The Longevity of Expansions

By Joseph H. Haimowitz

As the current expansion nears its eighth anniversary, it becomes tempting to wonder whether the second-longest expansion in U.S. economic history is nearing an end. The only U.S expansion to last longer was a nearly nine-year expansion that occurred during the Vietnam War. Thus, the current expansion is heading into uncharted territory as the longest peacetime expansion in U.S. history. The length of the current expansion might be viewed by some analysts as worrisome.

The article examines whether there has been a systematic shift in the behavior and length of expansions in the post-World War II period. Understanding whether there has been such a shift may help policymakers, businesses, and consumers evaluate the upside and downside risks to the economic outlook. The article argues that the length of the current expansion does not signal a downside risk to the economy. When viewed in the context of all other postwar expansions, the length of the current expansion should not be seen as worrisome.

The article is divided into two sections. The first section examines whether there has been a shift in U.S. expansion lengths over time and

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shows the average length of expansions has increased dramatically since World War II. In addition, the section also shows that expansions after World War II have not shown a significant tendency to become more likely to end as they get older. The second section discusses several likely factors for this shift in the behavior of expansions and evaluates whether these factors continue to be applicable in the current expansion. In particular, the section discusses how the increased role of the government and structural shifts, such as shifts in the sources of income to more cyclically stable sectors, in the postwar U.S. economy may have led to an increase in the length of expansions.

I. ARE EXPANSIONS GETTING LONGER?

With the current expansion poised to become the longest peacetime expansion in U.S. history, and with two of the three longest expansions in U.S. history having occurred since 1980, it is natural to ask whether there has been a systematic shift in the length of expansions. In particular, one can investigate whether there has been an increase in the average length of expansions in the post-World War II period. A related issue that several researchers have examined has been whether there is any evidence that expansions are more likely to end as they get longer and whether this tendency has changed over time.[1]

This section provides a brief introduction to business cycles and uses the historical record of U.S. business cycles to examine these two issues.

What are business cycles?

Business cycles are a recurring pattern of expansion and recession in economic activity around a long-run growth path.[2] The two phases of the business cycle, expansion and recession, are separated by turning points called peaks and troughs.[3] The highest point reached by economic activity in each cycle is called the peak and the lowest point reached by economic activity is called the trough.

The official business cycle dates for the U.S. economy are determined by the National Bureau of Economic Research.[4] Officially, the NBER defines a recession as "a recurring period of decline in total output, income, employment, and trade, usually lasting from six months to a year, and marked by widespread contractions in many sectors of the economy."[5] The responsibility for dating business cycles belongs to the Business Cycle Dating Committee of the NBER. The Committee meets occasionally to determine if a period of expansion or recession has ended and to determine the date of the phase's conclusion.[6]

The Business Cycle Dating Committee begins by determining whether the economy is indeed in a new phase. If, for example, the Committee believes the economy may have entered a recession, they use the historical record of business cycles by comparing the current episode with past recessions and other past episodes that were not classified as recessions but had some characteristics of recessions. When making these comparisons, the Committee examines three characteristics of the episode. These characteristics are the duration of the episode, the size of the decline in economic activity, and the diffusion of the decline in economic activity across different sectors, industries, and regions. Once it has been established that the business cycle has entered a

new phase, the Committee next faces the task of determining the month in which a turning point had been reached. To do this they examine many monthly and quarterly economic series that have been determined to coincide with the business cycle. The turning points in these individual series are compared to see if they coincide. Since the turning points in these series often do not coincide precisely, the Committee uses its judgment to choose among these competing dates and select the business cycle turning point date.

The historical record of U.S. business cycles

The dates determined by the NBER's Business Cycle Dating Committee to be business cycle turning points are shown in the first two columns of Table 1. The dates of business cycle troughs are in the first column and the dates of business cycle peaks are in the second column. Since 1854 there have been 31 recessions and 32 expansions. The U.S. business cycle chronology is often divided into two subsamples, a prewar subsample and a postwar subsample.[7] In the prewar period there were 22 recessions and 22 expansions. In the postwar period there have been 9 recessions and 10 expansions.

The last two columns of Table 1 list the duration of recessions and expansions since 1854. The durations of expansions and recessions in the U.S. historical experience have been quite varied. The last expansion listed in the table has not yet been completed but, as of November 1998, has lasted 92 months. The shortest recession on record lasted 6 months while the longest recession lasted 65 months. The briefest expansion lasted 10 months while the longest expansion lasted 106 months.

A glance at the historical record suggests a number of features about business cycle phases. First, expansions have tended to last longer than recessions. Second, the duration of business cycle phases appears to have changed following

Table 1

NBER BUSINESS CYCLE CHRONOLOGY FOR THE U.S.

Dates		Duration	
Trough	Peak	Recession	Expansion
Dec. 1854	Jun. 1857	–	30
Dec. 1858	Oct. 1860	18	22
Jun. 1861	Apr. 1865	8	46
Dec. 1867	Jun. 1869	32	18
Dec. 1870	Oct. 1873	18	34
Mar. 1879	Mar. 1882	65	36
May 1885	Mar. 1887	38	22
Apr. 1888	Jul. 1890	13	27
May 1891	Jan. 1893	10	20
Jun. 1894	Dec. 1895	17	18
Jun. 1897	Jun. 1899	18	24
Dec. 1900	Sep. 1902	18	21
Aug. 1904	May 1907	23	33
Jun. 1908	Jan. 1910	13	19
Jan. 1912	Jan. 1913	24	12
Dec. 1914	Aug. 1918	23	44
Mar. 1919	Jan. 1920	7	10
Jul. 1921	May 1923	18	22
Jul. 1924	Oct. 1926	14	27
Nov. 1928	Aug. 1929	13	21
Mar. 1933	May 1937	43	50
Jun. 1938	Feb. 1945	13	80
Oct. 1945	Nov. 1948	8	37
Oct. 1949	Jul. 1953	11	45
May 1954	Aug. 1957	10	39
Apr. 1958	Apr. 1960	8	24
Feb. 1961	Dec. 1969	10	106
Nov. 1970	Nov. 1973	11	36
Mar. 1975	Jan. 1980	16	58
Jul. 1980	Jul. 1981	6	12
Nov. 1982	Jul. 1990	16	92
Mar. 1991	?	8	92

Note: The current expansion has lasted 92 months as of Nov. 1998.

Source: National Bureau of Economic Research.

Table 2

AVERAGE DURATIONS OF RECESSIONS AND EXPANSIONS

Period	Expansion	Recession	Expansion/Recession
All	35.4	17.7	2.00
Prewar	26.5	21.2	1.25
Postwar	54.1	10.4	5.20

Notes: Calculations are based on the NBER business cycle chronology presented in Table 1. The entire sample consists of all expansions and recessions between 1854 and 1998 excluding the wartime June 1938-February 1945 expansion. The prewar sample consists of the 21 expansions and 21 recessions that occurred between 1854 and 1938. The postwar sample consists of the 10 expansions and 10 recessions that occurred between 1945 and 1998.

World War II. Recessions appear to have gotten shorter and expansions appear to have gotten longer.

The length of business cycle phases

The observations about the length of business cycle phases are presented more formally in Table 2. The table shows the average duration of completed recessions and expansions in the whole sample as well as the prewar and postwar subsamples. These statistics confirm that the average lengths of both expansions and recessions have changed dramatically in the postwar period. The average length of expansions has more than doubled. Expansions, on average have lasted 4.5 years in the postwar period while prewar expansions lasted less than 2.25 years on average. The average length of recessions has been halved in the postwar period. In the postwar period recessions, on average, have lasted only 10 months, compared with 20 months in the prewar period.

This change in the average lengths of expansions and recessions has led to a substantial increase in the amount of time the economy spends in expansions relative to the time it spends in recessions. While, on average, expansions have lasted twice as long as recessions over the entire sample, the two subsamples tell very different stories. Prior to the end of World War II, expansions lasted only 25 percent longer than recessions. Since the end of World War II, expansions have lasted more than five times as long as recessions.

Do expansions become more likely to end as they get longer?

The observations that expansions have lasted longer than recessions and have gotten longer in the postwar period do not offer any insight into whether an expansion is more likely to end the longer it gets. Intuitively, we understand that the proportion of expansions that reach a given length declines as the given length increases. For example, the business cycle chronology in Table 1 indicates that 100 percent of all identified expansions lasted longer than 8 months, while 0 percent lasted longer than 106 months. The question investigated in this section is subtler than whether the probability of an expansion having ended by a specified length increases with the specified length. This section investigates whether the probability of an expansion ending at a specified length, given that it has lasted up to that point, increases with the speci-

fied length. In less formal terms this can be thought of as investigating whether expansions "die of old age."

A statistical model that has been used by economists to analyze this question is the hazard model.[8] The main purpose of hazard models is to provide a statistical framework to model the conditional probability of an event taking place. A conditional probability is the probability of one event occurring given that another event has already taken place. In this article's analysis the conditional probability being modeled is the probability that an expansion ends at a specified length given that it has lasted until that time. An example of this would be the probability that an expansion ends in its 92nd month given that it has lasted through 91 months.

The basic formulation of the hazard model used in this article is characterized by the hazard function

$$\lambda(t) = \gamma \alpha \, t^{\alpha-1},$$

where t is the length of the observed expansion and γ and α are parameters which will be estimated. The hazard function, $\lambda(t)$, can be interpreted as the rate at which expansions will end at length t given that they have lasted until t. The parameter γ can be thought of as a constant term that is inversely related to the average length of expansion. Thus, if all other things are the same, larger values for γ will imply a shorter average duration of expansions.

The parameter α determines whether the conditional probability of an expansion ending increases, decreases, or does not change as the length of the expansion increases. If α is greater than 1, then the conditional probability of an expansion ending increases as the expansion gets longer. For example, if α is greater than one, then the probability of an expansion ending in its 92nd month given that it has lasted through 91 months is greater than the probability of an

expansion ending in the 22nd month given that it has lasted through 21 months. If α equals 1, then the conditional probability of an expansion ending does not change as the length of the expansion increases. Thus, if α equals 1, then the probability of an expansion ending in the 92nd month given that it has lasted through 91 months is the same as the probability of an expansion ending in the 22nd month given that it has lasted through 21 months.

The results from estimation of the hazard model appear in Table 3. Details about the estimation of the hazard model appear in Appendix A. The data used in estimation consist of expansion lengths from 1854 through November 1998 excluding the 80-month-long expansion that occurred during World War II.[9] The first column of the table presents results from estimating the hazard model using data on the whole sample of expansions. Although the parameter is estimated to be greater than 1, it is not found to be statistically greater than 1, suggesting that expansions do not die of old age. However, this result for the whole sample of expansions could be masking important differences in prewar and postwar expansions.

Results in the second and third columns of Table 3 suggest that the behavior of business cycles before and after World War II is different. In the prewar period the parameter is estimated to be significantly greater than 1, providing evidence that the probability of an expansion ending at a specified length, given that it has lasted up until that point, increased with the length of the expansion. In the postwar period, however, the parameter is not estimated to be significantly greater than 1, suggesting that in recent history the conditional probability of an expansion ending has not increased with the length of the expansion. Thus, postwar expansions do not seem to die of old age.[10] In addition, Appendix B shows that this result is not sensitive to alternative business cycle chronologies.

Table 3

DOES THE PROBABILITY OF AN EXPANSION ENDING INCREASE AS THE EXPANSION GETS LONGER?

	All Expansions	Prewar Expansions	Postwar Expansions
γ	.0150 (.018)	.0003 (.001)	.0037 (.010)
α	1.212 (.285)	2.381* (.521)	1.385 (.578)

Notes: Standard errors are in parentheses. * indicates that the coefficient is significantly greater than 1 at the 5 percent level. Calculations are based on the NBER business cycle chronology presented in Table 1. The entire sample consists of all expansions and recessions between 1854 and 1998 excluding the wartime June 1938-February 1945 expansion. The prewar sample consists of the 21 expansions and 21 recessions that occurred between 1854 and 1938. The postwar sample consists of the 10 expansions and 10 recessions that occurred between 1945 and 1998.

This section has shown that expansions have changed in the postwar period. The average length of expansion has increased and expansions no longer become more likely to end as they get older as they did in the prewar period. The next section discusses several factors that might have led to this shift.

II. WHY MIGHT EXPANSIONS BE GETTING LONGER?

The previous section presented evidence that the behavior of expansions shifted in the postwar period. First, the average length of expansions has increased dramatically in the postwar period. Second, in contrast to the prewar period, expansions in the postwar period have not shown a tendency to die of old age. A number of factors, such as the larger role of the government in the postwar economy and structural shifts in the economy, may have contributed to this shift in the behavior of expansions. This section examines the impact these factors have had in the postwar period as well as in the current expansion.

The larger role of government and structural shifts have largely contributed to a reduction in the volatility of economic activity.[11] However, in an economy that is growing over time a reduction in the volatility of economic activity would lead to longer expansions and shorter recessions. Figures 1 and 2 illustrate how the volatility of economic activity and the length of expansions are related. The top panel of Figure 1 shows a stylized example of how economic activity might fluctuate around a long-run growth path in a low-volatility economy. The top panel of Figure 2 shows a stylized example of how economic activity might fluctuate around the same long-run growth path in a high-volatility economy.[12] The bottom panel in each figure illustrates how economic activity changes in each of these two economies. The shaded bars indicate periods of expansion. The low-volatility economy depicted in Figure 1 has experienced longer expansions and shorter recessions than the high-volatility economy depicted in Figure 2. Expansions in the low-volatility economy are longer than expansions in the high-volatility

economy because long-run growth in the economy dominates smaller fluctuations around the long-run growth path more than larger fluctuations around the long-run growth path.

Larger role of government

One potential explanation for the shift in the behavior of expansions during the postwar period has been the larger role that the government has played in the economy. In the postwar period the size of the government has increased dramatically, automatic stabilizers have become more prevalent, many financial reforms have been enacted, and policy, both fiscal and monetary, has become more proactive.

Larger government sector. In the postwar period the government sector has been larger as a percentage of the economy than in the prewar period. Government spending represented about 5 percent of total spending from 1869 to 1916, 11 percent of total spending from 1919 to 1939, and 20 percent of total spending from 1947 to 1997.[13] Spending by the government sector is less affected by fluctuations in economic activity than spending in other sectors. For example, federal government spending on defense is largely independent of the ups and downs of the business cycle. Other categories of spending, such as investment spending by businesses, are highly sensitive to fluctuations in economic activity. As a result, growth of the government sector relative to other sectors of the economy has helped to moderate swings in economic activity and extend economic expansions. Government spending has continued to remain an important part of overall spending during the current expansion. Over the 1990-97 period, government spending represented 19 percent of total nominal spending. Thus, government spending is likely to continue to be a stabilizing influence on the economy for the foreseeable future.

Use of automatic stabilizers. The emergence of automatic stabilizers is perhaps even more important than the increased size of the government sector. Automatic stabilizers are items on the federal budget that change automatically when economic activity changes.[14] Automatic stabilizers are countercyclical. Spending on automatic stabilizers rises as economic activity declines and falls as economic activity increases. Two important examples of automatic stabilizers are unemployment insurance and the income tax system. When the unemployment rate rises, more people receive unemployment benefits. This partially offsets the effect of lost income and helps to cushion a decline in consumer spending. The income tax system acts in a similar manner. When the economy goes into a recession, people's incomes fall and they pay less income tax. This reduction in income taxes helps offset the decline in personal income so that disposable income doesn't fall as much and, hence, helps cushion the decline in consumer spending. These two important automatic stabilizers remain in place today, of course, and would provide a boost should economic activity begin to slow.

Financial reforms. The postwar period has also benefited from the financial reforms that were enacted following the 1929 stock market crash. Although these reforms occurred before World War II, many of their effects appeared after the war. In their review of U.S. monetary history, Friedman and Schwartz observed that many prewar recessions had been associated with banking crises. These crises were often precipitated by rumors that a bank would fail. Depositors acted on these fears and rapidly withdrew their deposits from the bank. If this withdrawal of deposits was large enough, the bank would run out of reserves and be forced to close, which in turn would fuel rumors of failures of other banks, and the vicious circle would continue. The establishment of the Federal Deposit Insurance Corporation (FDIC) in 1934 has helped prevent further banking crises by removing the incentive of depositors to act upon rumors of potential bank failures. Other important reforms, such as the Glass-Steagall Act and the
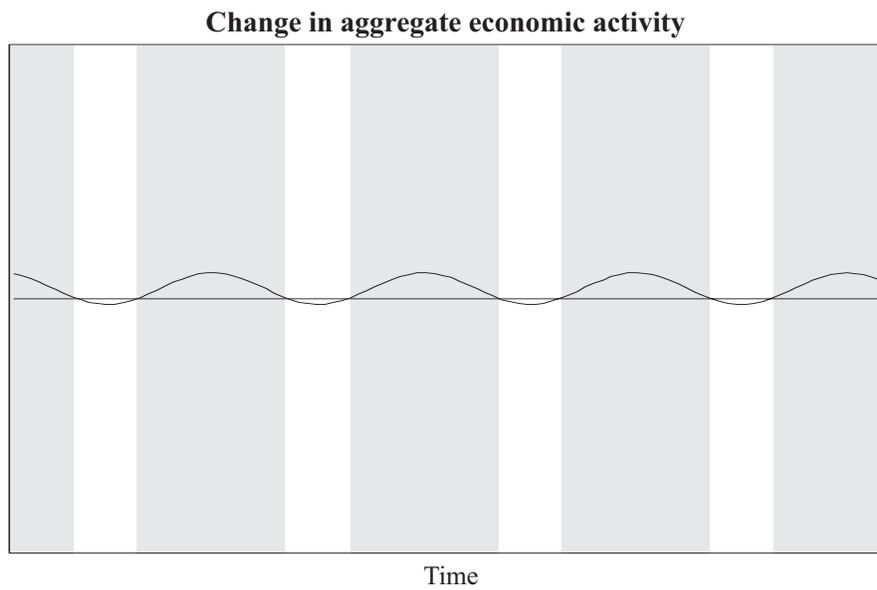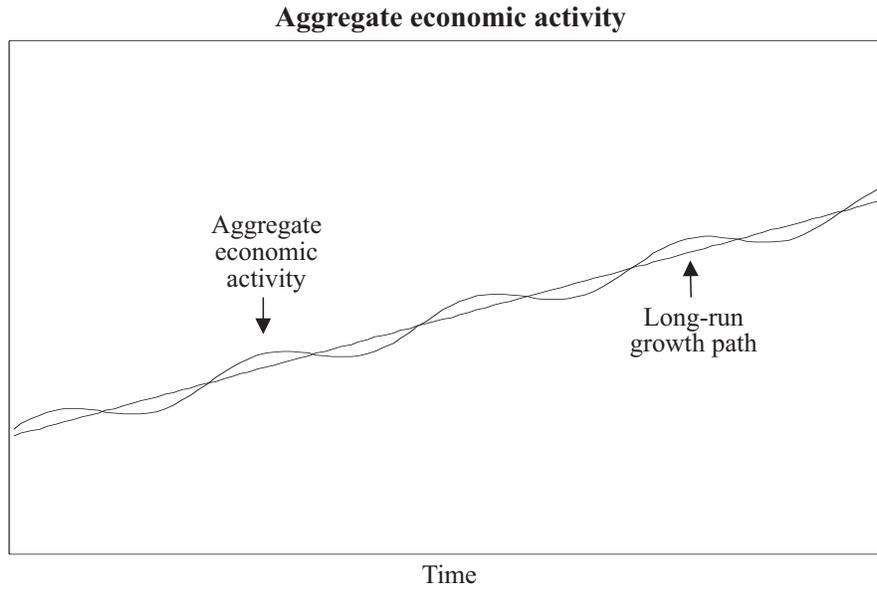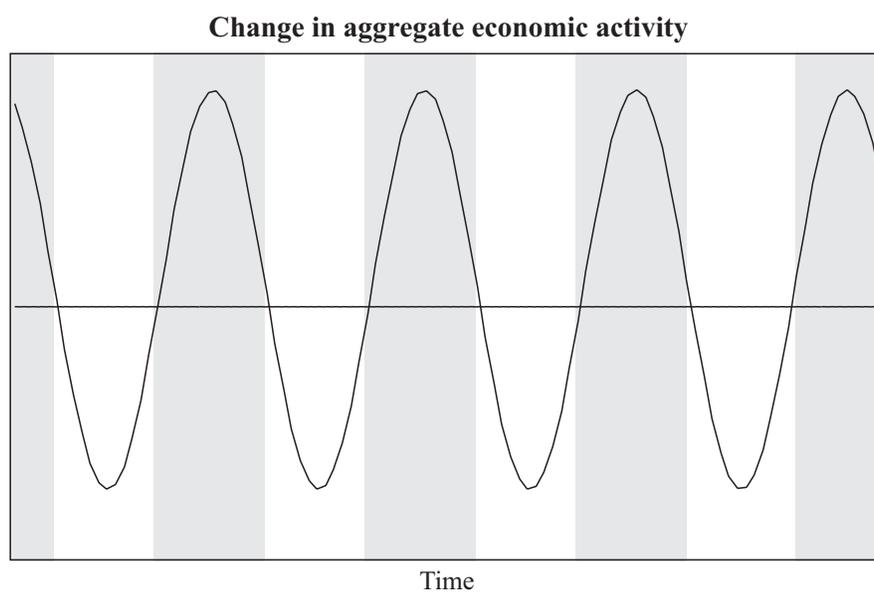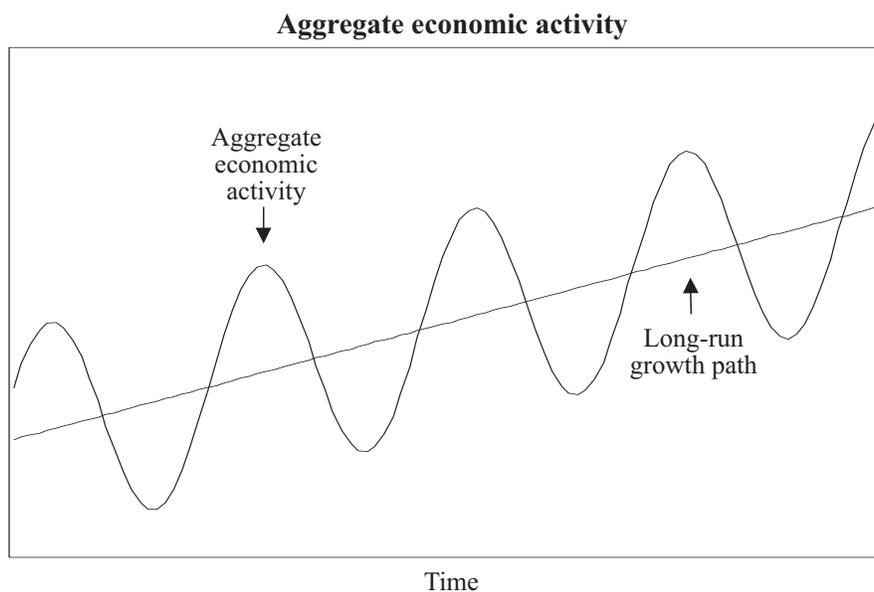
Figure 1
LOW-VOLATILITY ECONOMY

Aggregate economic activity

Aggregate
economic
activity

Long-run
growth path

Time

Change in aggregate economic activity

Time

Figure 2
HIGH-VOLATILITY ECONOMY

Aggregate economic activity

Aggregate
economic
activity

Long-run
growth path

Time

Change in aggregate economic activity

Time

Securities and Exchange Act of 1934, have also helped stabilize financial markets. The Securities and Exchange Act, for example, was designed to help inform investors and to prevent some abuses in financial markets by requiring corporations that issue securities to disclose certain information to the public and by restricting insider trading.

Economic policy activism. Government economic policy, both fiscal and monetary, has become more proactive. Since World War II and the enactment of the Employment Act of 1946, the economic mandates of the federal government and Federal Reserve System have been to pursue policies consistent with the full employment of resources. As a result, both fiscal policy and monetary policy have been more active in their attempts to stabilize the economy, prolong expansions, and end recessions. Well-timed, proactive fiscal and monetary policy might help extend expansions if policymakers stimulate the economy when economic activity is projected to slow and if policymakers can effectively tap the brakes when inflationary imbalances in the economy appear to be emerging.

The federal government can pursue these goals by adjusting government spending and tax rates. For example, the Economic Recovery Tax Act of 1981 and the 1986 Tax Reform Act were championed as a way to help Americans work, save, and invest more, which in turn would encourage sustainable economic growth.[15] Other government policies not specifically concerned with economic goals can also have an important effect on the economy.[16] However, the argument that fiscal policy can help stabilize the business cycle is subject to a caveat. Although discretionary fiscal policy has the potential to stabilize the economy, Zarnowitz and Moore (1982) have argued that the timing of fiscal policy actions has, at times, destabilized the economy.

The Federal Reserve System can pursue policies consistent with the full employment of resources through its control of credit. If economic growth is too slow, the Federal Reserve can stimulate the economy by increasing the amount of credit available to the economy. Conversely, if the economy is growing too rapidly, the Federal Reserve can slow the economy by reducing the amount of credit available to the economy. Monetary policy may have had a greater stabilizing effect in the postwar period, in part because of the mandate of the Employment Act of 1946, but also because during its early existence the Federal Reserve had limited tools at its disposal and was unsure of the effect of the tools it did possess.[17]

Structural changes in the economy

A second potential explanation for the shift in the behavior of expansions after World War II has been structural shifts in the economy. In the postwar period consumption has shifted toward less cyclically sensitive components, the composition of personal income has shifted toward more cyclically stable sources, employment has shifted toward more cyclically stable sectors, new inventory management techniques have been introduced, the economy has become increasingly globalized, and consumers and businesses may have become more confident in the economy.

Shifts in consumption, income, and employment. Some components of spending are more cyclically sensitive than other components. On the consumption side, durable goods consumption is more volatile than nondurable goods and services consumption. Most durable goods are highly storable and depreciate slowly. Since they last a long time, durable goods purchases can be postponed during economically difficult times. As a result, the demand for durable goods is highly sensitive to fluctuations in economic activity. At the opposite end of the spectrum are services. Services, in general, cannot be stored and, consequently, the demand for services is relatively stable. Nondurable goods, which include foodstuffs and clothing as well as other

items, are typically more storable than services but their lives are not as long as durable goods. Consequently, the demand for nondurable goods is more sensitive than the demand for services but less sensitive than the demand for durable goods.

In the postwar period there has been a large shift in consumer spending away from nondurable goods toward services and a modest shift in consumer spending away from nondurable goods toward durable goods. Spending on nondurable goods represented 56 percent of total consumer spending, on average, during the 1869-1939 period and 41 percent of total consumer spending during the 1947-97 period.[18] Between these two time periods the share of total consumer spending accounted for by services increased from 35 percent to 46 percent and the share of total consumer spending accounted for by durable goods increased from 9 percent to 13 percent. Hence, on net spending shifted toward the least cyclically sensitive component of consumption. This shift in spending patterns may have reduced the sensitivity to fluctuations of overall consumer spending and helped lengthen expansions.[19]

In recent years consumer spending has continued to shift toward less sensitive components. The large shift away from nondurable good spending toward spending on services has continued. In addition, there has been a small shift in spending away from durable goods toward services. From 1990 to 1997 spending on services represented 57 percent of total consumer spending. Spending on the more volatile components of consumption, durable goods spending and nondurable goods spending, represented 12 percent and 31 percent of total consumer spending, respectively. This recent shift may have contributed to a further reduction in the volatility of economic activity and a lengthening of expansions.

Some sources of income are more recession prone than others. Zarnowitz and Moore

(1986b) documented a shift in sources of income from those sources that have been more recession prone to those sources that have been less recession prone. They showed that the share of income accounted for by the most recession-prone sources (private wages and salaries, farm proprietors' income, and nonfarm proprietors' income) has drifted down since 1919. In 1919 these sources accounted for over 73 percent of total income, but by 1997 these sources accounted for 52 percent of total income. Over this same span the share of income accounted for by the least recession-prone sources (government wages and salaries, other labor income and transfer payments, dividends, interest, and net rent) drifted up from 27 percent to 48 percent of total income. This shift in the composition of income by sources appears to have strongly affected movements in total personal income. Zarnowitz and Moore (1986b) performed an experiment which showed that declines in personal income during seven postwar recessions from 1948 to 1980 would have been twice as large had there been no shift in the sources of income.[20] Although the shift in the composition of income appears to have stabilized since the early 1980s, the share of income accounted for by the least recession-prone sources is still quite high relative to historical norms and should continue to be a source of stabilization for the economy.

A third shift that has occurred in the economy has been a shift in employment between sectors. Zarnowitz and Moore (1986b) documented a shift in employment from cyclically sensitive sectors to cyclically insensitive sectors. They showed that the share of nonagricultural employment accounted for by the economy's four most cyclically sensitive sectors (transportation, communication, and public utilities; mining; construction; and manufacturing) has declined steadily. These sectors accounted for 57 percent of total nonagricultural employment, on average, from 1900 to 1939.[21] In the postwar period, from 1947 to 1997, these sectors accounted for less than 40 percent of total nonag-

ricultural employment. Over the same period the share of nonagricultural employment accounted for by the economy's four least cyclical sectors (finance, insurance, and real estate sector; wholesale and retail trade; government; and other services) has increased steadily. From 1900 to 1939 these sectors accounted for 43 percent of total nonagricultural employment. Since 1947, these sectors have accounted for over 60 percent of total nonagricultural employment.[22] This trend has continued in the current expansion: since 1990 the least cyclical sectors of the economy have accounted for 74 percent of total nonagricultural employment.

A shift in employment from cyclically sensitive sectors to cyclically insensitive sectors, in principle, could help moderate fluctuations in economic activity. However, while this explanation seems reasonable several researchers have concluded that the shift in employment has probably had little effect on the volatility of the business cycle or the duration of expansions.[23]

Changes in inventory behavior. While inventory investment is only a small part of total spending, fluctuations in inventories play an important role in business cycles. Researchers have shown that inventory investment has been an important factor in the decline of output during prewar and postwar recessions. For example, studies by Abramowitz and by Blinder have shown that changes in inventory investment have typically accounted for between 50 percent and 70 percent of the peak-to-trough decline in real GNP during recessions over the 1919-75 period. Over the course of a business cycle inventories may be a destabilizing influence and may help precipitate the ends of expansions. In the early stages of expansion consumption rises before output, which leads to inventories being drawn down. As a result, businesses attempt to increase their inventories. This increased investment in inventories causes a further increase in income and consumption and, hence, further increases in inventory investment, output, and

sales. At some point during the expansion the rate of sales growth slows, resulting in an unintended buildup in inventories. When businesses observe this buildup of inventories, they correct the imbalance by lowering their output to bring actual inventories more in line with their desired level. As a result, income and, hence, consumption and sales decline, leading to further desired decreases in inventories.

Recently, improved inventory management techniques may also have helped stabilize economic activity and lengthen economic expansions. Improved inventory management, through innovations such as the implementation of "just-in-time" management techniques and the use of bar codes, allows firms to hold lower levels of inventories. Consequently, inventory imbalances are less likely and when they do occur will tend to be less severe, leading to less of a need for inventory corrections and helping to lengthen expansions.[24] Over the last several years inventory accumulation has been rapid. Despite this rapid accumulation of inventories, however, there does not appear to be an inventory imbalance. Inventories have remained quite low relative to sales. Thus, a large, destabilizing swing in inventories does not appear to be likely in the near term.

Increased globalization. While the increased globalization of the U.S. economy has been an important postwar change, its effects on the volatility of economic activity and, hence, on the length of expansions are somewhat ambiguous. Some aspects of increased globalization can help reduce volatility in the economy. For example, as imports have become more important, spending by businesses and consumers has become increasingly divided between foreign and domestic goods. Consequently, reductions in spending by businesses and consumers have become increasingly absorbed by imports and have tended to reduce the volatility of economic activity in the United States. Other aspects of increased globalization can increase volatility in

the economy. For example, the recent economic turmoil in Asia and elsewhere in the world has demonstrated how increased globalization might increase volatility in the U.S. economy.

The economic turmoil that began in mid-1997 has affected the U.S. economy primarily through an increased trade deficit. Devaluations of the currencies of the countries embroiled in this turmoil reduced the dollar price of imports from these countries and raised the price of U.S. exports to these countries. As a result, the demand for imports from these countries has increased and the demand for U.S. exports has decreased. The affected countries have also experienced a substantial reduction in their growth, which has further reduced their demand for U.S. exports. Consequently, the U.S. trade deficit has increased, causing growth to slow substantially. For example, the growth of the trade deficit subtracted more than two percentage points, on average, from overall GDP growth in the first two quarter of 1998. Over the 1995-97 period, in contrast, the growing trade deficit subtracted only one-tenth of a percentage point, on average, from overall GDP growth. With the Asian economic spreading to other countries, the growing trade deficit is likely to continue to be a drag in the near future.

Shifts in confidence. A final structural change that may have occurred in the postwar period has been an increased level of confidence in the economy by consumers and businesses and, hence, more positive expectations about future economic conditions. Expectations play an important role in the economy. The economy can continue to operate at a high level in the face of unfavorable shocks when consumers and businesses are optimistic about the future prospects for the economy. Conversely, economic activity may slow despite favorable current conditions

when consumers and businesses are pessimistic about the future. Economists call this phenomenon self-fulfilling expectations: if expansions are expected to be shorter and expansions are expected to be longer, then they will be. Relatively long expansions since World War II may have helped reinforce these beliefs.

Confidence in the economy remains strong today. Two of the most widely publicized measures of consumer confidence, the Conference Board's index of consumer confidence and the University of Michigan's index of consumer sentiment, have reached record-high levels during the current expansion and have continued to remain high.

III. CONCLUSION

This article has shown that the long duration of the current expansion should not be viewed as worrisome when examined in the context of all other postwar expansions. First, expansions in the postwar period have been more than twice as long as expansions in the prewar period. Second, in the postwar period the fact that an expansion is long, in and of itself, is not an important determinant of the likelihood of its ending. An expansion that has lasted until the 91st month is no more likely to end in the next month than an expansion that has lasted until the 21st month. Furthermore, many of the factors that have contributed to this behavior over the postwar period are still true in the current expansion.

Although expansions in the postwar period have been longer and have not tended to die of old age, it is necessary to recognize that every expansion is different. Thus, policymakers cannot become complacent and will need to continue to assess whether imbalances have arisen in the economy and whether shocks have negatively affected the outlook for the economy.

APPENDIX A

Hazard models are one method that has been used to analyze duration data. Duration data consist of a series of data points that represent the time spent in different states. For example, the last two columns of Table 1 consist of data on the length of time the economy has spent in two states: recession and expansion. Other examples of duration data used in economic analyses have been the length of unemployment spells (Lancaster) and the length of time between transactions of a stock (Engle and Russell). Duration data have also been used extensively outside the economics field, particularly in the health-related sciences. An example of such data would be the time to mortality for heart transplant patients.

When estimating the hazard model two characteristics of the data must be dealt with. First, the data on expansion lengths that are being used include one observation that has been censored. That is, there is one observation whose full length is not yet known. The current expansion has lasted 92 months but is not yet complete. The only information we can glean from this observation is that the expansion has lasted at least 92 months. Treating this observation as a completed expansion would be incorrect and would affect the estimates obtained.

Second, the data on expansion lengths are truncated in the sense that we do not observe any expansions less than a certain length. For example, suppose an expansion is defined as two or more consecutive quarters

of real GDP increases; then we would not see expansions lasting one quarter or less. In this case, the data on expansion lengths would be truncated at one quarter. In reality, the definition of expansions is much less precise. Nevertheless, to obtain correct estimates, it is necessary to control for this truncation of the observed data.

The likelihood function for the hazard model is given by

$$L(\bullet) = \sum_{i=1}^{N} \{ d_i \log(\gamma) + d_i \log \alpha$$
$$+ (\alpha - 1) d_i \log(t_i) - \gamma (t_i^{\alpha} - t_o^{\alpha}) \}.$$

The parameters to be estimated are α and γ. The length of expansion i is given by It_i. The likelihood function corrects for censored observations through the dummy variable, d_i, which takes the value of 1 if an observation is uncensored and 0 if the observation is censored. The likelihood function corrects for the fact that our data are truncated through the variable t_0. In practice, the truncation value, t_0, has been chosen by using observed expansion lengths as a guide. The values of t_0 are chosen as the minimum observed expansion length minus 1 for the sample of expansions being examined. Over the entire sample of expansions the shortest observed expansion has been 10 months, implying that $t_0 = 9$. During the prewar period the shortest expansion was also 10 months implying that $t_0 = 9$. However, during the postwar period the shortest expansion was 12 months, implying that $t_0 = 11$.

APPENDIX B

Are the results sensitive to alternative business cycle dates?

This appendix examines the sensitivity of the results of this article to alternative business cycle dates. It also discusses why the NBER business cycle chronology may be flawed and introduces two alternative business cycle chronologies. The estimates presented show that there are only small differences in the results when alternative business cycle chronologies are used.

Why consider alternative business cycle dates?

The average lengths of expansions and recessions before and after World War II are vastly different. One explanation for this difference is that business cycle dynamics were very different in the two periods. A second explanation for this difference is that there may be an inconsistency in the way the dates of business cycle peaks and troughs were determined in the prewar and postwar periods. For example, the NBER officially defines a recession as "a recurring period of decline in total output, income, employment, and trade, usually lasting from six months to a year, and marked by widespread contractions in many sectors of the economy." This definition conforms very well to the postwar business cycle experience, during which 8 out of 10 recessions lasted between six months and a year. However, in the prewar period only 3 out of 21 recessions lasted less than a year.

There are several reasons why there may be an inconsistency in the dating of business

cycle peaks and troughs between the prewar and postwar periods. First, there is a great deal of difference in the availability of economic data in the prewar and postwar period. The availability of monthly and quarterly data was very limited during the early part of the NBER business cycle chronology. In addition, the data that were available largely were related to prices rather than production or employment. Second, the NBER focused on detrended data when determining business cycle turning points prior to 1927 but has used data with the trend still in it to determine business cycle turning points since then. Finally, there are differences in the way early and modern NBER researchers treated extreme values in the individual series examined.

Alternative business cycle dates

Because of these apparent inconsistencies in the NBER's business cycle dating methodology, several researchers have compiled alternative sets of business cycle dates. Romer (1994) applied an algorithm to industrial production data to determine business cycle turning points.[25] Watson (1994) compiled another set of business cycle turning point dates. He examined whether systematic differences in the volatility of the series used to date prewar and postwar business cycle turning points are important by creating an alternative set of postwar business cycle turning point dates using only those series which had been used to date the prewar recessions.[26]

The alternative sets of business cycle turning point dates developed by Romer and by Watson appear in Table B1. The Romer set

APPENDIX B - *continued*

Table B1

ALTERNATIVE BUSINESS CYCLE CHRONOLOGY FOR THE U.S.

Romer chronology		Watson chronology	
Trough	Peak	Trough	Peak
—	—	Dec. 1854	Jun. 1857
—	—	Dec. 1858	Oct. 1860
—	—	Jun. 1861	Apr. 1865
—	—	Dec. 1867	Jun. 1869
—	—	Dec. 1870	Oct. 1873
—	—	Mar. 1879	Mar. 1882
—	Feb. 1887	May 1885	Mar. 1887
Jul. 1887	—	Apr. 1888	Jul. 1890
—	Jan. 1893	May 1891	Jan. 1893
Feb. 1894	Dec. 1895	Jun. 1894	Dec. 1895
Jan. 1897	Apr. 1900	Jun. 1897	Jun. 1899
Dec. 1900	Jul. 1903	Dec. 1900	Sep. 1902
Mar. 1904	Jul. 1907	Aug. 1904	May 1907
Jun. 1908	Jan. 1910	Jun. 1908	Jan. 1910
May 1911	Jun. 1914	Jan. 1912	Jan. 1913
Nov. 1914	May 1916	Dec. 1914	Aug. 1918
Jan. 1917	Jul. 1918		
Mar. 1919	Jan. 1920	Mar. 1919	Jan. 1920
Jul. 1921	May 1923	Jul. 1921	May 1923
Jul. 1924	Mar. 1927	Jul. 1924	Oct. 1926
Dec. 1927	Sep. 1929	Nov. 1928	Aug. 1929
Jul. 1932	Aug. 1937	Mar. 1933	May 1937
Jun. 1938	Dec. 1939	Jun. 1938	—
Mar. 1940	—	—	Feb. 1945
—	Oct. 1948	Oct. 1945	Aug. 1948
Oct. 1949	—	Oct. 1949	Apr. 1951
—	Aug. 1953	Jan. 1952	Jul. 1953
Aug. 1954	Aug. 1957	Feb. 1954	Jun. 1956
Apr. 1958	May 1960	Apr. 1958	Nov. 1959
Feb. 1961	—	Sep. 1961	Oct. 1966
—	Oct. 1969	Jun. 1967	Nov. 1969
Nov. 1970	Nov. 1973	Jan. 1971	Oct. 1973
Jul. 1975	Mar. 1980	May 1975	Sep. 1978
Jul. 1980	Jul. 1981	Jan. 1980	Apr. 1981
Apr. 1983	—	Dec. 1982	Apr. 1984
—	Jul. 1990	Jan. 1986	Jun. 1989

Sources: The Romer chronology of business cycle dates was obtained from Romer (1994). The Watson chronology of business cycle dates was obtained from Watson (1994).

APPENDIX B - *continued*

extends only as far back as 1887 because of limitations on the availability of industrial production data prior to that year. The postwar Romer chronology is quite similar to the actual NBER chronology but the prewar chronologies differ markedly. There is one cycle that the NBER identified that was not identified by Romer and there are two cycles identified by Romer that had not been identified by the NBER. In addition, the turning point dates for the cycles identified by both

Romer and the NBER differ substantially.

The Watson chronology takes the NBER prewar business cycle chronology as given and, hence, his business cycle chronology extends back to 1854. Since World War II Watson has identified three cycles which the NBER had not identified. Also, the turning point dates for the cycles identified by both Watson and the NBER sometimes differ substantially.

Table B2

SENSITIVITY OF RESULTS TO USING ROMER CHRONOLOGY

	All expansions	Prewar expansion	Postwar expansions
Romer chronology			
γ	.0074	.0030	.0026
	(.011)	(.006)	(.007)
α	1.371	1.697	1.508
	(.337)	(.495)	(.617)
Restricted NBER chronology			
γ	.0158	.0014	.0025
	(.022)	(.003)	(.006)
α	1.214	2.002	1.522
	(.324)	(.600)	(.573)

Notes: Standard errors are in parentheses. Calculations are based on the NBER business cycle chronology presented in Table 1 and the Romer business cycle chronology presented in Table B1. The entire sample for the Romer chronology consists of all Romer expansions between 1887 and 1990 excluding the wartime March 1940-October 1948 expansion identified by Romer. The entire sample for the NBER chronology consists of all NBER expansions between 1887 and 1990 excluding the wartime June 1938-February 1945 expansion. The prewar sample for the Romer chronology consists of the 15 expansions that Romer identified as occurring between 1887 and 1939. The prewar sample for the NBER chronology consists of the 14 expansions that the NBER identified as occurring between 1887 and 1938. The postwar sample for the Romer chronology consists of the 8 expansions that Romer has identified as occurring between 1945 and 1990. The postwar sample for the NBER chronology consists of the 9 expansions that the NBER has identified as occurring between 1945 and 1990.

APPENDIX B - *continued*

Table B3

SENSITIVITY OF RESULTS TO USING WATSON CHRONOLOGY

	All expansions	Prewar expansions	Postwar expansions
Watson chronology			
γ	.0006	.0003	.0131
	(.001)	(.001)	(.040)
α	2.208*	2.381*	1.392
	(.385)	(.521)	(.754)
NBER chronology			
γ	.0089	.0003	.0025
	(.011)	(.001)	(.006)
α	1.369	2.381*	1.522
	(.290)	(.521)	(.574)

Notes: Standard errors are in parentheses. * indicates that the coefficient is significantly greater than 1 at the 5 percent level. Calculations are based on the NBER business cycle chronology presented in Table 1 and the Watson business cycle chronology presented in Table B1. The entire sample for the Watson and NBER business cycle chronologies consists of all expansions that occurred between 1854 and 1990 excluding the wartime June 1938-February 1945 expansion. The prewar samples for both the Watson and NBER business cycle chronologies consist of the 21 expansions that occurred between 1854 and 1938. The postwar sample for the Watson chronology consists of the 12 expansions that Watson has identified as occurring between 1945 and 1990. The postwar sample for the NBER chronology consists of the 9 expansions that the NBER has identified as occurring between 1945 and 1990.

Implications of the alternative business cycle chronologies

The results from estimating the basic hazard model using both the Romer and NBER business cycle chronologies for the 1887-1990 period appear in Table B2. As shown in the bottom half of the table, using the NBER business cycle chronology for the restricted 1887-1940 period slightly alters one important result from the analysis of the prewar period presented in the main text of the article. Expansions over the shortened prewar chronology do not appear to become more likely to end as they get longer.[27] However, as shown in the top half of the table, using the Romer business cycle chronology instead of the NBER business cycle chro-

APPENDIX B - *continued*

nology for the 1887-1990, 1887-1940, and 1949-40 periods does not alter any of the results. In particular, postwar expansions do not show any significant tendency to die of old age.

The results from estimating the basic hazard model using both the Watson and NBER business cycle chronologies for the 1854-1990 period appear in Table B3. The prewar results for the NBER and Watson chronologies were identical since Watson took the prewar NBER business cycle chronology as given. Using the Watson business

cycle chronology did alter one conclusion obtained using the NBER business cycle chronology. Expansions over the entire Watson chronology appeared more likely to end as they got older. However, the key conclusion from this article was unchanged when the Watson business cycle chronology was used instead of the NBER business cycle chronology. The behavior of expansions in the postwar period was different than that of expansion in the prewar period. Postwar expansions have demonstrated no significant tendency to die of old age.

ENDNOTES

[1] Economists have used a variety of techniques to analyze the probability of an expansion ending. Diebold and Rudebusch (1987, 1991) and Watson (1994) have used nonparametric methods to examine the length of business cycle phases. Sichel (1991) and Diebold, Rudebusch, and Sichel have used parametric methods, like the ones used in this article, to examine whether the probability of an expansion ending depends on the length of the expansion. Other researchers, such as Stock and Watson and Filardo and Gordon, have used leading indicators to model the probability of recessions. Huh (1991) and Watson (1991) provided an introduction to several of these methodologies.

[2] The guiding principles used to define business cycles were laid out in the mid-1940s. Arthur Burns and Wesley Mitchell defined business cycles as "…a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own" (1946, p. 3).

[3] The Burns and Mitchell definition of business cycles might be interpreted as suggesting that the business cycle consists of more than two phases. Some researchers, including Shultze; Eckstein and Sinai; and Sichel (1994) have identified three stages of the business cycle: recession, recovery, and expansion. As in the standard definition, a recession is a period during which aggregate economic activity declines. The recovery stage of the business cycle is defined as a high-growth period that follows the recession stage and boosts aggregate economic activity back to its prerecession level. The third stage, the expansion, is a slower growth period during which aggregate economic activity exceeds its prerecession level.

[4] The NBER is a private, nonprofit, nonpartisan research organization dedicated to promoting a greater understanding of how the economy works.

[5] This definition, as well as other information on U.S. business cycles, is available at http://www.nber.org/cycles.html. Although a common definition of recession is at least two consecutive quarters of decline in real GNP, the NBER makes clear that this is not how they define a recession. Zarnowitz and Moore (1986a) have pointed out two drawbacks to this rule-of-thumb. First, even though GNP is a very comprehensive indicator it is only able to

measure some aspects of aggregate economic activity. Second, because all economic series contain some measurement error it is better to identify business cycles based on the weight of evidence from a consensus of indicators rather than a single indicator. Other researchers, including Zarnowitz and Moore (1986b), McNees, and Watson (1991), have pointed out that recession dates obtained using this rule-of-thumb do not correspond to official recession dates very well.

[6] Although it may be widely agreed that a business cycle phase has ended the dating of the turning point does not occur immediately upon the end of a business cycle phase. The Committee last met in December 1992 when they determined that a trough had been reached in March 1991. For the last six turning points, it has taken an average of ten months between the date of a turning point and the date it was announced.

[7] The prewar subsample consists of business cycle phases that were completed prior to the end of 1945. The postwar subsample consists of business cycle phases that were completed after 1945.

[8] For an excellent introduction to hazard models, see Kiefer.

[9] Although this article deals with expansions the hazard models used in this analysis could also be applied to data on recessions. Copies of this analysis of recession lengths are available from the author upon request.

[10] These estimates confirm that the conclusions reached by Sichel and Diebold, Rudebusch, and Sichel using business cycle data ending in 1990 have been unchanged during the current business cycle.

[11] Many economists, such as DeLong and Summers, have argued that there has been a significant decline in the size of economic fluctuations between the prewar and postwar periods. Others, such as Romer (1986), have argued that there was no increase in the stability of the U.S. economy in the prewar period. Any evidence of increased stability, Romer argued, was due to flawed prewar data. However, O'Brien demonstrated that Romer's results were sensitive to the choice of data series that were compared, the choice of detrending method, and the time periods compared.

[12] The two example economies differ only with respect to the amplitude of the fluctuations around the long-run growth path. The long-run growth paths in each of these two example economies are identical. In addition, the periodicities of the fluctuations around the long-run growth path in each of these two example economies are the same.

[13] Data for the 1869-1916 period were obtained from the

U.S. Department of Commerce (1975). Data for the 1919-39 period were obtained from Balke and Gordon. Data for the 1947-97 period were obtained from the U.S. Department of Commerce (1998).

[14] Although automatic stabilizers are items in the government's budget, they are not part of discretionary fiscal policy. Discretionary fiscal policy involves the government enacting changes in the government budget.

[15] For a given level of volatility of economic activity, an increase in growth would lead to longer expansions and shorter recessions. Expansions in an economy with a higher long-run rate of growth are longer than expansions with a lower long-run rate of growth because higher long-run growth tends to dominate fluctuations around the long-run growth path more than lower long-run growth.

[16] For example, the Veteran's Benefits Act of 1944 (GI Bill) has helped to promote economic growth and, hence, lengthen expansions through the development of human capital.

[17] Although the Federal Reserve System was established in 1914, its mandate and the tools it had available to it were limited during the earliest years of its existence. For example, the Federal Reserve did not have the power to change reserve requirements and its open market operations were limited because Reserve Banks did not have securities they could sell. Open market operations did not become the dominant monetary policy tool until after World War II. In addition, during the prewar period the role of the Federal Reserve System was still being debated and the Federal Reserve was still learning about the effects of the monetary policy tools they had at their disposal. For an excellent discussion of the history of the Federal Reserve System and the conduct of monetary policy, see Meulendyke.

[18] These percentages are based on nominal spending data from two sources. Data for the 1869-1931 period were obtained from the U.S. Department of Commerce (1975) and the rest of the data were obtained from U.S. Department of Commerce (1998).

[19] This net shift in spending toward the most cyclically sensitive component of consumption does not necessarily translate into a reduction in the cyclical sensitivity of overall consumer spending. Since spending is shifting away from nondurable goods toward the more sensitive durable goods component and the less sensitive services component, the impact of this shift on the sensitivity of overall consumer spending would depend on the sensitivities of spending on durable goods and spending on services relative to the sensitivity of spending on nondurable goods. For example, if spending on durable

goods was significantly more cyclically sensitive than spending on nondurable goods and spending on services was only slightly less cyclically sensitive than consumer spending, on net, shifted toward services the cyclical spending of overall consumer spending might increase.

[20] In their experiment Zarnowitz and Moore created a pseudo history of declines in personal income during recessions by weighting the actual declines in the sources of personal income by their 1948 shares of total personal income. Using this pseudo history they found that personal income would have declined 2.3 percent on average over the seven recessions from 1948 to 1980 compared with an actual 1.1 percent average decline during these recessions.

[21] These cyclically sensitive sectors also accounted for a large share of employment prior to 1900. For example, Kendrick reported that in 1869 these sectors accounted for almost 59 percent of total nonagricultural employment.

[22] Caves observed a qualitatively similar, though not as sharp, trend in the distribution of income among these eight sectors.

[23] Watson (1994) and Filardo (1997) have both investigated this relationship. Watson (1994) examined whether the employment shift from cyclically sensitive sectors to cyclically insensitive sectors has led to an increase in the length of expansions in the postwar period. He performed two experiments, both of which suggest that the increased length of expansions in the postwar period is not a result of the changing composition of employment. In the first experiment Watson created a pseudo prewar history of sectoral employment by using prewar trend components of sectoral employment and postwar cyclical components of sectoral employment. He found that the

trend components of sectoral employment explained the apparent difference in prewar and postwar phase durations. In the second experiment he created a pseudo prewar and postwar history of sectoral employment using a dynamic factor model. He found that implausibly large covariance among employment in various sectors would be necessary to explain average prewar phase durations.

Filardo (1997) investigated whether the declining manufacturing share in employment since 1960 has led to a less volatile business cycle and longer expansions. He found no evidence of such a relationship.

[24] The effect of improved inventory management techniques is most likely to have been noticed in the last two decades. However, Filardo (1995) and Allen showed that the effect of these changes in inventory management techniques on economic activity has, to date, been negligible. Nevertheless, Allen concluded by suggesting that, in the long run the inventory management innovations can reduce the boom-bust cycle in the economy.

[25] This is a loss-based algorithm that incorporates the notion that recessions must be of significant duration and amplitude.

[26] He used the algorithm developed by Bry and Boschan to find peaks and troughs for seven series and then judgmentally based his business cycle turning point dates based on the turning point dates for the specific series.

[27] The difference between the prewar period results for the 1887-1940 sample presented in Table B2 and the 1854-1940 period presented in Table 3 is very small. Although α is not significantly greater than 1 at the 5 percent significance level, it is significantly greater than 1 at the 6 percent significance level.

REFERENCES

Abramovitz, Moses. 1950. *Inventories and Business Cycles with Special Reference to Manufacturers' Inventories*. New York: National Bureau of Economic Research.

Allen, Donald S. 1995. "Changes in Inventory Management and the Business Cycle," Federal Reserve Bank of St. Louis, *Economic Review*, July/August, pp. 17-26.

Balke, Nathan S., and Robert J. Gordon. 1986. "Historical Data," in Robert J. Gordon, ed., *The American Business Cycle: Continuity and Change*. Chicago: The University of Chicago Press.

Blinder, Alan S. 1990. "Inventories and the Structure of Macro Models," in Alan S. Blinder, ed., *Inventory Theory and Consumer Behavior*. Ann Arbor: The University of Michigan Press.

Burns, Arthur F., and Wesley C. Mitchell. 1946. *Measuring Business Cycles*. New York: National Bureau of Economic Research.

Bry, Gerhard, and Charlotte Boschan. 1971. *Cyclical Analysis of Time Series: Selected Procedures and Computer Programs*. New York: National Bureau of Economic Research.

Caves, Richard E. 1980. "The Structure of Industry," in Martin Feldstein, ed., *The American Economy in Transition*. Chicago: The University of Chicago Press.

DeLong, J. Bradford, and Lawrence H. Summers. 1986. "The Changing Cyclical Variability of Economic Activity in the United States," in Robert J. Gordon, ed., *The American Business Cycle: Continuity and Change*. Chicago: The University of Chicago Press.

Diebold, Francis X., and Glenn D. Rudebusch. 1991.

"Shorter Recessions and Longer Expansions," Federal Reserve Bank of Philadelphia, *Business Review*, November/December, pp. 13-20.

_____. 1987. "Does the Business Cycle Have Duration Memory?" Federal Reserve Board of Governors Special Studies Paper no.223.

_____, and Daniel E. Sichel. 1993. "Further Evidence on Business-Cycle Dependence," in James H. Stock and Mark W. Watson, eds., *Business Cycles, Indicators, and Forecasting*. Chicago: University of Chicago Press.

Eckstein, Otto, and Allen Sinai. 1986. "The Mechanisms of the Business Cycle in the Postwar Era," in Robert J. Gordon, ed., *The American Business Cycle: Continuity and Change*. Chicago: The University of Chicago Press.

Engle, Robert F., and Jeffrey R. Russell. 1994. "Forecasting Transaction Rates: The Autoregressive Conditional Duration Model," NBER Working Paper 4966, December.

Filardo, Andrew J. 1997. "Cyclical Implications of the Declining Manufacturing Employment Share," Federal Reserve Bank of Kansas City, *Economic Review,* Second Quarter, pp. 63-87.

_____. 1995. "Recent Evidence on the Muted Inventory Cycle," Federal Reserve Bank of Kansas City, *Economic Review*, Second Quarter, pp. 27-44.

_____, and Stephen F. Gordon. 1998. "Business Cycle Durations," *Journal of Econometrics,* vol. 85, no. 1, pp. 99-124.

Friedman, Milton, and Anna J. Schwartz. 1963. *A Monetary History of the United States*, 1867-1960. Princeton: Princeton University Press.

Huh, Chan G. 1991. "Recession Probability Indexes: A Survey," Federal Reserve Bank of San Francisco, *Economic Review,* Fall, pp. 31-40.

Kendrick, John W. 1961. *Productivity Trends in the United States.* New York: National Bureau of Economic Research.

Kiefer, Nicholas M. "Economic Duration Data and Hazard Functions," *Journal of Economic Literature*, vol. 26, no. 2, pp. 646-79.

Lancaster, Tony. 1979. "Econometric Methods for the Duration of Unemployment," *Econometrica*, vol. 47, no. 4, pp. 939-56.

McNees, Stephen K. 1987. "Forecasting Cyclical Turning Points: The Record in the Past Three Recessions," Federal Reserve Bank of Boston, *New England Economic Review*, March/April, pp. 31-40.

Meulendyke, Ann-Marie. 1989. *U.S. Monetary Policy and Financial Markets*. New York: Federal Reserve Bank of New York.

O'Brien, Anthony Patrick. 1992. "Has Industrial Production Been Less Volatile Since World War II?" *Quarterly Review of Economics and Finance*, vol. 32, no. 3, pp. 60-67.

Romer, Christina D. 1994. "Remeasuring Business Cycles," NBER Working Paper 4150, August.

_____. 1986. "Is the Stabilization of the Postwar Economy a Figment of the Data?" *American Economic Review*, vol. 94, no. 3, pp. 314-34.

Schultze, Charles L. 1964. "Short-Run Movements of Income Shares," in *The Behavior of Income Shares: Selected Theoretical and Empirical Issues*. Princeton, N.J.: Princeton University Press.

Sichel, Daniel E. 1994. "Inventories and the Three Phases of the Business Cycle," *Journal of Business and Economic Statistics*, vol. 12, no. 3, pp. 269-77.

_____. 1991. "Business Cycle Duration Dependence: A Parametric Approach," *The Review of Economics and Statistics*, vol. 73, no. 2, pp. 254-60.

Stock, James H., and Mark W. Watson. 1993. "A Procedure for Predicting Recessions with Leading Indicators: Econometric Issues and Recent Experience," in James H. Stock and Mark W. Watson, eds., *Business Cycles, Indicators, and Forecasting*. Chicago: The University of Chicago Press.

U.S. Department of Commerce. 1998. Bureau of Economic Analysis. *Survey of Current Business.* August.

_____. 1975. *Historical Statistics of the United States: Colonial Times to 1970*. Washington: Government Printing Office.

Watson, Mark W. 1994. "Business-Cycle Durations and Postwar Stabilization of the U.S. Economy," *American Economic Review*, vol. 84, no. 1, pp. 24-46.

_____. 1991. "Using Econometric Models to Predict Recessions," Federal Reserve Bank of Chicago, *Economic Perspectives*, November/December, pp. 14-30.

Zarnowitz, Victor, and Geoffrey H. Moore. 1986a. "Forecasting Recessions Under the Gramm-Rudman-Hollings Law," NBER Working Paper 2066, November.

_____. 1986b. "Major Changes in Cyclical Behavior," in Robert J. Gordon, ed., *The American Business Cycle: Continuity and Change.* Chicago: The University of Chicago Press.

_____. 1982. "Sequential Signals of Recession and Recovery," *The Journal of Business,* vol. 55, no. 1, pp. 57-86.