During the last two centuries, US real GDP has grown at an average rate of about 3.5% a year, but this growth has been anything but smooth: quarterly growth rates over the last fifty years have ranged from $-7.8\%$ (in 1978) to $16.7\%$ (1980). Both are reported at annual rates: the quarterly growth rate multiplied by four. Most developed countries are similar in this respect. Developing countries differ primarily in having greater volatility.

Although every business cycle has its own personality, most share a number of traits. We review the salient ones below.

![Graph showing US real GDP and its trend.](image)

**Figure 1:** US real GDP and its trend.

### Cycles and volatility

In the words of Arthur Burns and Wesley Mitchell, the pioneers of business cycle research:

Business cycles are a type of fluctuation found in the aggregate economic activity of nations.... 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 phases 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.

(Measuring Business Cycles, National Bureau of Economic Research, 1946)

Let’s try to dissect Burns and Mitchell’s definition. The fluctuations they allude to are fluctuations in macroeconomic variables around their trends. To start with, let’s consider GDP. If you graph GDP over time, you do not obtain a smooth line. A smoothed version of its time path is what we call GDP ‘trend’. Figure 1 depicts both of them. The ‘cycle’ is defined as the difference between the two. There’s more than one way to compute the trend; here we use a simple algorithm called the ‘HP filter’ which is used widely by academics and occasionally by practitioners (‘HP’ here stands for Hodrick-Prescott, two economists, not Hewlett-Packard). What’s important is that the properties listed below are not specific to this filter. For example, you get a similar picture if you use quarter-on-quarter or year-on-year growth rates.

![Figure 1: Business Cycles: Percentage fluctuations of GDP around its trend.](image)

Figure 2: Business Cycles: Percentage fluctuations of GDP around its trend.

Figure 2 shows the US business cycle from the beginning of 1950 to the last quarter of 2004. The vertical lines correspond to the peaks and troughs of the business cycle. We call expansions the periods between a trough and the following peak. We call recessions the times between a peak and the following trough.

Defining peaks and troughs is somewhat arbitrary. For example: many specialists believe that to have a recession, GDP growth must be negative for two consecutive quarters. Not everybody agrees. The National Bureau of Economic Research (NBER), which dates business cycles in the US, maintains that ‘a recession is a significant decline in economic activity spread across the
economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales.’ Additional information is given on the NBER’s web site. The NBER determined that the slowdowns of the mid-60s did not qualify as recessions, which is why we did not mark them as such in Figure 2.

You can gain a better sense of the volatility of GDP by looking at the histogram pictured in Figure 3. The average cycle is zero by construction (the filter does this automatically). The volatility is reflected in the standard deviation (1.62%) and in the wide range of histogram. The bell-shaped standard normal distribution with the same mean and standard deviation is graphed for comparison.

Figure 2 also shows that, as Burns and Mitchell stated, business cycles are ‘recurrent’ but ‘not periodic’. Cycles are recurrent in the sense that they keep on happening. At the end of the 1990s, toward the end of the longest expansion in US history, many argued that the business cycle was dead, just to be proven false only a few months later. Business cycles are not periodic, in the sense that they do not happen at predictable times and for predictable lengths of time.

Expenditure components

Burns and Mitchell talk about fluctuations in ‘many economic activities’. Among these activities are the expenditure components of GDP. Are their fluctuations similar to those of GDP? If we compute the deviations from trend of (real) expenditure components, we see that the components
move up and down at the same times (i.e. they are coincident series), but they differ in volatility. Figure 4 illustrates these tendencies for the US.

Figure 4: Fluctuations in GDP, investment, and consumption.

Investment in plants and equipment is substantially more volatile than output as a whole. Its standard deviation is 7.36%. This implies that if the cycle in output rises 1%, the cycle in investment typically rises more than 4%. This extreme volatility makes investment expenditures a natural indicator of business cycles. You might think about why this is so; it’s an issue we’ll come back to in the near future.

Consumption, in contrast, is less volatile than output. Its standard deviation is only 1.28%, about 80% of GDP’s. Consumption can be further decomposed into expenditures on durable goods (furniture, automobiles, appliances) and nondurables plus services (food, haircuts). Interestingly, the former is more than three times as volatile as GDP. Consumer purchases of durable goods act much like investment by firms. Again, you might think about why this is so: when output rises, why do expenditures on nondurables and services rise by a modest amount while expenditures on durable goods rise sharply?

These differences across expenditure components have obvious analogs across industries: sales of autos and machinery are more volatile than sales of food and books. Analysts talk about some industries (and firms) being more cyclical than others.
Labor markets move with the cycle

Labor markets also move with the business cycle — indeed, it’s often the way in which business cycles make themselves known to us most directly. Figure 5 shows how fluctuations in employment and average hours worked co-vary with those in GDP. The main difference from the expenditure components is timing. You can see in the figure that the ups and downs in output typically lead those in employment by 1-2 quarters. Employment typically falls well after output does, and rises afterwards. For this reason, we say that employment is a lagging series. The current expansion is an extreme case (output rebounded well before employment) but the general pattern is not unusual. Average hours worked (the data here are for manufacturing only), on the other hand, tend to lead the cycle. At the onset of a recession, hours start falling before GDP and well before employment. For this reason, we call it a leading series.

Other features of employment status also vary over the business cycle. In Figure 6 we overlay fluctuations in employment and in the unemployment rate on those in real output. As expected, the unemployment rate is high when output is below trend and is low when output is above trend. We say that unemployment is counter-cyclical: it moves in the opposite direction of GDP.

Financial markets, too

Financial markets — all of them! — move up and down with the business cycle, which is why analysts and investors spend so much time studying business cycle indicators.
Figure 6: Fluctuations in GDP, employment, and unemployment.

Figure 7: Fluctuations in GDP and in the S&P 500 index.
Figure 8: Fluctuations in GDP and in the 3-month T-Bill yield.

Figure 9: Fluctuations in GDP and in the term spread.
Equity markets are strongly pro-cyclical. Figure 7 shows the cyclical behavior of the S&P 500 index. Other broad-based market indexes show similar patterns. You can see there that equity prices are much more volatile than real GDP and often change direction 2-3 quarters before it. The stock market also has turning points that do not correspond to turning points in GDP; as they say in the trade: ‘the stock market predicted 12 of the last eight recessions’. You might look for some of these ‘false signals’ in Figure 7.

Interest rates also exhibit a cyclical pattern, although one that’s more complex than the stock market. Short-term interest rates tend to be pro-cyclical. This is evident from Figure 8, which shows the time-path of the yield on the 3-month US Treasury Bill. Another celebrated indicator is the spread between long- and short-term bond yields, which tends to change direction prior to the economy. See Figure 9, which graphs the spread between the 10-year US Treasury bond yield and the Federal Funds rate.

**Executive summary**

Business cycles around the world share these properties:

1. Economies do not grow smoothly. They exhibit a lot of short-run volatility.

2. Spending on investment goods (by firms) and on consumer durables (by households) are more volatile than output. Household spending on nondurable goods and services is less volatile than output.

3. Most variables are procyclical: they move up and down with real GDP. Examples include consumption, investment, employment, and the stock market.

4. Some variables are countercyclical: they rise when GDP falls, and vice versa. Examples include: unemployment and (not shown) net exports.

5. Some economic indicators lead the cycle (the stock market, the term spread, hours worked), some are coincide with it (consumption, investment), and some lag it (employment).

**Review questions**

Think about each of the following questions, which we’ll address at greater length shortly.

1. Why is consumption is less volatile than output? Investment more volatile?
2. Why does employment lag output?

3. Why does the stock market lead output?

4. Why does the yield curve steepen before an expansion?