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The Cyclical Behavior of Prices

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INTRODUCTION

The National Bureau of Economic Research celebrated its fiftieth anniversary in 1970. In those fifty productive years, the National Bureau has generated a large number of studies bearing upon the cyclical behavior of prices. The work of Wesley C. Mitchell, Frederick C. Mills, Arthur F. Burns, Thor Hultgren, Daniel Creamer, George Stigler, Solomon Fabricant, Milton Friedman, Irving Kravis, Robert Lipsey, and many others has provided new statistical information or better organized data about the price system, findings about its internal structure and network of relationships, and generalizations pertaining to the monetary, competitive, cost, and other economic factors that influence prices and are in turn shaped by them. The general tendency for the price level to move with, rather than against, changes in the level of output; the lags of retail prices behind wholesale prices; the lags in wage rates and in unit labor costs; the marked inverse influence of changes in unit costs upon profit margins—all these and many additional findings have stemmed from National Bureau studies.

On the statistical side, we are indebted to Mills for the development of price indexes for various classifications of commodities; to Hultgren for carefully matched price and cost indexes; to Creamer for indexes of wage changes in the 1920's and 1930's; to Fabricant and to Kendrick for

Note: I am indebted to John Layng, Nancy Leach, and Mildred Tweedy of the Bureau of Labor Statistics staff for their assistance in the preparation of materials for this report.

comparable price and productivity indexes; to Kravis and Lipsey for prices of goods bought and sold in foreign commerce; to Stigler and Kindahl, most recently, for indexes of transaction prices at wholesale; and so on. These new statistics have not only illuminated the past; they have led to the continuing provision of and improvement in current statistics on prices, wages, costs, and productivity. For these and other reasons, our debt to the work of the National Bureau is not only large, but growing. It is not my purpose, however, to review and evaluate the work that has already been done. Rather, I shall set forth a few additional results, particularly with reference to the period since 1946.

Inflation is characterized by a general and widely diffused rise in prices and costs. However, all prices and factors affecting prices do not begin to rise or fall at the same time. In part, this is due to the existence of more or less regular sequences in the movement of different prices. Prices in some markets almost always begin to rise more promptly than in other markets. Similarly, some prices typically begin to fall sooner than others.

Moreover, prices do not all move at the same pace, and in particular they do not necessarily move at the same pace as wages or costs of production. Prices of some types of assets, such as common stocks or land, rise or fall, while the money price of other assets, such as savings accounts or debt instruments, may not change at all. These differences in price behavior have significant consequences. Real wages––money wages adjusted for price changes––may rise or fall, with vital effects on the wage earner and his family. Profit margins, dependent on the difference between prices and costs, may rise or fall, thereby encouraging or discouraging expansion of production, development of investment plans, or shifts of resources from one activity to another.

This paper sets forth the results of a recent study of the cyclical behavior of prices. It describes a chronology of fluctuations in the rate of change in the price level (particularly since 1946); considers the relationship between these fluctuations and those in economic activity in general; examines how price increases and decreases are diffused through the price system; measures the tendencies of some prices to lead and others to lag; shows how the rates of change in costs and prices alter their relationship to one another during a cyclical swing; and finally, examines the current price situation in the light of these historical findings.

A REFERENCE CHRONOLOGY FOR PRICES

The National Bureau's reference chronology of peaks and troughs, created by Wesley Mitchell, is one of the simplest yet most effective devices for studying business cycles. It has become widely used. Nowadays almost every economic statistician knows what the "shaded areas" on charts of monthly time series represent. A similar device may be employed for studying movements in the price system. To do so, a number of questions must be faced. Should the chronology represent peaks and troughs in the level of prices or in their rate of change? If the latter, how should the rate of change be measured? What index or set of indexes of prices should be used to establish the chronology? What criteria should be set up to define the chronology and identify its turning points?

The business cycle chronology is based on the working definition of business cycles set forth by Mitchell in his 1927 volume, *Business Cycles--The Problem and Its Setting,* and later refined by Burns and Mitchell in their 1946 monograph, *Measuring Business Cycles.* In brief, the definition applied three criteria to the problem: the magnitude, the duration, and the diffusion of fluctuations in economic activity. One inquired how large the fall or rise in total activity was, how long it lasted, and how widely it was diffused over different economic sectors. Turning points were identified not by a single aggregate, such as gross national product, but by determining the consensus among a number of series, each of which had some claim to represent or reflect total economic activity.

A business cycle chronology was constructed not only for the United States, but also for Great Britain, France, and Germany. Still other countries, such as Canada, Japan, and Italy, have constructed business cycle chronologies along similar lines. Much is to be said for developing a price chronology in a similar manner. Whether it is the level of prices or their rate of change that is selected as the ultimate variable, attention should be focused upon swings that are of substantial size, last more than just a few months, and are widely diffused throughout the price system. A single general price index is most convenient for this purpose. Although the idea of an index of the general price level is an ancient one, today no single widely accepted measure exists. The three leading candidates would be the Consumer Price Index, the Wholesale Price Index, and the Implicit Price Deflator for Gross National Product. Each of these has its merits and deficiencies for the purpose.

The deflator is quarterly, and the other two indexes are monthly; other things equal, a monthly chronology is to be preferred. The deflator has the largest economic coverage, but that also means it includes some dubious elements, notably "prices" in the government sector which---lacking good information on the price of government purchases---are really wage rates. For this reason, many consider the Private GNP Deflator a better price index. The deflator is affected not only by changing prices but also by changes in the composition of output, whereas the other two indexes use fixed weights and hence reflect price changes alone.

The Wholesale Price Index, of course, does not cover one part of the price system, namely, services. Also, it has some gaps in its industrial coverage and depends in part upon list prices rather than actual transaction prices. The Consumer Price Index is the closest approximation of the three to an actual transaction price index, but is limited to prices paid by urban wage earner and clerical worker families. Unlike the other two, it includes prices for existing goods, such as houses and used cars, as well as for currently produced goods and services.

These considerations do not point to a clear-cut conclusion, except to suggest a real need for a monthly general price index. Lacking this, I have based the chronology in this paper upon the rate of change in the Consumer Price Index, using the GNP Deflator and the Wholesale Price Index, and some of their principal components (e.g., the Private Deflator and the WPI for industrial commodities) to provide supplementary evidence. The CPI has risen almost continuously since 1954, but there have been sizable fluctuations in its rate of increase, and the chronology identifies these fluctuations. The rate of inflation is, of course, a matter of major concern. The chronology shows when this rate, as measured by the CPI, reached high points and low points since 1947.

For the identification of turning points, we are fortunate to have, again thanks to the National Bureau, a computer program recently developed by Charlotte Boschan and Gerhard Bry. This essentially reproduces, in an objective and mechanical fashion, most of the choices of "specific cycle" turning points that used to be entirely dependent upon the judgment of National Bureau staff. Of course, it uses criteria that are similar to those used by the staff. It bases its choices upon whether the fluctuations in the data are large enough and long enough to be reflected in various moving averages, but does not explicitly use any criterion as to the size of a swing. Despite this, it is rather uncanny in its ability to detect and identify turning points independently selected by experts—and, I might add, to uncover inconsistencies in judgment by the less expert. We have used the turns selected by the computer program in a large majority of instances. The exceptions are due to the occasional failure of the program to select a large movement because it is too short, or (more frequently) to select very small movements simply because they last quite long. I dare say our entire analysis could have been carried out strictly in terms of the turning points identified by the computer program, without major effect upon our conclusions.

After deciding upon the rate of change in prices as the variable that the chronology would represent, several other decisions remain. First, the rates of change must be seasonally adjusted or derived from seasonally adjusted indexes. During the past year the Bureau of Labor Statistics has been reporting the seasonally adjusted rate of change in the CPI. The seasonal pattern has a relatively small effect upon the level of the index (currently the largest and the smallest seasonal factors are, respectively, 100.12 in July and 99.83 in January and February). Nevertheless, it has a substantial effect upon rates of change over short periods. For example, the rate of change from July 1969 to January 1970 is raised from an annual rate of 5.7 per cent to 6.3 per cent after seasonal adjustment, which is equivalent to dividing a seasonal index of 90 into the unadjusted rate. This seasonal effect has been powerful enough to cause the unadjusted July-to-January rates to be lower than either the preceding or the following January-to-July rates in four out of the past five years.[1]

Next, precisely how the rate of change is to be measured must be determined. The range of possibilities is wide. The interval over which a change is measured can be as short as one month or as long as twelve months

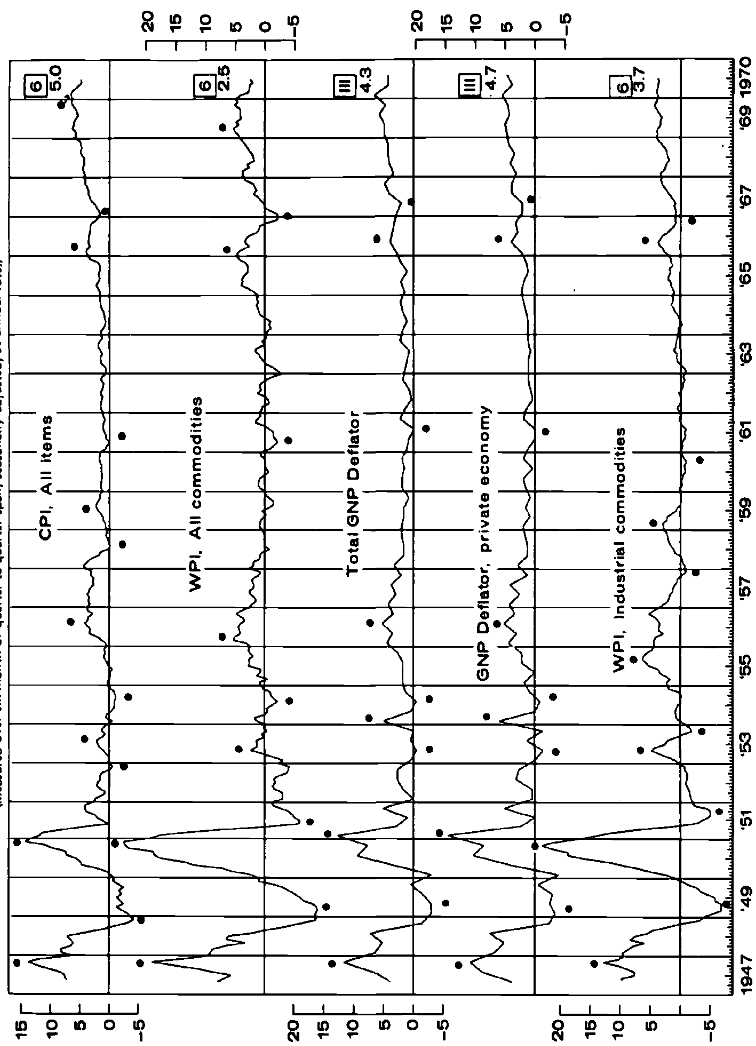
[1] The magnification of the seasonal effect on the rate of change compared with the level can be illustrated as follows. The increase in the seasonal factor from 99.83 in January to 100.12 in July is 0.6 per cent at an annual rate. If the increase in the unadjusted index is at a 6 per cent annual rate, the seasonal factor is accounting for about one-tenth of the rise. Of course, it has an equal and opposite effect on the increase from July to January. The ups and downs in the rate of increase that are attributable to seasonal factors can be quite misleading in judging trends in the rate of inflation. For example, the unadjusted rate of increase during the six months ending in July 1965 showed a sharp acceleration, but by January 1966 the rate had declined sharply again, largely for seasonal reasons. There was a similar acceleration in July 1966, and then a retardation again in January 1967. This time, however, the decline was reflecting both seasonal factors and the 1967 minirecession. In short, as the figures given below indicate, the seasonally adjusted rates show the onset of inflation in 1965, its interruption in 1967, and its continuation thereafter.

Per Cent Change at Annual Rate, CPI, All Items

	Unadjusted	*Seasonally Adjusted*
1964--January-July	1.1	0.6
July-January	1.1	1.6
1965--January-July	2.4	1.9
July-January	1.5	2.0
1966--January-July	4.2	3.7
July-January	2.5	3.1
1967--January-July	3.2	2.6
July-January	3.6	4.2
1968--January-July	5.0	4.4
July-January	4.3	5.0
1969--January-July	6.7	6.1
July-January	5.7	6.3
1970--January-July	6.0	5.4

Chart 1. Rates of Change in Comprehensive Price Indexes (Centered)

(Measured over six-month or quarter-to-quarter span, seasonally adjusted, at annual rate.)



• Price cycle peak or trough.

[6] Arabic number indicates latest month for which data are plotted. ("6" = June)

[III] Roman numeral indicates latest quarter for which data are plotted. ("III" = third quarter) or more. Monthly indexes can be averaged over calendar quarters, or over moving three-month intervals, and rates of change measured between these averages. More complicated smoothing formulas can be applied. Generally, month-to-month changes are highly erratic, so some form of smoothing is desirable. On the other hand, smoothing formulas can twist and distort cyclical patterns and timing relationships. After some experimentation I have concluded that the rate of change over a six-month span meets reasonably well such criteria as smoothness, simplicity, and limited distorting effects, for the CPI and most other price and wage series. For series that are available only in quarterly form, quarter-to-quarter changes are used. (Although the interval between two adjacent quarters is only three months, the averaging over a quarter offsets the shorter interval, so the smoothing effect is similar to a six-month change.) Occasionally, I use changes over twelve-month or four-quarter spans, when these are the only data available or when the six-month or one-quarter rates are unduly erratic.[2]

Taking into account the foregoing considerations, Chart 1 presents the reference chronology, based upon the rate of change in the Consumer Price Index, together with the rates of change in the other comprehensive indexes mentioned above. Six contractions in the rate of change are identified: in 1947-48, 1950-52, 1953-54, 1956-58, 1959-61, and 1966-67. We have marked a tentative peak in February 1970. If confirmed, this will mark the beginning of the seventh contraction since 1947 (see below). Taking the 23 year period between the 1947 and 1970 peaks, we find that expansions in the rate of change lasted 162 months in the aggregate, while contractions covered 106 months (see Table 1). That is, although the level of the Consumer Price Index has been generally rising during this period, the rate of increase has declined over long stretches—aggregating nearly nine years.

The other indexes show broadly similar fluctuations, but with exceptions, especially in the period 1959-64. In terms of these comprehensive indexes, therefore, the chronology seems to represent fluctuations that are spread widely throughout the price system. This matter will be examined more directly in the section on diffusion indexes.

[2] A question related to the length of span is whether the rates of change should be centered within the interval they cover or placed at the terminal month. Placing at the terminal month, while convenient for current analysis, tends to make the dates of historical peaks or troughs later the longer the interval over which change is measured. Thus, six-month rates of change will typically turn down after month-to-month changes do, and twelve-month changes still later. Centering eliminates this bias, and is especially important when different spans are being used for different series. In this paper we shall follow the convention of centering, and since we generally use a six-month span this means that dates are three months earlier than they would be had they been set at the terminal month.

TABLE 1

Reference Chronology for the Rate of Change in Prices, Based on the Consumer Price Index, 1947–70

Peaks and Troughs	Dates	Per Cent Rate of Change[a] At Peak	Per Cent Rate of Change[a] At Trough	Change in Rate from Peak to Trough	Change in Rate from Trough to Peak	Number of Months from Peak to Trough	Number of Months from Trough to Peak
Peak	Oct. 1947	13.8	–	–	–	–	–
Trough	Nov. 1948	–	–4.3	–18.1	–	13	–
Peak	Nov. 1950	14.3	–	–	+18.6	–	24
Trough	Nov. 1952	–	–.6	–14.9	–	24	–
Peak	July 1953	2.1	–	–	+2.7	–	8
Trough	Aug. 1954	–	–1.2	–3.3	–	13	–
Peak	July 1956	4.3	–	–	+5.5	–	23
Trough	July 1958	–	–0.2	–4.5	–	24	–
Peak	July 1959	2.3	–	–	+2.5	–	12
Trough	March 1961	–	0	–2.3	–	20	–
Peak	Jan. 1966	4.1	–	–	+4.1	–	58
Trough	Jan. 1967	–	1.6	–2.5	–	12	–
Peak	Feb. 1970[b]	6.7	–	–	+5.1	–	37
Average	1947–70	6.8	–0.8	–7.6	+6.4	18	27
	1952–67	3.2	–0.1	–3.2	+3.7	17	26

[a]Change over six-month span, centered, seasonally adjusted at an annual rate.
[b]Tentative. The latest figure centered on July 1970 is 5.0 per cent.

Some interesting points emerge from Table 1. During the first three contractions in the rate of change in the CPI, the rate fell below zero, that is, the index declined. But the rate barely reached zero in the next two contractions (1958 and 1961), and did not do so at all in the last one (1967). Indeed, the level of the rate at its successive low points becomes progressively higher throughout the period. There is a related tendency for the declines in the rate to become progressively smaller. In the first two contractions the rate dropped 18 and 15 percentage points; in the next two, 3 and 4½ percentage points; and in the last two, 2 and 2½ percentage points. However, the high points in the rate have not become progressively higher, nor have the expansions become progressively larger. If there has been a rising floor under the rate, there has not been a rising ceiling also. One possible explanation, which needs further exploration, is that the rising importance of services, and the diminishing importance of foods, in family budgets has had the effect of preventing declines in the rate of change of the CPI from reaching as low a level in recent years as they did earlier in the postwar period.

PRICE CYCLES AND BUSINESS CYCLES

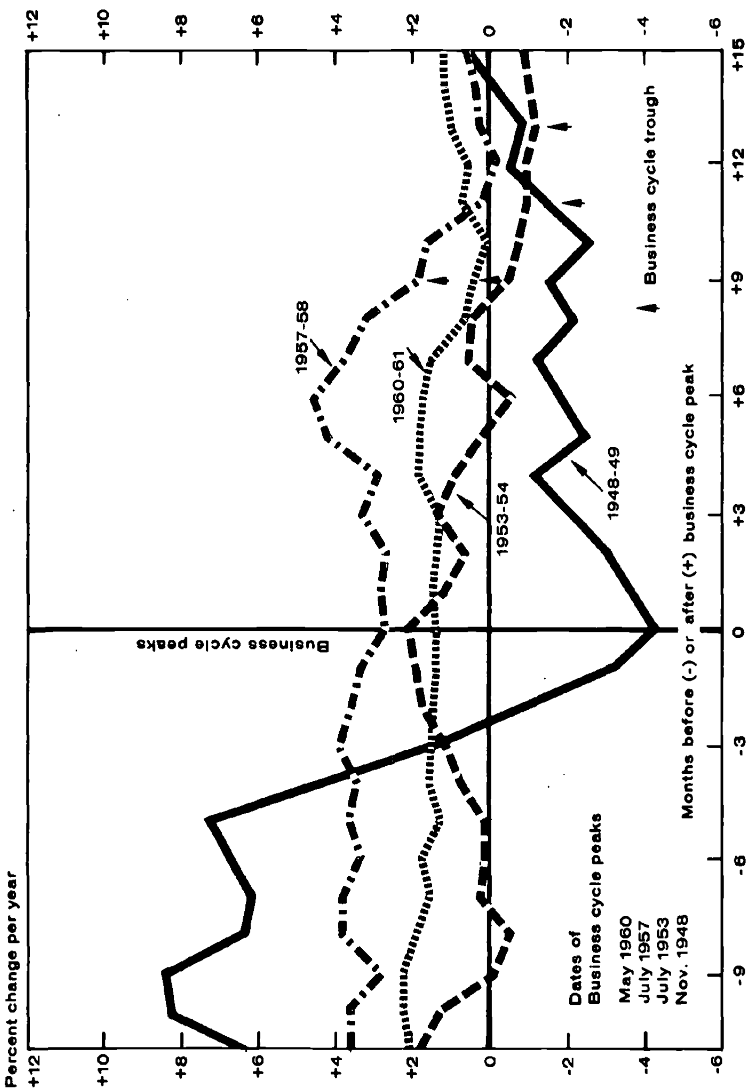
How does the price chronology compare with the business cycle chronology? Four of the price contractions correspond with the four business contractions of 1948-49, 1953-54, 1957-58, and 1960-61. But the business expansion of 1949-53 was interrupted by the price contraction of 1950-52 during the Korean War, and the long business expansion that began in 1961 was interrupted by the price contraction of 1966-67. Both of these interruptions were also characterized by some hesitancy in business as well. Hence there is a notable degree of correspondence between the behavior of the rate of change in the Consumer Price Index and general economic activity. Since World War II, every economic slowdown or actual recession has been accompanied by a cyclical contraction in the rate of change in the price level, and cyclical contractions in the rate of change in the price level have not occurred at other times.

This does not mean, however, that a business recession as defined by the National Bureau of Economic Research is a necessary condition for a reduction in the rate of inflation. As already noted, two such reductions since 1947 have occurred at times when the economy merely slowed down. Moreover, several of the declines in the rate of price rise that were associated with business cycle contractions began well before the contraction in business activity got underway. The 1947 and 1956 peaks in the rate of change in the Consumer Price Index both came about a year before the business cycle peak, and the 1959 price peak came ten months before the business peak. In fact, in 1948, all of the decline in the rate of change in prices---and it was substantial---took place before the recession began. In 1953, the two peaks coincided. More often than not, then, the CPI has begun to decelerate while business activity was still expanding.

On the other hand, low points in the rate of price change have coincided rather closely with business cycle troughs, at least on three out of four occasions. The 1948 upturn in the rate of price change (from a level of -4 per cent) came eleven months before the business upturn, but the 1954 price upturn coincided with the business upturn, while the 1958 and 1961 price upturns followed the business turn by three months and one month, respectively. In short, declines in the rate of price change have typically started earlier and hence have continued somewhat longer than business cycle contractions.

However, the rate of price change has usually persisted at a low level, even a negative level, beyond the point of upturn. These tendencies are illustrated in Chart 2. Perhaps the most striking showing is that about a year after the business peak the rates of price change have all been in the vicinity of zero,

Chart 2. Rates of Change in the Consumer Price Index before and after Business Cycle Peaks



NOTE: Rates of change over 6-month span, centered, seasonally adjusted at annual rate.

plus or minus 1 per cent. The food price component of the CPI, highly sensitive to economic demand, is largely responsible for this result.

DIFFUSION OF PRICE CHANGES

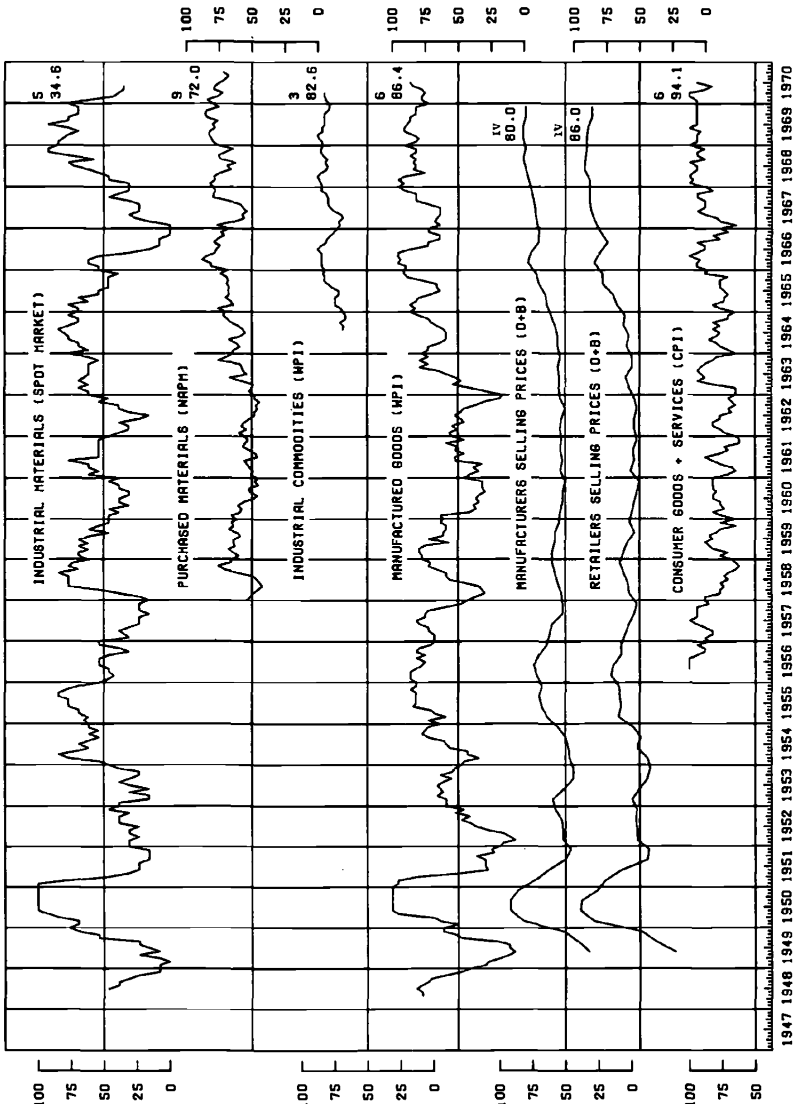
One of the characteristics of business cycles that Wesley Mitchell deemed important, and which he demonstrated empirically time and again, was their generality. "A business cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals . . . ," says the definition formulated by Burns and Mitchell in 1946. Among the many activities are prices, and we have just seen that the rate of change in the price level is clearly one of the participants in the ebb and flow of business cycles.

This observation does not, however, directly answer the question whether the price chronology we have constructed reflects widespread similar movements among different prices. We can get at this question by examining diffusion indexes of prices, for such indexes report how many out of a given population of prices are rising at a particular time and how many are falling. In terms of the popular conception of whether or not the economy is experiencing inflation, or whether inflation is getting worse or better, variations in the degree of generality of price increases are perhaps more significant than variations in the rate of change in a price index.

Chart 3 brings together several price diffusion indexes and illustrates several propositions. First, at all times some prices are falling and some are rising, but the proportions that are in the one category or the other vary greatly. Second, the most widespread increases in prices generally have occurred during the periods marked off as expansions in our price chronology; and the most widespread reductions, during the contractions. That is to say, the reason why the consumer price index increases more rapidly at some times than at others is not only that price increases at those times are larger but also that they are more widespread.

Third, there are discernible sequences in the process whereby price changes spread through the economy. Prices of industrial materials take an early position, wholesale prices of manufactured goods move somewhat later, and retail prices of consumer goods and services come still later. The sequences among those parts of the price system that are shown in the chart are so long drawnout, in fact, that on several occasions (notably during 1957-58) the most widespread declines in the early-moving prices came almost at the same time as the most widespread increases in consumer prices. Unless the sequences in the price system are taken into account, one could be misled into thinking that the cyclical swings in prices are less general than they are in fact.

CHART 3. DIFFUSION INDEXES OF PRICES
(PERCENT RISING, CENTERED)



LEADS AND LAGS IN PRICES

The diffusion indexes in Chart 3 depict some of the sequences in the price system. But we can examine the matter more thoroughly by referring to the rates of change in a larger array of price indexes, using the price chronology as a reference frame in the same way that the business cycle chronology has been used to study leads and lags in economic activities generally. In this manner we can observe not only the leads and lags of other prices vis-à-vis the Consumer Price Index, but also their leads and lags with respect to one another.[3]

Looking first at certain major components of the Consumer Price Index we find that the turns in the commodity component match those in the total index very closely (see Table 2). On five occasions since 1956 (when the commodity-service grouping first becomes available) the turns in the rate of change in the commodity index and in the total index came in exactly the same month, while on the remaining occasion the commodity turn was one month earlier. This correspondence is due more to food prices, whose volatile movements have a marked effect on both the commodities component and the total, than to commodities other than food. As for prices of services, their well-known tendency to lag is apparent. Perhaps less well known is that the rate of change in service prices undergoes cyclical movements that correspond closely, except for the lag, to those in commodity prices. The lag of service prices behind commodity prices averages about three months. These relations are shown by Chart 4.

Turning to wholesale prices, we find that the total WPI exhibits a slight tendency to lead the total CPI (see Table 3). That is, it leads on five occasions, exactly coincides four times, and lags only once. The lead appears to derive more from the industrial commodities in the WPI than from the farm products, processed foods, and feeds component. The latter component, however, matches the CPI quite closely, and of course compares most directly with the food price component of the CPI, which, as we have seen, itself has a dominant effect on the CPI. The behavior of consumer prices depends, to an extent most city dwellers are probably unaware of, on the behavior of farm prices.

The industrial commodities component of the WPI has turned before the CPI nine times since 1948, coincided once, and lagged twice. The tendency to lead is imparted primarily by the prices for crude and intermediate materials

[3] This is possible, and efficient, only when a large portion of the cyclical turns in the other price series can be matched with those in the CPI. This is generally, but not always, the case.

TABLE 2

Leads and Lags in Rates of Change of Major Components of the Consumer Price Index, 1947–70

Item	Dates of Corresponding Peaks and Troughs					Lead (–) or Lag (+) in Months, at Turns in CPI, All Items			
	All Terms	Commodities[a]	Food	Other Commodities[a]	Services[a]	Commodities[a]	Food	Other Commodities[a]	Services[a]
Peak	10/47	–	10/47	–	–	–	0	–	–
Trough	11/48	–	11/48	–	–	–	0	–	–
Peak	11/50	–	11/50	–	–	–	0	–	–
Trough	11/52	–	2/53	–	–	–	+3	–	–
Peak	7/53	–	2/54	–	–	–	+7	–	–
Trough	8/54	–	10/54	–	–	–	+2	–	–
Peak	7/56	7/56	4/56	12/56	2/57	0	–3	+5	+7
Trough	7/58	7/58	7/58	7/58	9/58	0	0	0	+2
Peak	7/59	7/59	5/60	4/59	6/59	0	+10	–3	–1
Trough	3/61	3/61	3/61	5/60	5/61	0	0	–10	+2
Peak	1/66	1/66	12/65	–	6/66	0	–1	–	+5
Trough	1/67	12/66	1/67	–	4/67	–1	0	–	+3
Peak	2/70[b]	3/69	11/69	–	–	–	–	–	–
DATES OF EXTRA PEAKS AND TROUGHS[c]									
Peak			9/63	–	7/61				
Trough			4/64	10/56	10/62				
Peak			–	1/58	8/63				
Trough			–	–	4/65				

Item	Summary of Leads and Lags in Turns in CPI, All Items			
	Commodities[a]	CPI, Food	Other Commodities[a]	Services[a]
Number of:				
Leads	1	2	2	1
Exact coincidences	5	6	1	0
Lags	0	4	1	5
Total timing comparisons	6	12	4	6
Rough coincidences[d]	6	10	2	4
Median lead (–) or lag(+), in months:				
At peaks	0	0	+1	+5
At troughs	0	0	–5	+2
At all turns	0	0	–1.5	+2.5

Note: Dashes indicate no timing comparison. Per cent changes are computed over 6-month spans, centered, and seasonally adjusted at annual rate.

[a]Data are not available before 1956.

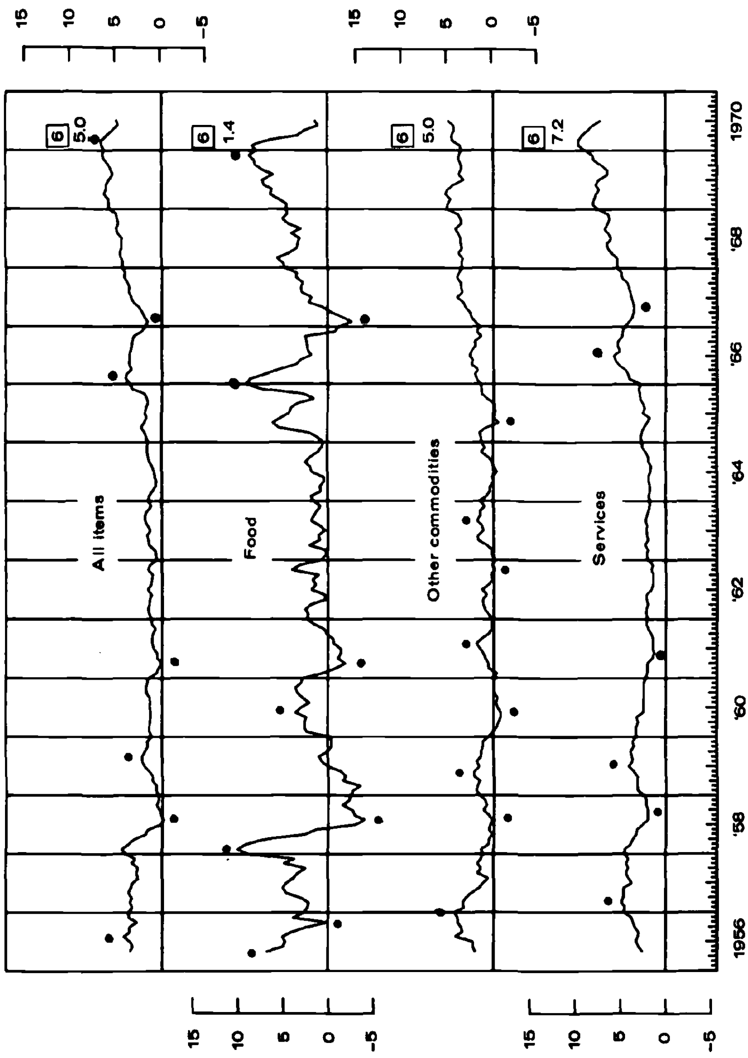
[b]Tentative.

[c]Extra peaks and troughs are those that do not match turns in the CPI, all items.

[d]Rough coincidences include exact coincidences and leads or lags of 3 months or less.

Chart 4. Rates of Change in the Consumer Price Index and Its Major Components

(Measured over 6-month or quarter-to-quarter span, seasonally adjusted, at annual rate centered)



• Price cycle peak or trough.

[6] Arabic number indicates latest month for which data are plotted. ("6" = June)

TABLE 3

Leads and Lags in Rates of Change of Wholesale Price Indexes, 1947–70

Peaks and Troughs (1)	CPI, All Terms (2)	WPI, All Commod-ities (3)	WPI, Industrial Commod-ities (4)	WPI, Farm Products, Processed Foods and Feeds (5)	WPI, Crude Materials (6)	WPI, Crude Materials Less Food (7)	Spot Market Price Index, Industrial Materials[a] (8)	WPI, Inter-mediate Materials (9)	WPI, Consumer Finished Goods (10)	WPI, Consumer Foods (11)	WPI, Other Consumer Goods (12)	WPI, Producer Finished Goods (13)
	Dates of Corresponding Peaks and Troughs											
Peak	10/47	10/47	10/47	10/47	10/47	8/47	–	10/47	10/47	10/47	10/47	8/48
Trough	11/48	2/49	4/49	11/48	11/48	4/49	–	2/49	11/48	11/48	2/49	7/49
Peak	11/50	11/50	10/50	11/50	11/50	7/50	8/50	10/50	9/50	9/50	10/50	10/50
Trough	11/52	6/51	8/51	11/52	5/51	8/51	6/51	7/51	11/52	1/53	10/51	9/52
Peak	7/53	4/53	4/53	2/54	2/54	4/53	3/54	4/53	2/54	2/54	4/53	–
Trough	8/54	7/54	10/53	9/55	9/55	10/53	–	7/54	7/54	7/55	10/53	–
Peak	7/56	2/56	8/55	3/56	2/56	9/55	–	7/55	12/57	12/57	11/56	8/56
Trough	7/58	–	11/57	12/58	7/59	–	9/57	11/57	8/58	12/58	3/58	5/58
Peak	7/59	–	2/59	2/60	–	–	8/58	2/59	2/60	2/60	2/59	12/58
Trough	3/61	3/61	9/60	3/61	–	8/60	9/60	7/61	2/61	3/61	2/61	6/60
Peak	1/66	1/66	4/66	11/65	11/65	12/65	8/64	4/66	12/65	12/65	–	10/66
Trough	1/67	12/66	10/66	12/66	12/66	10/66	11/66	11/66	12/66	12/66	–	4/67
Peak	2/70[b]	3/69		3/69	3/69	5/69	6/69		12/69	12/69	–	
	DATES OF EXTRA PEAKS AND TROUGHS[c]											
Peak		None	None	2/57		–	2/61	7/63	10/61	12/62	None	None
Trough				12/57	2/57	10/57	4/62	3/64	12/62	12/63		
Peak				9/61	2/58	7/58						
Trough				12/62		–						
Peak					9/61	4/61						
Trough					12/62	4/62						

LEADS (–) AND LAGS (+) IN MONTHS, AT TURNS IN CPI, ALL ITEMS												
Peak	10/47	0	0	0	0	–2	–	0	0	0	0	+10
Trough	11/48	+3	+5	0	0	+5	–	+3	0	0	+3	+8
Peak	11/50	0	–1	0	0	–4	–3	–1	–2	–2	–1	–1
Trough	11/52	–17	–15	0	–18	–15	–17	–16	0	+2	–13	–2
Peak	7/53	–3	–3	+7	+7	–3	+8	–3	+7	+7	–3	–
Trough	8/54	–7	–10	+13	+13	–10	–	–1	–1	+11	–10	–
Peak	7/56	–5	–11	–4	–5	–10	–	–12	+17	+17	+4	+1
Trough	7/58	–	–8	+5	+12	–	–10	–8	+1	+5	–4	–2
Peak	7/59	–	–5	+7	–	–	–11	–5	+7	+7	–5	–7
Trough	3/61	0	–6	0	–	–7	–6	+4	–1	0	–1	–9
Peak	1/66	0	+3	–2	–2	–1	–17	+3	–1	–1	–	+9
Trough	1/67	–1	–3	–1	–1	–3	–2	–2	–1	–1	–	+3
SUMMARY OF LEADS AND LAGS AT TURNS IN CPI, ALL ITEMS												
Number of:												
Leads		5	9	3	4	9	7	8	5	3	7	5
Exact coincidences		4	1	5	3	0	0	1	3	3	1	0
Lags		1	2	4	3	1	–	3	4	6	2	5
Total timing comparisons		10	12	12	10	10	–	12	12	12	10	10
Rough coincidences[c]		8	5	7	5	4	2	7	9	7	5	5
Median lead (–) or lag (+), in months:												
At peaks		0	–2	0	0	–3	–7	–2	+.5	–.5	–1	+1
At troughs		–1	–7	0	0	–7	–8	–1.5	–.5	+1	–4	–2
At all turns		–5	–4	0	0	–3.5	–8	–1.5	–.5	0	–2	0

Note: Dashes indicate no timing comparison. Percentage changes are computed over 6-month spans, centered, and seasonally adjusted at annual rate.

[a]Weekly index, not a component of the WPI.

[b]Tentative.

[c]Extra peaks and troughs are those that do not match turns in the CPI, all items.

[d]Rough coincidences include exact coincidences and leads or lags of 3 months or less.

other than foods, rather than for finished goods. Prices for crude materials other than food have led nine out of ten turns in the CPI since 1947, an average lead of about four months. This index is similar in its movements and timing to the weekly index of spot market prices of industrial materials prices. On most occasions the turns in the rates of change in these two materials price indexes have occurred within a month or two of each other. Prices for producer finished goods—–i.e., machinery, equipment, trucks, office furniture, etc.—–show about as much tendency to lag behind as to lead the movements in the CPI. Many of these relationships as well as others are depicted in Charts 5 and 6.[4]

The rate of change in the GNP Deflator is a lagging indicator relative to the rate of change in the CPI (see Table 4). This is true also of the Private Deflator, since its turns usually coincide with those of the total. The deflators have lagged behind the turns in the CPI far more frequently than they have led or coincided with it, and the average lag has been about three months.

[4]The recent study by Stigler and Kindahl (*The Behavior of Industrial Prices*, New York, NBER, 1970) indicates that the substitution of an index of transaction prices for the present BLS index, which is based in large part on list prices, would, if anything, reduce the length of the leads of industrial commodity prices relative to the CPI. Their index of industrial prices covers about 19 per cent of the content of the BLS industrial commodities index, and they construct an index of comparable coverage from BLS data. The turning points in the rates of change (over six-month spans, centered) correspond as follows with those in the Consumer Price Index:

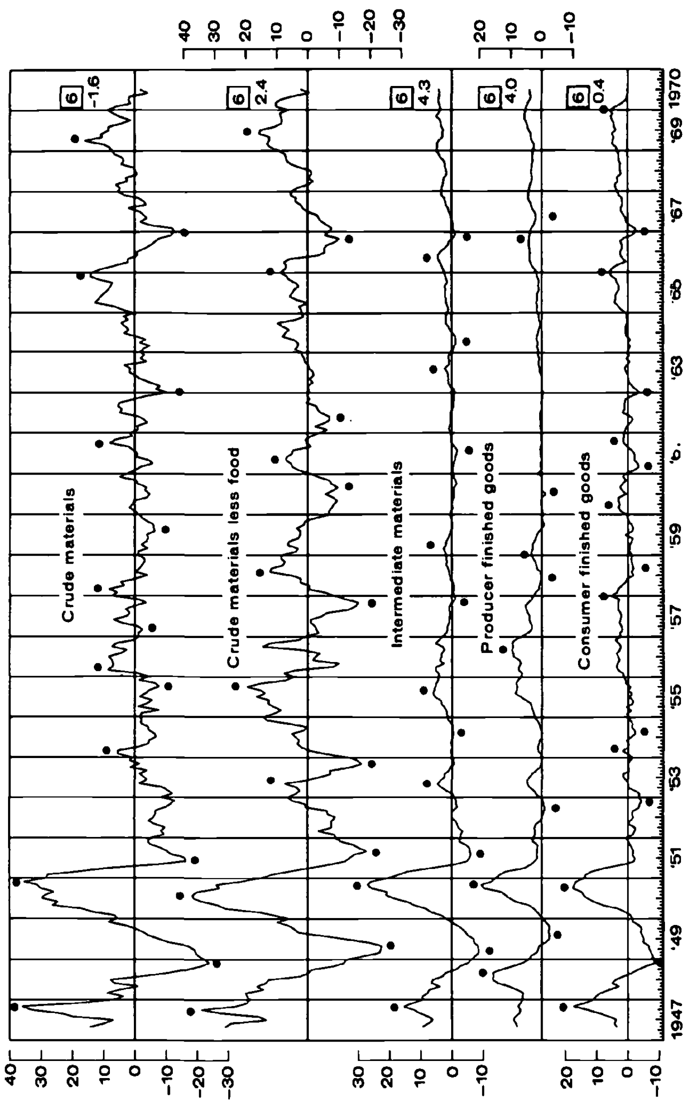
	Trough	*Peak*	*Trough*
CPI, all items	7/58	7/59	3/61
WPI, industrials			
Restricted coverage			
NBER	3/58	10/58	7/61
BLS	1/58	8/58	2/61
Total, BLS	11/57	2/59	9/60

	Lead (–) or Lag (+) in Months, at Turns in CPI		
WPI, industrials			
Restricted coverage			
NBER	–4	–9	+4
BLS	–6	–11	–1
Total, BLS	–8	–5	–6

The NBER index lags behind the comparable BLS index at each turn, apparently because of the inclusion in the former of long-term contract prices at the dates when deliveries were made rather than when the contracts were consummated. Otherwise, the transaction price index might be expected to lead.

Chart 5. Rates of Change in Wholesale Price Indexes, by Stage of Process

(Measured over 6-month span, seasonally adjusted, at annual rate, centered)



• Price cycle peak or trough.

6 Arabic number indicates latest month for which data are plotted. ("6" = June)

Chart 6. Rates of Change in Wholesale and Consumer Price Indexes
(Measured over 6-month span, seasonally adjusted, at annual rate, centered)

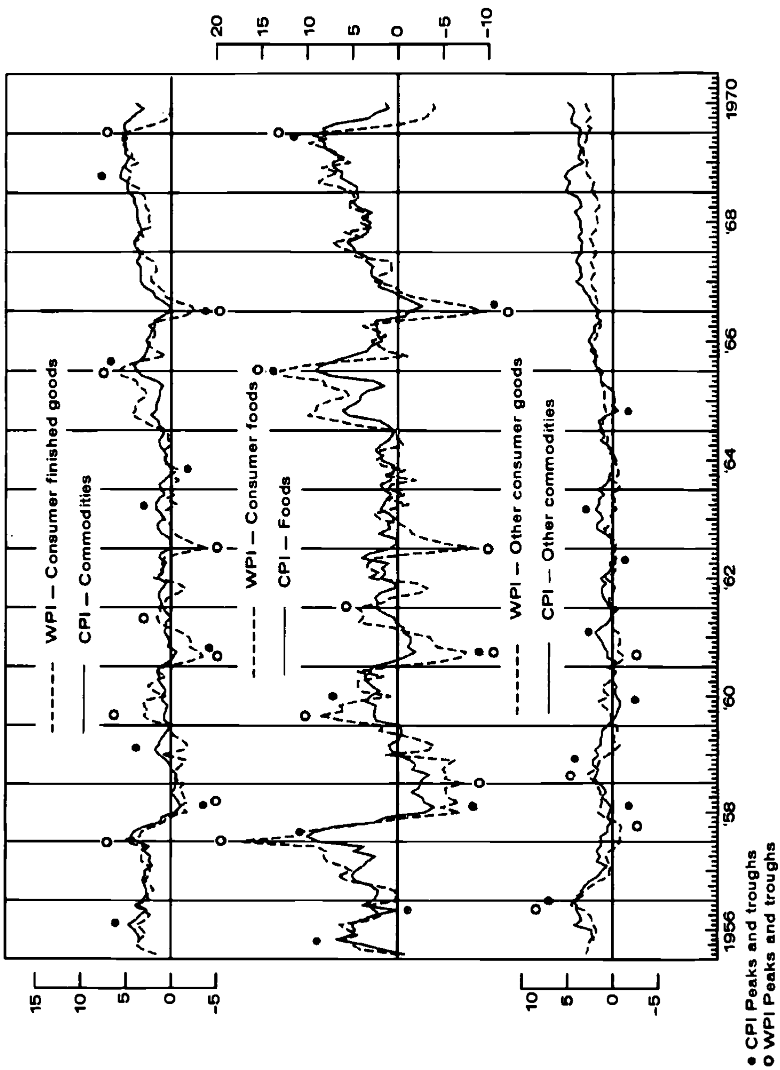


TABLE 4

Leads and Lags in Rates of Change of GNP Implicit Price Deflators, 1947–70

Peaks and Troughs	CPI, All Items	Dates of Corresponding Peaks and Troughs GNP deflator		Lead (–) or Lag (+), in Months, all Turns in CPI, All Items GNP deflator	
		Total	Private Sector	Total	Private Sector
Peak	10/47	10/47	10/47	0	0
Trough	11/48	4/49	1/49	+5	+2
Peak	11/50	1/51	1/51	+2	+2
Trough	11/52	4/53	4/53	+5	+5
Peak	7/53	1/54	1/54	+6	+6
Trough	8/54	7/54	7/54	–1	–1
Peak	7/56	7/56	7/56	0	0
Trough	7/58	–	–	–	–
Peak	7/59	–	–	–	–
Trough	3/61	7/61	7/61	+4	+4
Peak	1/66	4/66	4/66	+3	+3
Trough	1/67	4/67	4/67	+3	+3
Peak	2/70[a]	–	–	–	–

Item	Summary of Leads and Lags at Turns in CPI, All Items, (GNP deflator) Total	Private Sector
Number of:		
Leads	1	1
Exact coincidences	2	2
Lags	7	7
Total timing comparisons	10	10
Rough coincidences[b]	6	7
Median lead (–) or lag (+), in months:		
At Peaks	+2	+2
At troughs	+4	+3
At all turns	+3	+2.5

Note: Dashes indicate no timing comparison.
[a]Tentative.
[b]Rough coincidences include exact coincidences and leads or lags of 3 months or less.

The reason for the lag may be that personal consumption expenditures—–i.e., the type of expenditure reflected in the CPI—–constitute less than two-thirds of total GNP, and prices for the two largest elements in the remainder—–fixed investment goods and government services—–are relatively sticky. The fluctuating weights in the GNP Deflator may be a factor, also. When the Deflator is computed with fixed (1958) weights, as the Department of Commerce has done since 1962, the 1966 peak and the 1967 trough in the rate of change are reached one quarter earlier, and the most recent high is two quarters earlier.

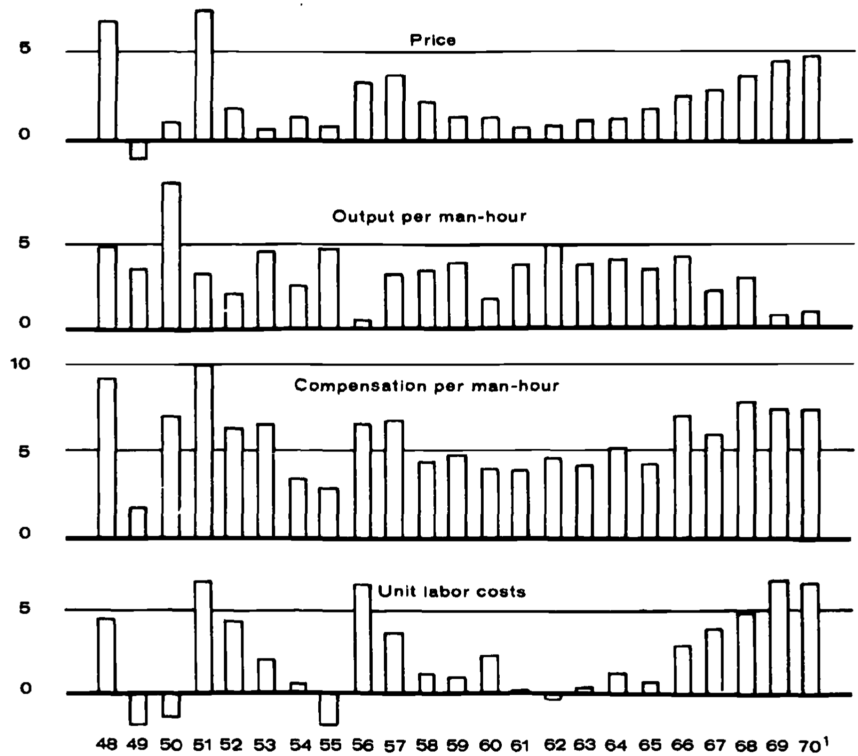
In this brief review we have, of course, only scratched the surface of the complex structure of leads and lags in the price system. In the vanguard are the wholesale prices of raw and semifabricated materials. At the rear are the retail prices of services. In between are the wholesale and retail prices of foods and many other commodities. We have dealt with fairly large groups of prices of goods and services, and have not touched upon the prices of fixed assets, such as land or buildings, or the price of labor, or interest rates. There is a large amount of room for further investigation.

PRICES, COSTS OF PRODUCTION, AND PROFITS

During the past few years a systematic body of statistics has been built up that connects the rate of change in the price level with rates of change in compensation per man-hour, output per man-hour, labor costs per unit of output, profits, and other costs per unit of output. The data are available quarterly for the private sector as a whole, as well as for certain major elements of the private sector. They tell us some things about the cyclical behavior of prices and the factors affecting them that hitherto could be inferred only indirectly, if at all.

The year-to-year rates of change in these data since 1947 for the total private economy are shown in Charts 7 and 8. They reveal that output per man-hour has risen in every year and that hourly compensation has done likewise. In most years, the increase in compensation has exceeded the increase in productivity, so labor costs per unit of output have also risen. But the fluctuations in unit labor costs are wider than in productivity or compensation, and they also bear a closer relationship to price. The remaining costs (depreciation, interest, and indirect taxes) also fluctuate considerably per unit of output, in part no doubt because of their relatively fixed nature; but they have been generally increasing relative to output in the postwar period. The fluctuations in profits per unit of output are wider still, and for the most part they move inversely with unit labor costs and with total unit costs.

Chart 7. Annual Percent Change in Prices, Productivity, Labor Compensation and Unit Labor Costs, Total Private Economy, 1948-1970

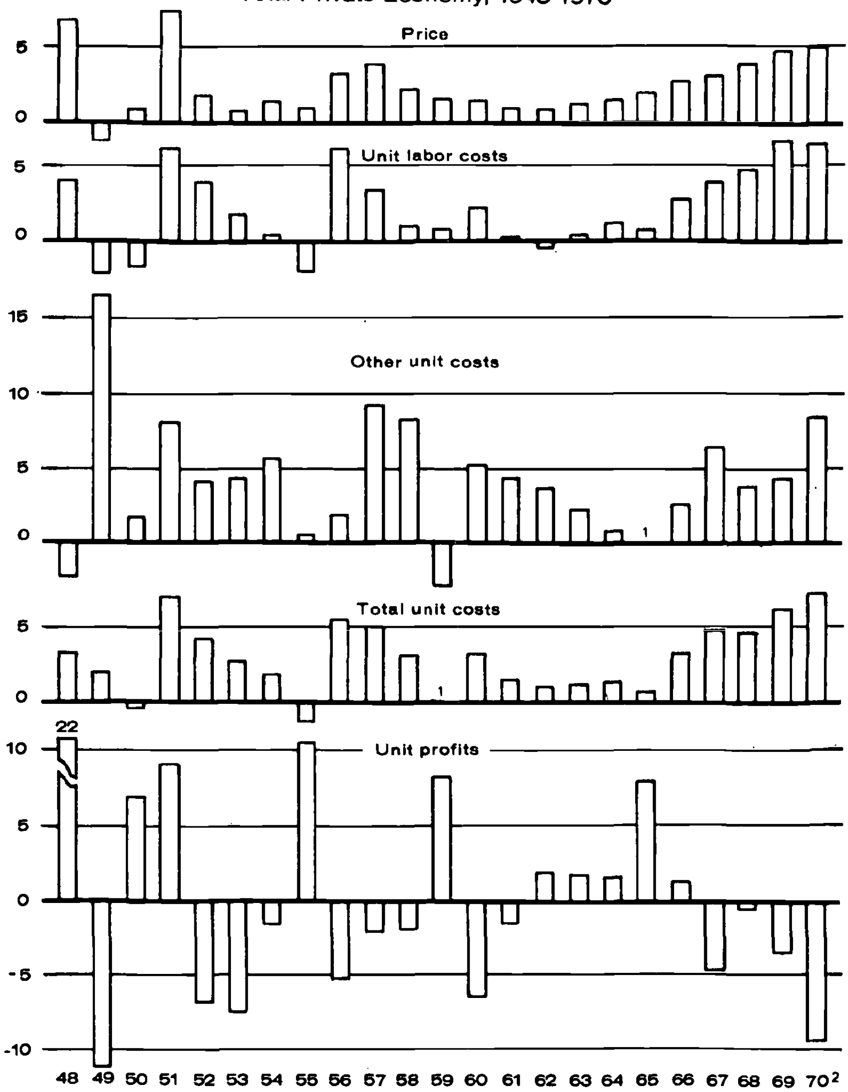


[1] 2nd quarter 1970 over 2nd quarter 1969.

Compensation and labor costs include wages and salaries and supplemental payments for employees and an estimate of the salaries and supplements for the self-employed. Other (nonlabor) costs include depreciation, interest and indirect taxes. Profits include corporate profits, estimated profits of unincorporated enterprises, and net rental earnings of owner-occupied dwellings.

Unit costs and unit profits are total costs and profits divided by total output.

Chart 8. Annual Percent Change in Prices and Unit Costs
Total Private Economy, 1948-1970



[1] Indicates plotting at zero.
[2] 2nd quarter 1970 over 2nd quarter 1969

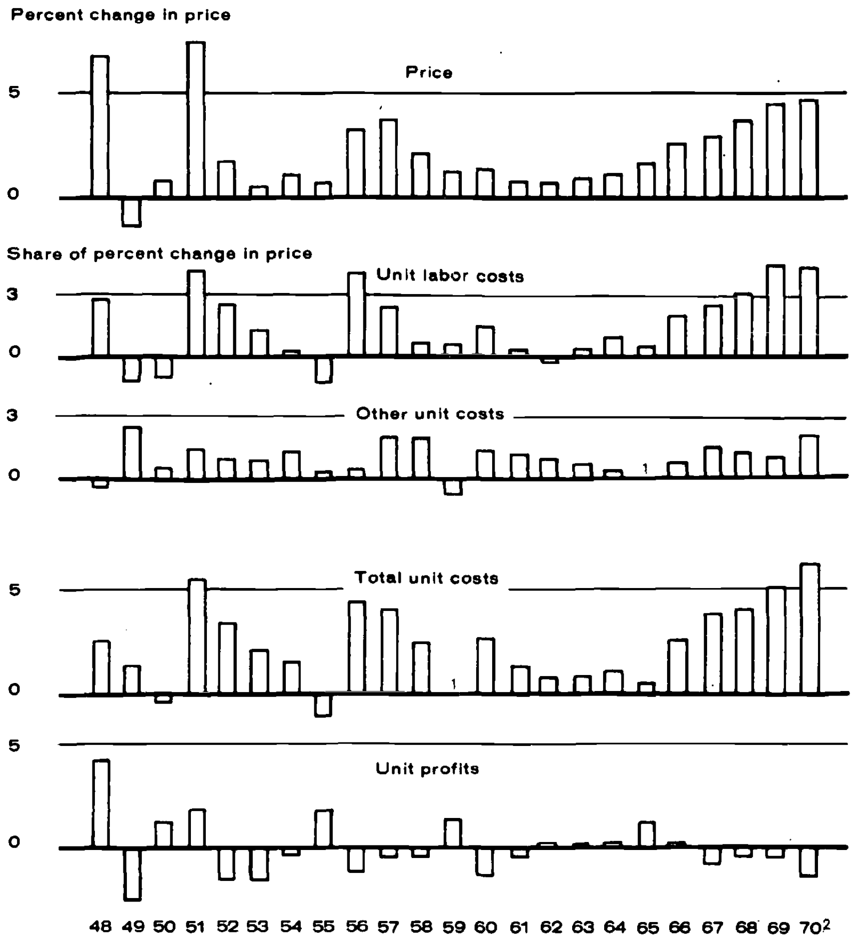
For definitions see note to Chart 7.

The relationships of costs and profits to price depend not only on how they fluctuate but also on their magnitude. The data enable us to take the magnitude into account and thereby decompose the change in price into its constituent cost and profit components (see Chart 9). Thus in 1968-69, for example, when the price index rose 4.5 per cent, the share absorbed by increased unit labor costs was 4.0 percentage points; the share that went to meet increases in other unit costs was equivalent to 0.9 percentage points, while the decline in unit profits offset the rise in costs to the extent of 0.4 percentage points. In general, since payments for labor constitute the largest single cost and since unit labor costs have generally been rising, the share of unit labor costs usually has been positive and closely related to the change in price. The share of other costs is smaller, though usually positive, and less well correlated with the change in price. As often as not, the share of price change absorbed by unit profits has partly offset the increases in other costs.

A fairly characteristic picture of the behavior of costs and profits during a cyclical rise and fall in the rate of change in prices emerges from these data, particularly when use is made of the quarterly figures. At the bottom of the price cycle, with prices relatively stable or declining, the rate of increase in output per man-hour is high, but after prices start rising it diminishes as the upswing in prices continues. Rates of increase in hourly compensation, on the other hand, are usually at a moderate level during the initial phase of the upswing in prices, but soon begin to rise, partly in response to the price movement. As a joint result of the changing discrepancy between the rates of change in compensation and productivity, the rate of change in unit labor costs diminishes during the initial phase of the price expansion, but rises sharply in the later phase. Other unit costs follow somewhat the same path; so, at the start of the price expansion, costs are rising less rapidly than prices while at its close they are rising more rapidly than prices, even though the price rise has in the meantime accelerated. Unit profits, therefore, typically rise rapidly at the start of a price expansion, but decline at the end.

As the downswing in the rate of price increase begins, output per man-hour usually continues to show lower growth rates for a time, but shortly a recovery sets in. This reduction in physical costs is no doubt partly a consequence of the downswing in prices, as producers react to the profit squeeze, but it also serves to support it. Further support is provided by a decline in the rate of increase in hourly compensation. Both factors generate a decline in the rate of increase in unit labor costs. Other unit costs also show lower rates of growth as the price contraction continues. The upshot is that while the increase in total unit costs exceeds that of prices at the start of the price contraction and unit profits are therefore declining, this situation is reversed before the end of the price contraction. Cost increases become

Chart 9. Decomposition of Annual Rates of Change in Prices into Cost and Profit Components, Total Private Economy, 1948-1970



[1] Indicates plotting at zero.

[2] 2nd quarter 1970 over 2nd quarter 1969

For definitions see note to Chart 7.

sharply lower or actual cost reductions take place, the downswing in costs exceeds that in prices, and unit profits begin rising again.

This description of the interplay of costs and profits during a cycle in the rate of change in prices is, of course, highly generalized. Although it is based on recent data, it follows fairly closely the process that Wesley Mitchell described nearly sixty years ago in his classic treatise, *Business Cycles,* whereby costs rise relative to prices and encroach upon profits during an economic boom. I believe it can still help us to comprehend and to anticipate the developments experienced both when inflationary pressures build up and when they subside.

THE CURRENT SITUATION

One of the purposes of the National Bureau's studies of business cycles was to make possible better judgments about the current economic situation. Improved statistical data, more precise knowledge of economic relationships, and better understanding of the changing nature of these relationships all serve this end. There is a reverse effect as well. The unfolding situation may, by adding one more observation, so to speak, help to confirm, to contradict, or to modify what we thought we had learned from the past. It is well, therefore, to consider some recent developments in the cyclical behavior of prices to see whether they are illuminated by, or help to illuminate, our historical findings.

Our tentative peak date for the reference chronology of prices, based upon the rate of change in the Consumer Price Index, is February 1970. This is the date when the seasonally adjusted rate of change over a six-month interval reached its highest level in the current upswing, 6.7 per cent per year, and began to decline. February is simply the central month of that interval, which runs from November 1969 to May 1970. Several factors persuade me to call this a tentative rather than a definite peak. The most important, of course, is that the subsequent decline to 6.0 per cent in March, 5.4 per cent in April, 4.8 per cent in May, and 5.0 per cent in June and July has been brief, but at present writing the July figure (representing the change from April to October) is the latest we have. The decline to date is shorter than any previous contraction in our chronology—the shortest was 12 months in 1966-67. In magnitude, the decline (1.7 percentage points) is smaller than in 1966-67 (2.4 points). Unless the decline continues, therefore, it will not qualify as a contraction in our chronology.

Although we cannot, therefore, at this time consider the peak to be firmly established, there are a number of bits of evidence pointing in that direction. First, the rates of change in the CPI over shorter spans than six months show peaks around the turn of the year, with much larger declines thereafter. Next, our observations upon leads and lags suggest that a peak in the rate of change in the CPI is apt to be matched closely by one in food prices and to be followed by one in service prices. In fact, food prices reached their highest rate of increase over a six-period interval, nearly 9 per cent per year, in November 1969. The decline to the latest figure, about 1 per cent at an annual rate, has been precipitous. As for services, their high point to date, about 9½ per cent, occurred in February 1970, some three months after the turn in food prices.

Third, corroboration is to be found in the behavior of other price indexes, notably the WPI, where we now have data through November. The total index reached its peak rate of increase (over a six-month span, seasonally adjusted at annual rate) in March 1969 at 5 per cent, and has declined since then to about 2 per cent. The decisive drop occurred in the farm products, processed foods, and feeds component, from 8½ per cent in December 1969[5] to a negative figure currently (September 1970). Industrial commodity prices, as usual, have shown a much milder movement but nevertheless did decline from a 4 per cent rate in October 1969 to about 3 per cent currently. The drop in the rate of change in food prices at wholesale has been sharper than at retail, as has usually been the case in the past. The high month was December 1969, at 10 per cent, and the latest figure is –2 per cent.

The prices of crude materials at wholesale have played their traditional role by declining early and sharply. Their peak rate of increase, 16 per cent per year, was attained in March 1969. The latest, and lowest, rate is –3 per cent. The weekly industrial materials index has behaved in a similar, though more extreme, fashion, by declining from a peak rate of increase of 25 per cent per year in January 1969 to a current low of –14 per cent, a drop of 39 percentage points in the past year and a half. The GNP Deflator reached its fastest rate of increase between the fourth quarter of 1969 and the first quarter of 1970, namely, 6.4 per cent. The latest figure, for the second to the third quarter, is 4.6 per cent.

Finally, all the diffusion indexes of Chart 3 have receded from their highs, which were reached during 1968 and 1969. The decline to date has been largest in the index that has typically moved earliest: industrial materials prices. In general, the rise in prices is no longer as widespread as it was, and price reductions are now somewhat more common.

All these developments are consistent with what has happened during past economic slowdowns. Although we must await further evidence to be confident that a decline of substantial dimensions in the rate of change in prices is under way, if this welcome development does take place it will mark

[5] The cyclical peak is March 1969, at 9 per cent.

one more occasion when the price system has reacted to a reduction in demand pressures.

The long-continued upswing in the rate of change in prices, and its recent subsidence, have been accompanied by changes in costs and profits that bear a striking resemblance to earlier episodes. Table 5 tells the story. Between 1964 and 1969 unit labor costs accelerated steadily, partly as a result of the acceleration in compensation rates per hour, partly because of the retardation in output per man-hour. Other costs also accelerated, but the big contributor to the advance in the rate of increase in total costs was labor cost. By 1966 costs were rising faster than prices, and they have continued to do so every year since. At the same time, unit profits began to decline, and they have

TABLE 5
Percentage Change in Prices, Costs, and Profits, Total Private Economy, 1965–70

Year	Price	Output	Output per Man-hour	Compensation per Man-hour	Unit Labor Costs	Other Unit Costs[a]	Total Unit Costs	Unit Profit[b]
Change from preceding year								
1965	1.7	6.6	3.4	4.1	0.7	0.0	0.5	8.0
1966	2.5	6.4	4.0	6.9	2.8	2.5	2.8	1.3
1967	2.9	2.3	2.1	5.8	3.7	6.2	4.4	–4.5
1968	3.6	4.9	2.9	7.6	4.6	3.7	4.3	–0.4
1969	4.5	2.9	0.7	7.2	6.5	4.1	5.8	–3.3
1970[c]	4.6	–0.2	0.9	7.3	6.3	9.2	7.1	–10.8
Change from preceding quarter at annual rate								
1969								
Third	4.5	2.5	1.6	8.2	6.5	5.5	6.2	–5.9
Fourth	4.7	–1.0	0.8	8.8	7.9	10.1	8.5	–17.5
1970								
First	5.3	–3.0	–2.5	6.8	9.6	9.0	9.4	–20.0
Second	4.1	0.7	3.7	5.3	1.5	12.3	4.4	1.8
Third	4.5	1.6	4.6	7.7	3.0	9.6	4.8	2.4

Source: U.S. Department of Labor, Bureau of Labor Statistics, September 1970.

[a] Includes depreciation, interest, and indirect taxes.

[b] Includes corporate profits, estimated profits of unincorporated enterprises, and set rental earnings of owner-occupied dwellings.

[c] Second quarter 1969 to second quarter 1970.

declined each year also. Mitchell himself could not have asked for a better illustration of the process he described.

The annual time unit used in Table 5 is too crude to show changes during the past few months, but the quarterly data reveal an important shift. Between the first and second quarters of this year the rate of change in the price index for the private sector fell to 4 per cent, the lowest rate since 1968. Output per man-hour advanced at an annual rate of about 3 per cent, also the best showing since 1968. Coupled with a decline in the rate of increase in hourly compensation to about 5 per cent, this produced a sharp decline in the rate of increase in unit labor costs to around 2 per cent. Quarter-to-quarter changes are, of course, erratic, but the directions these changes began to take in the second quarter and continued in the third are in line with what previous experience suggests is likely when an inflationary boom comes to an orderly end and a downswing in the price cycle begins.

THE NEED FOR FURTHER WORK

In my former capacity at the National Bureau of Economic Research, one of my favorite pieces of advice to authors was to close their reports with suggestions for further research and for improved statistics. To follow my own advice on this occasion is surely fitting.

I shall confine myself to a single general admonition, which is, to pay more attention to the price side of economics. Over the past twenty-five years or so, this aspect has been relatively neglected. It is time, I think, for a change. A great concern has developed over the problem of inflation in this country, and not only in this country but around the world. Our ability to cope with it depends on our ability to understand it, and the starting point for understanding is statistical information and research.

Statistical information and research has helped to resolve the problem of the business cycle. The cyclical behavior of prices is ripe for an equally thorough probing. The National Bureau of Economic Research and the Bureau of Labor Statistics, continuing a long and fruitful cooperative relationship, might well devote themselves to this end.