CHAPTER Cb

Business Fluctuations and Cycles

Editor: Richard Sutch

Economic Fluctuations, Recessions, and Depressions

Richard Sutch

If one takes the long view, the story of the American economy has been one of steady growth. The output of the economy has grown more rapidly than the population, thus raising the standard of living over time. The per capita output of the economy has grown at a rate of about 2 percent per year from at least the 1850s to the present day (Table Ca9–19). However, if one takes the short view – which is, after all, the view of most contemporaries – then the performance of the economy is decidedly mixed. The growth path of the American economy has been punctuated by recurrent episodes of absolute decline. Short periods when the economy is in decline are called recessions; if the decline is particularly severe and sustained, the term "depression" is used. Short periods during which an economy recovers from an episode of interrupted growth are called expansions. When used technically, the terms "recession" and "depression" refer only to the contraction phase of a downturn. However, it is also common to refer to the entire period during which the economy operates below its potential as a recession or a depression (see Figure Cb-A). For example, the "Great Depression of the 1930s" is a term historians apply to the entire period of decline, 1929–1933, and then the slow recovery lasting until 1940.

These fluctuations are a simultaneous movement of output and employment in many industries across nearly all sectors of the economy. In other words, they are a "macroeconomic" phenomenon.[1] A recession is more than an isolated setback in one or two industries or within a localized region. Simultaneous declines and expansions in many industries and regions can occur because the economy is a complex, highly interconnected network of businesses, consumers, and income earners. The misfortunes of one sector or group are quickly transmitted to other industries through these connections. When other industries respond in parallel, the downturn widens as it deepens in a self-reinforcing downward spiral. For example, if consumers as a group become cautious or feel nervous about their future economic situation, they may decide to cut back purchases of new automobiles. In the face of uncertainty, they decide that they can get along with the old car for another year. The resulting decline in new car sales leads to cutbacks in automobile production, which in turn means fewer orders by auto manufacturers for new tires and automobile radios. With the fall in new auto sales, there is a diminished need for truck drivers to transport new cars to dealers. When autoworkers and truck drivers are put out of work because of the decline in sales, they cut back on their consumption of many goods, thus transmitting the decline in demand even more broadly.

Precisely what forces precipitate the change from boom to bust or from bust to boom in American history is still a subject of unsettled debate. The issue has led to the creation of a vast literature. Historians have typically examined each episode as an isolated event and have placed the blame on a diverse set of disturbances, such as shocks to key industries, political upheavals, bad weather, financial panics, and, in the twentieth century, on mistakes or even deliberate mismanagement of the economy by political leaders. Economists, by contrast, have focused on the periodic recurrence of economic fluctuations and the broadly similar patterns of downturn and recovery, and typically have chosen to study the business cycle as a single analytic entity. It was once thought that the business cycle had a mathematical regularity and predictability that could be uncovered by systematic study. This view is no longer held widely. Instead, most economists view economic fluctuations as complex, varied, and unpredictable, with multiple causes and uncertain dynamics. Some economists view them as inherent in market-oriented economies and others consider them accidental departures from a position of "economic equilibrium." An excellent introduction to the topic with a good review of the history of thought on the subject is Zarnowitz (1992). David Glasner (1997) has edited a valuable general reference.

A classic study of the business cycle was undertaken by Arthur F. Burns and Wesley C. Mitchell (1946). They defined a cycle as beginning at a peak in business activity and consisting of a contraction to a trough followed by an expansion composed of a recovery to the previous peak and then a continued expansion toward the next peak. Table Cb1–4 reproduces the chronology of the Burns–Mitchell business cycles beginning with 1790 and running to 1855. The table dates the peaks and troughs by year and gives the length of each contraction and expansion. Table Cb5–8, using dating by

[1] The study of economic fluctuations, together with the study of economic growth, constitutes one of the two main branches of economics. Called "macroeconomics," this subdiscipline takes a systemic approach that looks at the economic system as a whole. Two standard introductions to macroeconomics are J. Bradford DeLong (2002) and Robert J. Gordon (2000).

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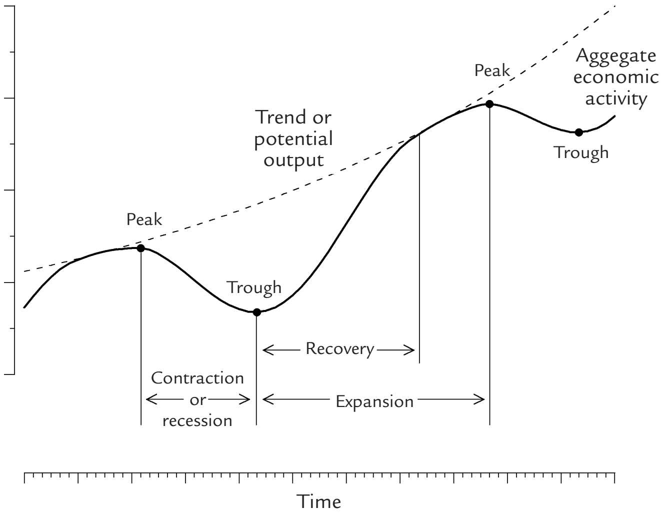

FIGURE Cb-A Nomenclature of the business cycle

Documentation

This stylized picture of a business cycle graphs a measure of aggregate economic activity, such as real per capita gross domestic product or an index of industrial production, as a solid line. The level of potential output is assumed to grow exponentially along the dashed trend line. An exponential trend has the property that the annual percentage change in the series is a constant. The constant is the rate of growth. A peak in economic activity occurs when the measured series reaches a local maximum. Two such peaks are shown in the figure. A trough is reached when the series is at a local minimum. A contraction in economic activity, commonly called a recession, occurs as output or production falls from the peak to a trough. A recovery lasts from a trough until the economy returns to its long-run growth path. In general usage, an expansion is measured from trough to peak.

month rather than calendar year, extends the chronology up through March 2001.

Burns and Mitchell established the dates up through World War II using a rather complex procedure that required the contraction phase to be substantial in magnitude (depth), sufficiently sustained (duration), and broadly felt (diffusion). Since World War II, the National Bureau of Economic Research (NBER), a private not-for-profit research organization in Cambridge, Massachusetts, has maintained the generally accepted business cycle chronology. The NBER's Business Cycle Dating Committee does not use a mechanical empirical formula for dating the start or end of a recession. Instead, the committee members are asked to use their educated judgment in making these determinations (Hall 2002). Although the NBER is in the Burns and Mitchell tradition, the modern procedures are different and somewhat inconsistent with the procedures used to date the pre–World War II recessions. For a discussion and an alternative set of dates for the period 1887–1940, see Romer (1994). Defined by the Burns-Mitchell-NBER methodology, business cycles last more than one year.

This chapter differs from other chapters in *Historical Statistics of the United States* in two ways. Other chapters focus on presenting long time series of annual data to document trends and slowly evolving developments in American history (see, for example, Chapter Ca, on national income accounting). With few exceptions, the time series reported in the other chapters are not presented more frequently than with annual observations, although in many cases monthly or even daily data are available in the original source or in historical archives. Economic fluctuations that are the subject of this chapter, however, are best studied using data that are recorded monthly or quarterly. Second, the other chapters of *Historical Statistics of the United States* set out to survey the entire quantitative historical record of the subject matter under review. This chapter cannot provide a comprehensive and exhaustive review and at the same time present time series on a monthly basis. This task would fill many volumes, not a single chapter. Here, our objective is different. This chapter is meant to help the user of *Historical Statistics of the United States* analyze the trends and long-term movements documented in the other chapters with a greater sensitivity to the disruptions in those trends caused by economic fluctuations.

Although the presentation of data here is sparse, there are several machine-readable data bases that provide access to a large volume of historical time-series data on economic fluctuations. A standard source, available on the Internet, is the NBER business cycle archive, which has good coverage of the period between World War I and World War II (and thus the Great Depression) (Feenberg, Miron, et al. 1967). A proprietary source for the period from 1947 to date is Standard and Poor's DRI BASIC Economics Database. There are only a few monthly time series with extensive track records for the period before World War I. One compilation of such data for the period 1860–1880 is Mitchell (1908). For the period 1879–1911, see Mitchell (1913). A review of available monthly time series for the period before World War II with a bibliography of sources can be found in Burns and Mitchell (1946).

Trend-Cycle Decomposition

In a stagnant economy with no population growth, it would be easy to observe fluctuations in aggregate economic activity as time series such as real gross domestic product (GDP) or total employment moved up and down. However, because the American economy has grown throughout its history, its economic fluctuations cycle about a rising trend. When the growth is strong and the fluctuations are weak, the trend may mask or distort the fluctuations. Thus, the study of fluctuations is intrinsically bound to the study of growth.

An illustration may help. Figure Cb-B presents a time plot of real GDP per capita using quarterly data for the period 1947–2003. GDP is a measure of the total annual economic output of the country. "Real" GDP is the national GDP adjusted to eliminate the impact of inflation on the figures. Real GDP is divided by the population to obtain real per capita GDP (series Cb11). This series is often taken as a measure of aggregate economic activity. As is clear from the graph (which uses a logarithmic scale), the series exhibits a long-term upward trend that is perturbed by periodic, but irregular, fluctuations. We wish to decompose the series into two components, its trend and the departures from the trend. Neither component is observed, so we must have additional information or impose restrictive assumptions before we can separate the two components. For example, if by a priori assumption or theorizing we can characterize the trend component sufficiently, we can extract the fluctuation component from the series by subtraction. Alternatively, if theory or assumption allows us to characterize the properties of economic fluctuations, then the trend component can be extracted by subtraction.

Burns and Mitchell (1946) conceived of the business cycle as a continuous sequence – a contraction followed by revival, which

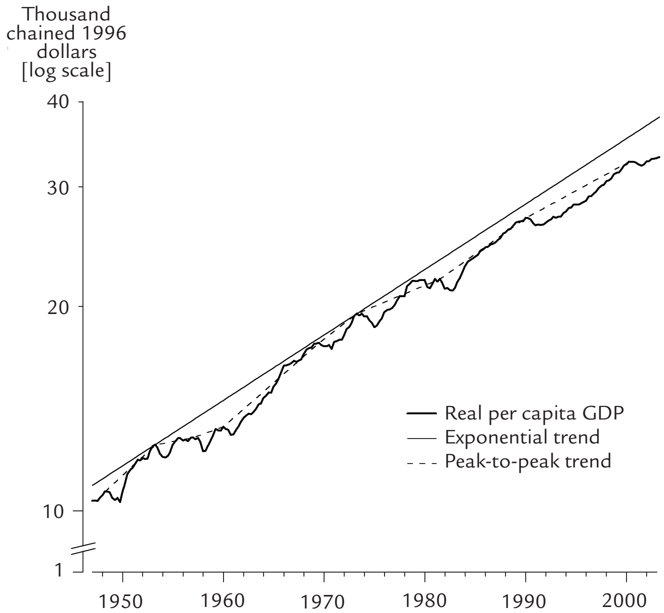

FIGURE Cb-B Real per capita gross domestic product with trends: 1947–2003

Sources

Series Cb11–12 and Cb14.

would be followed by a resumed expansion, which would terminate with a new contraction. This conception defines the trend as a line of constant growth rate that moves from peak to peak of the series. Such a trend for real per capita GDP is provided in series Cb14 and is displayed in Figure Cb-B. Although the Burns–Mitchell approach to trend-cycle decomposition has an intuitive appeal, it is subject to two objections. First, the method proposed for dating the peaks of the series is both arbitrary and vague: the peaks had to be more than a year apart, and the resulting cycle could not be divisible into "shorter cycles of similar character" (Burns and Mitchell 1946, pp. 5–8). Second, in principle there is no reason why a cyclical peak in a given series should represent a point on the long-run trend. Indeed, several recessions, including the Great Depression of the 1930s, exhibit a W-shape. In such recessions, economic activity fell, began to revive, but then fell again before a full recovery was reached.

To avoid these difficulties, macroeconomists in the 1950s and 1960s adopted the simplifying assumption that aggregate economic activity would grow at a constant exponential rate for long periods spanning multiple business cycles. To implement this assumption, one needs to choose only two points through which the trend passes and calculate the rate of growth between them. Series Cb12, also graphed in Figure Cb-B, is a simple exponential trend for real per capita GDP calculated in this manner for the period 1947:1 to 2003:2. The line passes through the observations of real per capita GDP for 1953:1 and 1973:2. The two dates were chosen so that all of the actual data lie below the trend line. All departures from the trend (series Cb13) could be said to measure how far actual economic performance is below a ceiling defined by the trend. Throughout the entire time span shown, the trend grows at a constant rate of 2.24 percent per year.

As an alternative to selecting two points, the rate of exponential growth may be calculated as one element in an econometric time-series analysis of the macroeconomy. With this approach, output would be modeled as a function of several economic variables and a time trend or, equivalently, the change in output would be modeled as a function of economic variables and a constant. Typically, such models are estimated by linear or logarithmic regression, and the trend is thus estimated in such a way as to minimize the sum of the squared deviations from the trend. With this methodology, deviations are balanced between positive and negative departures from the trend. A pioneering study in this tradition is by Lawrence R. Klein (1950, Chapter 3, model III).

The exponential approach implemented either by the point-to-point method or by regression analysis was soon found to be unsatisfactory. The deviations from the trend did not correspond well with other measures of poor economic performance, such as the unemployment rate. For example, series Cb13 implies that the entire period from 1953 through 1969 was of suboptimal performance, but many macroeconomists would argue that 1957, late 1959 to early 1960, and the period 1965–1969 represented reasonably satisfactory, if not optimal, aggregate economic activity. Extrapolating the trend beyond 1973 produces a widening divergence, suggesting that the trend rate of growth may have been lower in the 1980s and 1990s than during the twenty years prior to 1973.

In principle there is no reason why a trend could not change its rate of growth. Economists' notions of the causes of economic growth make reference to the stock of productive capital relative to the labor force, the training and education of the labor force, and the progress of science and technology. These underlying determinants of growth may change at different speeds or even move in different directions at various times in the economy's history, causing potential output or trend output to grow more or less rapidly as a consequence. For example, in Figure Cb-B it would appear that the rate of growth of real per capita GDP in the 1960s was substantially higher than the rate of growth in either the 1950s or the 1970s.

Unfortunately, the sources of economic growth are difficult if not impossible to measure accurately. Technological progress in particular has never been adequately quantified (Gordon 1999, Abramovitz and David 2000; see also Denison 1962 and 1969, Jorgenson and Griliches 1967). Thus, some researchers specified a variable trend and sought to estimate it by statistical inspection of data on aggregate economic activity (for a review, see Stock and Watson 1988).

This approach soon uncovered a major problem. There was no way to know in advance – or to estimate statistically – how variable the trend may be. One economist's "trend" could be another's "cycle." The smoother the trend component is assumed to be, the larger will be the estimated fluctuations. The more irregularity in the trend, the smaller will be the amplitude of fluctuations. In the extreme case, one can imagine that *all* movements in economic time series represent variations in the trend rate of growth and that there is no business cycle at all. Such a view, however, would be contradicted by economic history. We have ample evidence that recessions in economic activity are coincident with human suffering in the face of unutilized or underutilized resources. They are associated with widespread unemployment, excess productive capacity, high rates of business and bank failures, and falling real income to a degree that seems unrelated to probable changes in capital, education, or technology. As the study of business cycles is motivated in no small part by the desire to mitigate these economic failures, assuming a highly variable growth trend that defines away the cycle has little appeal. The problem is further exacerbated if we imagine, as seems innocent enough, that our observations of economic data contain a random element, either because of measurement error or simply because human behavior has a random component. Beveridge and Nelson (1981) and Nelson and Plosser (1982) argue that many macroeconomic variables have time series properties that make them appear indistinguishable from a randomly variable trend (described in the literature as a "random walk with drift" or a "stochastic trend"). If this is true, a mechanical econometric solution to separating a variable trend from the cycle that relies on no data other than the series under study is not possible. Thus, new evidence needs to be brought to the problem (see Craine 1997).

On the other hand, moving in the opposite direction, assuming very little variability in the rate of growth would make all of the series' idiosyncrasies (and measurement errors) part of the deviations, thus confounding the study of the business cycle. This view, too, has little appeal. Moreover, detrending a series in this fashion can create spurious cycles. A famous study by Simon Kuznets (1958) postulated a cycle of approximately twenty years. To reveal the twenty-year cycle, Kuznets first used a five-year moving average to remove the business cycle and then an eleven-year differing operation to remove the trend. G. S. Fishman (1969) demonstrated that this technique was capable of creating a cycle of 20.3 years.

One alternative approach to the problem of separating trend from cycle is to make assumptions not about the trend but about the nature of the transitory component of a series. For example, if we believe that movements in the unemployment rate, business failure rate, level of consumer confidence, or other macroeconomic variables trace out (or define) the business cycle, we can then use data on these movements to estimate the cyclical component of aggregate economic activity. The best-known advocate of this approach was Arthur M. Okun (1962). Okun pointed out the close negative correlation between the rate of growth of real gross national product ($100\,(\Delta Y/Y_{t-1})$) and the change in the rate of unemployment (U):

$$100\,(\Delta Y/Y_{t-1}) = a - b\,(U_t - U_{t-1})$$

Although the exact quantitative form of this relationship has changed somewhat over the last forty years, it has remained remarkably stable.

In his original research, Okun found that a one-percentage-point decline in the unemployment rate was associated with an increase of three percentage points in the rate of growth. Subsequent research has recalibrated the estimates of the parameters a and b, using GDP (rather than gross national product) and a much longer period of observation, to state that a one-point change in the unemployment rate is associated with an additional output growth of 2 percent ($b = 2.0$) (Altig, Fitzgerald, and Rupert 1997, Gordon 2000, pp. 55–6). Although only a handy rule of thumb, this two-for-one relationship between output growth and the unemployment rate has come to be known as Okun's law.

The parameter a in the equation can be interpreted as the rate of growth when unemployment remains stable. Okun called this the "potential rate of growth," which in his original research was a constant. Using annual data for 1960–2002 (series Ba485 and Ca84 updated to 2002), the potential rate of growth is estimated as 3.32. However, few economists would accept the notion that the potential rate of growth has been a constant over many decades. The 1970s are generally conceded to have witnessed a productivity slowdown. Moreover, the relationship between growth and unemployment is thought to have shifted over time as demographic shifts and other developments have changed labor market dynamics. The primary demographic shift affecting this relationship was the move of the baby boom generation, born in the late 1940s and early 1950s, into the labor force. This caused the rate of unemployment at "full employment" to rise in the 1970s and then fall in the 1990s (Perry 1970; Easterlin 1987, pp. 114–27; Katz and Krueger 1999).

For these reasons, a modification of the Okun approach has gained favor. This brings another observed statistical relationship, the Phillips curve, to the problem of separating trend from fluctuations. The Phillips relationship is between the rate of inflation and unemployment. Named after A. W. H. Phillips, who first pointed out the statistical correlation (Phillips 1958), the relationship was made a central element of the analysis of economic fluctuations by Paul Samuelson and Robert Solow (1960), who explained that when unemployment was low and labor markets were tight, there would be upward pressure on inflation as bottlenecks appeared for goods in short supply relative to their brisk demand and as workers successfully competed for higher wages. This idea led to the concept of the nonaccelerating inflation rate of unemployment (NAIRU), which is the rate of unemployment at which there is neither an upward nor a downward pressure on the rate of inflation. Because this rate is unlikely to be a constant, most models postulate a time-varying NAIRU that is consistent with maintaining a stable rate of inflation, called the time-varying, nonaccelerating inflation rate of unemployment or TV-NAIRU (Gordon 1997, 1998). With this modification of Okun's method, the potential rate of output growth is defined as the rate of growth that holds the rate of unemployment equal to NAIRU.

Laurence Ball and N. Gregory Mankiw (2002) use the Phillips relationship to generate a time series that gives an estimate of NAIRU for each period. When the current rate of unemployment is more than this value of NAIRU, there is a downward pressure on inflation because the economy is operating below its full potential. When the actual rate is less than NAIRU, the tight labor market signals an imminent rise in the rate of inflation. Only when the rate is close to NAIRU is the economy close to operating at its noninflationary potential. Following this logic, whenever the value of the unemployment rate minus NAIRU (a measure of economic slack) changes from positive to negative or from negative to positive, we know that real GDP must be equal to its trend value. Once we have established the trend, the deviations from trend can be estimated by subtraction. Table Cb18–22 presents a decomposition of real per capita GDP using a simplified variation of the Okun–Phillips methodology.

It should be emphasized that the statistical relationships between output growth, unemployment, and inflation presumed in such calculations, although persistent and strong, are neither mechanical nor precisely measured. All kinds of other phenomena are capable of perturbing the interrelationships. In addition to the changes in the demographic features of the labor force, changes in labor productivity and in hours per worker and developments such as the rise of the temporary help industry, the greater emphasis on general skills rather than firm-specific skills (accelerated by the spread of computers), and the changing sectoral mix of output can have important consequences for both the trend in potential output and the fluctuations of actual output about this trend. Many investigators have sought to incorporate such secondary influences into the analysis to improve the estimates of NAIRU and Okun's law (see, for example, Weiner 1993; Staiger, Stock, and Watson

1997; Ball and Mankiw 2002). Although these investigators' estimates differ in detail, the broad picture obtained remains similar. One estimate of potential output that has special interest is the one prepared by the Congressional Budget Office (Arnold 2001). This series is reported in Table Cb23.

This discussion about trends and cycles may sound like a technical issue best left to experts, yet it is very important. The decomposition of an economic time series into trend and cycle can have important and far-reaching policy implications. The Employment Act of 1946 established the primary objective of macroeconomic policy to be the mitigation of the fluctuating component in aggregate economic output. Thus, the President and his Council of Economic Advisors must begin with some notion of which movements in economic variables constitute unhealthy fluctuations that would call forth compensatory policies and which movements are natural and unavoidable changes in the trend of potential output.

Selected Cyclical Indicators

The data on GDP are available on a quarterly basis, but not on a monthly basis. For this reason, several series of data that are available monthly are often used as "cyclical indicators" to track the performance of the economy on a month-to-month basis. The most natural cyclical indicator and the one most frequently used to measure the timing and depth of a recession is the unemployment rate. This measure is based on a survey of households conducted each month since the 1940s by the Bureau of the Census and analyzed by the Bureau of Labor Statistics. The unemployment rate measures the percentage of the civilian labor force that is not employed and is actively seeking work. The civilian labor force includes all individuals 16 years of age and older who are not institutionalized (in a prison, hospital, or a similar institution) or in military service, and who are either employed for pay or profit or unemployed. This concept excludes people without jobs who do not wish to work or who are not actively looking for work (see Chapter Ba, on labor, for further details). Table Cb24–27 presents the official unemployment rate on a monthly basis in both its original form and on a "seasonally adjusted" basis (series Cb25–26). The Bureau of Labor Statistics carries out the seasonal adjustment to remove the predictable seasonal fluctuations from the original data to help distinguish the movements in labor force utilization more clearly. The seasonally adjusted series is the "official" unemployment rate routinely cited in news accounts and political debate.

Table Cb24–27 also includes a measure of the unemployment rate for married men living with their wives. Unemployment among this group is consistently lower than the overall level of unemployment, and the series shows less erratic behavior. This is because single men, especially teenagers, and women experience higher rates of unemployment that seem to be more sensitive to economic fluctuations than the rate for married men is (see Chapter Ba, on labor, for further discussion). Because of its less volatile nature and the fact that it is less subject to shifts caused by demographic fluctuations, this series is sometimes preferred as a cyclical indicator.

Another widely cited cyclical indicator is the index of industrial production. The Federal Reserve System's Board of Governors has continuously calculated this series on a monthly basis since 1919. For this reason it is often called the FRB index. The index is a comprehensive indicator of industrial activity that measures the changes in the physical volume of manufacturing, mining, and

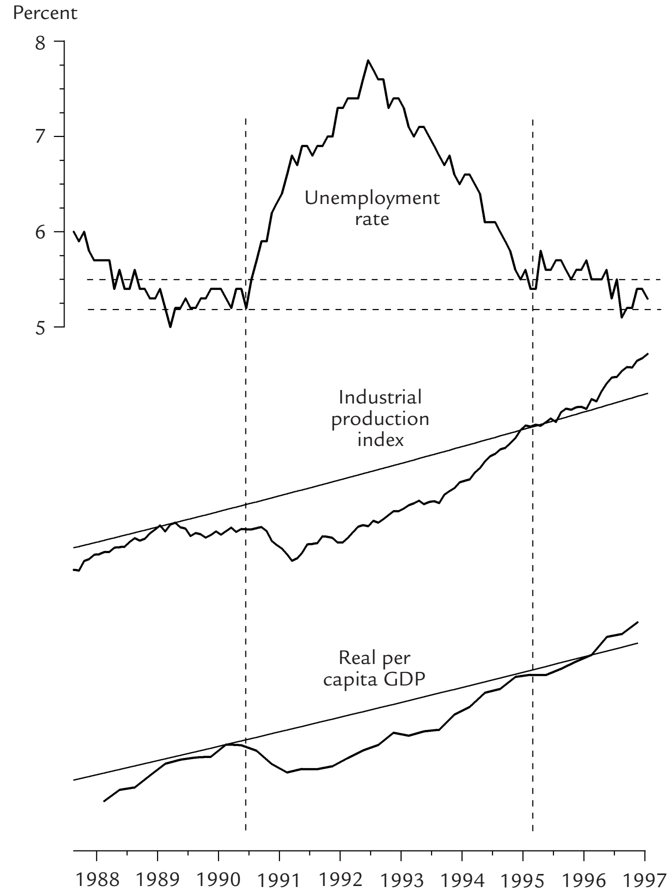

FIGURE Cb-C The recession of 1990–1991

Sources

Series Cb11, Cb26, and Cb31.

Documentation

The graph shows the unemployment rate, the Federal Reserve Board's index of industrial production, and the level of real per capita gross domestic product (GDP) for the period July 1987 through December 1997. The unemployment rate is expressed as a percentage of the labor force (with a scale to the left). Both the index of industrial production and real per capita GDP are displayed as logarithms so that constant growth rates appear as a straight line. The annual rate of growth of the trend shown for industrial production is 2.09 percent. The annual rate of growth of the trend for real per capita GDP is 1.22 percent. It would appear that the rise in unemployment began sometime in 1990, although 1989 saw no growth in industrial production. The National Bureau of Economic Research dated the peak in July 1990. Recovery, judged by the return of the unemployment rate to the range of 5.2 to 5.5 percent, was in early 1995. It would appear that during the recession and recovery the trend rate of growth of real per capita GDP was only half that of the post–World War II long-term rate of growth of 2.24 percent, as measured by series Cb12.

electric and gas utilities. Output at all stages of production (including intermediate as well as final products) is included. It does not cover production on farms or in the construction industry, transportation, retail or wholesale trade, government, or other services. Since its introduction in the 1920s, it has been revised from time to time to take account of the growing complexity of the economy and to make use of an increasingly rich set of statistical indicators. Table Cb28–31 presents the FRB index on a monthly basis in both seasonally adjusted and unadjusted formats.

Figure Cb-C displays the seasonally adjusted unemployment rate and FRB index along with the real per capita GDP for the recession of 1990–1991. All three indicators trace out a roughly similar pattern.

A broad comprehensive index of monthly industrial activity, comparable in quality to the FRB index, is not available for the period before 1919. Jeffrey A. Miron and Christina D. Romer (1990) have calculated an index of industrial production based on thirteen component series for the period 1884–1940 (series Cb28). The Miron–Romer index is not consistent with the FRB index because it is based on a very limited number of series. It is based heavily on inputs to the production process (for example, pig iron, coal, crude petroleum, cattle, and hog receipts at Chicago) and the output of very simple manufacturing processes (flour, coke) rather than on the output of highly fabricated products. The FRB index is preferred to the Miron–Romer index for the period 1919–1940; however, the data for this period are presented for both series so that a comparison of the two can be made and for the use of those who wish to have a consistent series that spans both the pre–World War I era and the period between World War I and World War II.

Students of business cycles have discovered a number of individual series that seem to move roughly in coincidence with fluctuations in the overall economy, among which are the unemployment rate and the index of industrial production. Others that can be mentioned in this regard include real personal income (less transfer payments), real manufacturing and trade sales, and total employee hours in nonagricultural establishments. In Table Cb32–34 a composite index of coincident indicators is presented, along with a composite index of leading indicators and an estimate of the probability that the economy will be in a recession within six months from the date of the index. For example, the recession index for May gives the estimated probability in May that the economy will be in a recession in November. These indexes were derived at the NBER by James H. Stock and Mark W. Watson (1989a, 1989b) and are described as "experimental." The search for coincident and leading indicators has a long tradition dating back to at least 1938 (Mitchell and Burns 1938).

Seasonal Adjustments

Some of the series in Tables Cb24–31 are presented in both their original form and after a seasonal adjustment has been made. Seasonal adjustments are designed to remove any predictable seasonal variations from the data so that the underlying change in the intensity of economic activity can be seen more clearly. In the cases of unemployment rates and the FRB index of industrial production, the seasonal adjustments are performed by the governmental statistical agency that published the numbers. The procedures used are often complex, but they all rely on a statistical analysis of the historical experience of the seasonal movements in the data. As an illustration, Figure Cb-D displays the difference between the unadjusted unemployment rate and the seasonally adjusted rate (series Cb25–26) for the twenty-four months between the beginning of 1998 and the end of 1999. Unemployment is typically higher than "normal" in June and July as students join the labor force and look for work. It is typically lower in the fall, and particularly in December, as employees are hired in the period of high activity associated with Christmas and holiday sales. Unemployment usually rises in the new year as holiday workers are laid off and inclement weather reduces the level of outdoor construction activity. This pattern is repeated year after year. Experts at the Bureau of Labor

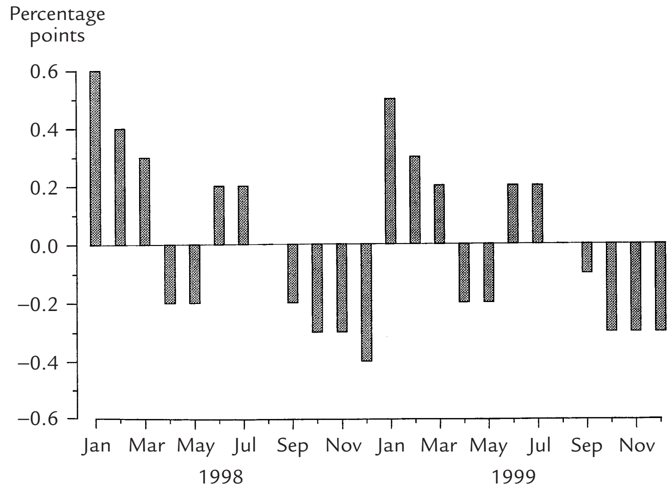

FIGURE Cb-D Seasonal adjustments for the unemployment rate: 1998–1999

Sources

Series Cb25 (unadjusted) minus series Cb26 (adjusted).

Statistics estimate these regular fluctuations and then adjust the unemployment rate to remove them. That is, the seasonally adjusted unemployment rate for December is adjusted to be higher than the actual unemployment rate to remove the purely seasonal drop associated with the holiday season.

Many economic time series exhibit some seasonal fluctuations, and in some cases the seasonal component dominates the other fluctuations in magnitude. The major difference between seasonal fluctuations and business cycles is that the former are predictable and anticipated, whereas the economic fluctuations of the business cycle are not. It is tempting, then, to employ seasonally adjusted data, which bring the business cycle fluctuations into view without the distraction of the seasonal fluctuations. However, seasonal adjustment, like the techniques used for detrending data, can introduce spurious elements into a data series or confound the search for statistical relationships between multiple time series. Thus, many statisticians prefer to work with unadjusted data and to include explicit seasonal elements (or seasonal dummy variables) directly into their statistical analysis (Barsky and Miron 1989).

The Great Depression of the 1930s

By all accounts, the most disastrous recession in U.S. history was the Great Depression of the 1930s. The only other episode that rivals the Great Depression in both severity and length was the depression of the 1890s, which began with a collapse in late 1893. The economy persisted in a depressed state until after the turn of the century (Carter and Sutch 1992). The Depression of the 1930s is dated from a peak in mid-1929 and persisted for more than twelve years. The economy did not return to full-capacity production until 1942, after receiving the stimulus of wartime spending. According to the chronology of business cycles presented in Table Cb1–4, the Great Depression was actually two back-to-back recessions, one that lasted forty-three months, from August 1929 to March 1933, and a second that lasted thirteen months, from May 1937 to June 1938. However, the recovery from March 1933 to May 1937 was incomplete. The unemployment rate in 1937 was 9.2 percent, much higher than the rates of 2.9 percent in 1929 and 3.1 percent in 1942 (series Ba475). Thus, the Great Depression is a classic case of a W-shaped recession.

A number of long-lasting changes in the economy, the culture, and society seem to originate in or derive from the crisis years, though perhaps not as many as some would claim (Bordo, Goldin, and White 1998). The impact of the Depression on individual sectors of the economy both during the decade of the 1930s and in the decades to follow may be judged by surveying the numerous annual time series provided in the other chapters of *Historical Statistics of the United States.* Yet, the importance of the Great Depression and the interest in its evolution over the decade of the 1930s suggest that it is appropriate to provide a number of monthly data series to more closely track the events of that fateful decade (see Tables Cb35–76). An additional purpose is served by presenting this sampling of data. It will alert readers to the vast amount of detailed high-frequency data that exists for the period between World Wars I and II.

References

Abramovitz, Moses, and Paul A. David. 2000. "Growth in the Era of Knowledge-Based Progress: The Long Run Perspective." In Stanley L. Engerman and Robert E. Gallman, editors, *The Cambridge Economic History of the United States*, volume 3, *The Twentieth Century*. Cambridge University Press.

Altig, David, Terry Fitzgerald, and Peter Rupert. 1997. "Okun's Law Revisited: Should We Worry about Low Unemployment?" Federal Reserve Bank of Cleveland, *Economic Commentary* (May).

Arnold, Robert. 2001. "CBO's Method for Estimating Potential Output: An Update." Congressional Budget Office, Macroeconomic Analysis Division, August.

Ball, Laurence, and N. Gregory Mankiw. 2002. "The NAIRU in Theory and Practice." *NBER Working Paper* number 8940, May.

Barsky, Robert B., and Jeffrey A. Miron. 1989. "The Seasonal Cycle and the Business Cycle." *Journal of Political Economy* 97 (June): 503–34.

Beveridge, Stephen, and Charles R. Nelson. 1981. "A New Approach to Decomposition of Economic Time Series into Permanent and Transitory Components with Particular Attention to Measurement of the 'Business Cycle.'" *Journal of Monetary Economics* 7 (March): 151–74.

Bordo, Michael D., Claudia Goldin, and Eugene N. White, editors. 1998. *The Defining Moment: The Great Depression and the American Economy in the Twentieth Century.* University of Chicago Press.

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

Carter, Susan B., and Richard Sutch. 1992. "The Great Depression of the 1890s: New Suggestive Estimates of the Unemployment Rate, 1890–1905." *Research in Economic History* 14: 347–76.

Craine, Roger. 1997. "Trends and Random Walks." In David Glasner, editor, *Business Cycles and Depressions: An Encyclopedia.* Garland.

DeLong, J. Bradford. 2002. *Macroeconomics.* McGraw-Hill.

Denison, Edward F. 1962. *The Sources of Economic Growth in the United States and the Alternatives before Us.* Committee for Economic Development.

Denison, Edward F. 1969. "Some Major Issues in Productivity Analysis: An Examination of Estimates by Jorgenson and Griliches." *Survey of Current Business* 49 (May 1969): part 2. Reprinted with additional rejoinders and corrections in *The Measurement of Productivity*, Brookings Reprint 244. Brookings Institution Press, 1972.

Easterlin, Richard A. 1987. *Birth and Fortune: The Impact of Numbers on Personal Welfare.* 2nd edition. University of Chicago Press.

Feenberg, Daniel, Jeffrey Miron, Esther D. Reichner, and Hanna Stern. 1967. *Catalog of Business Cycle Series.* NBER Macrohistory Database.

Fishman, G. S. 1969. *Spectral Methods in Economics.* Harvard University Press.

Glasner, David, editor. 1997. *Business Cycles and Depressions: An Encyclopedia.* Garland.

Gordon, Robert J. 1997. "Time-Varying NAIRU and Its Implications for Economic Growth." *Journal of Economic Perspectives* 11 (Winter): 11–32.

Gordon, Robert J. 1998. "Foundations of the Goldilocks Economy: Supply Shocks and the Time-Varying NAIRU." In *Brookings Papers on Economic Activity*. Brookings Institution.

Gordon, Robert J. 1999. "U.S. Economic Growth since 1870: One Big Wave?" *American Economic Review* 89 (May): 123–8.

Gordon, Robert J. 2000. *Macroeconomics.* 8th edition. Addison-Wesley.

Hall, Robert (Chair, Business Cycle Dating Committee, National Bureau of Economic Research). 2002. "The NBER's Recession Dating Procedure." NBER Internet site, June.

Jorgenson, Dale W., and Zvi Griliches. 1967. "The Explanation of Productivity Change." *Review of Economic Studies* 99 (July). Reprinted in the *Survey of Current Business* 49 (May 1969): part 2, and reprinted with additional rejoinders and corrections in *The Measurement of Productivity*, Brookings Reprint 244. Brookings Institution Press, 1972.

Katz, Lawrence F., and Alan B. Krueger. 1999. "The High-Pressure U.S. Labor Market of the 1990s." In *Brookings Papers on Economic Activity*. Brookings Institution.

Klein, Lawrence R. 1950. *Economic Fluctuations in the United States, 1921–1941.* Wiley.

Kuznets, Simon. 1958. "Long Swings in Population Growth and Related Economic Variables." *Proceedings of the American Philosophical Society* 102: 25–52.

Miron, Jeffrey A., and Christina D. Romer. 1990. "A New Monthly Index of Industrial Production, 1884–1940." *Journal of Economic History* 50 (June): 321–37.

Mitchell, Wesley C. 1908. *Gold, Prices, and Wages under the Greenback Standard.* University of California Publications in Economics, volume 1. University of California Press.

Mitchell, Wesley Clair. 1913. *Business Cycles.* University of California Press.

Mitchell, Wesley C., and Arthur F. Burns. 1938. "Statistical Indicators of Cyclical Revivals." *National Bureau of Economic Research Bulletin* 69 (May 28): 4–8.

Nelson, Charles R., and Charles I. Plosser. 1982. "Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications." *Journal of Monetary Economics* 10 (September): 139–62.

Okun, Arthur M. 1962. "Potential GNP: Its Measurement and Significance." In *Proceedings of the Business and Economics Section.* American Statistical Association.

Perry, George. 1970. "Changing Labor Markets and Inflation." In *Brookings Papers on Economic Activity*. Brookings Institution.

Phillips, A. W. H. 1958. "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861–1957." *Economica* ns 25 (November): 283–99.

Romer, Christina D. 1994. "Remeasuring Business Cycles." *Journal of Economic History* 54 (September): 573–690.

Samuelson, Paul A., and Robert M. Solow. 1960. "Analytical Aspects of Anti-Inflation Policy." *American Economic Review* 50 (May): 177–94.

Staiger, Douglas, James H. Stock, and Mark W. Watson. 1997. "The NAIRU, Unemployment, and Monetary Policy." *Journal of Economic Perspectives* 11 (Winter): 33–49.

Stock, James H., and Mark W. Watson. 1988. "Variable Trends in Economic Time Series." *Journal of Economic Perspectives* 2 (Summer): 147–74.

Stock, James H., and Mark W. Watson. 1989a. "Indexes of Coincident and Leading Economic Indicators." *NBER Reporter* (Spring): 3–5.

Stock, James H., and Mark W. Watson. 1989b."New Indexes of Coincident and Leading Economic Indicators." In *NBER Macroeconomics Annual 1989*. National Bureau of Economic Research.

Weiner, Stuart. 1993. "New Estimates of the Natural Rate of Unemployment." Federal Reserve Bank of Kansas City, *Economic Review* (fourth quarter): 53–69.

Zarnowitz, Victor. 1992. *Business Cycles: Theory, History, Indicators, and Forecasting.* University of Chicago Press.