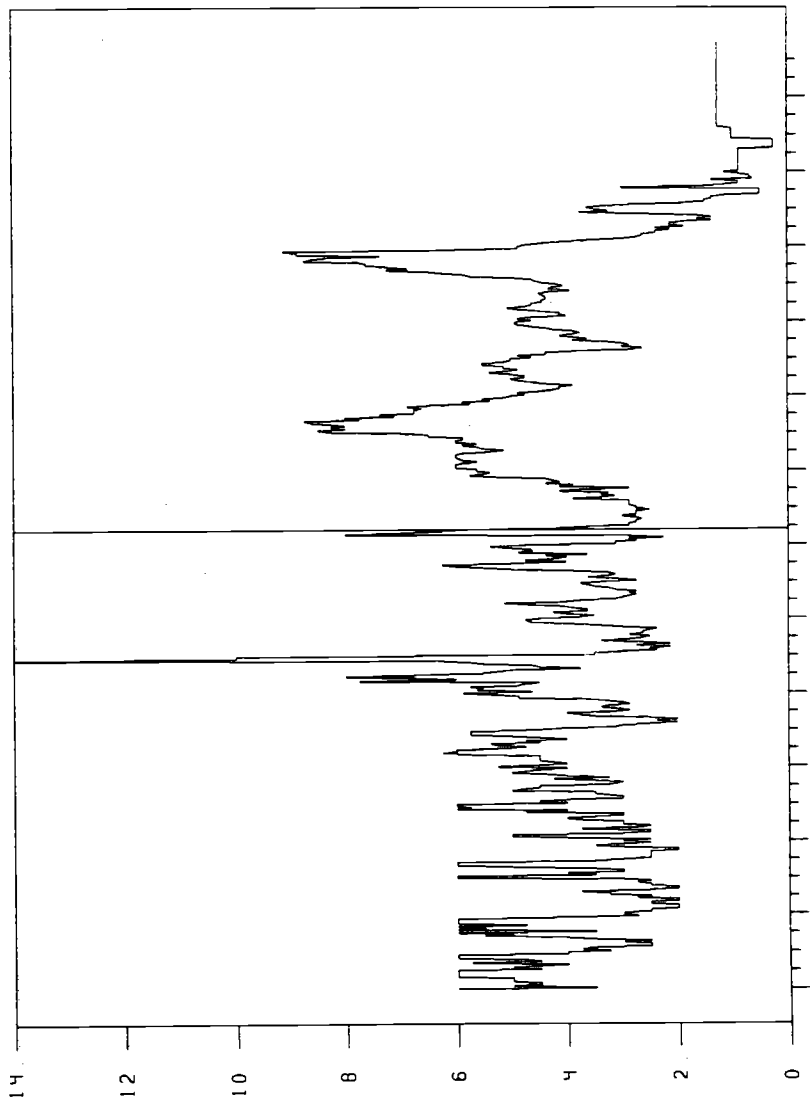


FIGURE 5 · REAL STOCK PRICES (MONTHLY DATA)



1890 1894 1898 1902 1906 1910 1914 1918 1922 1926 1930 1934 1938

FIGURE 6. NOMINAL INTEREST RATES (MONTHLY DATA)



1890 1894 1898 1902 1906 1910 1914 1918 1922 1926 1930 1934 1938

FIGURE 7: SEASONAL PATTERN IN NOMINAL RATES

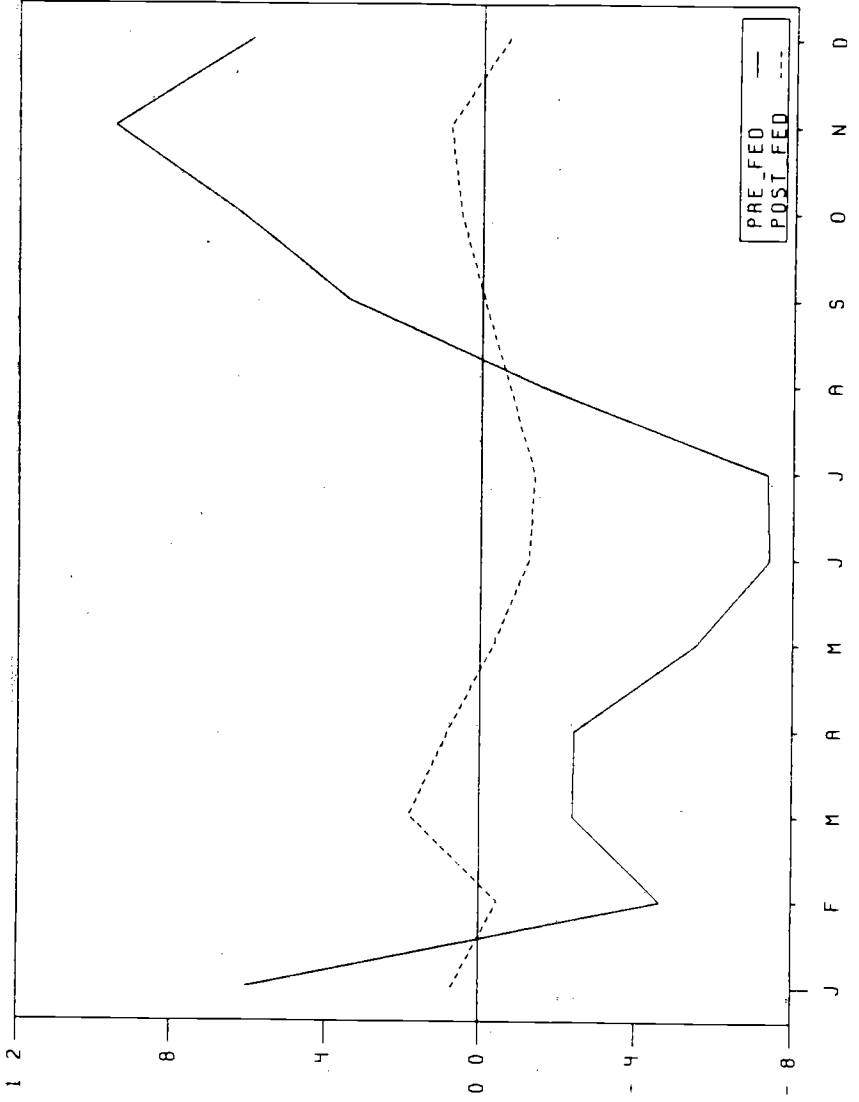


FIGURE 8 : HIGH-POWERED MONEY (MONTHLY DATA)

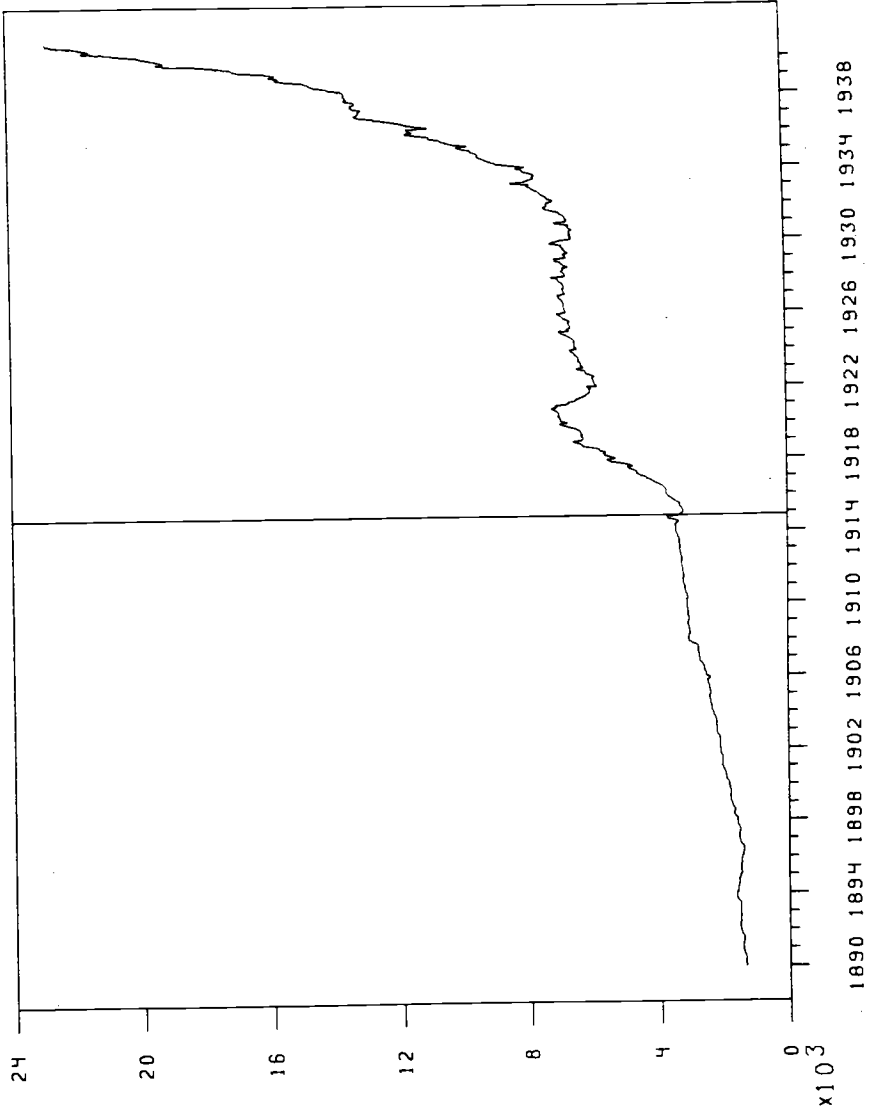


FIGURE 9: SEASONAL IN HIGH-POWERED MONEY

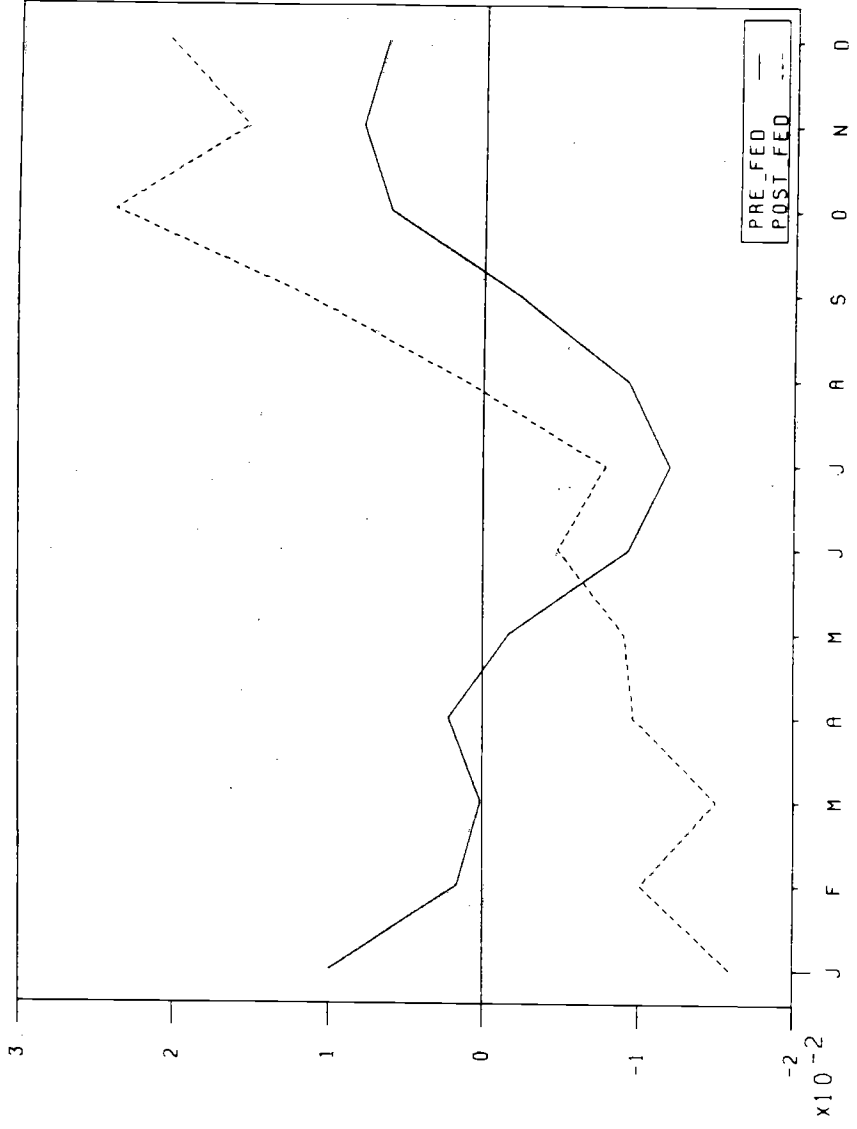




FIGURE 10 -- MONEY STOCK -- M2 (ANNUAL DATA)

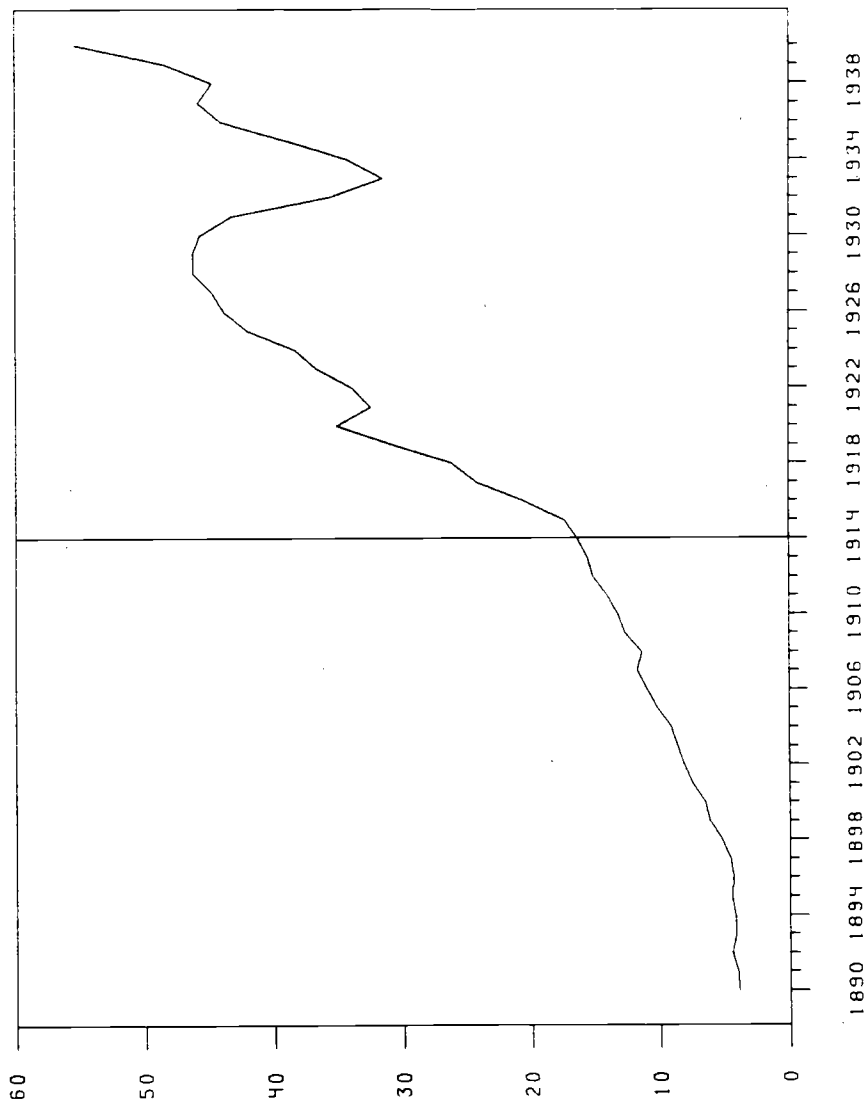
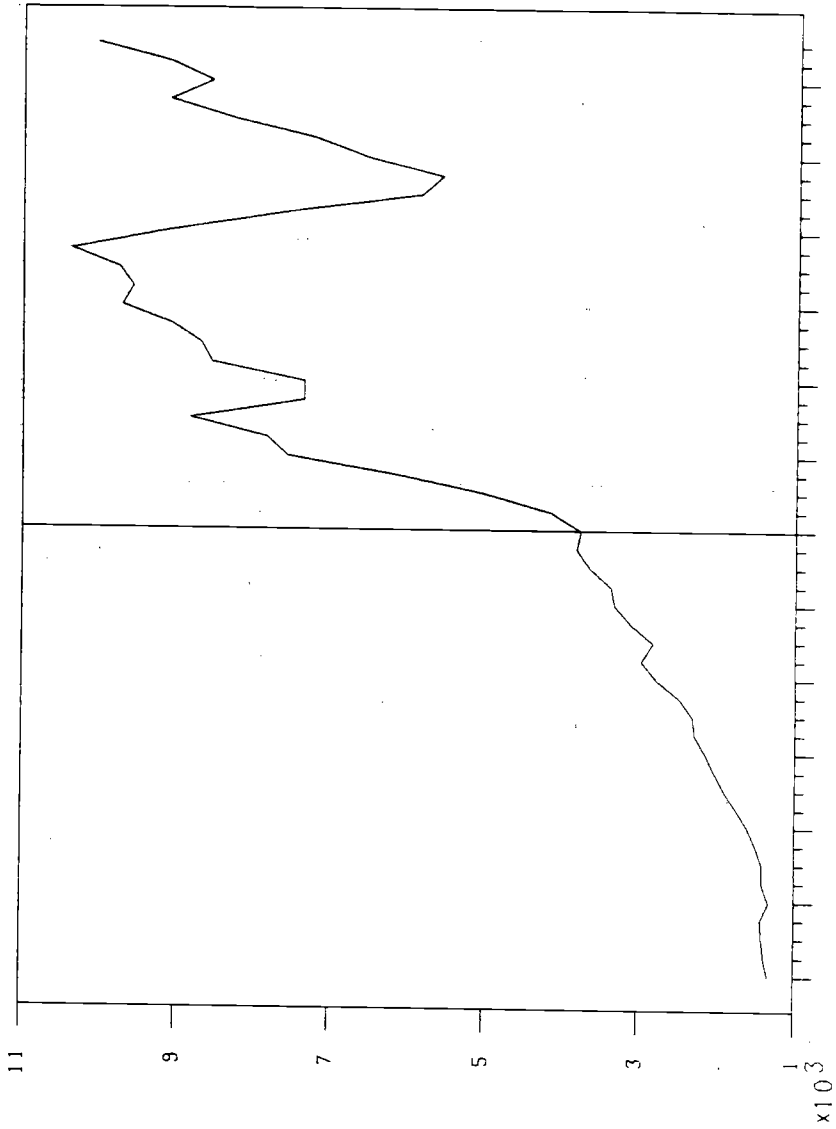


FIGURE 11 . NOMINAL GNP (ANNUAL DATA)



1890 1894 1898 1902 1906 1910 1914 1918 1922 1926 1930 1934 1938