Gregory W. Huffman
Associate Professor of Economics
Southern Methodist University and
Research Associate
Federal Reserve Bank of Dallas

A Primer on the Nature of Business Cycles

For a considerable time, economists have devoted much effort to obtaining a greater understanding of the causes of the business cycle, or (as it used to be called) the trade cycle. Business cycles, in themselves, are thought by many to be undesirable. Therefore, a greater understanding of the nature and causes of business cycles would be useful in leading to the development of government fiscal or monetary policies that alleviate their impact. Dynamic economic models developed in the past decade have been especially useful in enhancing our understanding of observed business cycles. Although the economics profession apparently still has some way to go to understand the full nature and causes of these fluctuations, it is possible at this stage to describe which features or sectors of economies contribute the most to observed business cycles.

Economists and analysts sometimes disagree about what might be the primary source of observed business cycles. Some might say that these cycles are caused by changes in technology, while others would ascribe much of the culpability to the behavior of government or central banks. The point of this article is not to settle this issue, nor even to describe the controversies. Instead of focusing on issues on which economists may disagree, this article is intended to study the issues about which little disagreement can take place. Specifically, the intention here is to describe the behavior of observed economic aggregates over the course of the business cycle. This article, then, is to be a "user's guide" to obtain a better understanding of the business cycle in the United States in particular and in market economies in general.

The article is organized as follows. The next section will show exactly how the different components of aggregate output behave over the course of the business cycle. Additionally, the different categories of consumption and investment will be studied in more detail. The behavior of labor productivity over the course of the business cycle will then be analyzed. Lastly, the business-cycle properties of the U.S. and Canadian economies will be compared.

Defining the business cycle

There are several different ways to define "the business cycle." Loosely speaking, the term usually refers to fluctuations of economic aggregates around their trend values. This is easily understood by looking at Figure 1. The solid line is the actual time path of the U.S. gross national product from the first quarter of 1947 through the third quarter of 1991.[1] The dotted line is what one might identify as the trend value of output over the same period.[2] The difference between these two lines will be referred to as the fluctuation of actual output around its trend value. Fluctuations of output above and below its trend are what is usually referred to as the business cycle. (See the

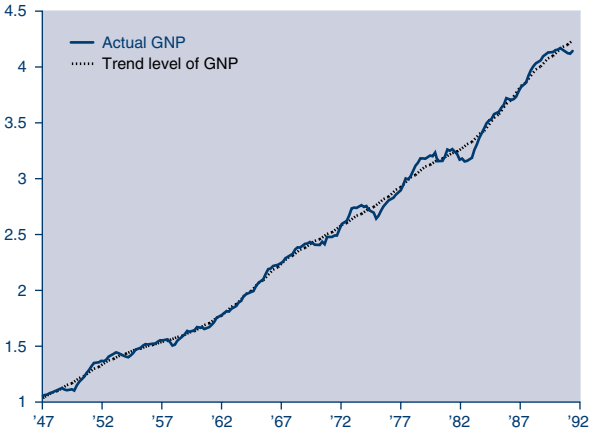
The comments of Stephen Brown, Kenneth Emery, and Mark Wynne are gratefully acknowledged.

[1] *The data are in 1982 dollars. This data set is the most recent for which government spending is available back to 1947.*

[2] *It should be noted that there are several ways to describe the behavior of the trend of an economic aggregate such as GNP. The method here is that employed in Hodrick and Prescott (1980). This method happens to give rise to a variable trend growth rate. An alternative description of the trend would change the definition of the cycles. However, for the most part, the magnitude and correlations of these fluctuations, described later, would be roughly the same even with an alternative definition of the trend.*

Figure 1
Actual and Trend Levels of GNP

Trillions of constant (1982) dollars



SOURCE OF PRIMARY DATA: U.S. Department of Commerce.

box titled "Is There a Trend in Economic Time Series?" on page 40.)

Obviously, aggregate output is not the only economic aggregate that exhibits growth and fluctuations; almost all the aggregates do. Therefore, for any such aggregate, its business-cycle fluctuations can be described as the fluctuations around its trend value.

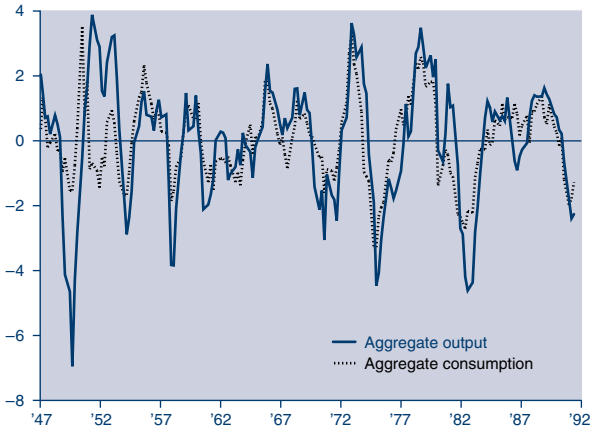
Aggregate spending in the United States can be separated into its components of aggregate consumption spending, investment and government spending, and exports and imports. Furthermore, these aggregates can be broken down into narrower categories, as will be shown later. It is then enlightening to inquire, Which components of aggregate output contribute to its observed fluctuations?

Consumption. In Figure 2, the fluctuations of aggregate output around its trend are the solid line. The vertical axis is a measure of the percentage deviation of the variable from its trend value. The dotted line represents the fluctuations of aggregate consumption. Analysis of this diagram reveals that the fluctuations in aggregate consumption are somewhat smaller than those of aggregate output. Perhaps this is not too surprising. Consumers apparently wish to "smooth" their consumption patterns: they do not increase their spending too much when times are good and do not cut back too much when times are bad.

The reason for this behavior can perhaps be best illustrated by the simple microeconomic experiment depicted in Figure 3. This diagram illustrates the choices open to an agent who must make consumption choices in two time periods. The horizontal axis measures the amount of consumption in the first period, while the vertical axis measures second-period consumption. The agent can spend M units on consumption in the two periods, and R is the net real interest rate. M represents the maximum real discounted value of consumption in the two periods. Given this information, the agent will then have indifference curve I_0 tangent to the budget constraint with wealth M. The agent will choose to consume C_1^* in the first period and C_2^* in the second period. Should some event occur, such as an increase in wealth from M to M', the agent can afford to consume more. The diagram illustrates the case in which the agent chooses to consume more in each period and, so, consumes C_1' in the first period and C_2' in the second period. This is the sense in which consumers are said to want smooth consumption patterns.[3]

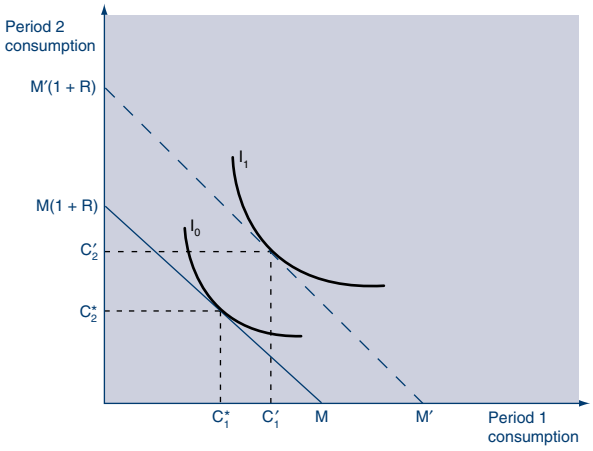
Figure 2
Aggregate Output and Consumption

Deviation from trend value
(Percent)



[3] *This is nothing more than a restatement of the permanent income hypothesis, as described by Milton Friedman (1957).*

Figure 3
Consumption Choices over a Two-Period Horizon



A practical illustration of such a phenomenon is that a person who wins a lottery and has a large increase in income, or a person who temporarily loses his job and has a decrease in income, rarely changes consumption purchases by an amount equal to the change in income but, instead, spreads the change in income out by changing both present and future levels of consumption purchases.

Consequently, with this analysis in mind, it is not surprising to observe that aggregate consumption does not exhibit pronounced fluctuations relative to those of aggregate output. Although aggregate consumption obviously fluctuates, its fluctuations could hardly be said to be the driving force behind aggregate output fluctuations. For aggregate output to fluctuate as much as it does, some component of output other than consumption must fluctuate more than does consumption.

Figures 4 through 6 present a further breakdown of the behavior of aggregate consumption. Figure 4 shows that the consumption of nondurable goods fluctuates very little relative to the level of aggregate output. Figure 5 illustrates similar behavior for the consumption of services. On the other hand, Figure 6 shows that the consumption of durable goods fluctuates much more than does the level of aggregate output. This diagram indicates that consumer purchases of such items as appliances and automobiles increase (decrease) *substantially* when output is growing (falling) relative to its trend value.

The behavior of the various components of aggregate consumption is further illustrated in Table 1. The first column indicates the relative volatilities of the components of aggregate output, as measured in percentage standard deviations, for the sample period. The percentage standard deviation of aggregate output over the period is 1.92 percent, and aggregate consumption fluctuates slightly less than does aggregate output. Nondurables consumption and consumption of services fluctuate less than does total consumption, but the consumption of durable goods fluctuates more.

The second column of Table 1 shows how the various aggregates are correlated with aggregate output. The closer are these numbers to 1, the more likely the relevant variable will tend to move in the same direction as aggregate output. It is clear from the table that all categories of consumption are procyclical; that is, on average, they tend to grow when aggregate output grows and to decline when output declines. However, these variables differ in the amount of fluctuation over the course of the business cycle.

Because of the relatively small fluctuations in aggregate consumption, some researchers have indicated that the presence of business cycles should

Figure 4
Aggregate Output and Nondurables Consumption

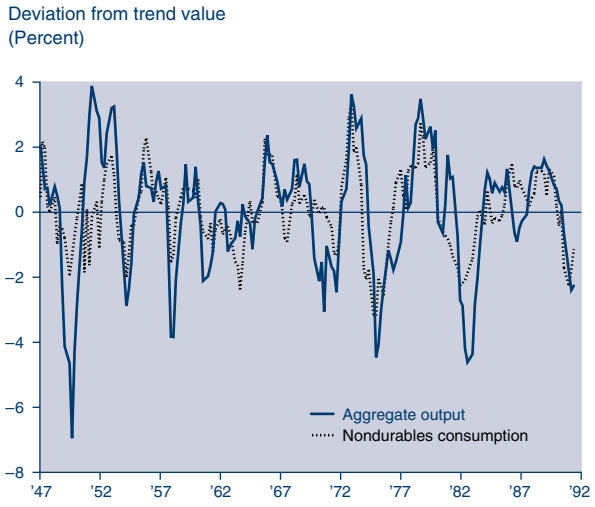


Table 1
Cyclical Behavior of Various U.S. Economic Time Series, 1947:1–1991:3

	Percentage standard deviation	Correlation with output
Aggregate output	1.92	1.000
Aggregate consumption	1.24	.681
Durable goods	5.36	.441
Nondurable goods	1.23	.635
Services	.71	.671
Aggregate investment	8.72	.777
Producer durable equipment	6.25	.793
Nonresidential structures	4.55	.476
Residential structures	10.77	.422
Aggregate government	4.38	.346
Federal defense	9.31	.411
Federal nondefense	12.11	–.164
Exports	6.92	.427
Imports	5.04	.647
Inventories	1.90	.645
Hours of work	1.85	.898
Labor productivity	.86	.302

SOURCE OF PRIMARY DATA: U.S. Department of Commerce.

not be a matter of great concern.[4] The reason is that consumers, for the most part, care about the quantity of goods they are able to consume. However, as indicated in Table 1, the quantity of aggregate consumption does not fluctuate very much over the course of the business cycle.

Table 2 shows how the components of consumption change as output changes at various lags.[5] All components of consumption are fairly highly correlated with output several quarters in the future. This means that purchases of consumption goods will begin to increase even before other components of aggregate output begin to rise and will fall before aggregate output begins to fall.

Investment. Figure 7 presents a comparison of the fluctuations in aggregate output and those of aggregate investment. It is apparent that the fluctuations in investment are *much larger* than those in output. Table 1 also illustrates the relatively large volatility of investment. Not all categories of

[4] *For example, Lucas (1987) constructs a model that allows him to ask how much average lifetime consumption the typical consumer would be willing to forgo to fully insure himself against future consumption fluctuations. For a wide range of plausible parameter values, Lucas finds that such a consumer would be willing to give up less than one-tenth of 1 percent of the average consumption level to rid himself of these fluctuations. This is not to say that consumers or policymakers should be indifferent about business cycles. Instead, the implication is that the societal costs of the fluctuations are likely to be small relative to the costs imposed by, say, distortional fiscal policy or compared with the benefits to be gained by even moderate increases in the consumption growth rate.*

[5] *Table 2 measures the simple correlations of aggregate output and the past or future levels of various components of consumption. For example, the correlation of output with the level of purchases of consumer durables two quarters ago is 0.465. The correlation of output with the level of consumption of services three quarters in the future is 0.181.*

Figure 5
Aggregate Output and Services Consumption

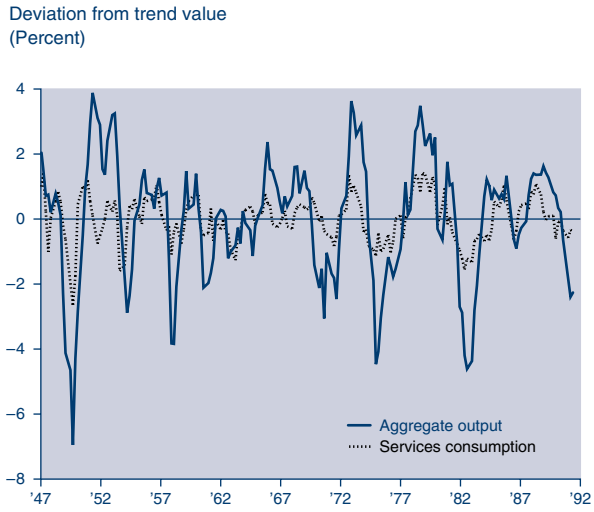
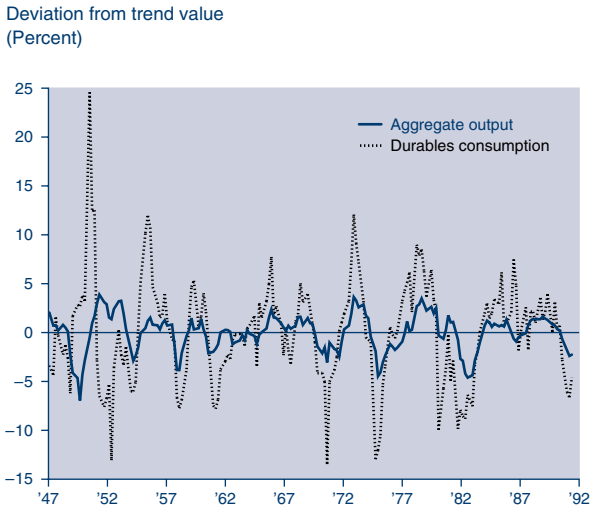


Figure 6
Aggregate Output and Durables Consumption



investment, however, behave in the same manner over the course of the business cycle. In particular, investment in producer durable equipment and investment in residential structures are especially volatile. Nevertheless, all components of aggregate investment are procyclical.

As Table 1 indicates, of all the components of aggregate output, aggregate investment and its subcomponents apparently are likely responsible for most of the observed fluctuations in output. Investigating the behavior of each subcomponent of aggregate investment reveals which fluctuates most over the course of the business cycle. As shown in Table 1, investment in residential structures (houses and apartments) exhibits extreme fluctuations, with investment in producer durable equipment and nonresidential structures being somewhat less volatile but still more volatile than aggregate output itself.

Table 3 shows how the different components of investment behave at different points in the business cycle. In the first column, the correlation between aggregate output and residential investment two quarters ago is 0.610, a relatively high value. Apparently, just before the growth rate of aggregate output begins to rise (fall), residential construction begins to rise (fall). Hence, one might think of residential construction as a leading indicator of aggregate output. The behavior of nonresidential investment is not at all similar to that of residential investment. The correlation between aggregate output and nonresidential investment two quarters ago is 0.016. However, the correlation of output and nonresidential investment two quarters in the future is 0.557. This might mean that producers or firms are reluctant to undertake this type of fixed invest-

Figure 7
Aggregate Output and Investment

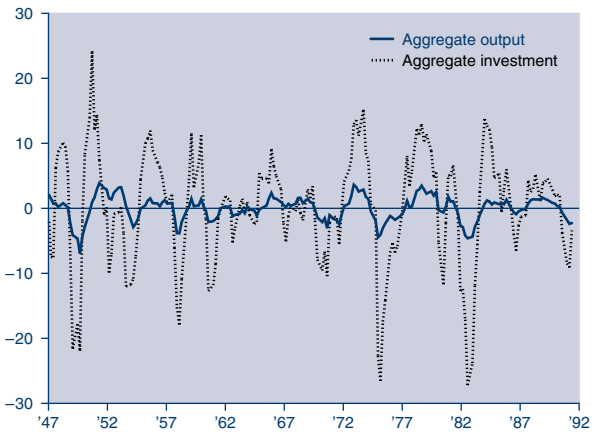


Table 2
Correlation of Various Components of Consumption with Aggregate Output for United States at Various Lags

Lag length (Quarters)	Correlation of output		
	With consumption of durable goods	With consumption of nondurable goods	With consumption of services
8	.065	–.211	–.243
7	.127	–.099	–.207
6	.187	–.039	–.130
5	.253	–.191	–.009
4	.348	–.335	.187
3	.411	.455	.397
2	.465	.575	.580
1	.480	.648	.692
0	.441	.635	.671
–1	.249	.520	.518
–2	.033	.339	.336
–3	–.201	.139	.181
–4	–.346	–.013	.043
–5	–.424	–.146	–.058
–6	–.387	–.223	–.115
–7	–.343	–.283	–.168
–8	–.268	–.307	–.211

ment until other components of output have already begun to increase.

Similar behavior is seen for investment in producer durable equipment. The correlation between aggregate output and investment in this equipment two quarters ago is 0.369, while the correlation for two quarters in the future is 0.674. Aggregate output is very highly correlated with investment in equipment in the same period, with a correlation coefficient of 0.793. Table 3 indicates that producers are willing to begin investment in durable equipment slightly earlier than in structures (nonresidential investment). This might be attributed to the fact that investments in equipment are typically smaller than those in structures, and producers are reluctant to make the larger investments until they are confident that sales have increased.

Table 3 also illustrates an interesting behavior for inventories. The correlation between aggregate output and inventories one to three quarters in the future is high. There is one obvious possible reason. As aggregate output rises, consumers increase their purchases of goods and thereby help deplete producer inventories, which firms, after several quarters, seek to replenish. Conversely, when aggregate output begins to fall, consumers hold off on these purchases, which helps to increase firms' inventories. Firms then move to lower the level of inventory holdings to minimize costs.

Table 1 and Figure 8 also show the behavior of aggregate inventories. This variable fluctuates to just about the same degree as does aggregate output. However, as will be shown, the *change in inventories* is also a component of aggregate investment, and it fluctuates tremendously.[6]

[6] *An increase or decrease in inventories of finished goods, semifinished goods, or raw materials is classified as an investment in inventories, and this is a component of aggregate GNP.*

As noted above, it is of interest to investigate which components of aggregate investment contribute most to the large fluctuations in the total. The prime candidate for being the primary source of these fluctuations would seem to be aggregate investment. Within this category, residential construction causes much of the fluctuations in total investment. However, another variable (excluded from Table 1) also contributes a great deal to the fluctuations in investment—namely, investment in business inventories. We can break down the variance of aggregate inventories according to this equation: $\Delta I = \Delta INVEN + \Delta OI$, where ΔI represents the *change* in total investment, $\Delta INVEN$ represents the *change* in inventory investment, and ΔOI is the *change* in all other forms of investment. This equation can then be used to show the following relationship for the respective variances:[7]

$$\text{var}(\Delta I) = \text{var}(\Delta INVEN) + \text{var}(\Delta OI) + 2\text{cov}(\Delta INVEN, \Delta OI).$$

This equation provides us with a tool to describe to what degree the changes in inventories are responsible for the behavior of changes in total investment. For the U.S. data, the values computed for the variables are as follows: var(ΔI) = 473.57, var($\Delta INVEN$) = 269.64, and var(ΔOI) = 125.27. The covariance in the equation is of negligible size. In other words, changes in inventory investment apparently are responsible for a very large quantity of the change in total investment over the course of the business cycle. This is especially surprising because the average change in business inventories represents only 3.4 percent of average changes in *total* investment in the post–World War II period.

Figure 8
Aggregate Output and Business Inventories

Deviation from trend value
(Percent)

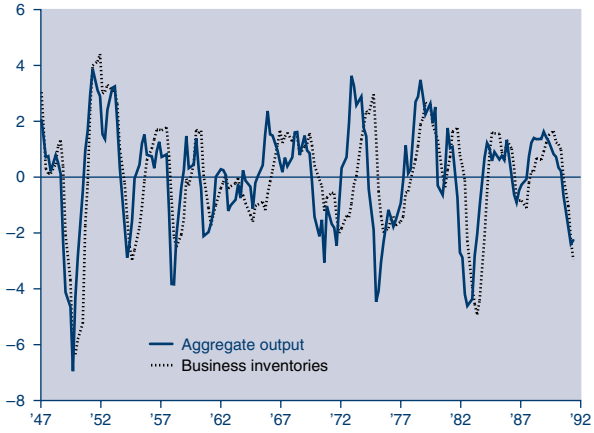


Figure 9
Changes in Aggregate and Business Inventory Investment

Billions of constant (1982) dollars

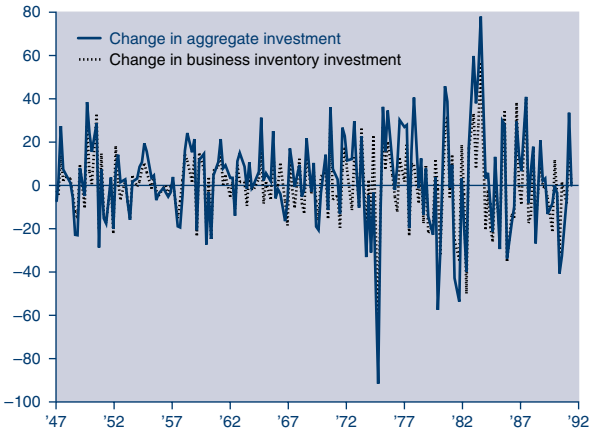


Figure 9 further illustrates this behavior. Shown here are the change in aggregate investment and the change in business inventory investment. From the diagram it is hard to see the difference between these two variables, but this is the important point. Despite the fact that business inventory investment is a very small portion of total investment, most of the changes in the latter variable from quarter to quarter are due to changes in inventory investment.

[7] *The variance of a variable is a measure of the degree of fluctuation exhibited by the variable in question. For example, if var(ΔI) equals zero, then it must be the case that the change in investment is always the same. Cov(ΔINVEN,ΔOI) is the covariance of the change in inventory investment and the change in all other forms of investment. This is a measure of the degree to which these two variables move together over the course of the business cycle.*

Table 3
Correlation of Various Components of Investment and Inventories with Aggregate Output for United States at Various Lags

Lag length (Quarters)	Correlation of output: With lagged residential investment	With lagged nonresidential investment	With lagged producer durable equipment	With lagged inventories
8	.032	–.335	–.336	–.351
7	.115	–.383	–.309	–.361
6	.213	–.413	–.259	–.368
5	.330	–.399	–.182	–.349
4	.468	–.331	–.056	–.283
3	.565	–.186	–.124	–.131
2	.610	.016	.369	.094
1	.572	.261	.614	.362
0	.422	.476	.793	.645
–1	.172	.561	.811	.805
–2	–.078	.557	.674	.844
–3	–.276	.466	.467	.766
–4	–.398	.337	.227	.596
–5	–.423	.201	.016	.392
–6	–.396	.060	–.136	.176
–7	–.350	–.043	–.248	–.022
–8	–.304	–.128	–.323	–.193

It should also be noted that by far the largest portion of business inventory investment is attributable to changes in inventories of nonfarm businesses.

Government spending, exports, and imports. Table 1 and Figure 10 indicate that total government spending is more than twice as volatile as aggregate output. Additionally, both defense spending and nondefense spending of the federal government are much more volatile than is aggregate output. Given this behavior of federal spending, government spending at the state and local levels clearly is much less volatile over the course of the business cycle.

Although total government spending is moderately procyclical, federal nondefense spending is countercyclical. This behavior might be attributed to what are sometimes referred to as "automatic stabilizers." That is, some types of government spending programs actually increase (decrease) more when aggregate output is declining (increasing), which contributes to the countercyclical spending pattern.

Table 1 and Figures 11 and 12 show that exports and imports are much more volatile than is aggregate output, but both are procyclical. Exports to other countries typically increase when income in the other countries increases and the foreign consumers demand more American-made goods. To the extent that income in other countries moves in tandem with that in the United States, one would expect U.S. exports to be procyclical. For identical (but reversed) reasons, U.S. imports also would be procyclical.

Productivity and employment hours. In analyzing the behavior of the business cycle, it is important to consider employment, or total hours of work, and labor productivity. Productivity refers to how much is produced, on average, by each hour worked. In other words, one usually gauges the productivity of the U.S. economy by calculating the quantity of goods and services produced and then dividing by the quantity of hours worked in producing those goods and services.

Figure 13 and Table 1 indicate that hours of work are about as volatile as is aggregate output over the course of the business cycle. But Figure 14 and Table 1 indicate that labor productivity is less volatile than output or hours of work. This is of interest because one might tend to believe that changes in productivity are closely linked to changes in hours of work. That is, when workers are most productive, it will be in the interest of employers to hire more workers or to have employees work longer hours. Apparently, however, relatively small changes in productivity help produce larger swings in the quantity of hours worked.

A well-known tenet is that the growth rates of some components of aggregate output increase before those of other variables. A variable whose growth rate increases just before a period of faster economic growth is referred to as a leading indicator of aggregate output.[8] It is important to investigate which variables exhibit this behavior and which variables exhibit faster growth after most other variables.

Analysis of Figure 14 shows why some people think of labor productivity as a leading indicator of aggregate output. Changes in productivity tend, on average, to be followed by changes in aggregate output, in the same direction, from three to five quarters later. Therefore, if labor productivity were to begin to rise substantially this quarter, one might reasonably expect aggregate output to increase in about a year. Note that Figure 14 shows that this sequence does not happen for every period but on average.

This relationship is illustrated in the middle column of Table 4, which lists the correlations between output and labor productivity at various lags. Changes in productivity provide practically no information about how output will behave two years into the future but are a good leading indicator of output at shorter ranges, such as one year. However, contemporaneous productivity and output exhibit a much weaker correlation. Note also that this relationship is not symmetric; output is a "negative" leading indicator of productivity.

This analysis illustrates why some economists suggest that the key to higher economic growth in the United States is to raise labor productivity. Table 1 indicates that a rise in labor productivity is likely to be accompanied by a subsequent increase in aggregate output. Furthermore, the more productivity rises, the more future output will

Figure 10
Aggregate Output and Government Spending

Deviation from trend value
(Percent)

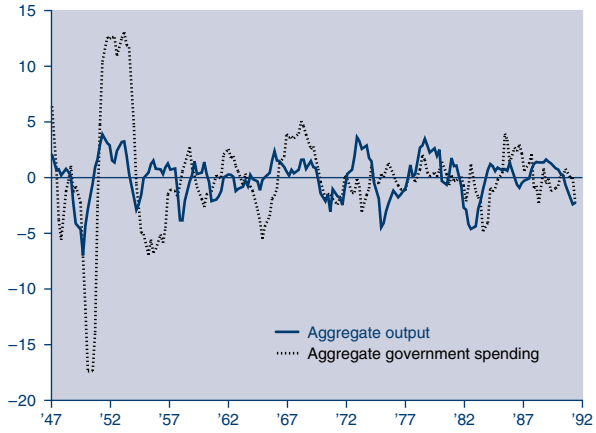
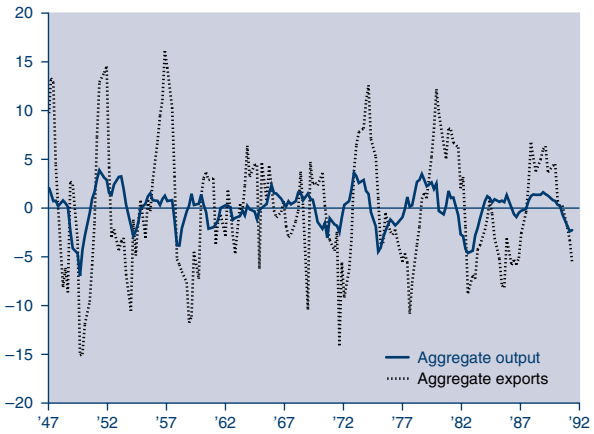


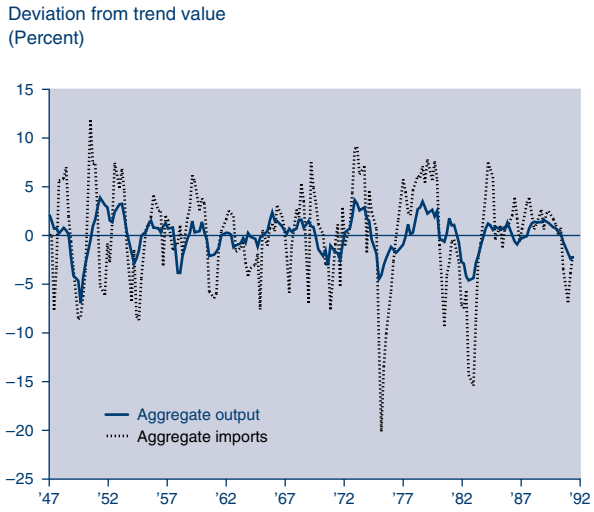
Figure 11
Aggregate Output and Exports

Deviation from trend value
(Percent)



[8] *Productivity is only one of several measures of future economic activity. Koenig and Emery (1993) provide an analysis of the performance of the U.S. Commerce Department's composite index of leading indicators.*

Figure 12
Aggregate Output and Imports



increase. Figure 14 shows how the recent increase in productivity has apparently been accompanied by a subsequent rise in output, which has helped pull the U.S. economy out of the latest recession.

Table 1 and Figure 13 show that the level of output and total hours of work are very highly correlated. This is not surprising. If the quantity of goods and services produced is to rise, more work must be undertaken to produce the goods and services because, over short periods, increasing the use of labor is easier than increasing the quantity of capital. However, with output and employment tending to move in tandem, it is not surprising that labor productivity is a good leading indicator of future employment hours as well. The third column of Table 4 shows that a change in labor productivity tends, on average, to be followed by a change in employment hours, in the same direction, from four to six quarters later.

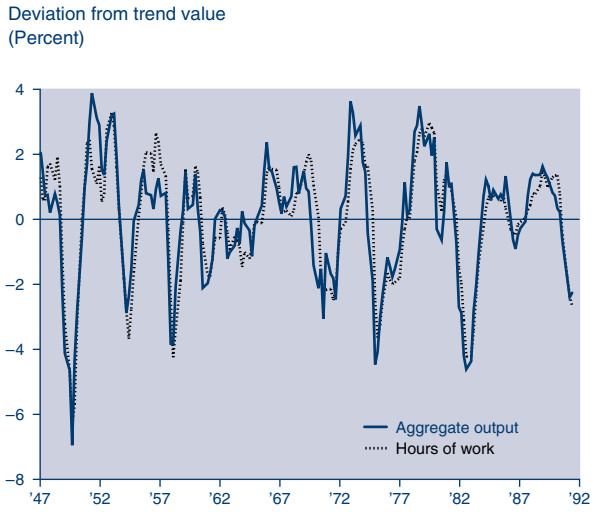
Lastly, labor productivity is not the only leading indicator or gauge of future economic activity. Table 3 indicates that, to some extent, residential investment and investment in producer durable equipment are leading indicators. They begin to increase just before aggregate output rises. In addition, Table 2 shows that consumption of nondurable goods and consumption of services are also leading indicators.

Some international comparisons

An appropriate question at this juncture is, How robust are the above-described features of the U.S. business cycle? That is, do all market economies exhibit the same sort of cyclical fluctuations as does the U.S. economy, or is each economy very special or different? If all economies exhibit very different types of business cycles, then the policy remedies used to deal with them might need to be quite distinctive. On the other hand, if economies exhibit similar business cycles, then unique and economy-specific policies do not have to be used.

Fortunately, many market economies apparently exhibit cyclical fluctuations that are very similar to those observed in this country. The Canadian economy is a good example. Table 5 presents statistics for the Canadian economy that are the counterpart of the U.S. statistics in Table 1.[9] The two economies are strikingly similar in many respects. First of all, both have aggregate invest-

Figure 13
Aggregate Output and Employment Hours



[9] *In 1991, Canada accounted for 20.4 percent of U.S. merchandise exports and 19 percent of U.S. merchandise imports. Japan, the next biggest trading partner, accounted for only 11.3 percent and 18.7 percent, respectively.*

Table 4
Correlation of Aggregate Output and Employment Hours with Labor Productivity for United States at Various Lags

Lag length (Quarters)	Correlation of output with lagged productivity	Correlation of hours with lagged productivity
8	.160	.262
7	.315	.427
6	.419	.521
5	.480	.561
4	.492	.523
3	.486	.441
2	.488	.301
1	.390	.095
0	.302	–.149
–1	.001	–.310
–2	–.183	–.400
–3	–.314	–.389
–4	–.343	–.343
–5	–.325	–.273
–6	–.294	–.219
–7	–.264	–.175
–8	–.220	–.134

ment that is much more volatile than aggregate output, which, in turn, is more volatile than aggregate consumption. For both countries, durable goods consumption is more volatile than nondurable goods consumption, which is more volatile than service consumption in both countries. In both economies, the variability of investment in residential construction is greater than that of producer durable equipment, which is greater than the variability of investment in nonresidential structures. Government spending, imports, and exports exhibit similar degrees of variability. The correlations of these economic time series with aggregate output for the respective countries are also similar.

There are other business-cycle features that are of much interest. Many models commonly used to study business cycles generally imply that movements in consumption in two different countries should be highly correlated. This implication is especially strong when the countries have a great deal of trade in goods and capital, as do Canada and the United States. The reason is simple. As illustrated earlier, there is a general presumption that consumers prefer smooth consumption patterns, rather than "feasting" today and "famine" tomorrow. If some temporary event in the United States causes consumers to cut back on consumption today, they should be able, at least to some

Figure 14
Aggregate Output and Labor Productivity

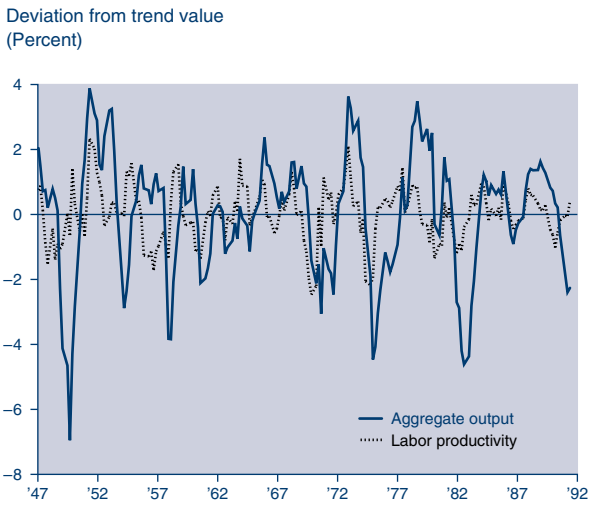


Table 5
Cyclical Behavior of Various Canadian Economic Time Series, 1947:1–1991:3

	Percentage standard deviation	Correlation with output
Aggregate output	1.84	1.000
Aggregate consumption	1.77	.753
Durable goods	6.96	.665
Nondurable goods	1.29	.478
Services	1.09	.471
Aggregate investment	5.01	.624
Producer durable equipment	7.79	.568
Nonresidential structures	6.29	.367
Residential structures	8.14	.370
Aggregate government	4.38	.184
Exports	4.04	.536
Imports	5.69	.762
Inventories	4.19	.300

SOURCE OF PRIMARY DATA: Statistics Canada.

extent, to borrow from abroad (through financial markets) to increase present consumption and pay back the loan by forgoing future consumption. Hence, even the vagaries of the business cycle should still leave consumption in different countries highly correlated, despite any other similarities or differences in aggregate behavior.

This description applies, in particular, to the presumed behavior of consumption of services and nondurable goods, because they are easily purchased. The general economic presumption, however, is that purchases of durable goods might be somewhat less correlated across countries. The reason is that consumers are somewhat inhibited in purchasing *and* selling durable goods to smooth their consumption paths of these goods. Furthermore, consumers sometimes have to acquire outside financing to purchase houses, cars, and televisions. Arranging such financing can be costly, and a consumer may be reluctant to purchase and sell numerous durable assets. Additionally, because of the relatively thin resale market in used consumer durable goods, it is costly for a consumer to trade in them to smooth consumption patterns.

Some economists would suggest that there is perhaps less reason to believe that the correlation of various categories of investment in two countries will be higher over the course of the business cycle than the correlation of, say, the components of consumption. Technological innovations in the two countries might make their investment change in a different manner. Lastly, there would seem to be little economic presumption that government spending in the two countries should be strongly correlated.

It is, then, of interest to see if these predictions are in accord with the data for Canada and the United States. Table 6 presents the correlations of the various aggregates in this country and Canada.[10] The correlation between aggregate output in these two countries is 0.637. However, except for government spending, none of the subcategories of GNP has a greater degree of correlation.

A very surprising result in Table 6 is that durable goods consumption and investment in

[10] *Backus, Kehoe, and Kydland (1992) document that for many countries, aggregate consumption is less highly correlated across countries than is aggregate production.*

Table 6
Correlation of the Components of Aggregate Output for Canada and United States

	Correlation coefficient
Aggregate output	.637
Aggregate consumption	.540
Durable goods	.578
Nondurable goods	.270
Services	.152
Aggregate investment	.194
Producer durable equipment	.387
Nonresidential structures	.260
Residential structures	.533
Aggregate government	.714
Exports	.393
Imports	.435
Inventories	.608

residential construction are two of the components of aggregate spending that are the most highly correlated in the United States and Canada. For the reasons described earlier, the components of aggregate output that are most likely to be highly correlated across countries—consumption of services and consumption of nondurable goods—have the lowest correlations. Durable goods consumption is more highly correlated than are the other components of consumption.

Inspection of Tables 1, 5, and 6 reveals that investment in residential construction in the United States and Canada is more highly correlated than it is with the output of their respective countries. Furthermore, both investment in residential structures and investment in producer durable equipment in the two countries are more highly correlated than is the consumption of services. These outcomes are especially surprising in light of the fact that the amount of trade in goods, services, and capital between the countries apparently is large and they have relatively similar economic systems.

In addition, Table 6 shows that the degree of correlation between government spending in the two countries is rather high, although there is no natural economic reason why it should be. Lastly, the degree of correlation of inventories in the countries is high as well.

Final remarks

This article has documented exactly how the various aggregates in the U.S. economy fluctuate over the course of the business cycle. Some aggregates increase just before aggregate output begins to rise, while other variables lag aggregate output. It has been shown that labor productivity is a leading indicator of aggregate output and that these two variables are highly correlated.

The article also shows that the business cycles observed in Canada and the United States since 1947 are very similar in many respects. There is a very strong parallel pattern between the aggregates in the two countries. This pattern of behavior does not mean, however, that their business cycles are coincident or identical. In fact, although economic theory might predict that various components of consumption in the two countries should be highly correlated, the data appear to indicate the opposite. For example, the correlation between the consumption of services and the consumption of nondurable goods is very low. Future research needs to be done to provide a greater understanding of this seemingly anomalous behavior.

Is There a Trend in Economic Time Series?

To some extent, analysts disagree about what is meant by "business cycle." Many would support the idea that this term should refer to the fluctuations of output around its trend value. However, there is also disagreement about what constitutes the trend value of output.

At one extreme is the view that the trend level of output grows at some *constant* rate of, say, 2.5 percent per year. People who support this view are said to maintain that output is trend stationary, with a constant trend growth rate. Fluctuations of actual output around this trend are referred to as the business cycle.

At the other extreme is the view that there is no identifiable constant "trend level of output" that would allow isolation of the business-cycle fluctuations. This view maintains that the future trend level is the level of output that the economy would produce in the future *if output grew at the current level forever*. That is, the economy is always on its trend path, and there are no deviations from trend. If the growth rate changed in the future, then the trend level would also change. This view is that the only fluctuations to be concerned with are changes in the growth rate or the trend, rather than deviations from trend. Researchers using this technique are said to view economic aggregates as growth or difference stationary. They might use the term "business-cycle fluctuations" to refer to the changes in the growth rates of the various economic time series.

The approach in the article here is somewhere between these two polar views. As Figure 1 shows, the trend (dotted) line is not a straight line. This means that the trend level of output *grows at a variable rate*. This way of decomposing the growth and fluctuation components of economic time series, suggested by Hodrick and Prescott (1980), has become popular in business-cycle research. King and Rebelo (1993) analyze this filter in detail and make some comparisons with other detrending methods. Christiano and Eichenbaum (1990) discuss whether it can even be determined if there is a trend in economic time series.

Just as analysts might disagree about what is meant by "business cycle," they might also disagree about what is meant by "recession" and "expansion." Does "recession" refer to periods when output is declining and, if so, declining for how long? Or does the term refer to when output is below trend and, if so, how much below which trend? One popular method for defining these terms is that used by the National Bureau of Economic Research. The NBER looks at a broad range of economic time series that can be said to characterize aggregate economic activity. It uses these data to identify peaks in economic activity—which help to identify the onset of recessions—and troughs—which indicate when the recessions have ceased. This approach is described in Zarnowitz (1992). The ancestor of this research is the original work of Burns and Mitchell (1946). More recently, Wynne and Balke (1993) describe similar dating schemes and use them to identify the asymmetries in the U.S. business cycle.

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