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Lessons Learned? Comparing the Federal Reserve's Responses to the Crises of 1929-1933 and 2007-2009

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Lessons Learned? Comparing the Federal Reserve's Responses to the Crises of 1929-1933 and 2007-2009

David C. Wheelock

The financial crisis of 2007-09 is widely viewed as the worst financial disruption since the Great Depression of 1929-33. However, the accompanying economic recession was mild compared with the Great Depression, though severe by postwar standards. Aggressive monetary, fiscal, and financial policies are widely credited with limiting the impact of the recent financial crisis on the broader economy. This article compares the Federal Reserve's responses to the financial crises of 1929-33 and 2007-09, focusing on the effects of the Fed's actions on the composition and size of the Fed balance sheet, the monetary base, and broader monetary aggregates. The Great Depression experience showed that central banks should respond aggressively to financial crises to prevent a collapse of the money stock and price level. The modern Fed appears to have learned this lesson; however, some critics argue that, in focusing on the allocation of credit, the Fed was too slow to increase the monetary base. The Fed's response to the financial crisis has raised new questions about the appropriate role of a lender of last resort and the long-run implications of actions that limit financial losses for individual firms and markets. (JEL E31, E32, E52, E58, N12)

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The financial crisis of 2007-09 is widely viewed as the worst financial disruption since the Great Depression of 1929-33. The banking crises of the Great Depression involved runs on banks by depositors, whereas the crisis of 2007-09 reflected panic in wholesale funding markets that left banks unable to roll over short-term debt. Although different in character, the crisis of 2007-09 was fundamentally a banking crisis like those of the Great Depression and many of the earlier crises that preceded large declines in economic activity (Gorton, 2009).

Table 1 reports information about every U.S. recession since the Great Depression of 1929-33—more specifically, the periods designated as economic contractions by the National Bureau of Economic Research (NBER). The recent recession began in December 2007, according to the NBER. Although their Business Cycle Dating Committee has not officially identified the end of this recession, many economists believe that it ended in the middle of 2009; thus, the data used for this recession span December 2007 through June 2009.

In terms of duration, decline in real gross domestic product (GDP), and peak rate of unemployment, the recent recession ranks among the most severe of all postwar recessions.[1] However,

[1] The recession of 1945 was marked by a sharp, but short-lived decline in output as industries sharply reduced the production of war material at the end of World War II.

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Table 1

Key Macro Performance Measures Across U.S. Recessions

Recession	Duration (months)	Real GDP: Decline peak to trough (%)	Unemployment: Maximum value during recession (%)	CPI: Change peak to trough (%)
1929-33	43	–36.21	25.36	–27.17
1937-38	13	–10.04	20.00	–2.08
1945-45	8	–14.48	3.40	1.69
1948-49	11	–1.58	7.90	–2.07
1953-54	10	–2.53	5.90	0.37
1957-58	8	–3.14	7.40	2.12
1960-61	10	–0.53	6.90	1.02
1969-70	11	–0.16	5.90	5.04
1973-75	16	–3.19	8.60	14.81
1980	6	–2.23	7.80	6.30
1981-82	16	–2.64	10.80	6.99
1990-91	8	–1.36	6.80	3.53
2001	8	0.73	5.50	0.68
2007-09	20*	–3.66	9.50	2.76

*The current recession end date has not yet been determined by the NBER; data are through 2009:Q2.

the recent recession was mild compared with the economic declines of 1929-33 and 1937-38. For example, real GDP fell 36 percent during 1929-33, and the unemployment rate exceeded 25 percent. Moreover, the price level, measured by the consumer price index (CPI), fell by 27 percent. By contrast, the CPI *rose* 2.76 percent between December 2007 and June 2009.

Monetary, fiscal, and financial policies are widely credited for limiting the impact of the financial crisis of 2007-09 on the broader economy. In nominating Ben Bernanke for a second term as chairman of the Board of Governors of the Federal Reserve System, President Obama credited Bernanke with helping to prevent an economic freefall.[2] Chairman Bernanke (2009c) has also cited "aggressive" policies for insulating the global economy, to some extent, from the financial crisis. Bernanke noted that, in contrast, monetary policy was "largely passive" during the Great Depression.

This article summarizes the Federal Reserve's response to the financial crisis of 2007-09 and compares it with the Fed's response to financial shocks during the Great Depression. First, the article describes the Fed's actions as the recent crisis evolved. Initially, the Fed focused on making funds available to banks and other financial institutions, but used open market operations to prevent lending to individual firms from increasing total banking system reserves or the monetary base. As the crisis intensified, the Fed drew on authority granted during the Depression to provide emergency loans to distressed nonbank firms. The Fed also lowered its target for the federal funds rate effectively to zero and eventually purchased large amounts of U.S. Treasury and agency debt and mortgage-backed securities. The article shows the effects of these actions on the Fed's balance sheet, the monetary base, and broader monetary aggregates.

[2] The White House press release (www.whitehouse.gov/the_press_office/Remarks-By-The-President-and-Ben-Bernanke-at-the-Nomination-of-Ben-Bernanke-For-Chairman-Of-the-Federal-Reserve/) provides the text of the president and Bernanke's remarks.

The Fed was considerably less responsive to the financial crises of 1929-33. It neither lent significantly to distressed banks nor increased the monetary base sufficiently to arrest declines in the money stock and price level. The article discusses alternative explanations for the Fed's failure to pursue a more aggressive policy during the Great Depression. It also examines the impact of the Fed's doubling of reserve requirements in 1936-37, when officials feared that a large increase in excess reserves posed a significant inflation threat.

The next section summarizes the Fed's response to the crisis of 2007-09 and examines its impact on the composition and size of the System's balance sheet, the monetary base, and the growth of broader monetary aggregates. Subsequently, the article describes the Fed's actions in response to the financial shocks of the Great Depression, again focusing on the effects of the Fed's actions on the monetary base and broader monetary aggregates. Finally, the article compares the Fed's responses to the crises of 2007-09 and 1929-33 and highlights mistakes made during the Great Depression that the Fed did not repeat during the recent crisis.

THE FED'S RESPONSE TO THE CRISIS OF 2007-09

The Initial Phase: August 2007–February 2008

The recent financial crisis began with the downturn in U.S. residential real estate markets. Beginning in early 2007, a growing number of banks and hedge funds reported substantial losses on subprime mortgages and mortgage-backed securities, many of which were downgraded by credit rating agencies. The crisis first appeared in interbank lending markets in early August, when the London Interbank Offered Rate (LIBOR) and other funding rates spiked after the French bank BNP Paribas announced that it was halting redemptions for three of its investment funds (Brunnermeier, 2009). The Federal Reserve sought to calm markets by announcing on August 10 that "the Federal Reserve is providing liquidity to facilitate the orderly functioning of financial markets" and noting that, "as always, the discount window is available as a source of funding" (Board of Governors [BOG], 2007). Subsequently, on August 17, the Board of Governors voted to reduce the primary credit rate by 50 basis points and to extend the maximum term of discount window loans to 30 days. Then, in September, the Federal Open Market Committee (FOMC) lowered its target for the federal funds rate in the first of many cuts that took the rate essentially to zero by December 2008.[3]

Financial strains eased somewhat in September and October 2007 but reappeared in November. On December 12, the Federal Reserve announced the establishment of reciprocal currency agreements ("swap lines") with the European Central Bank and Swiss National Bank to provide a source of dollar funding in European financial markets. Over the next 10 months, the Fed established swap lines with a total of 14 central banks.

On December 12, the Fed also announced the creation of the Term Auction Facility (TAF) to lend funds directly to banks for a fixed term. The Fed established the TAF in part because the volume of discount window borrowing had remained low despite persistent stress in interbank funding markets, apparently because of a perceived stigma associated with borrowing at the discount window. Because of its anonymity, the TAF offered a source of term funds without any of the associated stigma.[4] As of December 28, 2009, the Fed had provided $3.48 trillion of reserves through TAF auctions.

Rescue Operations, March-August 2008

Financial markets remained unusually strained in early 2008. In March, the Federal Reserve established the Term Securities Lending Facility (TSLF) to provide secured loans of Treasury securities to primary dealers for 28-day terms.[5] Later in March, the Fed established the

[3] The St. Louis Fed provides a timeline of Federal Reserve and other official actions in response to the financial crisis (http://timeline.stlouisfed.org/index.cfm?p=home).

[4] The Fed's website (www.federalreserve.gov/monetarypolicy/bst.htm) describes the TAF and other credit and liquidity programs instituted since 2007.

[5] Primary dealers are banks and securities broker-dealers that trade U.S. government securities with the Federal Reserve Bank of New York on behalf of the Federal Reserve System. As of February 17, 2010, there were 18 primary dealers (www.newyorkfed.org/aboutthefed/fedpoint/fed02.html).

Primary Dealer Credit Facility (PDCF) to provide fully secured overnight loans to primary dealers. The PDCF, a temporary facility, expired on February 1, 2010.

Because not all primary dealers are depository institutions, the Fed invoked authority under Section 13(3) of the Federal Reserve Act, which permits the Federal Reserve to lend to any individual, partnership, or corporation "in unusual and exigent circumstances" if the borrower is "unable to secure adequate credit accommodations from other banking institutions." Such loans must be "secured to the satisfaction of the [lending] Federal Reserve Bank."[6] Section 13(3) was written into the Federal Reserve Act in July 1932 (and amended by the Banking Act of 1935 and Federal Deposit Insurance Corporation Improvement Act of 1991) out of concern that widespread bank failures had made it difficult or impossible for many firms to obtain loans, which depressed economic activity.[7] The Fed made 123 loans totaling a mere $1.5 million in the four years after the section was added to the Federal Reserve Act in 1932.[8] Section 13(3) was not used again until 2008, when it became an important tool in the Fed's effort to limit the financial crisis.

Shortly after Section 13(3) was used to create the PDCF, the Federal Reserve Board again invoked Section 13(3) when it authorized the Federal Reserve Bank of New York to lend $29 billion to a newly created limited liability corporation (Maiden Lane, LLC) to facilitate the acquisition of the distressed investment bank Bear Stearns by JPMorgan Chase. Bear Stearns was heavily invested in residential mortgage-backed securities, highly leveraged, and relied extensively on overnight loans to fund its investments. Bear Stearns faced imminent failure when the firm's creditors suddenly refused to continue to provide funding (Brunnermeier, 2009). Because of Bear Stearns' large size and interconnections with other large financial institutions through derivatives trading and loans, the Federal Reserve determined that "allowing Bear Stearns to fail so abruptly at a time when the financial markets were already under considerable stress would likely have had extremely adverse implications for the financial system and for the broader economy" (Bernanke, 2008a).[9]

The PDCF—and especially the Maiden Lane loan—marked significant departures from the Fed's usual practice of lending only to financially sound depository institutions against good collateral.[10] Former Federal Reserve Chairman Paul Volcker (2008) contends that the Fed's financial support for the acquisition of Bear Stearns by JPMorgan Chase tested "the time-honored central bank mantra in time of crisis: 'lend freely at high rates against good collateral'…to the point of no return." Certainly nothing like this support was provided or even contemplated by the Fed during the Great Depression.[11]

In July 2008, the Federal Reserve Board once again authorized loans to non-bank financial firms when it granted the Federal Reserve Bank of New York authority to lend to the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac) if necessary to supplement attempts

[6] See "Federal Reserve Act—Section 13: Powers of Reserve Banks" (www.federalreserve.gov/aboutthefed/section13.htm) for the text of this section.

[7] Bernanke (1983) argues that bank failures increased the cost of credit intermediation during the Depression and shows that bank failures help explain the decline in economic activity.

[8] See Fettig (2008) for a short history of Section 13(3) and Federal Reserve lending to non-bank firms or see Hackley (1973) for a more detailed history of Section 13(3) and other lending programs.

[9] Maiden Lane acquired $30 billion (face value) of mortgage instruments from Bear Stearns. JPMorgan Chase provided a $1 billion loan to Maiden Lane and agreed to take the first $1 billion of any losses on its portfolio. As of January 7, 2010, the net portfolio holdings of Maiden Lane were valued at $26.7 billion, and the outstanding principal amount of the Federal Reserve Bank of New York loan to Maiden Lane was $28.8 billion (data source: Federal Reserve Statistical Release H.4.1, *Factors Affecting Reserve Balances*, Table 4; www.federalreserve.gov/releases/h41/Current/).

[10] Schwartz (1992), however, notes that the Fed made sizable discount window loans to both Franklin National Bank and Continental Illinois Bank before their failures in 1974 and 1984, respectively, as well as to many smaller banks that bank supervisors had identified as being in weak financial condition. The Federal Deposit Insurance Corporation Improvement Act of 1991 sought to limit discount window borrowing by failing banks.

[11] However, following the stock market crash in 1929, the Federal Reserve Bank of New York extended loans to New York City banks to enable them to absorb stock market loans held by securities firms. The Fed also offered support through commercial banks to issuers of commercial paper following the failure of Penn Central Corporation in 1970 (Schwartz, 1992).

by the U.S. Department of the Treasury to stabilize those firms. The Fed was not called on to lend to either firm, however, and the Treasury Department placed both Fannie Mae and Freddie Mac under conservatorship in September 2008.

Rescue Operations, September 2008–May 2009

The financial crisis intensified during the final four months of 2008. Lehman Brothers, a major investment bank, filed for bankruptcy on September 15 after the failure of efforts coordinated by the Fed and Treasury Department to find a buyer for the firm. Subsequently, the Fed has been widely criticized for not rescuing Lehman Brothers. Allan Meltzer (2009), for example, argues that allowing Lehman Brothers to fail was "a major error" that "deepened and lengthened the current deep recession" (Meltzer, 2009a,b). Chairman Bernanke (2008b), however, has stated that "the troubles at Lehman had been well known for some time, and investors clearly recognized…that the failure of the firm was a significant possibility. Thus, we judged that investors and counterparties had time to take precautionary measures." Furthermore, by law, the Federal Reserve is not permitted to make unsecured loans and, according to Chairman Bernanke (2009c), the available collateral at Lehman Brothers "fell well short of the amount needed to secure a Federal Reserve loan of sufficient size to meet [the firm's] funding needs." Hence, the firm's failure was unavoidable (Bernanke, 2009c). Nonetheless, Chairman Bernanke has also stated that "Lehman proved that you cannot let a large internationally active firm fail in the middle of a financial crisis" (CBS News, 2009).

Within hours of the Lehman bankruptcy, the Fed was forced to confront the possible failure of American International Group (AIG), a large financial conglomerate with enormous exposure to subprime mortgage markets through the underwriting of credit default insurance and other derivative contracts and portfolio holdings of mortgage-backed securities. Fed officials determined that "in current circumstances, a disorderly failure of AIG could add to already significant levels of financial market fragility and lead to substantially higher borrowing costs, reduced household wealth, and materially weaker economic performance" (BOG, 2008a). Hence, on September 16 the Fed again invoked Section 13(3) of the Federal Reserve Act and made an $85 billion loan to AIG, secured by the assets of AIG and its subsidiaries. Thus, in the span of two days, the Fed confronted the failure of two major financial firms. Neither firm was a depository institution and thus could not obtain support through the Fed's normal lending programs. In the case of Lehman Brothers, Federal Reserve officials determined that they could not prevent the firm's failure and concentrated on trying to limit the impact on other financial firms and markets. However, in the case of AIG, Fed officials determined that a rescue of the firm was necessary to protect the financial system and broader economy, and they therefore called on emergency lending authority granted under Section 13(3).

The Lehman bankruptcy produced immediate fallout. On September 16, the Reserve Primary Money Fund announced that the net asset value of its shares had fallen below $1 because of losses incurred on the fund's holdings of Lehman commercial paper and medium-term notes. The announcement triggered widespread withdrawals from other money funds, which prompted the U.S. Treasury Department to announce a temporary program to guarantee investments in participating money market mutual funds. The Federal Reserve responded to the runs on money funds by establishing the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) to extend non-recourse loans to U.S. depository institutions and bank holding companies to finance purchases of asset-backed commercial paper from money market mutual funds.[12] Again, the Fed drew on its Section 13(3) authority (BOG, 2008b).

To help stabilize the financial system, on September 21, the Fed approved the applications of Goldman Sachs and Morgan Stanley to become

[12] A non-recourse loan is ultimately guaranteed only by the collateral pledged for the loan. Should a borrower default on an AMLF loan, the Federal Reserve could seize the asset-backed commercial paper pledged as collateral for the loan, but not other assets of the borrower.

bank holding companies and authorized the Federal Reserve Bank of New York to extend credit to the U.S. broker-dealer subsidiaries of both firms, as well as to Merrill Lynch (BOG, 2008c). A few days later, the Fed increased its existing swap lines with the European Central Bank and several other central banks to supply additional dollar liquidity in international money markets.

Financial markets remained in turmoil over the ensuing weeks. To help alleviate financial strains in the commercial paper market, the Fed established the Commercial Paper Funding Facility (CPFF) on October 7. This facility provided financing for a special-purpose vehicle established to purchase 3-month unsecured and asset-backed commercial paper directly from eligible issuers. Once again, the Fed relied on Section 13(3) as the legal basis for establishing the CPFF, just as it did on October 21, when it created the Money Market Investor Funding Facility (MMIFF). Under the MMIFF, the Fed offered to provide loans to a series of special-purpose vehicles that purchase assets from money market mutual funds and other eligible investors (BOG, 2008d,e).

The Fed's next rescue operation came in November, when it participated with the Treasury Department and Federal Deposit Insurance Corporation in a financial assistance package for Citigroup. The Federal Reserve agreed, if necessary, to provide a non-recourse loan to support a federal government guarantee of some $300 billion of real estate loans and securities held by Citigroup (BOG, 2008f). To date, the Federal Reserve has not been called on to make a loan under this agreement.

Two days later, on November 25, the Federal Reserve again invoked Section 13(3) of the Federal Reserve Act when it announced the creation of the Term Asset-Backed Securities Lending Facility (TALF). Under this facility, the Federal Reserve Bank of New York provides loans on a non-recourse basis to holders of AAA-rated asset-backed securities and recently originated consumer and small business loans (BOG, 2008g). The TALF was launched on March 3, 2009, and the types of eligible collateral for TALF loans were subsequently expanded on March 19 and May 19, 2009.[13]

Throughout the fall of 2008, the Federal Reserve Board approved the applications of several large financial firms to become bank holding companies; these firms included Goldman Sachs, Morgan Stanley, American Express, CIT, and GMAC. The Board cited "unusual and exigent circumstances affecting the financial markets" for expeditious action on several of these applications. As bank holding companies, these firms are subject to Federal Reserve oversight and regulation, but they benefit from additional funding sources (chiefly deposits) and access to the Fed's discount window programs.

In addition to the Fed's rescue operations and programs to stabilize specific financial markets, the FOMC reduced its target for the federal funds rate in a series of moves that lowered the target rate from 5.25 percent in August 2007 to a range of 0 to 0.25 percent in December 2008. On November 25, 2008, the FOMC announced its intention to purchase large amounts of U.S. Treasury securities and mortgage-backed securities issued by Fannie Mae, Freddie Mac, and the Government National Mortgage Association (Ginnie Mae). The FOMC increased the amount of its purchases in 2009. The stated purpose of the purchases of mortgage-backed securities was to reduce the cost and increase the availability of credit for the purchase of houses (BOG, 2008g). The move to support a particular market through open market purchases is highly unusual for the Federal Reserve and unprecedented on this scale since before World War II.[14]

The Impact of Fed Actions on Monetary Aggregates

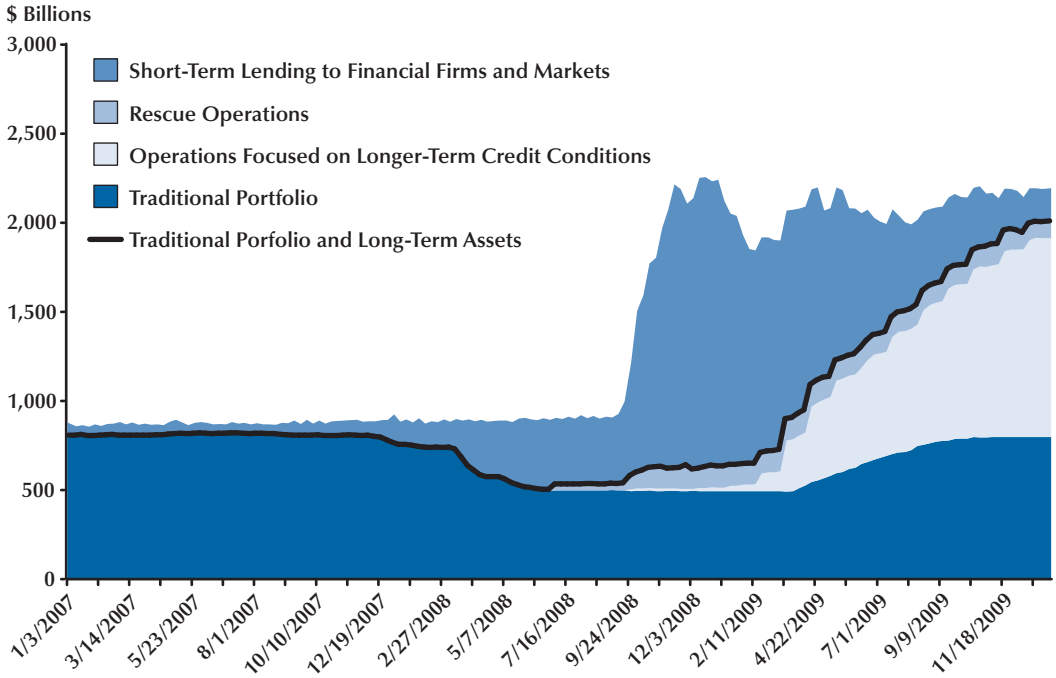
The Fed's actions in 2007-09 resulted in large changes in, first, the composition and, ultimately, the size of the Federal Reserve's balance sheet. Figure 1 shows the changes in the volume and

[13] See "Term Asset-Backed Securities Loan Facility" (www.federalreserve.gov/monetarypolicy/talf.htm) for details about the TALF program.

[14] Before the mid-1930s, the Federal Reserve Banks routinely purchased bankers' acceptances ("bills") in the open market. The Fed's founders sought to promote the use of the dollar and U.S. financial markets for the financing of international trade by creating an active acceptance market. Federal Reserve Banks set the interest rates ("bill buying rates") at which they would purchase acceptances and purchased the quantities that were offered at those rates.

Figure 1

Composition of Federal Reserve Assets



SOURCE: Federal Reserve H.4.1 Balance Sheet.

composition of Federal Reserve assets since the beginning of 2007. The share of the Fed's assets composed of loans and securities other than those issued by the Treasury began to rise in August 2007, when the financial crisis first appeared in interbank funding markets and the Fed eased terms for discount window loans. However, the overall size of the Fed's balance sheet remained roughly constant until September 2008 because the Fed offset (or "sterilized") increases in loans with open market sales of Treasury securities.[15]

The Federal Reserve was unable (and perhaps unwilling) to sterilize the large increase in its lending to financial institutions that occurred when the financial crisis intensified in September 2008. Loans to AIG in September 2008 and the introduction of the CPFF, AMLF, and increased swap lines with foreign central banks in September and October 2008 all resulted in a large increase in Federal Reserve credit outstanding.

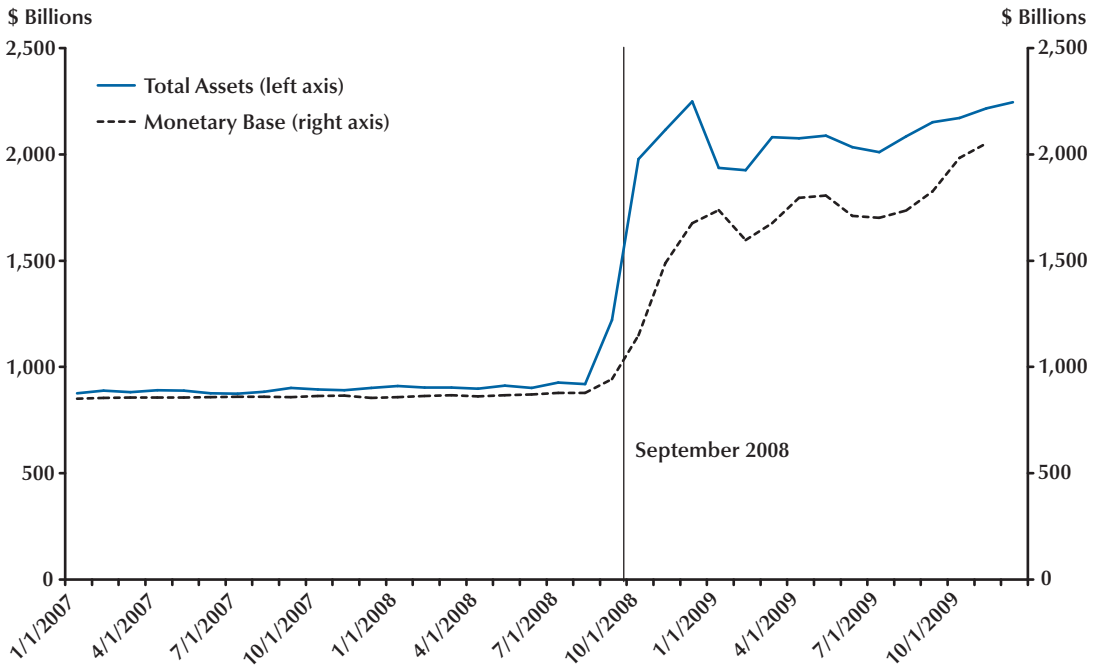
The Fed's total assets reached a peak in the second week of December 2008 and began to fall as the strain in the financial markets eased and the volume of Federal Reserve credit extended through the CPFF, AMLF, and swap lines declined. Total assets began to rise again in the second quarter of 2009, however, when the Federal Reserve began to purchase Treasury and agency securities and mortgage-backed securities and the TALF was introduced. Federal Reserve lending to financial firms and markets remained high through September 2009, but became a smaller portion of the Fed's total assets when the Fed's holdings of Treasury and agency debt and other long-term assets, such as mortgage-backed securities and TALF loans, began to rise.

Figure 2 shows the relationship between the size of the Fed's balance sheet and the monetary

[15] The increase in Fed lending was also partly offset by an increase in U.S. Treasury deposit balances with Federal Reserve Banks.

Figure 2

Federal Reserve Assets and the Monetary Base (2007-09)



base, which consists of currency in circulation and the reserves held by depository institutions.[16] As the figure shows, the monetary base was relatively constant until September 2008, when the Fed stopped using open market sales to prevent its lending to banks and other financial firms from increasing the System's total assets. Figure 3 shows that the growth rate of the M2 monetary aggregate also increased sharply in the fourth quarter of 2008 and remained correlated with monetary base growth throughout 2009.

Chairman Bernanke (2009a) has described the Fed's response to the financial crisis as "credit easing" to distinguish the policy from the "quantitative easing" approach that Japan and some other countries have at times adopted. Unlike a pure quantitative easing policy, which targets the growth of the monetary base or a similar narrow monetary aggregate, the Fed's credit-easing policy was at least as much concerned with the allocation of credit supplied by the Fed to the financial system as with the quantity. Indeed, before September 2008, the Fed focused exclusively on reallocating an essentially fixed supply of Federal Reserve credit to the financial firms with the greatest demand for liquidity.[17]

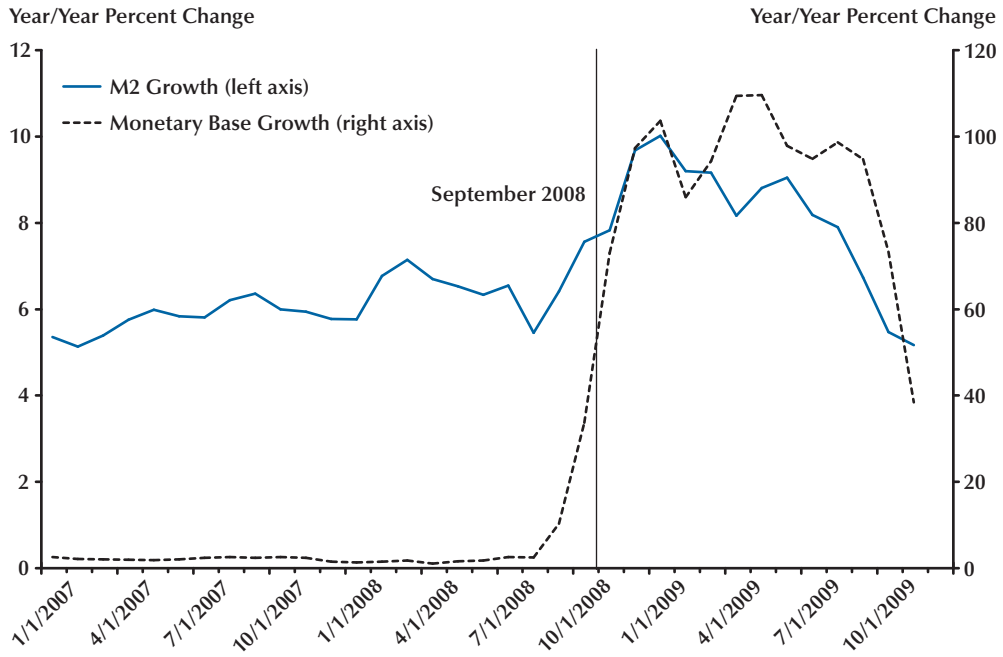
Policy entered a new phase in September 2008, when the Fed's rescue operations and later its large purchases of U.S. Treasury and agency debt and mortgage-backed securities caused the

[16] Figure 2 shows the St. Louis Adjusted Monetary Base, which is a measure of the base that is adjusted for changes in reserve requirements over time. Other measures of the monetary base, including unadjusted measures, show essentially the same relationship with the Federal Reserve balance sheet. These data are available from the Federal Reserve Bank of St. Louis (http://research.stlouisfed.org/fred2/).

[17] Thornton (2009a) notes that the Fed's initial attempt to satisfy heightened liquidity concerns without increasing the monetary base contrasted with its use of open market operations to increase the monetary base sharply at the century date change (Y2K) in December 1999 and following the terrorist attacks on September 11, 2001. He argues that the Fed may have been reluctant to increase the monetary base to better control the federal funds rate or because Fed officials viewed targeted credit allocation as a more effective means of encouraging banks to lend and avoid selling illiquid assets.

Figure 3

Monetary Base and M2 Growth (2007-09)



System's total assets and the monetary base to more than double in size. However, the Fed's objective in purchasing mortgage-backed securities was to reduce mortgage interest rates and promote recovery of housing markets, rather than simply to increase the total amount of credit available to the financial system. Nonetheless, the program helped to increase the growth of broader monetary aggregates and thereby likely reduced the risk of deflation.

THE FED'S RESPONSE TO THE CRISES OF 1929-33

The Federal Reserve's response to the financial crisis and recession of 2007-09 was markedly more aggressive than the Fed's anemic response to the Great Depression. The Fed's policy failures during the Great Depression are legendary. The Fed—specifically, the Federal Reserve Bank of New York—reacted swiftly to the October 1929 stock market crash by lowering its discount rate and lending heavily to banks. However, the Fed largely ignored the banking panics and failures of 1930-33 and did little to arrest large declines in the price level and output. This section reviews Federal Reserve policy during the Great Depression and discusses prominent explanations for the Fed's behavior.

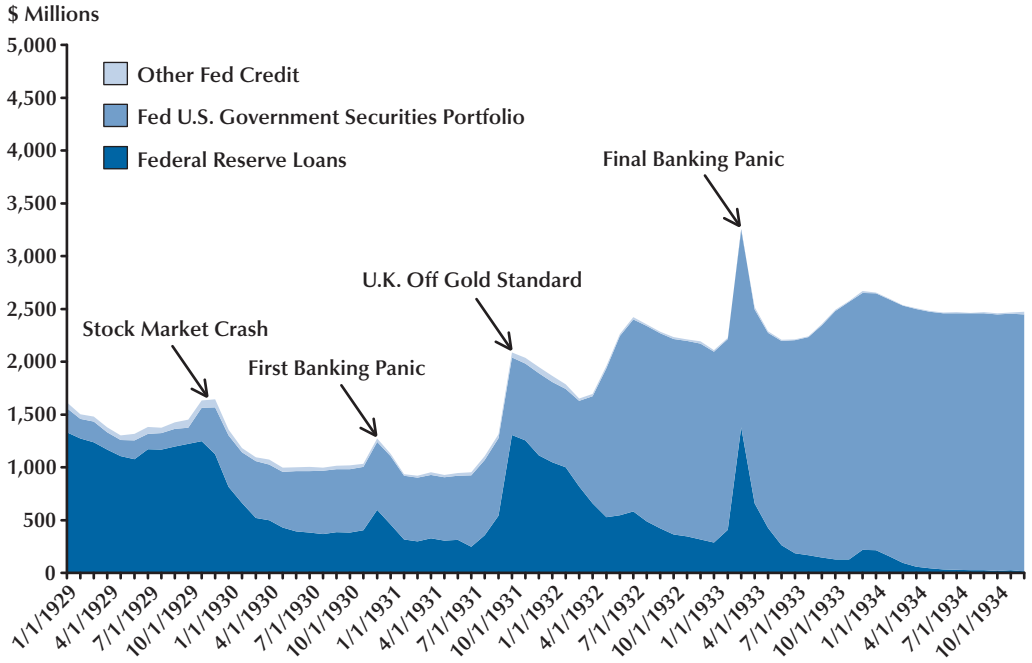
Fed Policy from the Stock Market Crash to Bank Holiday

Figure 4 shows the level and composition of Federal Reserve credit during 1929-34, providing one measure of the Fed's response to the major financial crises of the Great Depression.[18] Following the stock market crash, the Federal Reserve Bank of New York used open market purchases

[18] In recent years, Federal Reserve credit has been by far the largest component of Federal Reserve assets. However, before World War II, the Federal Reserve Banks held significant gold reserves and other assets aside from Federal Reserve credit. Hence, for the Great Depression period, we present data on Federal Reserve credit, rather than total assets, for better comparison with policy during the recent financial crisis.

Figure 4

Federal Reserve Credit (1929-34)



SOURCE: Board of Governors of the Federal Reserve System (1943, pp. 369-71).

and liberal discount window lending to inject reserves into the banking system, which enabled New York City banks to absorb a large amount of loans made by securities brokers and dealers. The New York Fed's actions were "timely and effective" in containing the crisis and preventing widespread panic in money markets and among bank depositors (Friedman and Schwartz, 1963, p. 339). The Federal Reserve Board reluctantly approved the New York Fed's actions ex post, but many members expressed displeasure that the New York Fed had acted independently.

The New York Fed pressed for additional easing in early 1930. However, the Federal Reserve Board rejected several requests for discount rate cuts and additional open market purchases. As Figure 4 shows, total Federal Reserve credit fell by about one-third during the first half of 1930, mainly because of declines in discount window loans and Fed purchases of bankers' acceptances.[19] As Figure 5 shows, the monetary base and broader measures of the money stock mirrored Federal Reserve credit outstanding—increasing sharply after the stock market crash but then falling with the decline in Fed credit during 1930. Friedman and Schwartz (1963) contend that the decline in the money stock was the main cause of the subsequent decline in economic activity.[20]

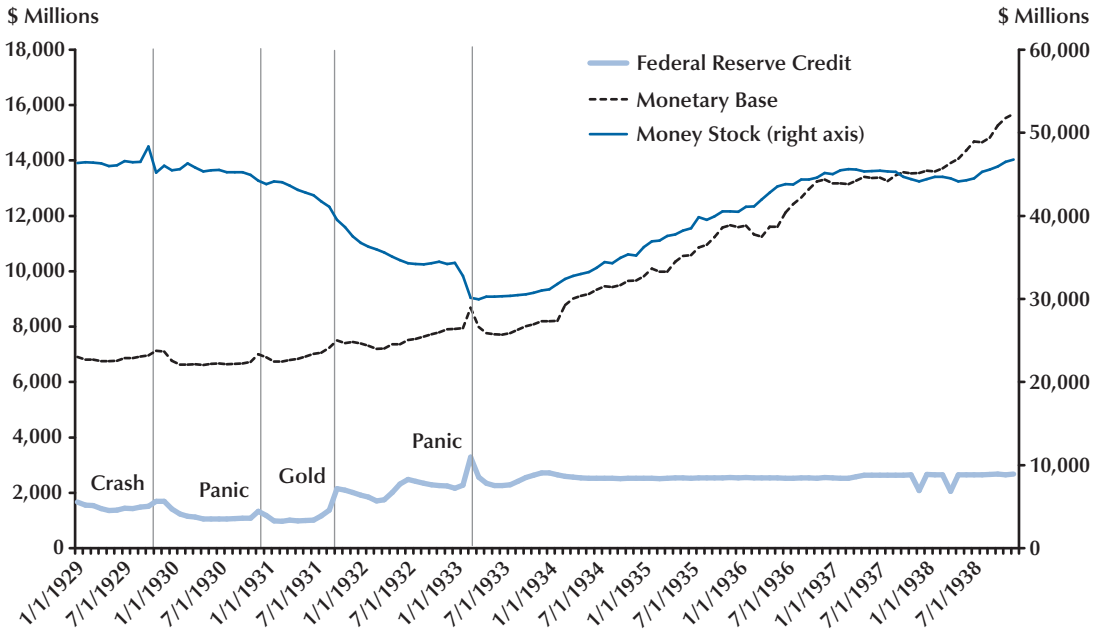
The stock market crash was the first in a series of financial shocks during the Great Depression. Friedman and Schwartz (1963) identify major banking panics in the fourth quarter of 1930, early 1931, fourth quarter of 1931, and in February-March 1933. As Figure 4 shows, total Federal

[19] Data for "Federal Reserve loans" in Figure 4 are for the sum of discount window loans and bankers' acceptances held by Federal Reserve Banks (which are referred to as "bills bought" in *Banking and Monetary Statistics, 1914-41* [BOG, 1943]).

[20] Friedman and Schwartz's (1963) monetary explanation of the Great Depression is widely, but not universally, shared among economists. See Parker (2007) for a survey of alternative views on the causes of the Great Depression.

Figure 5

Federal Reserve Credit and the Monetary Aggregates



SOURCE: Federal Reserve credit (see Figure 4); St. Louis adjusted monetary base (FRED; http://research.stlouisfed.org/aggreg/newbase.html); money stock (Friedman and Schwartz, 1963; Appendix A, Table A-1).

Reserve credit surged briefly following the stock market crash and during the banking panics of October-December 1930, September-December 1931 (which followed the United Kingdom's decision to leave the gold standard), and January-March 1933. On each occasion, the increase in Federal Reserve credit (and its impact on the monetary base) was quickly reversed. Moreover, as Figure 5 shows, when Federal Reserve credit finally began to grow in 1932, it only temporarily halted the decline in the broader money stock. This pattern is in marked contrast with the behavior of Federal Reserve credit and the monetary aggregates in 2008-09. Although the Fed did not increase the monetary base significantly until September 2008, the broader monetary aggregates continued to grow and the price level continued to rise, albeit slowly, throughout the financial crisis.[21] In addition, the monetary base rose sharply in the final four months of 2008 and remained large throughout 2009 (see Figure 2).

Why did the Fed permit its credit to contract after each financial shock of 1929-33? Meltzer (2003) argues that Fed officials misinterpreted the signals from money market interest rates and discount window borrowing. Consistent with guidelines developed during the 1920s, during the Depression, Fed officials inferred that low levels of interest rates and borrowing meant that monetary conditions were exceptionally easy, and that there was no benefit—and possibly some risk—from adding more liquidity. Federal Reserve Bank of New York Governor Benjamin Strong explained the use of the level of discount window borrowing as a guide to policy as follows:

[21] Although not apparent in the year-over-year growth rate shown in Figure 3, M2 growth slowed markedly between mid-March 2008 and mid-September 2008, which Hetzel (2009) contends is evidence of a tightening of monetary policy, along with the lack of any reduction in the FOMC's federal funds rate target between April 30 and October 8, 2008.

> Should we go into a business recession while the member banks were continuing to borrow directly 500 or 600 million dollars…we should consider taking steps to relieve some of the pressure which this borrowing induces by purchasing government securities and thus enabling member banks to reduce their indebtedness…As a guide to the timing and extent of any purchases which might appear desirable, one of our best guides would be the amount of borrowing by member banks in the principal centers…Our experience has shown that when New York City banks are borrowing in the neighborhood of 100 million dollars or more, there is then some real pressure for reducing loans, and money rates tend to be markedly higher than the discount rate. On the other hand, when borrowings of these banks are negligible…the money situation tends to be less elastic and if gold imports take place, there is liable to be some credit inflation, with money rates dropping below our discount rate. When [New York City] member banks are owing us about 50 million dollars or less the situation appears to be comfortable, with no marked pressure for liquidation.[22]

Discount window borrowing declined sharply, from $500 million for all Federal Reserve member banks in January 1930 ($39 million for New York City banks) to $231 million in April 1930 ($17 million for New York City banks), and $226 million in July 1930 ($0 for New York City banks). Fed officials interpreted these declines as indicating that monetary conditions were extremely easy and that no additional stimulus was required. For example, the governor of the Federal Reserve Bank of San Francisco argued in June 1930 that, "with credit cheap and redundant, we do not believe that business recovery will be accelerated by making credit cheaper and more redundant."[23] Indeed, some officials described monetary conditions as too easy and argued for a tighter policy. For example, in January 1930, the governor of the Federal Reserve Bank of Minneapolis wrote that "I cannot see the desirability of further ease of credit. It seems to me money is getting almost 'sloppy.'"[24] Several Fed officials believed that Federal Reserve credit should be withdrawn whenever economic activity slows. For example, the governor of the Federal Reserve Bank of Philadelphia stated: "We have been putting out credit in a period of depression when it was not wanted and could not be used, and we will have to withdraw credit when it is wanted and can be used."[25]

Federal Reserve credit increased temporarily in late 1930, as shown in Figure 4. Federal Reserve credit normally had a distinct seasonal pattern and typically rose in the autumn when loan demand and interest rates tended to rise. However, in December 1930, the Federal Reserve Bank of New York also purchased $175 million of U.S. government securities and bankers' acceptances to ease the financial market strains after the failure of the Bank of United States. Numerous banks failed throughout the United States between October and December 1930. Most were small banks that were not members of the Federal Reserve System, and thus unable to borrow at the Fed's discount window.[26] Friedman and Schwartz (1963) note that Fed officials felt no particular responsibility for nonmember banks. However, they argue that the Fed made a critical error in not saving the Bank of United States, which was a midsize New York City bank and a member of the Federal Reserve System. Although the Federal Reserve Bank of New York participated in discussions about a possible merger to save the Bank of United States, those talks broke down when neither the New York Fed nor the New York clearinghouse banks would guarantee $20 million of Bank of United States assets (Meltzer, 2003, pp. 323-24). As with the failure of Lehman Brothers in 2008, the Fed and clearinghouse banks elected to let the Bank of United States fail and focus on containing the resulting fallout.

[22] Presentation to the Federal Reserve Governors' Conference, March 1926 (quoted by Chandler, 1958, pp. 239-40).

[23] Quoted by Chandler (1971, p. 118).

[24] Quoted by Chandler (1971, p. 143).

[25] Minutes of the Open Market Policy Conference, September 25, 1930 (quoted by Chandler, 1971, p. 137). See Chandler (1971) and Meltzer (2003) for information about the policy views expressed by different Federal Reserve officials during the Depression.

[26] Before the Monetary Control Act of 1980, only Federal Reserve member banks had access to the Fed's discount window.

Federal Reserve credit outstanding declined sharply in early January 1931, as money market strains eased. The economic contraction deepened in 1931, deflation took hold, and interest rates and discount window borrowing declined still further. Another wave of bank failures occurred in the first half of 1931, but again most of the banks that failed were nonmember banks located outside New York City and other financial centers. For the first time, banks began to hold excess reserves—that is, reserves in excess of legal requirements. Fed officials took this as further evidence of exceptionally easy monetary conditions and considered engaging in open market sales to "soak up" excess liquidity (Meltzer, 2003, p. 328).

The next major financial shock occurred in late September 1931. After depleting most of its gold and foreign exchange reserves, the United Kingdom abandoned the gold standard on September 21, 1931, and allowed the pound to float freely. Speculation that the United States would soon also leave the gold standard caused large withdrawals of gold and currency from U.S. banks. The Federal Reserve responded by increasing its discount and acceptance buying rates in an attempt to halt and then reverse the gold outflow, and to demonstrate the System's resolve to maintain the gold standard. Federal Reserve officials interpreted their response to the gold outflow as consistent with Bagehot's rule to lend freely at a high interest rate (Meltzer, 2003, p. 348). The Fed did not make significant open market purchases to offset the withdrawal of gold and currency from banks, however, which exacerbated the decline in the monetary aggregates (see Figure 5). Moreover, when gold began to flow back into the banking system, Federal Reserve credit outstanding fell by more than the gold inflow, which resulted in a net decline in total bank reserves. Fed officials apparently were hesitant to make open market purchases because they saw a "disinclination on the part of member banks to use Federal Reserve credit for the purpose of extending credit to their customers."[27]

Besides doubting that open market purchases would serve any useful purpose, at least some Fed officials were concerned that large open market purchases would threaten the System's gold reserves. Although researchers subsequently have concluded that the Fed did have sufficient gold reserves (e.g., Friedman and Schwartz, 1963), Fed officials may have been concerned that large open market purchases would have touched off a resumption of gold outflows (Wicker, 1966). In any event, the excuse became moot when Congress enacted legislation in February 1932 that enabled the Fed to use U.S. government securities as collateral for Federal Reserve notes.[28] Under pressure from Congress, the Fed then purchased some $1 billion of government securities between February and August 1932.

Discount window loans totaled $848 million when the Fed began to purchase government securities in February 1932 and, hence, monetary conditions were tight according to the Fed's traditional policy guide. Discount window borrowing declined and banks began to accumulate substantial excess reserves as the Fed continued its purchases. Several Fed officials interpreted the increase in excess reserves as indicating that the Fed's purchases had little benefit. The Fed ended its purchases when discount window borrowing fell to the level it had been before Britain left the gold standard. Nonetheless, the purchases caused Federal Reserve credit to rise substantially (see Figure 4), which for a few months arrested the decline in the money stock (see Figure 5).

The final and most severe banking crisis of the Depression began in February 1933. Banking panics, marked by heavy withdrawals of currency and gold reserves, swept across the country. The Fed reacted as it had in response to gold outflows in 1931: by increasing its discount and acceptance buying rates. Federal Reserve credit increased sharply in March 1933, as discount window loans rose from $253 million on February 8 to $1.4 billion on March 8, and the Fed purchased some

[27] Federal Reserve Bank of New York Governor George Harrison (quoted by Meltzer, 2003, p. 350).

[28] The Federal Reserve Act required each Reserve Bank to maintain gold reserves equal to 40 percent of its note issue and reserves in the form of gold or other eligible securities (which did not include U.S. Treasury securities) equal to the remaining 60 percent. See Friedman and Schwartz (1963, pp. 399-406).

$400 million of bankers' acceptances. The Fed also purchased $100 million of government securities, but this was far too little to offset the decline in bank reserves caused by currency and gold withdrawals. In response to a request from the secretary of the Treasury for larger purchases of government securities, Federal Reserve governor Eugene Meyer replied that a rise in bond yields was a "necessary readjustment in a market which has been too high" and that "Purchases of Government securities at the present time would be inconsistent from a monetary standpoint."[29] Instead of supplying additional liquidity to the banking system, the Federal Reserve Board voted to suspend the Fed's gold reserve requirement and to recommend that President Hoover declare a national bank holiday. This action and many others were subsequently taken by President Roosevelt on his first day in office on March 5, 1933.

THE FED'S RESPONSE TO EXCESS RESERVES

The declaration of a national banking holiday, imposition of a temporary system of deposit insurance, and suspension of the gold standard were among the many actions taken by Roosevelt during his first days in office. Currency poured back into banks as they were reopened, and the money stock began to expand (see Figure 5). The inflow of reserves enabled banks to repay their discount window loans and by mid-1934, banks were almost entirely free of debt to the Fed. Under pressure from the Roosevelt administration, the Fed purchased some $600 million of government securities during 1933 (Meltzer, 2003, pp. 436-38) but then made no further purchases until 1937 except to replace maturing issues.

While the Fed sat on its hands, gold inflows caused commercial bank reserve balances to increase rapidly during 1934-36. Banks accumulated substantial excess reserves, which by 1935 comprised more than 50 percent of total reserves. Fed officials viewed excess reserves as a potential source of inflation because they could support a rapid increase in bank lending. In 1936, officials decided to increase reserve requirements in three steps from 13 to 26 percent on transactions deposits and from 3 to 6 percent on time deposits.[30] An alternative means of reducing excess reserves—selling securities in the open market—was rejected because by July 1936 the volume of excess reserves ($2.9 billion) exceeded the size of the Fed's securities portfolio ($2.4 billion).

Figure 6 shows the dates of each increase in reserve requirements. The policy was successful in reducing both excess reserves and, as the figure shows, the ratio of excess to total reserves. However, interest rates also rose, money stock growth declined sharply, and in May 1937 the economy entered a recession (the shaded region in the figure represents the recession period). In raising the amount of non-interest-earning reserve balances that banks were required to hold against each dollar of deposits, the hike in reserve requirements encouraged banks to reduce their lending in an effort to reduce deposits, which caused money stock growth to fall. The impact might have been less if the Fed had drained an equivalent amount of reserves by selling securities because the cost of holding deposits would have been unaffected. The impact might still have been large, however, if banks held excess reserves mainly as protection against depositor runs, rather than because they lacked profitable lending opportunities.

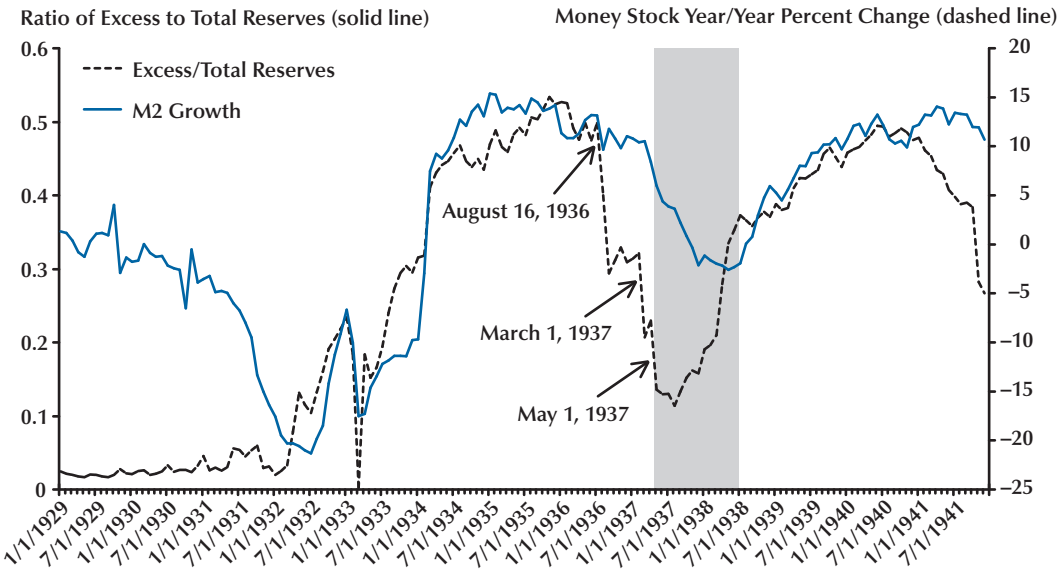
For the recent episode, Fed actions since September 2008 intended to alleviate credit market strains and encourage economic recovery have resulted in a large increase in excess reserves. Excess reserves rose from an average of less than 5 percent of total bank reserves during the 5 years ending in August 2008 to more than 90 percent in November 2008 and remained at similar levels through 2009. As in the 1930s, many observers contend that the large increase in excess reserves poses a significant inflation risk. However, the Federal Reserve appears unlikely to increase

[29] Quoted by Meltzer (2003, p. 383).

[30] The Banking Act of 1935 permitted the Federal Reserve Board to adjust reserve requirements within broad ranges. Before 1980, reserve requirements applied only to Federal Reserve member banks and varied according to a bank's location. In general, reserve requirements were higher for banks located in larger cities ("central reserve" and "reserve" cities) than in smaller cities and towns ("country" banks).

Figure 6

Excess Reserves and Money Stock Growth (1929-41)



SOURCE: Excess and total reserves (Board of Governors, 1943); money growth (Friedman and Schwartz, 1963; Appendix A, Table A-1).

reserve requirements to reduce excess reserves in the current environment—not because Fed officials are unconcerned about inflation risks, but because the Fed now has other tools to limit the growth in lending associated with a given stock of excess reserves. For example, the Federal Reserve now has the authority to pay interest on banks' reserve balances; in principle, then, the Fed could raise the interest rate high enough to discourage banks from increasing their lending beyond a desirable level.[31]

LESSONS LEARNED?

The Fed clearly did not repeat many mistakes of the Great Depression during the crisis of 2007-09. The Fed's response to the recent financial crisis was markedly different from, and undoubtedly influenced by, the experience of the Great Depression.[32] During the Depression, the Fed permitted the money stock to collapse and a serious deflation to occur. By contrast, the money stock continued to grow, albeit slowly at times, and the price level remained stable throughout the recent crisis.

During the Depression, Fed officials interpreted low levels of discount window borrowing as indicating that banks had no need for additional liquidity. Officials seem to have ignored the possibility that (i) banks were reluctant to borrow due to concern that anxious depositors would interpret a bank's borrowing from the discount window as a sign of weakness or (ii) that many banks were unable to borrow because they lacked eligible collateral (Chandler, 1971, pp. 225-33). By contrast, during the crisis of 2007-09, Fed officials acted quickly to encourage banks to bor-

[31] Dudley (2009) describes how the Fed could control bank lending by varying the interest rate paid on reserves and other methods that the Fed might use to limit the expansion of bank lending for a given stock of reserves.

[32] Federal Reserve Chairman Ben Bernanke has authored numerous research papers on monetary conditions and other aspects of the Great Depression. See Parker (2007) for an interview with Chairman Bernanke about his views on the Depression and for references to Bernanke's research on the Depression.

row from the Fed—first by issuing a statement that the discount window was available to meet the liquidity needs of banks, then by reducing the primary credit rate and increasing the maximum term of discount window loans, and finally by introducing the TAF to provide an anonymous source of term funds without any of the stigma associated with discount window borrowing.

During the crisis of 2007-09, the Fed also proved willing to provide loans to avoid the bankruptcy of financial firms that posed significant systemic risk. Further, Federal Reserve officials supported the Treasury Department's program to stabilize banks through capital purchases and stress testing. By contrast, with the exception of the New York Fed's massive injection of liquidity following the October 1929 stock market crash, the Fed paid little attention to systemic risks during the Great Depression.[33]

Although the Fed worked to avoid the bankruptcy of Lehman Brothers, Fed officials elected not to make a loan to forestall Lehman's bankruptcy filing. Many analysts believe that Lehman's bankruptcy significantly worsened the financial crisis. Meltzer (2009a,b) argues that this was a "major mistake": "After 30 years of bailing out almost all financial firms, the Fed made the horrendous mistake of changing its policy in the midst of a recession."

During the Depression, the Federal Reserve elected not to save the Bank of United States from failure, which Friedman and Schwartz (1963) contend was a major mistake that worsened the economic contraction. A key difference between the Lehman and Bank of United States events, however, was that the Fed acted swiftly to limit the financial distress caused by Lehman's bankruptcy in 2008, whereas the Fed did little in response to the failure of the Bank of United States or other bank failures during the Great Depression. For example, following Lehman's failure, the Fed provided an $85 billion loan to save AIG and established the AMLF to extend non-recourse loans to U.S. depository institutions and bank holding companies to finance their purchases of asset-backed commercial paper from money market mutual funds, which were under pressure from anxious depositors.

Another lesson of the Great Depression is how *not* to reduce bank excess reserves. In the 1930s, the Fed doubled reserve requirements to rein in excess reserves. This led to a sharp decline in monetary growth and a recession. In 2009, by contrast, the Fed seems to have rejected the option of increasing reserve requirements to reduce excess reserves and rather has focused on more flexible options that could be adjusted to market conditions and circumstances in the event that it becomes desirable to slow the growth of bank lending.

The Great Depression makes clear that central banks must not allow banking panics and other financial shocks to contract the money stock and cause deflation. However, the Depression offers little guidance on whether extending loans to specific firms or markets, let alone insolvent firms, is a necessary and effective element in the role of lender of last resort. Some economists argue that central banks should supply liquidity mainly, if not exclusively, through open market operations in government securities and not attempt to allocate credit through targeted lending to specific firms or markets (e.g., Goodfriend and King, 1988; Schwartz, 1992). During the Depression, the Fed neither made sufficient open market operations to prevent a collapse of the money stock or deflation nor lent significantly to distressed financial institutions.

Throughout the financial crisis of 2007-09, the Fed sought to alleviate credit market strains by supplying liquidity to affected firms and markets in an effort to reduce risky lending rates and restart "frozen" markets. The Fed focused on "the mix of loans and securities that [the Federal Reserve] holds and on how this composition of assets affects credit conditions for households and businesses," according to Chairman Bernanke (2009a), because "to stimulate aggregate demand in the current environment, the Federal Reserve must focus its policies on reducing [credit] spreads and improving the functioning of private credit markets more generally."

Some observers contend that the Fed's efforts to alleviate the financial crisis and stimulate the

[33] Bullard, Neely, and Wheelock (2009) describe the problem of systemic risk in financial markets and the recent financial crisis and discuss proposals to mitigate such risks.

economy by channeling credit to specific firms and markets were less effective than a policy aimed at rapidly expanding the monetary base.[34] Critics point to a decline in money stock growth in mid-2008 as evidence that policy was too tight and argue that the recession would have been less severe if the Fed had expanded the monetary base sooner (e.g., Hetzel, 2009; Thornton, 2009b).

Other critics worry that the Fed's lending to specific firms and to support particular markets may have adverse long-term consequences. For example, such lending may have weakened the incentives for creditors to monitor and penalize excessive risk-taking by firms deemed "too big to fail" (e.g., Buiter, 2009; Lacker, 2009; Reinhart, 2008).[35] Some argue that targeted lending also threatens the Fed's political independence, which is crucial to pursuing a stable monetary policy (e.g., Lacker, 2009; Poole, 2009). Thus, while the Federal Reserve did not repeat the disastrous policies of the Great Depression during the crisis of 2007-09, it remains unclear whether an alternative policy would have been more effective at alleviating the financial crisis and limiting its impact on the broader economy with potentially fewer long-term consequences.

[34] For example, Taylor and Williams (2009) find little evidence that liquidity provided through the Fed's TAF lowered interest rate risk spreads. McAndrews, Sarkar, and Wang (2008), however, conclude that the TAF eased credit market strains.

[35] Fed officials acknowledge the problems of too-big-to-fail policies, but contend that without another means of resolving the failures of firms that pose systemic risk, policymakers had little choice but to protect creditors from taking losses to avoid catastrophic consequences for the financial system and economy (e.g., Bernanke, 2009b).

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Institutions and Government Growth: A Comparison of the 1890s and the 1930s

Thomas A. Garrett, Andrew F. Kozak, and Russell M. Rhine

Statistics on the size and growth of the U.S. federal government, in addition to public statements by President Franklin Roosevelt, seem to indicate that the Great Depression was the primary event that caused the dramatic growth in government spending and intervention in the private sector that continues to the present day. Through a comparison of the economic conditions of the 1890s and the 1930s, the authors argue that post-1930 government growth in the United States is not the direct result of the Great Depression, but rather is a result of institutional, legal, and societal changes that began in the late 1800s. Thus, the Great Depression did likely trigger increases in government spending and regulatory involvement, but historical factors produced the conditions that tended to lend permanence to the growth of government that occurred during the Great Depression. (JEL N41, N42, H2, H5, B1)

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Throughout the eighteenth and nineteenth centuries, a limited federal government existed in the United States. The federal government had essentially no involvement in regulating the private sector and few goods were provided publicly, even during times of war and economic contraction. At the same time, taxes at the national level were few and tax rates remained relatively low. However, a limited federal government did not last. The twentieth century saw increased federal government regulation, the creation of new agencies, the expansion of existing agencies, the implementation of new taxes, increases in existing taxes, and an increase in government spending.

The dramatic growth in government spending started at the beginning of the Great Depression. For example, annual federal government per capita spending averaged $125 from 1792 to 1929 with no trend increase. However, real federal government per capita spending rose from roughly $250 in 1930 to nearly $9,200 in 2007.[1] In addition, federal government spending rose from 3 percent of U.S. gross domestic product (GDP) in 1929 to over 24 percent of GDP by 2009. The high level of unemployment, the decrease in national income, and the falling price level during the Great Depression seemingly caused the federal government to intervene to resolve this crisis. President Franklin Roosevelt stated in his 1933 inaugural address, "Our greatest primary task is to put people to work…It can be accomplished in part by direct recruiting by the government itself."[2] In fact, his desire to use government intervention as a quick remedy to the Depression was so strong that he also stated in his address that if Congress failed to follow his recommended poli-

[1] Per capita spending figures are stated in year-2000 dollars. Historical statistics on GDP and government spending are from the U.S. Census and the Office of Management and Budget, *Budget of the United States Government, Historical Tables*.

[2] Rosenman (1938).

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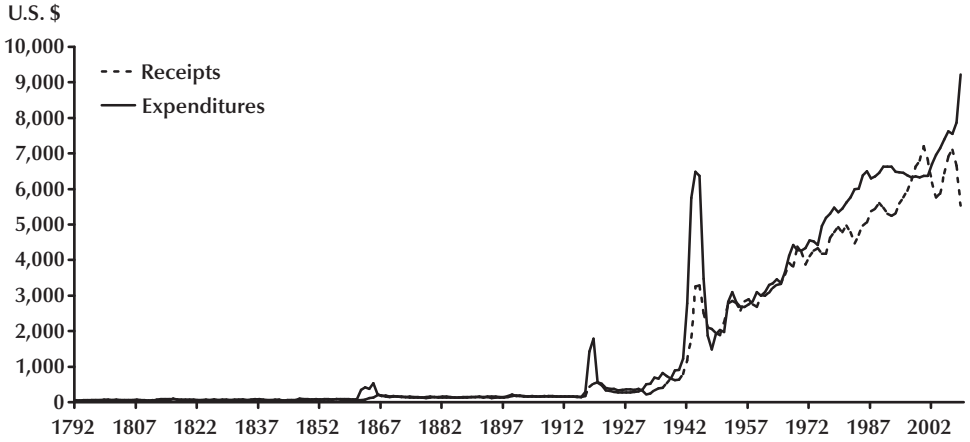
Figure 1

Real per Capita Federal Receipts and Expenditures (1792-2009)



cies, he would request "broad Executive power to wage war against the emergency as great as the power that would be given to me if we were in fact invaded by a foreign foe." Although these statements indicate a strong desire to strengthen government powers to soften the economic downturn, the severity of the economic contraction during the Depression cannot necessarily be deemed the proximate cause of the rapid growth in government spending since then.

In the 1890s a series of recessions neared the severity of the Great Depression and yet there was virtually no response by the federal government. The average annual increase in per capita government spending was 3.3 percent in the 1890s and 12.1 percent in the 1930s. The total percentage increase in per capita government spending was 28 percent for the 1890s and 131 percent for the 1930s. Clearly, something in the United States during the 1930s differed from conditions in the 1890s that spurred the federal government to react to the economic downturn.

This paper explains the growth in the federal government in the United States since the 1930s. The size of government refers not only to spending, but also to the number of regulations, agencies, and laws. We compare and contrast the two worst decades of economic activity in U.S. history: the 1890s and the 1930s. Although both decades were marked by substantial economic contractions, they also occurred during two very different political and social climates. The 1890s was a time when the federal government did not attempt to smooth the business cycle through activist policy, whereas the 1930s was a time of unprecedented federal government intervention in the economy that continues to this day. We suggest that post-1930 government growth is not due solely to the Great Depression, but rather is a result of institutional, legal, and societal changes that began decades earlier.

HISTORICAL BACKGROUND

The question as to the appropriate size and role of the federal government in the United States has its roots in the 1770s and 1780s during the writing of the Articles of Confederation and the U.S. Constitution. The debate then was reflected in the writings of the Federalists and the Anti-Federalists. The Federalists supported the Constitution and generally viewed the government as playing a greater role in society than the Anti-Federalists. The Anti-Federalists worried that the organization of the federal government, as written in the Constitution, gave the govern-

ment too much power and could result in monarchy. Despite the debate between these groups, government spending remained low for more than a century after ratification of the U.S. Constitution. Figure 1 shows no change in the trend of per capita federal spending from the late 1700s through the 1920s. The only increases during that period followed the Civil War and World War I.

In addition to federal expenditures, another measure of the size and scope of the federal government is the number of executive cabinet departments. This number changed little from the late 1700s through the 1920s. In 1789 there were four cabinet departments; by the end of the nineteenth century only two more had been added. However, since the beginning of the twentieth century another 10 departments have been added. Of those 10, the Department of Commerce and the Department of Labor were created before the 1930s. Table 1 lists the departments and years they were created.

There is little debate that the Great Depression was the worst economic period in U.S. history. However, economic data suggest that, to date, the decade of the 1890s was the second-worst economic period in U.S. history. Higgs (1987, p. 77) states, "Except [for] the Civil War, no crisis of the nineteenth century challenged America's political and economic order so profoundly as that of the mid-1890s."

According to the National Bureau of Economic Research, the United States had three separate recessions between 1890 and 1898.[3] As shown in Figure 2, the 1890s experienced some years of increasing GDP and some years of decreasing GDP. Due in part to the years of growth, the country was seen as experiencing brief economic expansions. However, these expansions likely went unnoticed by a substantial portion of the population because the unemployment rate remained high and prices were stagnant or falling.

Other macroeconomic statistics suggest that the recessions of the 1890s approached the severity of the Great Depression. The national unemployment rate from 1890 through 2009 is shown in Figure 3: There were six consecutive years of double-digit unemployment from 1893 through 1898, with unemployment reaching its highest point—18.4 percent—in 1894. Only during the Great Depression did the unemployment rate ever exceed 18.4 percent.

In addition to reductions in GDP and increases in the unemployment rate, the general price level fell 8.3 percent between 1890 and 1899.[4] As with the unemployment rate, the severity of the deflation was greater during the 1930s when the price level fell nearly 17 percent between 1930 and 1939. The duration of falling prices in the 1890s is consistent with negative economic growth.

Table 1

Cabinet Departments: Year Established

Department	Year established
State	1789
Treasury	1789
Justice	1789
Defense*	1789
Interior	1849
Agriculture	1889
Commerce	1913
Labor	1913
Health and Human Services	1953
Housing and Urban Development	1965
Transportation	1966
Energy	1967
Education	1979
Veterans Affairs	1987
Environmental Protection Agency†	1990
Homeland Security	2002

NOTE: *The date refers to the Department of War. The Department of Defense was officially created in 1949: The Department of War (1789), the Department of the Navy (1798), the Department of the Army (1947), and the Department of the Air Force (1947) were all reorganized under the Department of Defense in 1949 (see www.dod.gov). †Cabinet-level rank under George W. Bush. See www.whitehouse.gov/government/cabinet.html.

SOURCE: Cabinet Department websites.

[3] See www.nber.org/cycles.html for National Bureau of Economic Research recession dates.

[4] Source: *Historical Statistics of the United States* (online database: http://hsus.cambridge.org).

Figure 2

Change in Real per Capita GDP (1890-98)

It is unlikely that the hardships of the 1890s went unnoticed by the federal government, but laws, institutions, and the public's view on the role of government had to change before any government intervention would occur. President Grover Cleveland clearly stated his view on the limited role of the federal government when he vetoed the Texas Seed Bill in 1887, a bill that would have authorized the federal government to purchase and distribute seed grain to Texas farmers:

> I can find no warrant for such an appropriation in the Constitution; and I do not believe that the power and duty of the General Government ought to be extended to the relief of individual suffering which is in no manner properly related to public service or benefit. A prevalent tendency to disregard the limited mission of this power and duty should, I think, be steadily resisted, to the end that the lesson should be consistently enforced that, though the people support the Government, the Government should not support the people.[5]

Why did this view of a limited role for government involvement not last? As discussed later, institutional changes that occurred before the 1930s but not before the 1890s laid the foundation for greater government growth. Following Holcombe (2005), we categorize the changes as consistent with one of three existing theories on government growth: path dependency, budget maximization and taxation, and rational choice. Hindsight allows us to identify the events that served as the necessary conditions for the change in the size and growth of government. Without these events, the Great Depression may have had no lasting effect on public policy; but with these events, the growth in government spending was inevitable.

EXPLAINING GOVERNMENT SIZE AND GROWTH

Path Dependency

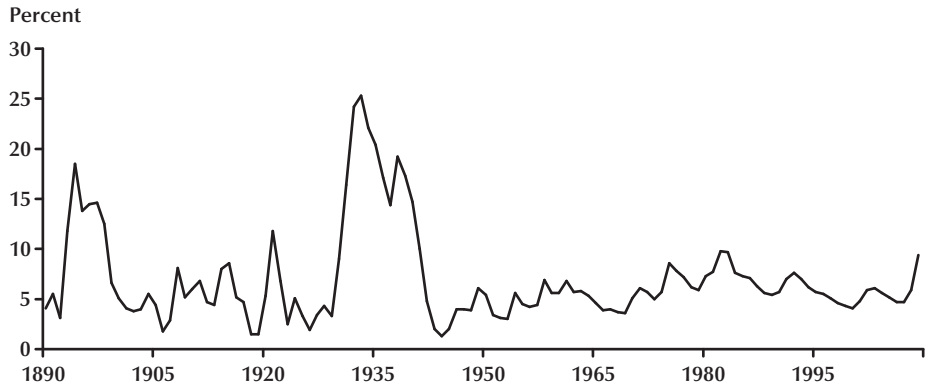
Theories of path dependency state that government spending is time dependent and that removal of programs is difficult once a government agency or program is in place. Government spending has considerable inertia, and changes in the level of real government spending from year to year are more likely to be increases than decreases. Path dependency explains why government spending continues to grow seemingly independent of the state of the economy (Holcombe, 2005).

The path dependency theory of government growth has two dimensions. One dimension is

[5] *Congressional Record* (1887).

Figure 3

U.S. Unemployment Rate (1890-2009)



the status quo bias, which states that if people are given a variety of choices, they have a preference toward continuity as opposed to change. In the government growth literature this translates into the electorate's preference to continue government programs, even though voters may have originally objected to their formation (Holcombe, 2005). In government spending parlance, ratcheting, a second dimension of path dependency, is the hypothesis that government spending increases remain after a crisis to prevent future crises of a similar nature (Peacock and Wiseman, 1961; Rasler and Thompson, 1985; Higgs 1987; Holcombe, 1996, 2005). This hypothesis neatly explains the increases in spending after the Civil War and World War I; however, it is difficult to identify upward ratchets in government spending since 1930 because government spending has increased continuously (Holcombe, 1996). The primary limitation of the path dependency literature is that it does not explain why the Great Depression caused the trend of government spending to change when the numerous crises during the preceding 150 years, including the 1890s, did not.

Budget Maximization and Taxation

Holcombe (2005) provides one possible explanation for the fact that per capita real government spending stayed essentially unchanged from 1792 through the 1920s. He argues that the primary constraint on government spending is the amount of tax revenue that it receives. This constraint on spending is supported by his earlier work (Holcombe, 1999), in which he shows the relationship between federal government benefits paid to Civil War veterans and the size of the federal government budget. In 1870, per capita spending on veterans was $7.20; this amount grew for the next 23 years to a high of $34.39 in 1893.[6] For the entire 23-year period, the federal government had a budget surplus and in 1894, the first of six consecutive years of deficits, the benefits to veterans fell because the balanced budget constraint was reached and the government limited spending to prevent the deficit from growing.

A balanced budget constraint and limited tax revenue can explain the lack of substantial federal government growth before the 1930s. Federal government taxes before the early twentieth century remained low and tax bases were few. Under the Articles of Confederation, funds for the federal government came from voluntary donations from the state governments. The inadequacy of this method of federal government financing was soon realized, and the federal government was given the power to levy excise taxes and customs duties after the ratification of the U.S. Constitution in

[6] Veteran spending is in per capita 1990 dollars.

1788. The excise taxes initially were imposed on distilled spirits, tobacco and snuff, refined sugar, carriages, property sold at auction, and some legal documents. Later, during the War of 1812, additional goods were subject to excise taxes and customs duties were increased.[7]

Throughout the first half of the 1800s it became clear to those in the South that they were subject to greater customs duties because they imported most of their manufactured goods from the northern states or abroad. This inequity in taxation contributed to the tensions between the northern and southern states before the Civil War (Holcombe, 1992; Holcombe and Lacombe, 1998). During the Civil War, the federal government passed the Revenue Act of 1861, which imposed the first federal income tax: a 3 percent tax on all income over $800. In 1862, the federal government imposed new excise taxes on playing cards, gunpowder, feathers, telegrams, iron, leather, pianos, yachts, billiard tables, drugs, patent medicine, and whiskey. At that time, the deduction was decreased from $800 to $600 and the tax rate was increased to 5 percent on all income over $10,000. The income tax was removed in 1872.

After the removal of the income tax, the federal government once again relied on various excise taxes for funds; for the next 22 years, the federal tax code did not include taxes on income. However, in 1894 the federal government imposed another income tax. This time, however, the Supreme Court deemed the tax unconstitutional. It was not until 1913 that the federal government was able to effectively impose another income tax through the ratification of the Sixteenth Amendment to the Constitution. The first income tax rates were extremely low by today's standards—between 1 percent and 7 percent—and the 7 percent tax bracket was for income in excess of $500,000 (more than $10 million in 2009 dollars). However, the low tax rates did not last long; by 1932 the lowest tax bracket was 4 percent and the highest tax bracket, which applied to incomes over $1 million, was 63 percent.

With the passage of the Sixteenth Amendment the government had a new source of income that substantially reduced its budget constraint. Under the model of bureaucracy proposed by Niskanen (1971) and the Leviathan model of government suggested by Brennan and Buchanan (1980), the government will take advantage of any opportunity to increase tax revenue to increase the funding of existing programs and to fund new government programs. Figure 1 shows that a close relationship between federal government spending and revenue has persisted over time.

The limited source of revenue serves as a self-imposed budget constraint that prevents the use of increased government spending to soften the impact of a recession. Holcombe and Mills (1995) argue that, without tax increases, the only alternative means to fund an increase in spending is through an increase in deficits, and deficit spending is constrained in that it is often politically unpopular. With the passage of the Sixteenth Amendment, the government was in a much better position to increase spending during the Great Depression than during the economic downturn of the 1890s. Holcombe and Lacombe (1998) claim that the government growth that dominated the twentieth century could not have occurred without the Sixteenth Amendment.

Rational Choice and a New Political Philosophy

The rational choice theory of government growth states that the government grows because citizens demand more government intervention. Based on the classic works of Hotelling (1929) and Downs (1957, 1961), the median voter theorem states that the level of government tends to reflect the preference of the median voter.[8] The late nineteenth and early twentieth century was a time of shifting social political philosophy and thus a change in the view of the median voter.

[7] See the U.S. Treasury "Fact Sheets: Taxes" for the history of the U.S. tax system (www.treas.gov/education/fact-sheets/taxes/ustax.shtml).

[8] If voters are ranked by political ideology with the most liberal on one side and the most conservative on the other side, the level of government that is provided reflects the view of the person in the middle, or the "median voter." See also Peltzman (1980); Meltzer and Richard (1978, 1981, 1983); Kristov, Lindert, and McClelland (1992); Becker (1983); and Wittman (1989, 1995).

The shift in philosophy must be partly attributed to the writings of Karl Marx and, to a lesser extent, Henry George. Marx's *Communist Manifesto* and *Das Kapital*, published in 1848 and 1867, respectively, stressed that unemployment and poverty will always exist in a capitalist society. Marx also argued that business owners lived well while the working class lived poorly. To eliminate this inequity he argued for the nationalization of industry "to promote working-class interests rather than those of the landed aristocracy, industrialists and financiers" (Hudson, 2008). Marx's idea of greater income equality, financial security, and social justice seemed to resonate with the working class. George drew similar appeal with his idea of a single tax on land that would replace all other taxes. His *Progress and Poverty* (1879) was widely read and influenced many industrial and labor reformers. Although he was not a Socialist, George did believe that it was necessary for the government to operate monopolies and basic infrastructure (Hudson, 2008). Together, these writings contributed to the leftward movement of the median voter and likely fueled the demand for federal regulation of the private sector, the growth in labor movements, the development of the U.S. Socialist Party, and a greater redistribution of income and wealth.

The result of this swing in philosophy is best captured in the social development now referred to as the Populist Movement and the Progressive Movement of the late nineteenth and early twentieth centuries. These movements represented the changing view of the relationship between the individual and the state in which a desire for a more active role of government in the economy developed. As the U.S. economy transformed itself from a system of many small, competitive units into a system of seemingly fewer firms of greater size, concern grew that the large corporations were becoming too rich and, importantly, too powerful. This concern is clearly presented in the founding document of the Populist Party adopted on July 4, 1892—the Omaha Platform.[9]

The Omaha Platform addressed three key issues: finance, transportation, and land. First, on the issue of finance, it stated that a national currency issued by the government should be distributed directly to the people "without the use of banking corporations." Second, it declared that "the government should own and operate the railroads in the interest of the people." Finally, it stated that land "should not be monopolized for speculative purposes" and that "All land now held by railroads and other corporations in excess of their actual needs, and all lands now owned by aliens should be reclaimed by the government and held for actual settlers only."

Additionally, government planning during the First World War and the introduction of "scientific management" by Frederick Winslow Taylor (Taylor, 1912) reinforced the government's ability to partly plan the economy. World War I required the government to be more involved in allocating resources to meet the needs of fighting the war; specifically, the government assumed control over the railroad industry. With the successful outcome of the war, the government was seen as capable of managing some aspects of the economy. Put more broadly, government planning and control could be a positive force in marshaling society's resources to achieve its goals, lending further credence to Taylor's theory. Under Taylor's approach, by applying the scientific method and empirical analysis to production techniques, firms could plan and better manage their production outcomes. In other words, scientific management could help a firm become more efficient. Therefore, Taylor's analysis of private sector production efficiency could also be used by public sector managers to help reduce the booms and busts of the business cycle (Bruce and Nyland, 2001).

Growing public support for greater government intervention, accompanied by a sense of unfair business practices by large corporations, indicated a clear desire for change in the country. This change came in the form of regulations at the federal government level that increased the government's involvement in the private sector. The first regulations were designed to eliminate price discrimination in specific industries and to preserve the competitive environment. For

[9] See http://history.missouristate.edu/wrmiller/Populism/texts/Documents/Omaha_Platform.htm for the entire text of the Omaha Platform.

example, the Interstate Commerce Act, passed in 1887, created the Interstate Commerce Commission and federally regulated the railroad industry. At that time, railroad companies had little or no competition on some routes and subsequently practiced price discrimination (Friedlaender, 1969, pp. 11-12). The Act required that railroads eliminate price discrimination, publish their fares, and charge a "reasonable and just" fare. The railroad industry was the first industry to be regulated by the federal government. Three years later in 1890, the Sherman Antitrust Act was passed: It made trusts illegal to ensure competition.

The banking and financial sectors also experienced greater government intervention early in the twentieth century. The dominant legislative act was the creation of a central bank through the implementation of the Federal Reserve Act of 1913. Specifically stated, the purpose of the Federal Reserve Act is "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."[10] Before 1913, the only time the U.S. government established central banks was to aid in the financing of wars. In 1791, the First Bank of the United States was chartered to help manage the debt of the Revolutionary War. The Second Bank of the United States was chartered in 1816, in part to help manage the debt of the War of 1812. Both bank charters were for 20 years and were not renewed when the charters expired.

Other examples of greater private sector regulation are the Food and Drugs Act of 1906 and the creation of the Federal Trade Commission in 1914. The Food and Drugs Act prohibited interstate transport of illegal food and drugs, banned the addition of specific ingredients, and regulated product labeling. The purpose of the Federal Trade Commission was to prevent unfair methods of competition, seek relief for injured consumers, regulate trade, conduct investigations of commerce, and make reports and legislative recommendations to Congress. These new regulatory agencies are further evidence of the changing role of the federal government and its move to becoming the "guardian of the economic well-being of its citizens" (Holcombe and Lacombe, 1998, p. 144).

In addition to the federal government's entry in regulating various industries within the private sector, the government also began to regulate the use of labor in the late 1800s. Although labor unions had existed to some degree in the United States since the signing of the Declaration of Independence, by the late nineteenth century they were growing in number and influence, as suggested by the formation of the American Federation of Labor in 1886. The coming years saw several union-led strikes that received national publicity, most notably the Pullman Strike outside Chicago in 1894 and the coal miners' strike in northeastern Pennsylvania in 1902. Union lobbying efforts influenced Congress to create the Bureau of Labor in 1884 and the U.S. Department of Labor in 1913 (Grossman, 1973). The purpose of the Department of Labor was "to foster, promote, and develop the welfare of the wage earners of the United States, to improve the working conditions, and to advocate their opportunities for profitable employment."[11]

The 1894 Pullman Strike was led by Eugene Debs, who in 1898 organized the Social Democratic Party of America and in 1901 led the organization of the Socialist Party of the United States of America. Debs, who moved up through the ranks of the labor unions, and the Socialist Party both had substantial public support; and Debs ran for president of the United States as a Socialist in 1900, 1904, 1908, 1912, and 1920. His success as a presidential candidate peaked in 1912 when he received 6 percent of the popular vote. This small percentage may not seem substantial, but it is evidence of changing views on the role of government and development of a new political philosophy.

In addition to the electorate changing its views on the role of government, the electorate itself

[10] From "History of the Federal Reserve" (www.federalreserveeducation.org/fed101/history/).

[11] From "Public Law 426-62: An Act to create a Department of Labor" (www.dol.gov/oasam/programs/history/organact.htm).

was also changing. In 1920, passage of the Nineteenth Amendment gave women the right to vote. While 29 of the 48 states had already given women this right before 1920, all but 4 of the 29 had done so since the turn of the century. Lott and Kenny (1999) explain that the overall voting pattern of women is more liberal than men's and as more women participated in elections, demand for government intervention in the economy increased. The more liberal views of women added to the changing view of government's role in society, thereby further reinforcing the new political philosophy of greater government intervention.

Within this new political philosophy came greater demand to make the government more accountable to the voters (Holcombe and Lacombe, 1998). To do so, the electoral process had to be changed. While the president and representatives in the U.S. Congress had always been elected through public elections, senators had not. The Constitution originally stated that the senators from each state were to be chosen by the state legislators. This legislative organization was written into the Constitution to prevent excessive democracy because "a democratic majority could overrun individual freedom just as surely as a monarch" (Holcombe and Lacombe, 1998, p. 148).

In pushing for greater government accountability, the voters demanded public elections for senators. The Seventeenth Amendment to the Constitution, ratified in 1913, stated that the senators of each state were to be elected by the people of the state. This Amendment greatly increased the power of the voters over the government, and beginning with the election of 1914, the voters determined the makeup of both houses of Congress.

In aggregate, the passage of regulatory acts over the private sector, the labor movement and its lobbying success, the Socialist movement and its growing political presence, the change in the voting franchise, and the change in the legislative electoral process are all evidence of a massive ideological shift that contributed to the departure from the limited role of government that had prevailed for more than a century. These events of the late 1800s and early 1900s created many of the institutions and laws that contributed to the growth in federal government spending and private sector intervention since the 1930s. Because these institutions and laws were not firmly in place in the 1890s, the federal government was unable to increase spending. Higgs (1987, p. 78) states more generally that government grows "only under favorable conditions, and such conditions did not exist in the 1890s."

CONCLUSION

Federal government spending and intervention in the private sector have increased steadily since the 1930s. While increased spending to reduce the effects of the Great Depression seems like a plausible explanation for the change in federal spending given the simultaneity of both events, the root cause of government growth is much more complicated. The complexity is evident in the fact that the trend in federal government spending did not change for the initial 150 years of the United States, including the severe recessions of the 1890s. This lack of growth was primarily due to a general view that the federal government should play a small role in society.

The view of a minimalist federal government during the eighteenth and nineteenth centuries was likely based on a strict interpretation of the Constitution regarding the powers of the U.S. Congress (e.g., the Preamble to the Constitution and Article 1, Section 8). In a famous letter to President Washington, Thomas Jefferson stated the importance of the federal government maintaining its limited mandates.[12] This view of limited government prevailed until the late 1800s. However, beginning with the regulation of the railroads in 1887, the federal government slowly moved in the direction of supervisor and manager

[12] Thomas Jefferson wrote the following on February 15, 1791, in a letter to President George Washington in reference to the creation of the *First Bank of the United States*: "I consider the foundation of the Constitution as laid on this ground: That 'all powers not delegated to the United States, by the Constitution, nor prohibited by it to the States, are reserved to the States, or to the people [10th Amendment].' To take a single step beyond the boundaries thus specially drawn around the powers of Congress is to take possession of a boundless field of power, no longer susceptible of any definition" (Jefferson's original letter is shown at www.loc.gov/exhibits/jefferson/images/vc129.jpg).

of the private sector. Federal government regulation steadily increased over the next 30 years. In addition, voters began to choose candidates who promised greater federal government involvement in the private sector. The first two decades of the twentieth century saw unprecedented changes in federal government regulation, taxation, the electoral process, and the public's demand for federal intervention in the private sector.

The government expanded in the 1930s for two reasons: First, its source of funds had increased with passage of the Sixteenth Amendment. With all barriers to the imposition of a personal income tax eliminated, the federal government had a substantial increase in its source of funds, thereby allowing increased spending. The second reason was a national ideological shift toward greater government. This shift was reflected by, and perhaps motivated by, the writings of Karl Marx and Henry George in the mid-1800s and later by women's increased participation in the electoral process. The implication of this shift is evident in the growth of the labor movement and the Socialist movement in the late nineteenth and early twentieth centuries. The status quo bias and upward ratchets in spending explain why government spending never retreats once implemented.

These ideological, legal, and societal changes resulted in increased federal government regulation over various industries and creation of institutions that set the stage for future government expansion. These events made the 1930s' growth in spending possible and enabled the government to swiftly alter the trend in spending and taxation. The severity of the Great Depression was not the sole catalyst that spurred government spending. If economic conditions were the only reason for government growth during the Great Depression, then the 1890s, too, would have experienced significant intervention by the federal government.

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Fiscal Multipliers in War and in Peace

David Andolfatto

Proponents of fiscal stimulus argue that government spending is needed to replace the private spending normally lost during a recession. Estimates of the so-called fiscal multiplier based on wartime episodes are used to support the proposition that a peacetime intervention can "stimulate" the economy in a desirable manner. The author argues that a wartime crisis is fundamentally different from a peacetime economic crisis. What may be desirable in war is not necessarily so in peace. This is demonstrated formally in the context of a simple neoclassical model, which delivers fiscal multipliers consistent with the wartime evidence. The optimal fiscal policy, whether it entails expansion or contraction, is independent of the size of the fiscal multiplier. (JEL E6, E62)

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Should governments attempt to "stimulate" the economy at the onset of a major recession? Until recently, the conventional wisdom has been that discretionary fiscal policy, even if desirable in principle, is operationally too clumsy a tool to be used in practice. In particular, the worst of a recession typically passes well before fiscal legislation is finally implemented. For those inclined to ascribe some role to government intervention, smoothing the business cycle has been viewed as a task best left to the monetary authority to address by way of an accommodative interest rate policy.

The recent U.S. recession, however, appears not to be a run-of-the-mill downturn. The labor market continues to show evidence of distress; and with nominal interest rates on short-term U.S. Treasuries close to zero, conventional monetary policy appears to have run out of ammunition. These conditions remind some people of Great Depression economics. In the popular media, proponents of fiscal stimulus are fond of reminding us that the beast of that great crisis was ultimately slain only with the large fiscal expenditures associated with World War II.

Current debate appears to be centered on estimates of the so-called fiscal multiplier (see, for example, Auerbach and Gale, 2009). The fiscal multiplier can be defined as the answer to the following question: If the government were to take a dollar out of the pocketbooks of its citizens (by way of a tax, either contemporaneous or deferred) and spend it on something that the nation produces, by how much would domestic income rise?[1]

There appears to be no definitive answer to this question. A major problem in extracting estimates from historical data is ascertaining the direction of causality. Much of the positive association between nondefense government spending and gross domestic product (GDP) may, in particular, reflect the government's response to an expanding economy rather than vice versa. For this reason, economists frequently restrict

[1] The intervention is implicitly assumed to be "temporary."

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attention to wartime episodes, where changes in government defense spending are reasonably interpreted as independent of macroeconomic developments. Estimates of defense spending multipliers commonly range between 0.5 and 1.0 (see Barro and Redlick, 2009; and Hall, 2009).

How should these estimated wartime multipliers be interpreted and, in particular, what can they tell us about the desirability of a peacetime fiscal stimulus? Interpretation requires theory; and here, I choose to address these questions in the context of a simple neoclassical model. I assume that society values government purchases. Moreover, I assume that the government manages its purchases efficiently in response to changes in the environment. The model is capable of generating fiscal multipliers in a range consistent with the wartime evidence.

Whether fiscal stimulus is warranted or not depends on the event triggering the crisis: The effect of a wartime event on the economic environment is fundamentally different from that of a recessionary event. The model explains why a fiscal stimulus is welfare improving for a wartime event and why a similar policy is likely to be welfare reducing for a recessionary event. Moreover, these welfare results apparently have little, if any, correlation with the actual size of the fiscal multiplier.

A SIMPLE NEOCLASSICAL MODEL

Consider an economy populated by a representative household with preferences defined over three types of goods: private consumption (c), home production (l), and government spending (g). Under the usual innocuous assumptions, these preferences can be represented by a utility function $U(c,l,g)$. With some loss of generality, I impose the following restrictions on these preferences:

$$U(c,l,g) = (1-\theta)\left[u(c)+h(l)\right]+\theta v(g), \tag{1}$$

where the functions u, h, and v are all increasing and weakly concave.[2] The parameter $0 < \theta < 1$ measures the relative weight that a household attaches to government spending (g) vis-à-vis private goods (c,l) in its preferences. In what follows, I model the arrival of war as an exogenous increase in θ (an event where society now places greater value on government spending relative to other goods).

Households have a limited amount of time, which I normalize to unity. Assume that this time is allocated across two competing uses: employment (n) and home production (l). This implies a time constraint,

$$n + l = 1. \tag{2}$$

Assume that time devoted to employment n generates GDP equal to zn, where $z > 0$ is a parameter that indexes labor productivity. The GDP is divided in some manner between private consumption and government spending; this implies a resource constraint,

$$c + g = zn. \tag{3}$$

So far, there is nothing "neoclassical" about this setup except that I have chosen to be explicit about household preferences and resource constraints. This model society, like societies in reality, faces a basic and fundamental problem: how to allocate scarce resources across competing uses. In my model society, the problem is relatively simple. First, how should society divide its scarce time across employment and home production? (This determines GDP.) Second, how should society divide GDP across consumption and government spending? (This determines the expenditure components of GDP.) The real debate in macroeconomic theory involves explaining (i) the process by which a society solves such problems and (ii) whether the solutions are in any well-defined sense "efficient."

In what follows, I abstract from processes and focus on outcomes. I begin by assuming that, conditional on functional forms u, h, and v and parameters θ and z, the outcome (c,g,l,n) is the solution to the problem of maximizing equation

[2] Implicit in this formulation is that the household makes no distinction between defense- and nondefense-related government spending. It would be of some interest to relax this assumption, as doing so may affect some of the conclusions that follow. Keep in mind that such distinctions are rarely, if ever, made in Keynesian models.

(1) subject to the resource constraints in equations (2) and (3). In mathematical terms, one can think of a benevolent social planner solving the following problem:

$$(4) \qquad \max_{n,g}\left\{(1-\theta)\left[u(zn-g)+h(1-n)\right]+\theta v(g)\right\}.$$

Denote the solution to this problem $n^*(\theta,z)$ and $g^*(\theta,z)$. This implies $c^* = zn^* - g^*$ and $l^* = 1 - n^*$. Let $y^* = zn^*$ denote GDP.

The solution described above is, by construction, *efficient* in the sense that it maximizes social welfare subject to resource constraints. By the second welfare theorem the same solution can be implemented as a competitive equilibrium. In other words, both planner and competitive markets are equally efficient mechanisms here. Focusing attention on the efficient outcome is, I think, a good place to start, as it serves as a useful benchmark. Using simple calculus, the solution (n^*,g^*) is described fully by the following two restrictions:

$$(5) \qquad zu'\left(zn^*-g^*\right)=h'\left(1-n^*\right)$$

$$(6) \qquad (1-\theta)u'\left(zn^*-g^*\right)=\theta v'\left(g^*\right).$$

Interpret condition (5) as follows: One additional unit of employment generates z units of output. At the margin, this additional output is valued by the marginal utility of consumption u'. Hence, zu' represents the marginal benefit of employment. The term h' represents the marginal benefit of home production—that is, the marginal cost of employment. Efficiency dictates that the marginal benefit and cost of employment be equal. Condition (6) may be interpreted analogously in terms of the marginal benefit and cost of government spending.

I want to examine how (n^*,g^*) depends on the parameters (θ,z). I begin by considering the special case in which h is linear, so that $h'(l) = \kappa > 0$. Roughly speaking, this implies that households find it easy to substitute their time across employment and home production. Assume that $u'',v'' < 0$. Conditions (5) and (6) in this case reduce to the following:

$$(7) \qquad zu'\left(zn^*-g^*\right)=\kappa$$

$$(8) \qquad (1-\theta)\kappa = z\theta v'\left(g^*\right).$$

War...

Now consider the effect of an exogenous increase in θ, which I interpret as a war event that threatens national security. From equation (8), we have

$$\frac{dg^*}{d\theta}=\frac{-v'\left(g^*\right)}{\theta v''\left(g^*\right)}>0.$$

This result seems sensible: A national security threat dictates that the government divert resources toward national defense. Note that condition (8) implies that $c^* = zn^* - g^*$ remains constant. As g^* is required to increase, this implies that employment n^* must rise (at the expense of home production). Formally, we have

$$z\frac{dn^*}{d\theta}=\frac{dg^*}{d\theta}.$$

The "multiplier" in this model can be calculated as dy^*/dg^*, which here is equal to 1. It is clear that the increase in government spending is welfare improving, but this result has nothing to do with the size of the multiplier. In particular, the result would still hold if the multiplier were less than 1 (a property that would emerge if $h'' < 0$, for example). In this latter case, private consumption would decline along with home production. These are sacrifices that society is willing to bear in the face of a national security threat that requires that resources be diverted toward government spending.

...and Peace

Consider next the effect of an exogenous decrease in z, which I interpret as a recessionary event that lowers labor productivity. From equation (8), we have

$$\frac{dg^*}{dz}=\frac{-v'\left(g^*\right)}{zv''\left(g^*\right)}>0.$$

To determine the implications for output, note that condition (7) implies $zu'(c^*) = \kappa$. Hence, $dc^*/dz = -u'(c^*)/(zu''(c^*)) > 0$. Since $y^* = c^* + g^*$, it follows that GDP increases in response to an increase in z.

The model suggests that the government should adjust its purchases in line with changing business conditions. As labor productivity improves, so should government purchases to meet the added "demand" for government services created by an expanding economy. The same logic works in reverse when labor productivity deteriorates.

What is the fiscal multiplier in this model? To answer this question, fix g at some arbitrary level (possibly g^*). Conditional on this g (and the prevailing z), the efficient level of GDP $\hat{y} = z\hat{n}$ satisfies $zu'(\hat{y} - g) = \kappa$. The fiscal multiplier is given by $d\hat{y}/dg = 1$, which is independent of z. When h is concave, it is easy to show that the fiscal multiplier takes the more general form,

$$\frac{d\hat{y}}{dg} = \frac{-z^2 u''(\hat{c})}{z^2 u''(\hat{c}) + h''(\hat{l})} \in (0, 1).$$

So, in general, theory suggests that the size of the fiscal multiplier depends on business conditions, as parameterized here by the labor productivity parameter z. If the functions u and h are quadratic (or approximately so), then the multiplier is a decreasing function of z. This suggests that the effect of fiscal stimulus on GDP is weaker during a recession than it is during an expansion. Intuitively, inducing the private sector to exert greater effort in a low-productivity environment has less bang for the buck.

But should one really care whether the fiscal multiplier is high or low? Interestingly, the model here suggests that government purchases should be procyclical (in fact, this is a general property of the data). An "exogenous" deviation from this optimal policy may stabilize GDP, but any such deviation from the optimal policy will be welfare reducing regardless of the size of the multiplier.

Caveats

The conclusions previously stated are based on a simple model, so it is prudent not to ascribe too much significance to these results. It is worthwhile to reflect on the key assumptions. The first key assumption is that society somehow manages to allocate scarce resources in an efficient manner in response to exogenous changes in the physical environment. The second key assumption is that recession is triggered by an exogenous decline in factor productivity.

Some may object that the first assumption is obviously violated by the existence of unemployment. This is a misguided criticism. There is, in fact, no theoretical justification for the proposition that the efficient level of unemployment should be equal to zero and/or be invariant to business conditions (see, for example, Andolfatto, 1996). Structural changes are normal in any dynamic economy and job search is necessary for the process of worker reallocation. Of course, the "equilibrium" level of unemployment may not be efficient. On the other hand, there is no a priori reason to believe that any given level of unemployment is inefficient either.

Regardless of whether the level of unemployment is efficient, models that explicitly incorporate the phenomenon of unemployment may deliver very different implications for the size of the fiscal multiplier (see, for example, Monacelli, Perotti, and Trigari, 2009). Even when this is the case, however, the size of the multiplier should not be confused with the appropriateness or desirability of fiscal stimulus policy.

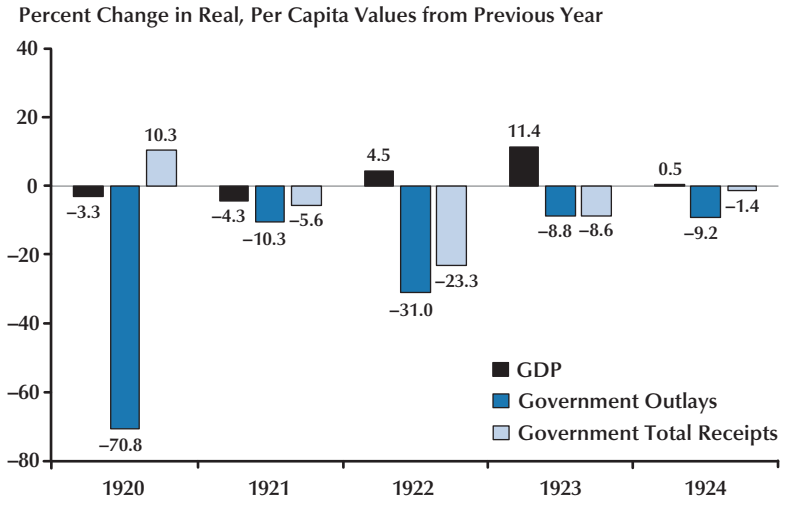
The more objectionable assumption, in my view, is that recessions are triggered by an exogenous decline in factor productivity. While measured factor productivity is, in fact, highly procyclical, much of its movement is likely endogenous. I prefer to think of z in the model as indexing the private sector's forecast of future return to current investment (including job recruiting activities)—what Beaudry and Portier (2006) call "news." It is not implausible to imagine that these forecasts vary substantially and at high frequency in accordance with the arrival of new information for all types of events (including future fiscal policy).

A Competing View

There are, of course, many competing views of the business cycle. Space does not permit an

Figure 1

GDP and Federal Government Outlays and Receipts



SOURCE: *Historical Statistics of the United States.*

extensive literature review. Nevertheless, I will comment on one view that seems unduly influential in policy circles and in the popular media. The hypothesis in question is rooted in a theory taught for generations in university economic principles courses.

The basic idea rests on the premise that the level of GDP is determined by society's willingness to spend, and that this willingness—at least on the part of the private sector—is determined primarily by inexplicable psychological factors ("animal spirits"). The more people spend, the more they will produce to meet this demand. According to this view, a recession is not characterized by any fundamental change in the structure of the economy (the parameter z in the model here). Instead, it is triggered by a sudden wave of pessimism that leads to a decline in "aggregate demand."

If one adopts the view that government spending is close to a perfect substitute for private spending, then the implied policy prescription seems clear enough. In particular, if a recession is triggered by a lack of private sector spending, then why not have the government step in and replace the missing spending?

This line of thinking is evident in the op-ed sections of many newspapers. One prominent example is the view expressed by Krugman (2009) in a *New York Times* article explaining why the United States recently avoided another Great Depression. The answer, evidently, is the different role played by the government this time around:

> Probably the most important aspect of the government's role in this crisis isn't what it has done, but what it hasn't done: unlike the private sector, the federal government hasn't slashed spending as its income has fallen...this has helped support the economy in its time of need, in a way that didn't happen back in 1930, when federal spending was a much smaller percentage of GDP.

The problem with this argument is not that it is necessarily wrong. The problem is that it is frequently portrayed as an incontrovertible truth. First, it is not true that the federal government "slashed spending" in the early 1930s (see Wheelock, 2010, in this issue).[3] But even more

[3] According to the Bureau of Economic Analysis/U.S. Census Bureau, real per capita federal government purchases increased each year from 1930-33 by 9.5 percent, 3.7 percent, 5.0 percent, and 24 percent, respectively.

important, this view does not explain how decade-long depressions were somehow avoided before the 1930s, when the federal government was even smaller (see Garrett, Kozak, and Rhine, 2010, in this issue), as shown in Figure 1.[4]

CONCLUSION

I have examined a neoclassical model in which the government is required to take an active role in managing its purchases. A wartime event dictates expansion of government services (e.g., military expenditures) at the expense of private sector spending. The implied wartime fiscal multiplier is not inconsistent with available evidence. A recessionary event dictates a contraction in government services, roughly in line with the necessary contraction in private expenditures. The peacetime fiscal multiplier is likely lower during a recession, but regardless of the size of the multiplier, the efficient policy does not call for a countercyclical expansion in government spending. This is true even though the effect of such a policy is to mitigate the decline in GDP.

A severe recession is typically characterized by a significant, though not disastrous, decline in GDP. But the focus on GDP hides the fact some sectors of the economy are typically affected much more severely than others. While the model presented here abstracts from these distributional considerations, it is easy to incorporate them. A model extended in this manner would not affect the main conclusion concerning the desirability of fiscal stimulus in a recession. At the same time, the model might imply a positive role for a redistribution policy that effectively insures unlucky households.[5] The basic message is one of sharing the hardship of recession; it may be desirable to have rich Peter pay poor Paul.

By way of contrast, the alternative "spend your way to wealth" view delivers a very different message. Notably, models based on this hypothesis also abstract from distributional considerations; that is, the imagined welfare gains from a fiscal stimulus do not come from improved distributional consequences. Instead, the focus rests exclusively on the size of the multiplier. If the fiscal multiplier is greater than 1 (as commonly asserted), then every additional dollar acquired from the private sector and spent on government purchases (somehow) generates more than a dollar in average income. To put things another way, there is no need to share the hardship of recession; a fiscal stimulus can, in principle, make everybody better off.

Such a message has obvious political appeal, which perhaps explains its perennial popularity in policy circles. I am inclined to conclude, however, that the available evidence—and available theories to interpret such evidence—suggest remaining circumspect in forming strong views one way or the other.

[4] I report federal government outlays instead of purchases as the latter measure is not available in the *Historical Statistics of the United States*. The two measures are likely to be highly correlated.

[5] This might be true, for example, if some insurance markets are unavailable or operate poorly.

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FOMC Learning and Productivity Growth (1985-2003): A Reading of the Record

Richard G. Anderson and Kevin L. Kliesen

The increasingly rapid productivity growth that began in the 1990s was the defining economic event of the decade and a major topic of debate among Federal Reserve policymakers. A key aspect of the debate was the contrast between information contained in aggregate data, which initially suggested little productivity gain, and anecdotal firm-level evidence, which hinted at the productivity acceleration. The authors revisit this debate from the actual FOMC transcripts. Their study illustrates the process by which policymakers filter incoming data to identify changes in underlying fundamental trends. (JEL E52, E58)

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This analysis, based on public verbatim transcripts of Federal Open Market Committee (FOMC) meetings, explores how the members of the FOMC adapted monetary policy from 1983 to 2003 in response to changing productivity growth.[1] A major challenge in monetary policymaking is recognizing changes in economic trends as they occur, that is, learning.[2] Thomas Sargent has explored, in a number of articles, how policymakers who begin with a flawed (or incomplete) model can, with experience through learning, converge on an "approximate but good enough" model of the economy.[3] The productivity acceleration is too recent for us to assess whether this occurred during that period; we leave that as a topic for future research.

In January 2004, Chairman Greenspan summarized the role of the productivity revolution in FOMC policymaking in a speech at the American Economic Association meeting (Greenspan, 2004):

> The rise in structural productivity growth was not obvious in the official data on gross product per hour worked until later in the decade, but precursors had emerged earlier. The pickup in new bookings and order backlogs for high-tech capital goods in 1993 seemed incongruous given the sluggish economic environment at the time. Plant managers apparently were reacting to what they perceived to be elevated prospective rates of return on the newer technologies, a judgment that was confirmed as orders and profits continued to increase through 1994 and 1995. Moreover, even though hourly labor compensation and profit margins were rising, prices were being contained, implying increasing growth in output per hour.

[1] The FOMC transcripts, searchable by meeting date, are available on the website of the Board of Governors of the Federal Reserve System (www.federalreserve.gov/monetarypolicy/fomc_historical.htm).

[2] Almost all histories of the Federal Reserve contain some element of policymakers learning about and responding to a changing economy (e.g., see Meltzer, 2003, and Friedman and Schwartz, 1963).

[3] See, for example, Sargent (2001) and papers cited therein.

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> As a consequence of the improving trend in structural productivity growth that was apparent from 1995 forward, we at the Fed were able to be much more accommodative to the rise in economic growth than our past experiences would have deemed prudent. We were motivated, in part, by the view that the evident structural economic changes rendered suspect, at best, the prevailing notion in the early 1990s of an elevated and reasonably stable NAIRU [non-accelerating inflation rate of unemployment]. Those views were reinforced as inflation continued to fall in the context of a declining unemployment rate that by 2000 had dipped below 4 percent in the United States for the first time in three decades.

Recent empirical studies confirm that FOMC decisions under Chairman Greenspan's leadership resembled an exercise in risk management. Killian and Manganelli (2008), for example, conclude that FOMC decisions during his tenure are "better described in terms of the Fed weighing upside and downside risks to their objectives rather than simply responding to the conditional mean of inflation and the output gap"; further, they reject the familiar hypothesis that FOMC decisions were consistent with a generalized Taylor rule based on expected utility maximization with quadratic and symmetric preferences in inflation and output.

The nearest antecedent to our analysis is Blinder and Reis (2005), who use a Taylor rule–like framework to formalize the concept of a "Greenspan standard" that "cherishes option value" and "pure period-by-period discretion."[4] Our analysis, at least in part, extends that of Blinder and Reis.

THE DATA

At each FOMC meeting, members' decisions are informed by (i) the staff's summary of incoming published data and (ii) the staff forecast. Figures 1A and 1B compare forecasts of labor productivity growth at four-quarter and one-quarter, horizons, respectively, with the corresponding first-published observed values. Staff forecasts during the early 1980s overpredicted productivity growth after the 1980 recession ended and underpredicted growth during the subsequent slowdown. Staff projections also missed a turning point at the start of the 1990 recession and the productivity acceleration that began in 1995. By 1998, staff projections of productivity growth tended to increase, tracking incoming published data. Staff forecasts tracked productivity well during the post-2000 recession—but failed to capture the later acceleration. The forecast errors are not symmetric; the staff forecasts more often (and by larger amounts) underpredicted rather than overpredicted productivity growth.

Figure 2 displays staff forecasts and initially published data for real gross domestic product (GDP), an essential part of the productivity forecast. It is evident that forecast misses in predicting output growth caused a large part of the misses in predicting labor productivity—the forecast error patterns are similar both at the four-quarter (Figure 2A) and one-quarter horizons (Figure 2B). Because the FOMC was concerned with gross national product (GNP), not GDP, during the 1980s, for completeness Figures 3A and 3B display real GNP for that period; the conclusion is unchanged.

THE 1980s

The ability of information and communications technology (ICT) to increase productivity was widely acknowledged during the "high-tech" boom of the 1980s—Wynne (2002), for example, notes that a computer was *Time* magazine's "Man of the Year" in 1982. Discussions of productivity appear frequently in the FOMC transcripts as early as 1983, focused on separating cyclical from trend productivity growth and correctly measuring productivity growth in the services-producing sector. Most often, staff projections of trend growth extrapolated the 1970s 1 to 1½ percent pace. At the May 1983 meeting, for example, the staff projected near-term productivity growth at a 3½

[4] Taylor (2005) stresses that the "Taylor rule" embodies general principles of good policymaking as much as it is a proscriptive policy rule. In this sense, Greenspan followed a Taylor rule–like regime.

percent annual rate, reflecting cyclical effects; trend growth was projected at a 1 percent rate during 1983, increasing to 1¼ to 1½ percent for 1984—a pace that Chairman Volcker labeled "pessimistic." In their defense, the staff noted that they had increased their projection from a previous ¾ of 1 percent rate. At the July meeting, the staff maintained the same projection, "just a little over 1 percent" to "in the 1¼ percent range." Committee members during the 1980s increasingly requested the staff to quantify the degree of uncertainty in their estimates, especially any downward bias—in counterpoint, members offered anecdotes from both the manufacturing and service sectors to suggest that the staff estimates were low. At the May 1984 meeting, for example, President Frank E. Morris (Boston Fed) and Chairman Volcker noted that the capital-goods boom underway was substantially "all electronics" and hence augured well for productivity gains. The staff, however, held fast to their forecast of modest labor productivity growth.

At the July 1984 meeting, trend productivity growth again was projected at a 1¼ percent pace. President Morris cited anecdotal evidence that firms were expecting "extraordinarily high productivity" from new capital, consistent with the perceived high cost of capital funding. The staff defended their projected 1¼ percent trend productivity growth rate by noting that it was twice the then-estimated 0.6 percent pace of the 1970s.

The discussion of the services-producing sectors at the November 1983 meeting was typical for the FOMC: President Theodore H. Roberts (St. Louis Fed) asked whether the economy's shift toward services and away from manufacturing was adequately incorporated in staff projections:

> On the productivity [issue]. I guess you took into account this major change from manufacturing to services in the 1970s as one of the factors holding back productivity. With services now such a large part of the economy, would that from here on out tend to cause the same or an increased rate of productivity if it stabilized, let's say?

The staff response highlighted the risk of measurement error:

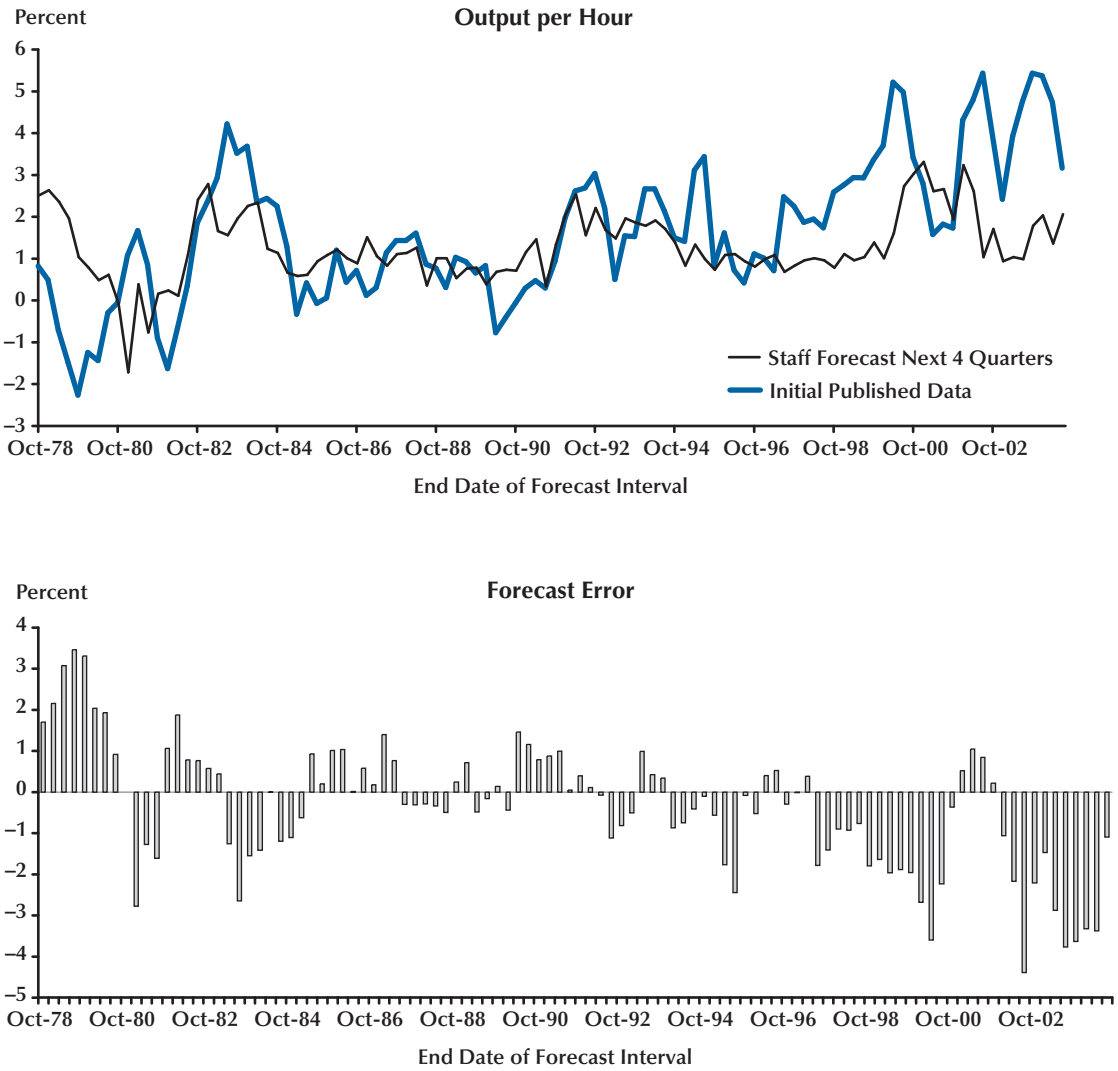
> The bulk of the research that was done, as we discussed earlier, was unable to pin that down for the 1970s. Most of the research showed that productivity slowed in service industries as well as in manufacturing industries. The pattern of the slowdown was at least the same across different types of industries, so we were unable to pin this productivity slowdown on the growing services sector. Looking ahead and having the services sector be one of the growing sectors, I'm not sure that that should detract from the things that seem to be important in the productivity slowdown. However undefined they may be. There are some technological changes that could affect the services sector as well as manufacturing.

President Roberts responded by asserting his belief that the services sector was beginning to experience increased productivity—"for the short run anyway." Skeptical members pressed the argument that service-sector data were plagued by mismeasurement. Subsequent data seemed to offer more support to skeptical Committee members than to the staff. At the September 1986 meeting, for example, Governor Wayne Angell argued: "Productivity in the service sector is low but I don't think we know how to measure it. Productivity in the goods producing sector remains right at the 3.2 percent level that it has been at for some time." Both Governor Angell and Chairman Volcker continued their criticism at the following meeting (November 1986). The staff acknowledged that incoming data for the manufacturing sector suggested "fairly substantial increases in productivity…For this cycle the gains are much more favorable in comparison to past cyclical experience than for the rest of the economy." Governor Angell repeated his suspicion of the measurements:

> Of course, what this means—and I've had several conversations with our staff over this—is that, with productivity in manufacturing doing what it is and the way we go about measuring it, we have to have negative productivity in the service sector. And that raises the question as to how we measure productivity in the service sector; the fact of the matter is that we really don't. So there is some kind of strange averaging process going on there. I think there's really grave doubt as to what our productivity in the service sector is. But if productivity in

Figure 1A

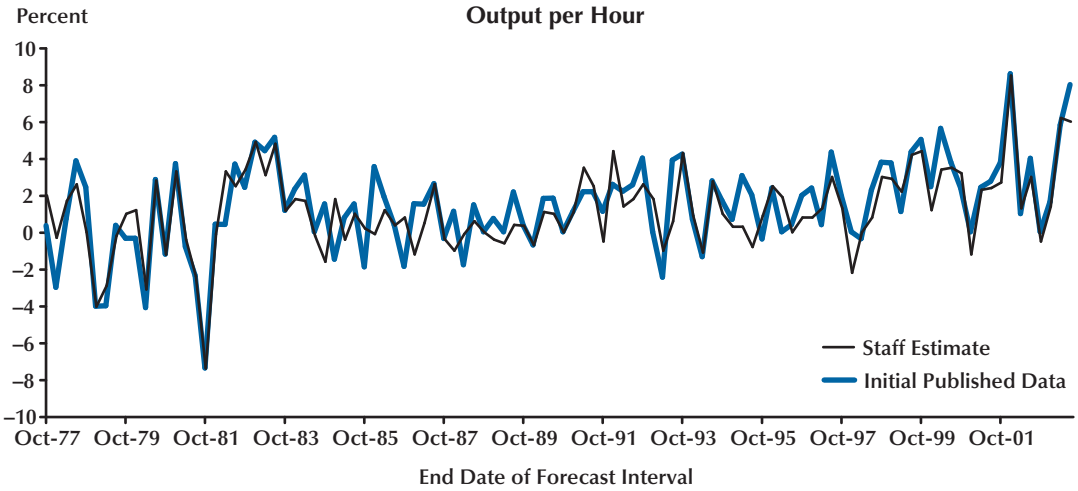
Labor Productivity, Nonfarm Business Sector: Initial Published Data and Forecast Error (Increase During the Next Four Quarters, Percent Annual Rate, Quarterly)

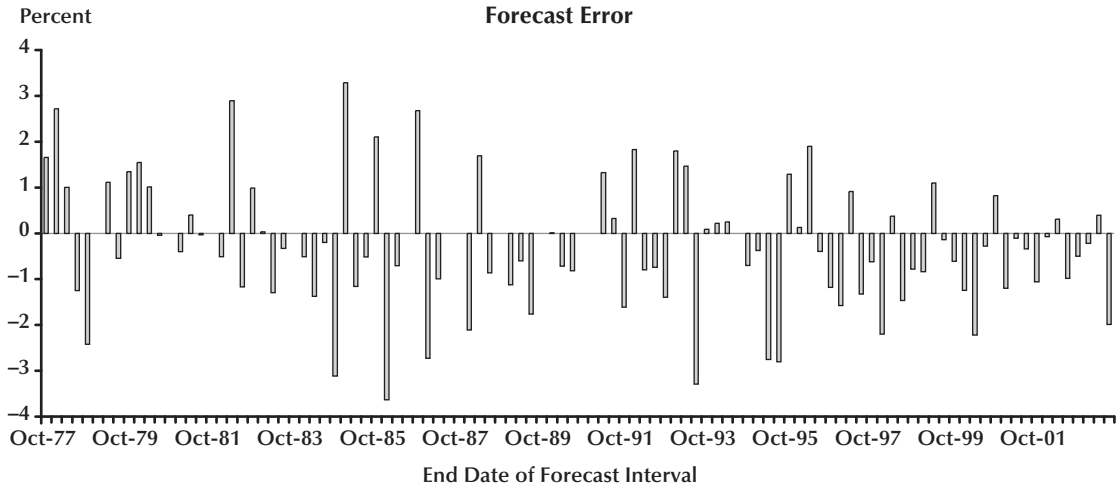


NOTE: The figure examines the accuracy of staff forecasts of the change in productivity during a four-quarter period that begins with the quarter in which an FOMC meeting occurred. The measure is calculated as follows: The BLS publishes labor productivity data eight times each year; we use the four issues that contain quarterly initial (first-time published) measurements. The figure compares the staff forecasts with the initial data subsequently published by the BLS. The last forecast shown is for the period ending 2004:Q3.

Figure 1B

Labor Productivity, Nonfarm Business Sector: Initial Published Data and Forecast Error (Increase During the Previous Quarter, Percent Annual Rate, Quarterly)

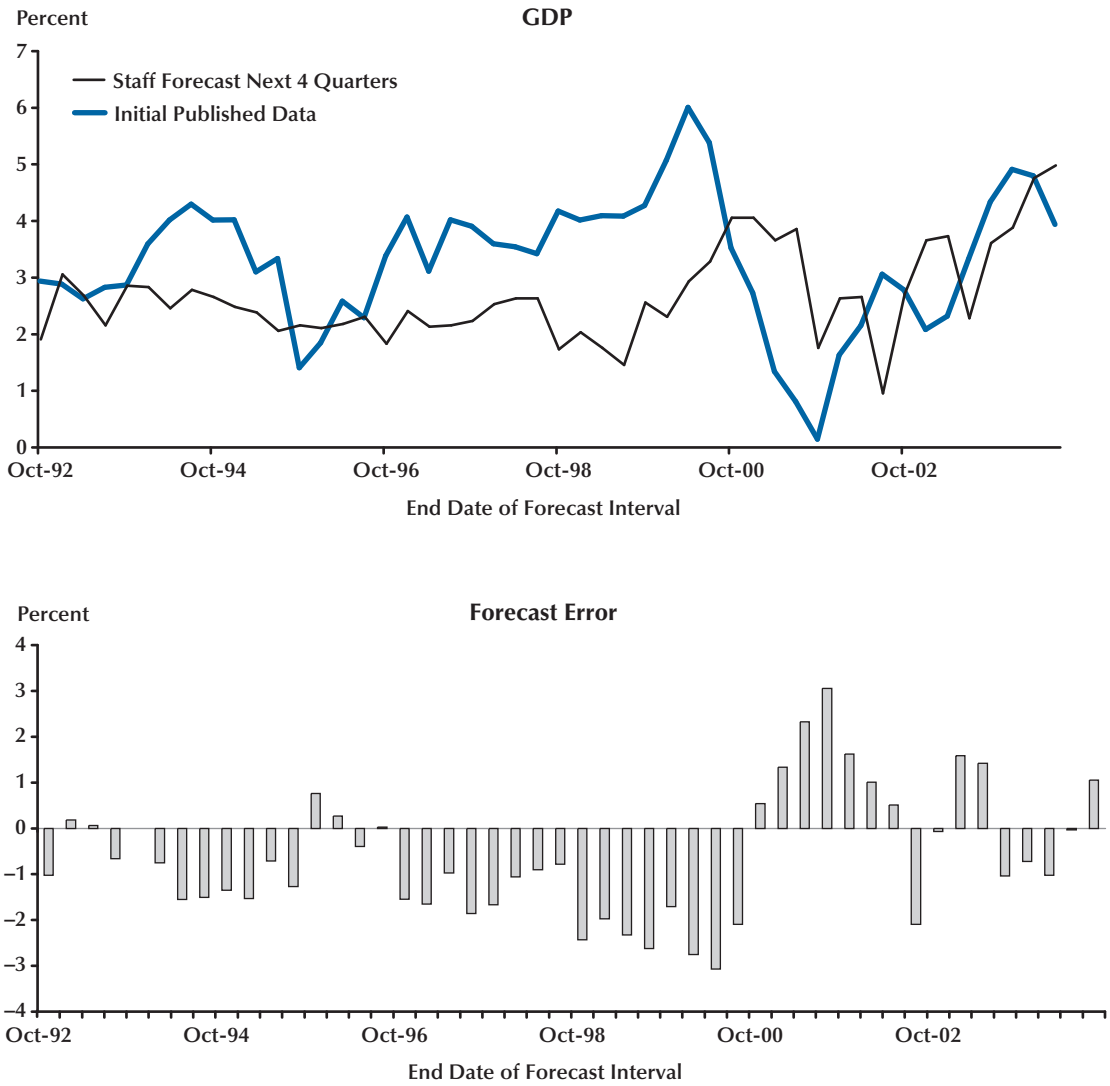




NOTE: The figure examines the accuracy of staff estimates of the productivity growth that occurred during the quarter immediately preceding the quarter in which the FOMC meeting occurred and before publication of an estimate for that quarter by the BLS. Our measure is calculated as follows: The BLS publishes labor productivity data eight times each year; we use the four issues that contain quarterly initial (first-time published) measurements. The figure compares the staff estimates with the initial data subsequently published by the BLS. The last estimate shown is for 2003:Q3.

Figure 2A

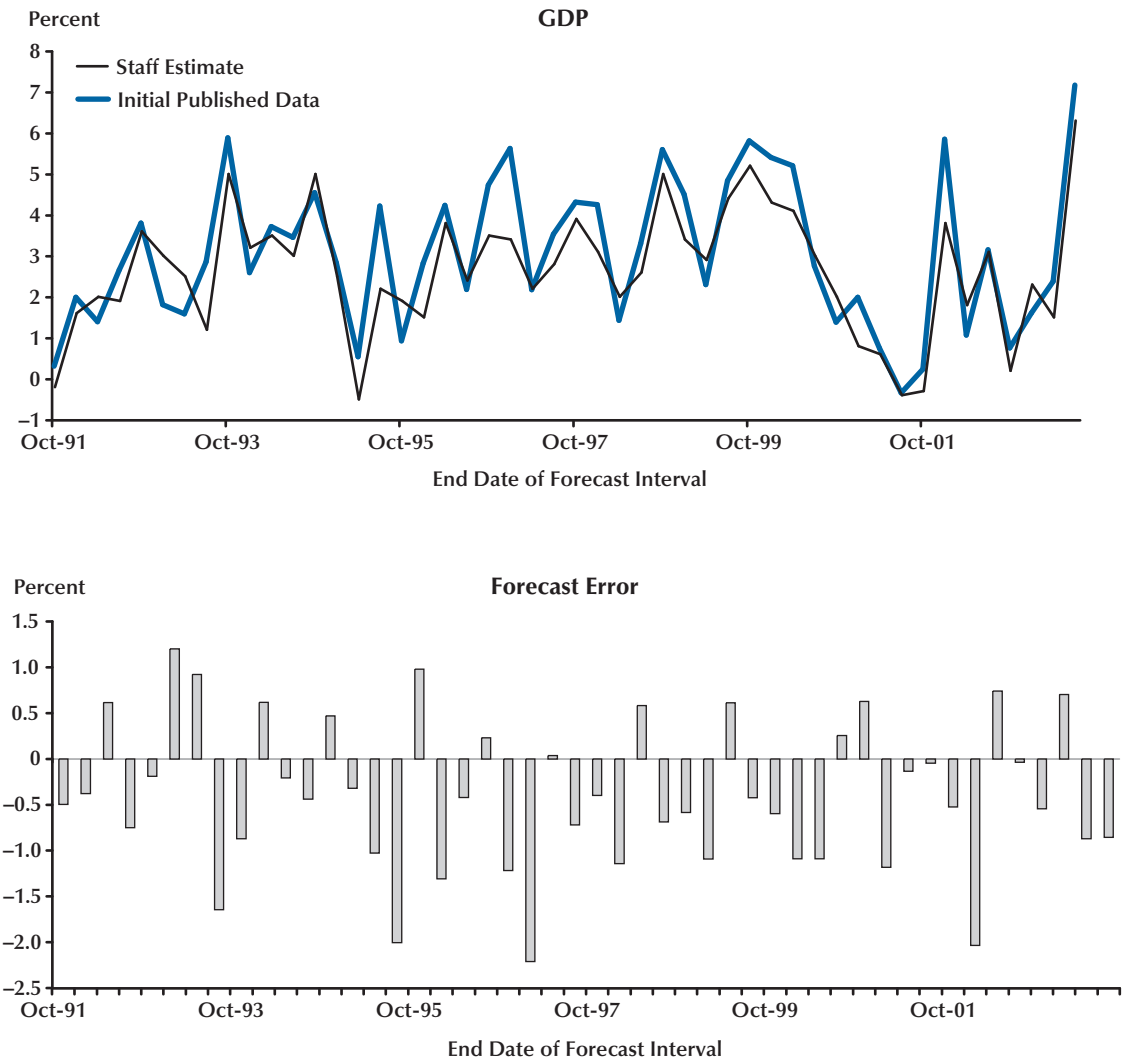
Real GDP Growth: FOMC Staff Forecast, Initial Published Data, and Forecast Error (Average Growth During the Next Four Quarters, Percent Annual Rate, Quarterly)



NOTE: The figure examines the accuracy of staff forecasts of real GDP growth during a four-quarter period that begins with the quarter in which an FOMC meeting occurred. Our measure is calculated as follows: The Bureau of Economic Analysis (BEA) publishes real GDP data 12 times each year; we use the 4 quarterly initial ("advance") estimates. The figure compares the staff forecasts with the initial data subsequently published by the BEA. The last forecast shown is for the period ending 2004:Q3.

Figure 2B

Real GDP Growth: FOMC Staff Forecast, Initial Published Data, and Forecast Error (Growth During the Previous Quarter, Percent Annual Rate, Quarterly)



NOTE: The figure examines the accuracy of staff estimates of the real GDP growth that occurred during the quarter immediately preceding the quarter in which the FOMC meeting occurred and before publication of an estimate by the Bureau of Economic Analysis (BEA). Our measure is calculated as follows: The BEA publishes real GDP data 12 times each year; we use the 4 quarterly initial ("advance") estimates. The figure compares the staff estimates with the initial data subsequently published by the BEA. The last estimate shown is for 2003:Q3.

Figure 3A

Real GNP Growth: FOMC Staff Forecast, Initial Published Data, and Forecast Error (Growth During the Next Quarter, Percent Annual Rate, Quarterly)

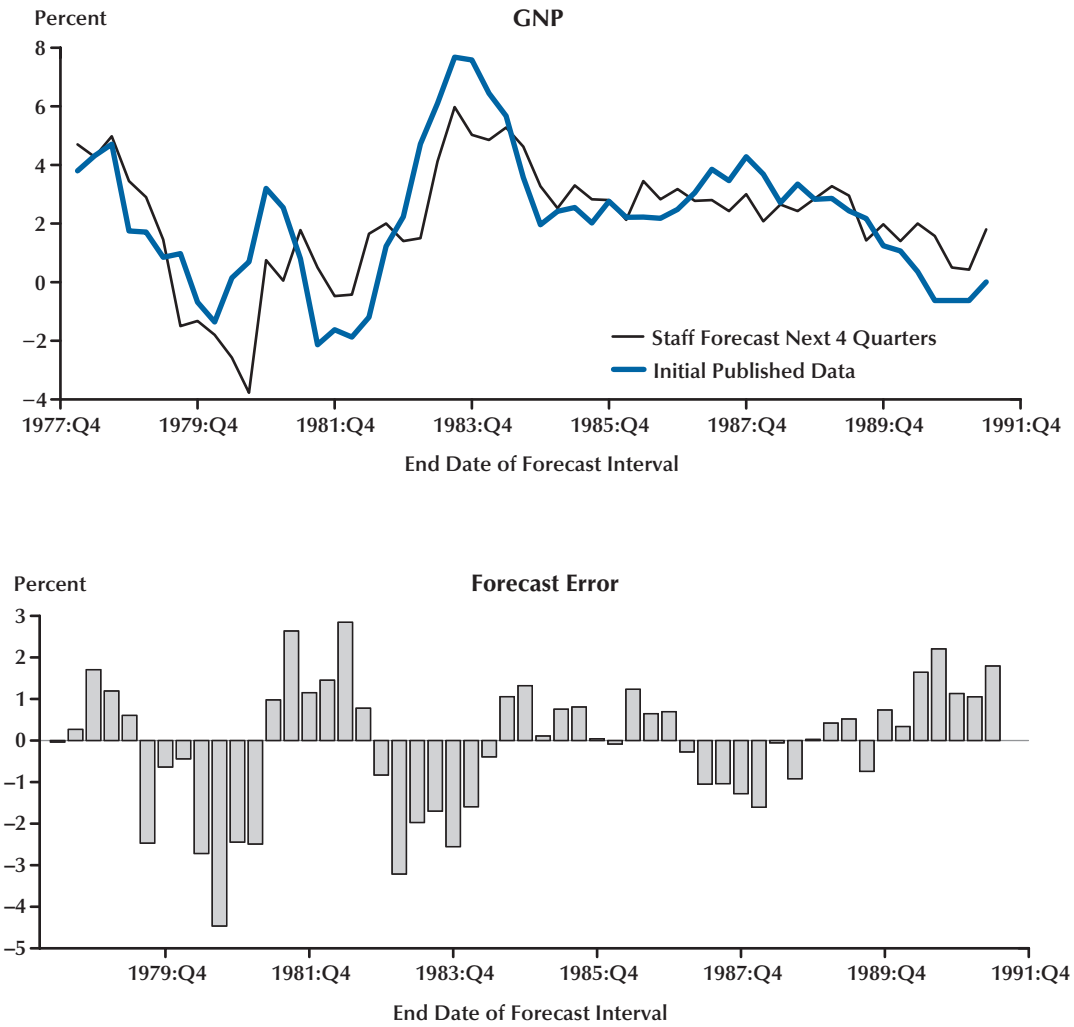
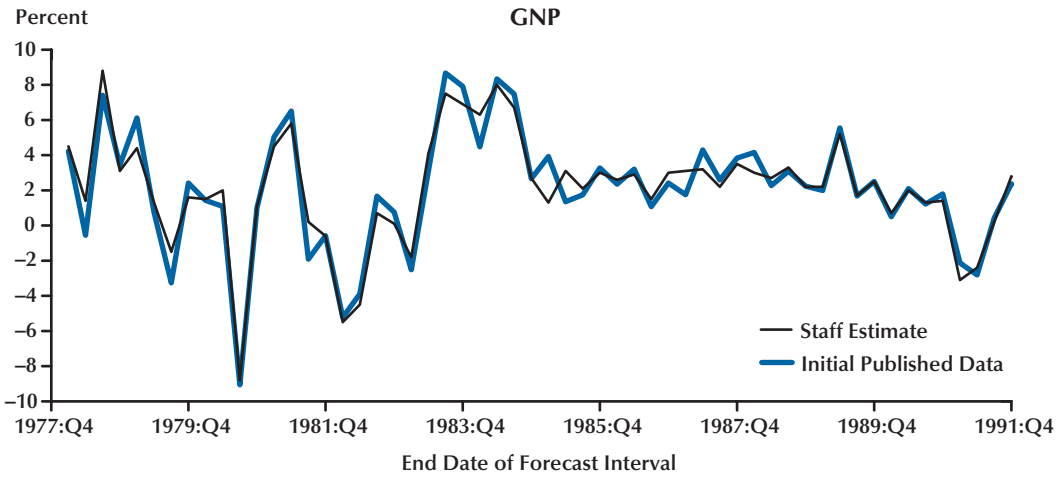
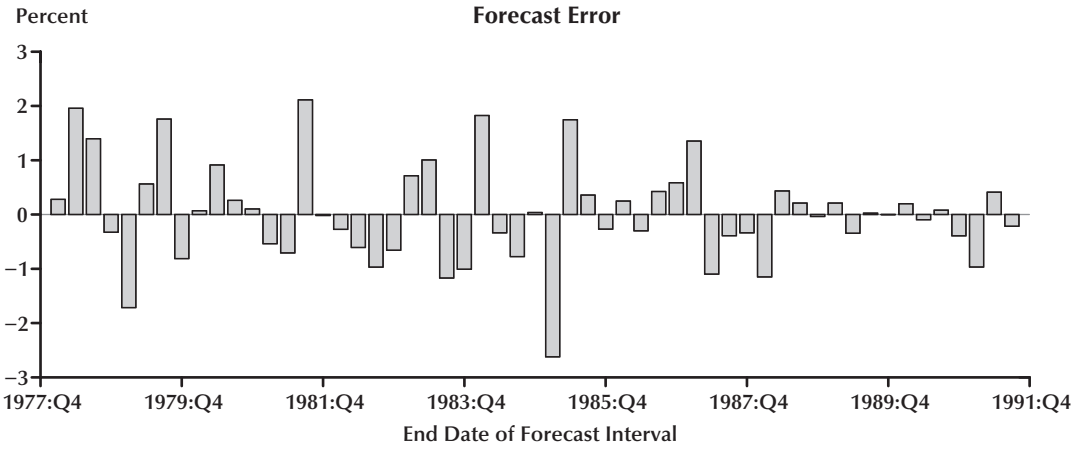


Figure 3B

Real GNP Growth: FOMC Staff Forecast, Initial Published Data, and Forecast Error (Growth During the Next Quarter, Percent Annual Rate, Quarterly)





> the service sector is stronger than we're measuring then that means, of course, that our economy is doing a little better than we are measuring. So there are those two aspects that are very interesting.

Chairman Volcker teased, "You don't think more computers mean less productivity?" to which Governor Angell responded, "No." Pressing further at the December 1986 meeting, Governor Angell asked, "How much different does productivity look if you differentiate between the service sector and the goods producing sector?"—to which the staff answered:

> Well, we don't really have good data, as you know, for well over a year. The evidence that we have suggests that manufacturing productivity is probably rising 3½ to 4 percent. Service sector productivity is just really quite poor. So, we are getting strong productivity gains: that is important in this forecast. In terms of potential growth, we are trying to look at trend productivity for the economy in total, but there is a great deal of variation among sectors.

Governor Angell followed up:

> Then it is possible that we really don't measure productivity in the service sector and don't measure the value of output in the service sector. We just assume productivity is going to be zero in the service sector, and lo and behold it is.

But the staff disagreed: "No, I think there is a little more information than that. Let's say it is open to question but there is a little more information than an assumption of zero." Such discussions continued throughout the 1980s. As the decade closed, at the November 1989 meeting, the staff's projected trend labor productivity growth was little changed from that of the previous decade: 1¼ percent. In fairness, data available in early 2010 vindicate the staff: Labor productivity growth in the nonfarm business sector averaged 1.4 percent per year during the decade.

THE 1990s

The FOMC's views on productivity changed during the 1990s, albeit slowly.

1992

The transcripts during the recession of 1990-91 contain little discussion of productivity. When discussion resumed in 1992, the staff projected trend labor productivity growth at the same pace as that of the prior decade. Transcripts for the first half of 1992 contain no new analysis of productivity. At the August meeting, for example, the projected rate was a 1 percent pace, similar to the 1980s. Both President Gary H. Stern (Minneapolis Fed) and Chairman Greenspan questioned the degree of uncertainty in that figure. The Chairman asked: "Is there a tendency that that 1 percent might be higher?" The staff, in reply, argued that their caution during the 1980s, when they refused to increase their projection, later was confirmed by the data:

> If one thinks back to where we were in the early '80s, coming out of that recession there was a tendency, I think, for many people to overestimate the improvement in productivity. There was talk then that the trend had improved to maybe 2 percent or in excess of 2 percent and it turned out to be a disappointment that as we progressed through the decade we didn't see that kind of improvement. I think it's always difficult when you see the good increases in productivity early on [in a recovery] to know exactly how much is trend and how much is cyclical.

At the December meeting, the Chairman noted that the early 1990s had been a "productivity-driven recovery" with little increase in hours worked, "unprecedented in the context of how little economic growth we have had since March 1991." He offered two explanations. The first he regarded as of lesser importance—output was unprecedentedly low, relative to available inputs of capital and labor, at the business cycle trough. The second, he argued, was essential: Improvements in software development were allowing businesses to rapidly reengineer business processes, with resulting increased long-term productivity growth. For years, he argued, major inputs of increasingly powerful ICT hardware generated little gain because software engineering lagged. Now, gains in output per work hour were being seen in both the manufacturing and nonmanu-

facturing sectors. Allowing for a lag of 5 years or longer for development of idiosyncratic systems, Greenspan's argument was consistent with the history of modern computer networking.[5]

1993

Discussion continued at the February meeting. Members noted the 3 percent increase in labor productivity in 1992 and asked why the staff projected a 1.3 percent pace during 1993. The staff noted the 1.3 percent pace was an increase from their previous projection of 1 percent. At the March meeting, the Chairman noted: "Productivity is picking up in a fairly substantial way, and I suspect it is basically real." At the August meeting, Governor Angell emphasized the discordance in the data:

> Productivity has been a real puzzle for me. Clearly, if your forecast gets really thrown awry you say it's a puzzle; and part of my real economic forecast for [1993] has certainly missed the mark. I really just don't understand productivity. I don't understand how we can have a decline in productivity for the business sector of 1½ and 2½ percent two quarters in a row when productivity in manufacturing has been rising at 4½ to 5 percent!

At the following meeting, he noted that revisions to the national income accounts had worsened the puzzle: "To make it even worse, the revisions seem to show productivity trends higher than we thought they were. We've got productivity trends [that are] very, very high." The Chairman noted: "The more I look at the data the more I'm inclined to believe, as some of you have hinted, that there is something wrong with the numbers we are looking at. It's just not credible to me that we can have a significant rise in employment and in hours both from the payroll series and the household series—two measures that are about as independent as one can get of an economic phenomenon—and say that the GDP indicates productivity declined in the first half of this year."

1994-1995

Both the data and the Committee's discussions proceeded, meeting by meeting, largely in the same fashion as the previous years. In our judgment, little is gained by a detailed review except for the meeting in December 1995, which has been cited by a number of authors including Blinder and Reis (2005). The Chairman offered "a broad hypothesis about where the economy is going over the longer term and what the underlying forces are." He argued that anecdotal evidence from industry-level sources demonstrated that purchases of equipment and software were changing business in permanent, fundamental ways but poor data quality made the change difficult to observe: "One would certainly assume that we would see this in the productivity data, but it is difficult to find it there. In my judgment there are several reasons, the most important of which is that the data are lousy." Further, he argued, such shifts are infrequent: "The underlying technology changes that support this hypothesis really appear only once every century, or 50 years, or something like that as best I can judge." Inflation was restrained because technological change had increased job insecurity and eroded human capital, causing both unusually restrained wage increases in the tight labor market relative to the historical record and a desire by workers for longer-term contracts (5 to 6 years). Furthermore, advances in ICT had reduced infrastructure and back-office costs, including communications and transport costs per unit of value added. He emphasized his continuing skepticism regarding productivity statistics and reiterated that businesses and industries must reorganize—often a slow process—to take full advantage of major technological innovations. With respect to monetary policy, he noted: "It is unclear exactly how [the reorganization] fits into our policy process. But I think it is important to put this point on the table, and I present it as a hypothesis since it is something that we will not be sure is the appropriate assessment of our changing world for probably five to ten

[5] The Software Engineering Institute at Carnegie-Mellon was established in 1984 to advance software engineering standards and practices. Also in 1984, the University of California at Berkeley released version 4.2 of BSD Unix, which included a complete TCP/IP (transmission control protocol/Internet protocol) networking implementation. Novell's NetWare was released in various versions between 1983 and 1986 using IPX (internetwork packet exchange) and TCP/IP protocols. In late 1994, Microsoft released its own 32-bit network solution for certain versions of Windows 3.11.

years." To bolster further his argument that actual productivity gains were greater than those in published data, the Chairman cited rapidly increasing profits.[6]

Former Federal Reserve Governor Laurence H. Meyer (2004) noted that the Chairman's views on the productivity acceleration were informed primarily by contacts in the business sector. Data available through the late 1990s, for example, suggested that the services-producing sector had achieved no productivity gains in 20 years—an unlikely event.

1996

The most important information presented to the Committee during 1996 was a productivity study conducted at the Chairman's behest by two Board staff members, Carol Corrado and Larry Slifman (1999). A number of authors have noted that, by 1996, the Chairman had been questioning the Bureau of Labor Statistics (BLS) official productivity figures for three years (e.g., see Woodward, 2000, pp. 171-74). Of particular concern were services-producing sectors, where little or no measured productivity gain had been found in the past two decades. Suspicion fell primarily on incorrect price indices for the sectors' outputs because mismeasurement would impose a downward bias on measured real output. The Corrado-Slifman study concluded that the data did *not* support a productivity acceleration, but that it was unlikely *actual* productivity in unincorporated services-producing businesses had decreased during the past two decades by approximately a half percent per year, despite published *measured* productivity so doing. Woodward (2000, p. 174) writes that "Greenspan was delighted."

[6] The indicator value of increasing profits as a signal of increased productivity has a long history; see, for example, comments by Edward Boehne during the February 1983 FOMC meeting. The Board staff's productivity trend rate, as of February 1983, was approximately 1 percent, versus 2½ percent earlier in the postwar period. The Board staff was forecasting actual productivity growth of 2½ percent in 1983 and 1½ percent in 1984, driven by manufacturing, with not as much going on in the services sector. In the FOMC transcripts, Board research director Kichline notes that some interesting things happened in 1982. One is that productivity started rising very early.

1997

Throughout the year, Committee members brought to the table numerous anecdotes regarding firms pursuing capital investment to increase productivity rather than expand capacity. Staff projections for trend productivity remained modest at approximately a 1 percent annual pace, decreasing somewhat late in the year based on staff judgment that strong actual productivity growth at rates near 2½ to 3 percent was "a spurt."

At the February meeting, the staff estimated that productivity during the fourth quarter had increased at a 2½ percent pace, and yet *reduced* the projection of trend productivity growth to 0.9 percent from an "optimistic" 1.1 percent. Governor Alice Rivlin noted: "The productivity data remain significantly mysterious; the low increases do not seem to fit with other indicators." The Chairman responded bluntly to suggestions that productivity growth had not picked up: "So, the productivity gains implicit in these data [the anecdotal reports] are larger than the ones we are getting in the official data. The one thing we know about the official data on productivity is that they are wrong."

At the March meeting, the Chairman noted that "productivity is badly underestimated and indeed may actually be accelerating." He argued that productivity in the nonfinancial corporate sector must be increasing at approximately the same rate as wages because unit labor costs were not increasing and corporate profitability was robust. At the May meeting, the staff increased their projected trend productivity growth to a 1.2 percent pace and suggested that the recent productivity acceleration was little more than might be expected with a "surge in aggregate demand." The Chairman noted that average hourly compensation data suggested productivity growth of approximately 3 percent between the first quarters of 1996 and 1997—but the data suggested a long-term decrease in productivity in the noncorporate business sector that "makes no sense.

At the July meeting, senior staff discussed the tendency for productivity gains to induce increases in aggregate demand (both producers' durable equipment and household spending) that outstrip increases in supply: "There is a bigger

effect in our models in terms of investment demand and consumer spending that actually causes the net effect of this improvement in productivity to be expansionary for the economy." The meetings during the balance of the year continued these same themes. Few new issues arose.

1998

The year 1998 was pivotal. As the economic expansion strengthened, the Committee focused on the role of the productivity acceleration in forestalling higher inflation.[7] At the February meeting, published data showed a sharp increase in productivity growth: Productivity in the nonfinancial corporate sector had grown at a 2.1 percent pace during the fourth quarter and increased 3.2 percent from 1996:Q4 to 1997:Q4, a full percentage point higher than during the comparable year-earlier period. Yet, the staff was projecting *slower* productivity growth during 1998, followed by a modest rebound in 1999. Members noted that, during the previous year, the staff had estimated the trend growth rate of productivity at ¼ of a percentage point; if correct, this slow increase, in the views of some members, portended higher inflation.[8] The staff assuaged fears by arguing that the projected growth of output was less than the growth of potential output and an increasing flow of cheap imports would further temper inflationary pressures.

The February meeting was noteworthy for a rare candid discussion of the dynamic linkages, as viewed by senior staff, among labor demand, wages, and labor productivity. The Chairman asked: "How significant is the correlation between nominal compensation and productivity?" The staff responded that the rate of wage increase may be regarded as predetermined [if not exogenous] during the period for which the Committee wished to discuss the path of inflation: "The correlation is very weak in the short run and the lags are so long that the largest compensation increases tend to occur when productivity increases are beginning to fall near the end of a cyclical expansion." Another staff member explained that, in a regression, nonfarm business productivity is not a significant factor in explaining nominal wage gains: "We know that real wage aspirations, loosely based on productivity, ought to be an important factor in conditioning wage demands, but businesses may not be willing to grant the wage increases. To the extent that fluctuations in productivity do not show up in wages, the first round effects will show through to profit margins rather than nominal compensation." The Chairman suggested that both workers and employers might be more forward looking than the staff described, negotiating labor contracts consistent with expected productivity growth. Furthermore, he suggested the likelihood of an endogenous component to productivity growth itself: "[W]hen nominal wages are beginning to accelerate, then business escalates its efforts to reduce costs and improve productivity. So, if that model were functioning in a meaningful sense, then a significant rise in nominal wages could very well merely reflect the fact that productivity was rising and therefore unit labor costs were not." Senior staff members cautioned that the long-run impact of more-rapid productivity growth on inflation was likely small. They noted that in model simulations where productivity growth increases by 1 percentage point and is sustained at that pace for a decade, "The simulations provide the cautionary note that these favorable effects on inflation are temporary… inflation will begin to pick up if unemployment is held at that lower rate, even if the trend in productivity is tilted up permanently." In the simulations, more-rapid productivity growth only briefly attenuates inflation: Within a year, the path of unit labor cost is unchanged as nominal compensation growth rises to reflect the higher productivity growth.

The staff also outlined a second mechanism in which more-rapid productivity growth *increases* rather than *decreases* inflationary pressures: "A faster trend for productivity increases demand

[7] The unemployment rate for the civilian noninstitutional population, as measured by the household survey, had peaked in 1992 at 7.5 percent. By 1997, it had fallen to 4.9 percent, most recently achieved in 1973 as the "Great Inflation" was beginning. In 1998, unemployment averaged 4.5 percent; in 1999, 4.2 percent; and at its cyclical low in 2000, 4.0 percent.

[8] Currently published figures, as of this writing, are 2.7 percent for 1997:Q4 and 3.0 percent 1996:Q4–1997:Q4 (versus 3.9 percent 1995:Q4–1996:Q4).

substantially, as the accelerator effects associated with attempts to keep capital growing in pace with the more-rapid growth in output cause investment to jump, and as consumption rises with permanent income. However, supply only picks up gradually, in line with faster productivity growth."

The March meeting began with the staff acknowledging that their previous real GDP growth forecast was too low. Yet, the staff forecasted first-quarter real GDP to grow at a 3.1 percent pace and labor productivity to *decrease* at a –2.2 percent pace. The staff argued that such a drop was not "implausible" given the increase in labor productivity during the previous two years relative to the staff's underlying trend: "If we have it right, a movement back toward the trend line was to be expected over time—and, given the erratic character of the series, a substantial drop in some quarter would be far from shocking." Committee members agreed that extreme uncertainty surrounds both the near-term increase and long-run trend in productivity. Several members noted that the staff's combined labor market and productivity projections implied sharp increases in unit labor costs and, given the Committee's markup-pricing analytical framework, higher inflation: 3 percent rates in the core CPI and core personal consumption expenditures (PCE) price indices. The staff counseled caution because other "special factors" were constraining inflation:

> It was supply uncertainties—questions about whether the economy might be able to sustain faster expansion through faster productivity growth and a higher level of resource utilization than suggested by history—that deterred the Committee from tightening last fall, and those uncertainties have not been resolved. Despite a low unemployment rate and anecdotes of strains in labor markets, wage and compensation inflation still seems to be moving up only slowly. Price inflation remains largely quiescent, and a resumption of robust investment spending in the first quarter should keep industrial capacity ample.

The Chairman repeated his skepticism of the productivity data:

> The productivity numbers are very rough estimates because we are measuring a whole set of product outputs from one set of data and a whole set of labor inputs from a different set. That they come out even remotely measuring actual labor productivity is open to question… the BLS estimates that output per hour increased at a 6.3 percent annual rate in the third quarter of 1997. It just is not possible for productivity to increase that fast.

At the May meeting, the staff projected slower near-term, but more-rapid longer-term, productivity growth. Responding to data revisions, the staff increased their projection of trend productivity growth to a 1½ percent pace. Some members were skeptical: Why should an increase in trend productivity growth reduce trend growth in unit labor costs, when economic theory suggests that long-run increases in wages and productivity move together? The Chairman reemphasized his faith in the productivity acceleration: "The more interesting data provide increasing evidence that the underlying trend of productivity is moving up…It is clear that a very significant acceleration in productivity has occurred compared with the previous trend. A goodly part, perhaps most of it though not all, is attributable to a pickup in the rate of capital deepening. There clearly have been improvements in the quality of labor and because the residual, which we call total factor productivity, has gone up as well."

At the June meeting, the staff's economic outlook echoed the Chairman's comments at the May meeting—labor productivity had accelerated, and the increase was due to capital deepening and improved multifactor productivity. Unit labor costs were projected as unchanged, with wage increases offset by productivity gains; labor compensation, measured by the employment cost index, was projected to increase at a 3½ percent rate. At this meeting, the Chairman emphasized that gains in productivity, in certain circumstances, engender increases in inflation, rather than decreases. "[A]s productivity growth has accelerated, expectations about earnings over the long run have moved up. This has created a major increase in stock prices and a virtuous circle wealth effect. We end up with (1) much higher

domestic demand and (2) lower prices because of the acceleration in productivity that has occurred."

Productivity was little discussed at the remaining meetings of 1998, as the Committee confronted the Russian debt default, the Asian financial crisis, and the rescue of the hedge fund Long-Term Capital Management. At the August meeting, a few members expressed doubt regarding continued strong productivity growth, while the Chairman expressed confidence in continued strong growth. At the December meeting, the staff noted that incoming data on GDP had been fully consistent with the more-rapid trend productivity growth accepted by the staff earlier in the year.

1999

Committee meetings during 1999 contained a wide range of viewpoints. Some members feared inflation based on their historical experience with tight labor markets and Phillips curve models. The staff feared inflation if wealth effects induced by the productivity acceleration caused aggregate demand to expand in advance of aggregate supply. The Chairman pressed forward his argument that the economy was benefiting from a technology shock on a scale not experienced since the nineteenth century.

At the February meeting, the Chairman noted that productivity increased during the third and fourth quarters at 4.7 and 4.8 percent annual rates, respectively, and that unit labor costs for nonfinancial corporations had increased over the four quarters of 1998 just 0.2 percent, with compensation per hour increasing 4.0 percent and productivity 3.8 percent. The staff, however, saw the productivity acceleration as sowing the seeds of their own demise. Productivity gains, they argued, were strengthening aggregate demand, especially for producers' durable goods, more rapidly than increasing aggregate supply: "Greater capital spending does raise the productivity of labor and the level of potential output over time, but its more significant effect in the short run is on demand. Thus, policy must be appreciably firmer if demand surprises on the upside, *even if it is productivity-enhancing spending that constitutes the surprise*" [italics added]. The Chairman argued that staff projections of rising inflation were wrong because the economy had experienced a "fundamental" change. He discarded his previous rationale for low inflation—workers' fear of job obsolescence, layoffs, and outsourcing:

> How is it possible, first, for hourly compensation growth to be flat or falling in an ever-tightening labor market? Let me begin by suggesting what does not explain it. You may recall that two or three years ago I was arguing that fear of job obsolescence was a major factor suppressing the nominal increase in compensation per hour. That factor clearly has not gotten worse; if anything, it has eased…[A]n increase in uncertainty and the fear of job loss amongst workers cannot account for this extraordinary combination of low unemployment and no acceleration in hourly compensation.

He cited globalization and its increased competition as denying pricing power to business:

> The argument is basically that tradable goods prices are being significantly held down by excess world capacity and that the arbitraging into the nontradable goods areas that occurs within economies, largely through wages, is the reason why service price inflation, which arguably has very little in the way of direct international globalization components, also has been restrained appreciably. In the United States this process has been augmented by a dramatic increase in the backlog of new technologies.

Moreover, he argued, it was unlikely that increases in aggregate demand would exceed gains in aggregate supply because employers would offset cost pressures through capital investment:

> [T]he synergies that have evolved over recent years have created a large pool of potential capital investments that firms can dip into to obtain a rate of return in excess of the cost of capital. We have seen considerable evidence of this in the sense that rates of return everywhere seem to be moving up.
>
> …[W]e are getting a rapid increase in opportunities for investment in new technology. It is overwhelming the expansion of demand, and the acceleration in the downward adjustment of prices suggests that we have a very large

> backlog of unexploited investments that, as they are implemented, are displacing labor and effectuating a very significant increase in multifactor productivity. That in turn has spilled over into labor productivity.
>
> …[I]t is evident that whenever nominal wage pressures have surfaced, producers have chosen to dip into the available technology to substitute profitable capital for labor. This has made the growth of potential output per hour variable; indeed, it's a function of nominal wage increases. The reason is that if nominal wage increases pick up, there is clear evidence in recent years that producers will endeavor to dip into that untapped pool of technological capital projects.

At the March meeting, the staff increased their estimate of trend productivity growth to a 1.9 percent pace and foresaw little inflationary pressure. Committee members expressed concern that the more-rapid productivity growth would not continue. The Chairman noted that repeated staff projections of slower economic growth and more-rapid inflation had been incorrect. He noted that the combination of a slower rate of increase in compensation per hour and accelerated productivity had lowered the growth in unit labor costs for the nonfinancial corporate area to 0.1 percent over the past four quarters. He emphasized again that measurement error plagued published productivity data, particularly the noncorporate business sector where published data suggested that "measured annual productivity had declined about 2 percent per annum on average since the late 1970s. That is just not credible."

The discussion of inflation intensified at the May meeting: The primary question was, with a 4 percent unemployment rate, is monetary policy consistent with stable inflation? Output grew at a 4 percent pace during the previous four quarters, with strong productivity gains and decreases in broad measures of nominal wage and price increases. Yet, the staff argued that projected productivity growth was inadequate to sustain long-run outcomes of 4 percent unemployment and near-constant inflation: Price inflation would increase unless domestic demand softened.

President Robert T. Parry (San Francisco Fed), seeking a measure of the uncertainty of the productivity forecast, was representative of the concerns: "Estimates of the productivity trend seem to have been revised quite frequently in the last few years. To me, this suggests greater uncertainty about the productivity forecast. Wouldn't you have to conclude that the uncertainties associated with our forecast of real output and inflation must be greater given the uncertainties that are associated with the productivity forecast?" Governor Meyer, however, accepted a shift in trend but argued that the staff likely had gone too far with their increases in the trend rate:

> The case for an increase in trend productivity growth is now more compelling after the strength in productivity over the last five quarters—and especially after the last two quarters—than it was based on the data for 1996 and 1997. And I believe the staff's pattern of incremental upward steps in trend productivity growth makes sense, with some acceleration in productivity beginning in late 1995 and a further acceleration in 1998. My problem with the staff forecast is that its projection of a 2¼ percent productivity trend over the forecast period [the following 8 quarters] is just too aggressive for my taste.

The Chairman acknowledged the risks of his preferred policy: "[T]he interesting issue is why wages are not rising faster if productivity is doing what all the evidence suggests it is doing. We have a unique anomaly. Credulity gets strained more and more the longer it goes on. It is hard to avoid the conclusion that there is an increasing imbalance here that we have to address."

At the June meeting, the staff projected trend productivity growth at a 2¼ percent pace, more rapid than other forecasters. (The Council of Economic Advisers, for example, projected a 1.6 percent rate.) At the August meeting, the staff's model simulations suggested that if productivity growth slowed and labor markets remained tight, inflation would accelerate. The Chairman saw no slowing of productivity growth:

> I find no evidence yet that the increase in the rate of growth of productivity has slowed at all. To be sure, the official published data for the

> second quarter, which showed productivity growth of 1.3 percent and will be revised to below 1 percent, would suggest a very significant slowing. The problem is that about 2 percentage points of that number reflects the change in the statistical discrepancy. And that published second quarter number is not in any way consistent with what we know is going on out in the real world.
>
> …The figures in the data that we are looking at from the income side show productivity growth over the four quarters ending in the second quarter of around 3½ percent.
>
> …Where is the inflation? It is not showing up anywhere in the basic price data. And the people out in the business world with whom I talk, and it's a fairly extensive group, keep complaining about their inability to raise prices. I do think that wages will continue to increase if productivity growth continues to rise. But since this would mean that unit labor costs would be little changed, that won't be a source of price pressures.
>
> …Inflation is clearly prone to acceleration should the increase in the growth of productivity slow or even stabilize. That hasn't happened yet as far as I can tell.

The Committee increased its target for the federal funds rate by 25 basis points.

At the October meeting, some members pressed for further increases in the federal funds target. The staff forecast called for slowing productivity growth and increasing inflation. The Chairman asked whether the staff model's foundations were adequately dynamic to capture the extraordinary supply-side changes that he recognized, noting that correct policy action hinged on one's judgment regarding the magnitude (and sign) of a "second derivative." He suggested that the staff models inadequately captured interactions between the demand and supply sides of the macroeconomy:

> I see as growing evidence that the models with which we have been trying to explain how the American economy functions are becoming increasingly obsolete. It is not that the econometric structure of the models is inappropriate, but certain simple assumptions are made in their structure that are driving the results we observe and are creating at least the presumption that we are missing something important.[9]

He asserted that the "second derivative" of productivity had been positive since 1995; that is, the longer-run trend growth rate of productivity had continued to increase.

October's discussion continued at the November meeting, as Committee members asked how long the Chairman's second derivative could remain positive before returning to its "traditional" value of zero. Members almost uniformly reported robust productivity gains in their Districts, and the staff increased their projected productivity growth rate by several tenths of a percent, in part due to revisions to national income accounts data.[10] The Chairman asked members to "follow his lead." Although incoming data supported his view, he conceded that productivity accelerations create "unbalanced" expansions that cannot continue. He cautioned the Committee that neither the large current account deficit nor the expanding employment of marginal workers could continue unchecked: Eventually, the imbalance between aggregate demand and supply would be resolved through increases in long-term real interest rates. "The trouble," he notes, "is that the lags are invariably quite long, and we do not know how much rate tightening [in monetary policy] is required to bring supply and demand into balance."

The year's final meeting, on December 21, was quiet. No significant new analysis was presented. The Chairman repeated his belief that increases in the growth rate of productivity—a positive second derivative—could not continue indefinitely. But few price pressures were noted, and the Committee agreed that a policy action would be unwise on the eve of the century date change.

2000

The Committee during 2000 came to regard further increases in productivity growth as

[9] The Chairman's comments describing inadequate attention to supply-side technology shocks echo, perhaps unintentionally, those of Nobel laureate Edward Prescott.

[10] For discussions of productivity revisions and the national income account revisions, see Anderson and Kliesen (2006).

unwelcome, lest stronger aggregate demand place upward pressure on inflation. (Ironically, the following year, the Committee came to regard further increases as a potential cause of unwelcome disinflation or, worse, deflation.)

The year began with optimism. At the February meeting, the staff increased their estimate of trend productivity growth to a 3 percent annual rate, double the pace of the 1980s and early 1990s. President Cathy E. Minehan (Boston Fed) noted that the staff's productivity growth projection was more rapid than almost all other forecasters. Governor Meyer defended the forecast, saying, "[T]he main difference is that the staff here has a very strong view of the interaction of supply and demand. This common force of productivity is affecting both demand and supply. I think they have been proven very accurate in that. One doesn't see that perspective in most of the private forecasts." The Chairman agreed and went further: "I think that is exactly right. In fact, the risks to the staff forecast may very well be on the up side. The probability that their forecast is too low is by no means negligible." Inflation concerns were widespread. President Michael H. Moskow (Chicago Fed) cited advice from his academic advisory council; others cited labor market pressure. Governor Edward M. Gramlich, in counterpoint, saw few inflationary pressures, noting that unit labor costs were near constant and that the Blue Chip survey was not forecasting an increase. But Governor Meyer saw inflation: "[My] judgment is based on the still more robust growth at the already very high labor utilization rate, by the dissipation or reversal of the favorable relative price shocks that have been restraining inflation, and by some signs of incipient pressure on nominal compensation and inflation." He explained that the Chairman's virtuous circle had become villainous:

> [There is] a growing appreciation of the importance of higher productivity growth in explaining recent macroeconomic experience…the key challenge for monetary policy today derives from the persistent imbalance between the growth in supply and demand…higher trend productivity growth appears to have had simultaneous effects on demand as well as supply via the investment boom to take advantage of profitable opportunities and via the consumption boom driven by the surge in equity values and perhaps expectations of higher permanent income.

He cited staff forecasts wherein "0.2 percent higher productivity growth results in ½ percentage point faster growth in basic demand. That's the problem I think we are facing." In his remarks, the Chairman expressed similar concern: "[I]nflation will stay down because of the acceleration in productivity. But, ultimately, if we do not solve the problem of the gap, meaning that if the acceleration in productivity leads to continued expectations of accelerating earnings per share, the only way to eliminate the wealth effect, which has to be eliminated, is for the market rate used by investors to calculate the present value of expected earnings to rise." He cautioned that "too aggressive" an increase in the federal funds policy target could "crack the [stock] market" and lead to financial instability. He proposed a 25-basis-point increase in the federal funds rate target, despite no evidence of increasing inflation. The Committee agreed in consensus.

At the March meeting, the staff again increased their estimate of trend productivity, by 0.2 percentage points, to 3.2 percent. Most members continued to foresee inflationary pressures. Staff noted that "absent a continuation of the almost astonishing productivity gains of the second half of last year, there is a clear risk that those [inflationary pressures] pressures will mount in coming months." Perhaps surprisingly, no member advanced the argument that investment in ICT capital had permitted businesses to reorganize to profitably employ workers previously too costly to employ, thereby increasing both demand and supply—an argument that had seemingly been popular among the Committee members only shortly beforehand.

Forecasts of higher inflation lent a grim tone to the May meeting. The staff projected a leveling-off of productivity growth at a modest 1.5 percent pace, but the Chairman argued, based on corporate profits, that productivity growth was as much as fourfold faster. Staff noted that inflation was tame: Although energy prices had boosted head-

line inflation, the chain price index for core PCE (omitting food and energy prices) was projected to increase only 2 percent during 2001. The staff recommended an aggressive 75-basis-point increase in the federal funds rate target to forestall possible inflation. The Chairman emphasized that inflationary pressures are not visible:

> What is remarkable at this stage is not that inflationary forces are picking up…when we look through the configuration of unit costs, the estimate we end up with is that unit costs have fallen over the last six months for nonfinancial corporations, indeed for nonfarm business generally…all of the price acceleration we have seen reflects widening profit margins… there is no evidence at this stage that we are experiencing a real underlying deterioration in inflation of the kind that we typically have seen in the past.

Nevertheless, he recommended a 50-basis-point increase in the federal funds rate target: "[T]he evidence indicates that productivity, indeed perhaps underlying GDP, is still accelerating…there is as yet no compelling evidence that inflationary pressures are easing, I believe it would be a mistake not to stay asymmetric and our press release should reflect such a decision."

At the June meeting, the momentum toward fighting inflation continued. Governor Gramlich cautioned against rapid policy change based on inflation forecasts: "Until now the real economy has been rocketing ahead at a seemingly unsustainable rate and there was at least a whiff in the air that underlying inflation was picking up. Now real growth has slowed, quite quickly in fact, and the signs of acceleration in inflation do not look so strong either." He interpreted the incoming data as suggesting little inflationary pressure:

> [T]emporary factors slowed the core inflation rate in 1998 and 1999 and these factors have now reversed, showing up as somewhat higher core inflation in early 2000. Abstracting from this reversal, there has been some but not that much of a rise in core inflation.
>
> …Nobody has mentioned long-term inflation expectations, but they have been remarkably stable, remarkably unresponsive to the oil price increases. In addition, the Treasury nominal/real interest rate spread looked as if it was increasing last month, but it has moved back down to fairly acceptable levels.
>
> …It is at least possible that the Fed has already done enough tightening and that we can stand back and examine our work.
>
> There are grounds for thinking that we have done enough already. If the long-run core inflation rate is about 2 percent and the long-run real interest rate is around 4 percent—which can be read from either the TIP [sic] [TIPS, Treasury inflation-protected securities] market or inflation-corrected nominal interest rates—the nominal federal funds rate should be at least 6 percent for a balanced economy. Throw in 50 basis points for leaning against the wind or adjusting for the balance of risks and we are at the present funds rate.

In fact, the business cycle dating committee of the National Bureau of Economic Research (NBER) would announce more than a year later, on November 26, 2001, that a cyclical peak occurred during March 2001, beginning a stubborn recession during which the Committee would reduce its federal funds rate target to 1 percent (on June 25, 2003).

At the August meeting, the staff again increased their projection of productivity growth, largely in response to revised data that suggested productivity growth at a 5 to 6 percent pace. The projected trend growth rate was revised upward to 3½ percent. Nevertheless, they predicted increased inflationary pressure due to tight labor markets.

2001

The slowing economic activity of late 2000 became widespread during 2001. The year began with a January 3 conference call triggered by weak incoming economic data. Committee members appeared to regard weakness in productivity growth as primarily cyclical. The Chairman noted: "I think it is important to indicate in our press statement that there is little evidence to date of any deterioration in the long-term advances in technology and the related expansion in produc-

tivity." He was supported by other Committee members.

Optimism continued at the January 30-31 meeting. The staff projected that multifactor productivity was "still growing rapidly…reflected in a strong expansion of permanent income."

At the May meeting, slower business investment spending caused the staff to reduce projected productivity growth, which also affected the inflation outlook: "The reduced pace of structural productivity also underlies the upward revision that we have made to our inflation forecast. In essence, the increases in nominal compensation that we are projecting imply more price pressure than we had previously forecast. In that regard, the incoming data on wages and prices have just about uniformly been to the high side of our expectations."

At the June meeting, the staff projected slower productivity growth and "upward pressure on price inflation." Core inflation was projected to change little because of the beneficial effects of falling energy prices and increased "slack in labor and product markets."

At the August meeting, revised national income data showed somewhat slower productivity growth than previously believed. Because prior-period inflation numbers were largely unchanged, the staff noted that less of the "outstanding inflation performance of the late 1990s" could be attributed to productivity gains.

No new issues regarding productivity surfaced at the October meeting. At the November meeting, the staff reduced projections of productivity growth to reflect the reallocation by business and government of productive capital into increased security following the September 2001 terrorist attacks. Further, both Committee members and the staff recognized that a productivity deceleration might cause aggregate demand to weaken faster than (or prior to) aggregate supply, causing unwelcome further disinflation. The staff noted, with irony, that many who had spent their careers promoting the virtues of slower inflation now found it necessary to promote more-rapid inflation. The situation was serious, if not precarious: The federal funds rate was at 2½ percent, the core PCE inflation rate was at 1½ percent, productivity was increasing, unit labor costs were falling, and economic activity was slowing. Considerable discussion at this meeting related to the mention of productivity in the press release because the Committee wished to acknowledge that (i) near-term productivity might be reduced by the reallocation of resources toward security efforts but (ii) trend productivity would not be harmed.

Projections of trend productivity growth were further reduced at the December meeting, to near 2 percent for 2001 and 1½ percent for 2002 (versus 2½ percent in 1998 and 1999). When trend productivity was accelerating, the staff emphasized the interaction between aggregate demand and supply. Now, with productivity decelerating, the same analysis caused concern regarding unwelcome disinflation—or even deflation. The Chairman noted that, because the federal funds rate was at a low level, it might be wise to leave the federal funds rate target unchanged for a time.

2002

On November 26, 2001, the NBER's business cycle dating committee announced March 2001 as the cyclical peak in economic activity. (On July 17, 2003, the committee would announce November 2001 as the cyclical trough.) At the FOMC, inflationary concerns were muted during the year as the focus shifted to supporting recovery.

At the January 2002 meeting, the staff projected that the economy was close to a cyclical trough—fourth-quarter GDP growth was near zero.[11] Trend productivity growth apparently had slowed, but some rebound was predicted in 2003. During the meeting's second day, newly released fourth-quarter GDP data suggested that productivity (measured as output per hour in the nonfarm business sector) had increased at a 3.1 percent pace, more rapidly than anticipated.

[11] The meeting opened with presentations regarding the zero bound problem in monetary policy, which arises when a central bank, working with an overnight interest rate as its single policy instrument, finds that the desired setting for that rate is below zero. Nominal interest rates cannot be less than zero (absent a subsidy or partial forgiveness of a debt). If the policy rate is at the zero bound and inflation is falling, then the real policy rate will be increasing; if, in turn, this further attenuates economic activity such that inflation falls further (or becomes negative), a cumulative process might be launched that drives the economy into an extended downward spiral.

The staff noted that stronger productivity growth would provide support for future capital investment and strengthen aggregate demand. Chairman Greenspan noted incongruities among incoming data regarding profits, productivity, and business investment: If the fourth quarter in fact was the cyclical trough, then productivity growth in that quarter should have been quite slow, followed by a rebound as the economy rebounded. Instead, fourth-quarter productivity growth was strong and profits higher than expected. Data incongruities caused productivity growth predictions to seem even more uncertain than usual.

The March meeting focused on the risk that continued strong productivity growth might cause further disinflation, or even deflation. Productivity was estimated to have increased in the fourth quarter at a 5¼ percent pace. For the first quarter, the staff had increased their forecast to a 5¾ percent pace. The Chairman, in his remarks, applauded the economy reaching price stability but noted that short rates were "in general" lower than desired. He noted that there had been a clear change in the economy: "My impression is that we are looking at something different. This is a different type of economy. This is a different type of business cycle. We now seem to be at a reasonably good point. We have come to that point in part by good policy judgment and in part by just plain luck."

At the May meeting, the staff acknowledged that productivity gains again had exceeded their projections. The staff noted that these gains in part might be cyclical, amplified by a higher-than-usual uncertainty regarding firms' future demand and sales, and in part likely were structural. But neither staff models nor intuition suggested a clear division. News reports, the staff members noted, suggested that layoffs at various firms had forced remaining staff to work harder, increasing stress and worker discontent; to some extent, such actions would not be sustainable over the long run. The Chairman noted that a slowing pace of business investment might portend slower future productivity growth.

The June meeting opened with three presentations on inflation forecasting. One presentation suggested that the pickup in productivity growth during the mid-1990s, combined with the lagged response of wages, explained most of the unanticipated decrease in inflation. The staff increased their projected trend productivity growth to 2 percent and 2½ percent, respectively, during 2002 and 2003, close to the pace during the "New Economy" second half of the 1990s. These increased projections raised concern regarding additional unwelcome disinflation. Relative to the 1990s, however, the 2002-03 gain was associated with less business investment demand (capital deepening) and more gains from business reengineering (multifactor productivity), reflecting at least in part the shift in rapid productivity growth from manufacturing (during the 1990s) to the services-producing sector (since 2000). Staff members noted also that recent productivity gains, perhaps more than usual, were reflecting firms' intent to squeeze production increases from existing employees because of uncertainty regarding future sales.

At the August meeting, the Committee noted that newly revised national income accounts data had "largely left intact" historical growth in productivity. At the September meeting, the staff again increased their projection of productivity growth in response to stronger-than-anticipated spending and weaker-than-anticipated hours: "We project an increase in nonfarm business output per hour of about 4 percent in the current quarter—a figure which, if realized, would bring the four-quarter growth in labor productivity to about 5¼ percent. Unlike the astonishing 7 to 8 percent increases that we saw at the turn of the year, the more recent increases almost certainly are not the result of businesses being surprised by unexpected strength in demand." The Chairman noted the changing forces driving productivity gains:

> [B]usiness firms have expended a great deal of effort to increase productivity through various means, including the use of previously unexploited efficiencies…that was a fairly solid argument that could be made earlier this year, but it gets pretty thin this far out into the recovery. What we have is a very substantial multifactor productivity growth because clearly we're not getting very extensive capital deep-

> ening. Something is happening, but it is not evident in the data. It's a data dilemma, but the answer is not that the data are faulty. Margins actually have been flat for the last three quarters. We are getting some price deflation in the corporate sector. Part of the acceleration in productivity is showing up in lower prices rather than in higher profit margins. Nonetheless, the data look pretty solid and fairly impressive, and one wonders why all the corporate managers are so gloomy. They are gloomy largely because they have no pricing power. They see very weak nominal sales, with the prices of many of their products falling abruptly while the growth of their real output is quite significant. Indeed, that's where a goodly part of the productivity gains are coming from.

At the November meeting, the members expressed heightened concern regarding the large output gap and continuing disinflation pressures. The Committee reduced the federal funds rate target to 1¼ percent.

The year concluded with the meeting of December 10. Once again, productivity had accelerated beyond even the staff's optimistic projections. The staff noted that reported productivity for the third quarter (the most recent data) had been boosted by an unusual feature of the U.S. statistical system: The output measure used in its calculation is a series for nonfarm business *excluding the housing sector*. Mortgage refinancing, which jumped in the third quarter, was treated as an intermediate input to the housing sector and, hence, was subtracted from total nonfarm business output to obtain the productivity measure—resulting in a somewhat inflated measure of the productivity increase. President J. Alfred Broaddus (Richmond Fed) noted that the Greenbook projected structural productivity to grow at more than a 2 percent pace in both 2003 and 2004, generating increased profitability, strong cash flows, and firming stock prices—all assisting stronger investment spending. He argued that the forecast's risks likely were weighted toward disappointment, especially regarding productivity growth—the forecast reflected an assumption that multifactor productivity would increase at a rate of 1½ percent in 2003 and 2004, slightly above even its recent pace.

2003

Robust productivity growth was at the forefront of the Committee's discussions during 2003. While household spending remained modest, business investment spending stubbornly refused to increase. With the federal funds rate target already low, further strong productivity growth threatened additional unwelcome disinflation and, worse, deflation.

The year's first meeting, January 28-29, opened with four presentations regarding monetary policy rules. Although productivity did not enter as a variable in the monetary policy rules in the four opening presentations, it dominated the Committee's discussion thereafter. The staff forecast called for accelerating economic activity after midyear, with stronger trend productivity growth and gains in real income and spending. The label "jobless recovery" reappeared, with staff noting that nonfarm payroll employment during the fourth quarter (of 2002) was less than at the cycle trough (2001:Q4), while labor productivity had increased 3.75 percent. Arguing that recent productivity gains had been achieved by "stretching" existing workers and that hiring would likely improve, the staff anticipated that actual labor productivity would increase at a 1¾ percent pace during 2003-04, somewhat below the projected longer-run trend of a 2¼ to 2½ percent pace.

At the March 18 meeting, the staff found no evidence that productivity growth was slowing. Some members cautioned that the Committee should be wary of the potential for further disinflation if the Iraq war or terrorist attacks caused an economic slowdown. Beyond disinflation concerns, members noted that strong productivity growth would eventually support stronger economic activity. Following the beginning of the Iraq war on March 19, the Committee held telephone conference calls on March 19 and April 1, 8, and 16. Productivity was mentioned only infrequently in these discussions, and then only to note its continuing strength and that rapid productivity increases were likely to dampen employment gains.

At the May 6 meeting, the staff noted that rising productivity was allowing firms to shed

workers more rapidly than might be anticipated during a period of sluggish output growth. The Chairman noted that incoming numbers on production and employment were "awful," but productivity growth was strong despite low capital investment. He suggested that firms had focused on increasing productive capacity during the strong capital investment period of 1995-2000 while largely ignoring increasing inefficiencies—"when the spending boom ended in the year 2000, there was a cumulative level of inefficiencies sitting there that were available for exploitation with a relatively modest amount of additional investment."

At the June meeting, the primary topic was monetary policy when overnight nominal interest rates neared their zero lower bound. Staff noted that the then-current federal funds rate target of 1¼ percent placed the Committee in a position it had not experienced for a half century, and presentations focused on unconventional policy tools—"shaping interest rate expectations" by committing to maintain the federal funds rate near zero for an extended period and altering both the composition and size of the Federal Reserve balance sheet. Staff discussed simulations of the Federal Reserve Board/U.S. model, suggesting probabilities as high as 40 percent that deflation would occur during 2004 and 2005 (defined as the core PCE index falling a cumulative ½ percent or more). The staff noted that productivity accelerations can be self-correcting if the productivity shock increases aggregate demand faster than it increases aggregate supply, a comforting observation but seen as unlikely in the forecasts. The productivity acceleration, once a fortuitous gift to the economy that both reduced inflation and boosted economic activity, risked becoming a scourge.

At the August meeting, however, the staff forecast was upbeat. Aggregate demand growth was stronger and exceeded estimates of the growth of potential (that is, of aggregate supply) with "stunning" productivity increases in the second quarter. Explanations were few. The staff noted that, "The intuition is that, as best we can figure out, a large amount of restraint on the part of employers is an important factor at this moment"—the restraint being reflected in sluggish payroll employment growth but rapid productivity growth. The staff projected that hiring would increase and productivity growth slow as business confidence increased, but Committee members' views differed from those of the staff and each other—some argued business confidence was low, others that it was high. The Chairman repeated his opinion that businesses were exploiting opportunities arising from capital investments during 1995-2000: How could it be otherwise with weak capital investment, strong productivity growth, and businesses reporting that intense competition left them no pricing power?

Productivity again was center stage at the September meeting. Incoming data supported the staff's previous forecast of a recovery in economic activity, particularly capital spending, yet the "margin of slack" in labor and product markets was expected to "recede only slowly" over the next two years, with modest wage growth and strong productivity growth resulting in minimal increases in structural unit labor costs and a decrease in headline CPI inflation from 2 percent to 1 percent. Trend productivity was projected to increase in 2004 and 2005, respectively, by 2½ and 2¾ percent.

The year closed quietly. At the October and December meetings, the staff noted that continuing strong productivity growth had attenuated hiring and placed downward pressure on unit labor costs; in addition, some members saw the high level of slack in labor markets placing further downward pressure on wages, unit labor costs, and inflation.

CONCLUSION

Growth of productivity has a long history as a discussion topic at Federal Open Market Committee meetings. Unexpectedly strong productivity growth during the early 1980s brought forward arguments foreshadowing those of the following two decades. How much should the Committee risk its price stability goal to gamble that nascent accelerations in productivity would persist? If the Committee were to regard the risk as unacceptable and tighten policy preemptively—

as suggested by inflation forecast targeting with models that do not incorporate the positive shock to productivity growth—how much output would be lost? And, how does this interact with the FOMC's dual mandate from the Congress to seek both price stability and maximum sustainable employment? The transcripts provide invaluable evidence regarding the real-world dynamics of group decisionmaking under conditions of pervasive uncertainty.

The transcripts make clear that Federal Reserve Chairman Alan Greenspan, relying on anecdotal evidence and disaggregate data, recognized the 1990s productivity acceleration before both the FOMC staff and private forecasters. A significant ingredient was higher earnings that could be explained by no mechanism except unexpectedly rapid productivity growth. Widespread recognition during the mid-1990s of the acceleration of productivity was delayed by weaknesses in measuring productivity. Initial aggregate data for 1995 and 1996, for example, showed little increase in measured productivity. Not until late in the 1990s did revised data vindicate the Chairman's intuition.

Beginning during the mid-1990s, unanticipated productivity growth typically was regarded by the Committee as a benevolent force that attenuated inflationary pressures by offsetting, in a markup pricing model, largely predetermined increases in wages. During the early 1990s, when employment growth was sluggish and unemployment high, economic activity was boosted by the wealth effects whereby aggregate demand tended to increase before aggregate supply. Sentiment changed during the late 1990s and early 2000s. Then, the Committee became concerned that wealth-induced increases in aggregate demand might cause increased inflation, and the Committee sought to reduce both household and business spending through sharp increases in its target rate. By 2003, slower economic activity turned the tide again, and more-rapid productivity was once again a desired benevolent partner in policy.

The FOMC's experience with productivity growth teaches several lessons. Anecdotal and disaggregate data can be informative, sometimes before changes become apparent in aggregate data. Further, monetary policy, indeed, is an exercise in risk management. Success in risk management sometimes requires some gambling instincts. During the 1990s, the FOMC's gambling paid handsome rewards. Policymaking by committee is difficult, and the skill of a chairman to bring consensus cannot be overvalued.

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