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Money, Interest Rates, Prices, And Output

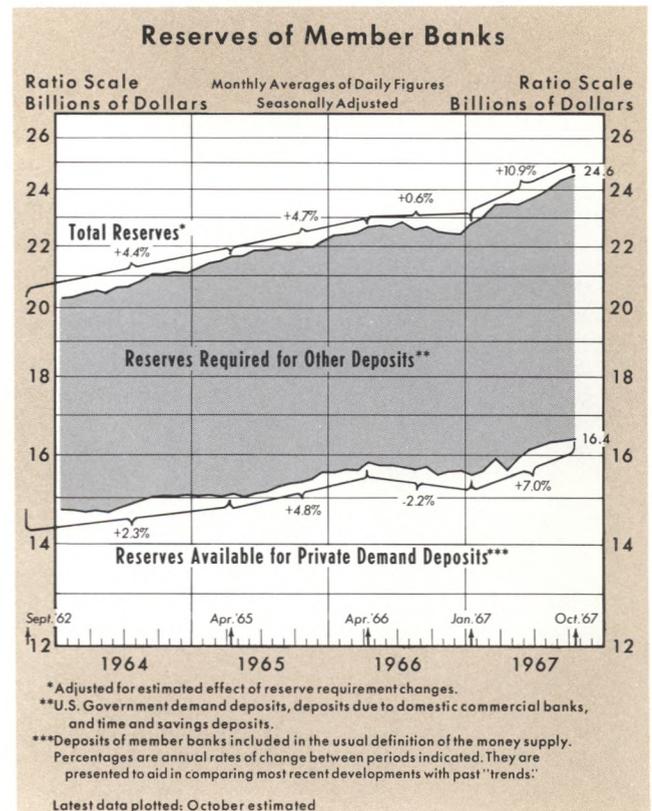
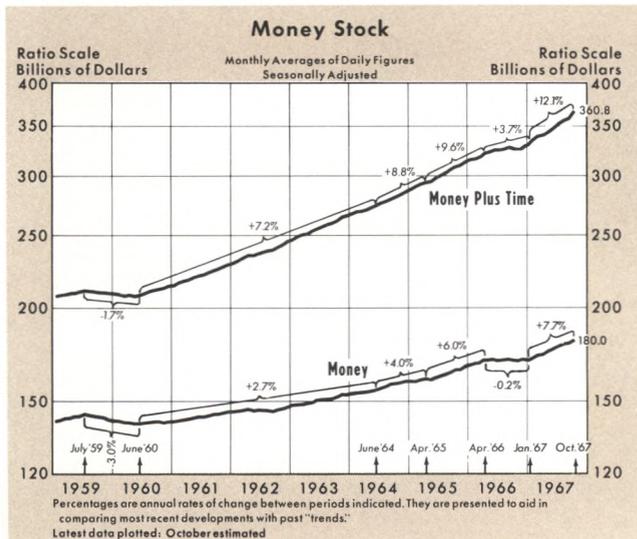
THE MONEY SUPPLY and commercial bank credit have risen rapidly since January. In recent months interest rates have also risen markedly. These developments might appear to be a paradox, but a close examination of economic relationships indicates that they can be interpreted in a way which is entirely consistent with economic theory. The developments in financial markets in the past two years have given rise to considerable question concerning the underlying forces affecting interest rates. This note traces these events and relates them to one frequently cited theory. Before discussing interest rate movements during the past two years, the current economic situation is briefly presented.

separately, private demand deposits (checking accounts) increased at a 9 per cent rate, currency held by the public at a 5 per cent rate and time deposits at a 17 per cent rate. In each case these rates were much faster than the trend rates.

Underlying the growth of money, total reserves of member banks increased at a 10 per cent annual rate, and reserves available for private demand deposits (total reserves minus required reserves on time, interbank, and Government deposits) increased at a 7 per cent rate. This increase in total reserves compares with a 5 per cent average rate of increase from 1964 to 1966 and a 3 per cent trend rate from 1957 to 1964. Federal Reserve credit, the main source of new reserves, rose

Recent Developments

The money stock, defined as private demand deposits plus currency, rose at an estimated 8 per cent annual rate from January to October, while money defined to include time deposits at commercial banks grew at a 12 per cent rate. Looking at the components

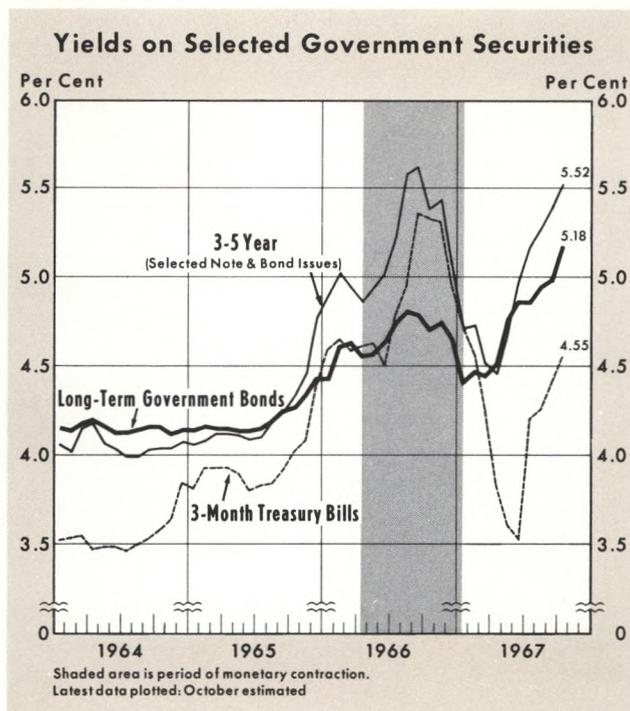


at a 12 per cent rate during the January to October period. The major component of Federal Reserve credit is the System's holdings of U. S. Government securities.

Most business indicators which in the earlier months of this year had indicated some softness turned up during the second quarter and have since risen rapidly. Retail sales increased at a 9.5 per cent annual rate from late spring to early fall, after about a 6 per cent increase during the previous twelve months. The growth trend in these sales from 1957 to 1966 was 5 per cent per year. Despite a major automobile strike, industrial production has risen at a 2 per cent rate since June, after declining at a 3.2 per cent rate from October last year to June. Total employment has risen at about a 3 per cent rate since late spring, somewhat faster than the 2 per cent rate of growth from early fall to late spring.

Gross National Product in current dollars increased at a sharp 8 per cent annual rate from the second to the third quarter this year, after growing at only a 3.4 per cent rate from the fourth quarter of 1966. Real output rose at a 4.2 per cent rate from the second to the third quarter after growing at only a modest 1 per cent rate from the fourth quarter 1966 to second quarter this year.

As indicated by the widening gap between the GNP figures in current and constant dollars on the chart, overall prices rose at a 3.5 per cent annual rate from the second to third quarter, up from a 2.3 per cent rate in the previous two quarters. Both consumer prices and industrial wholesale prices have been rising again since the May-June period, following a period of little pressure on prices in the previous few months.



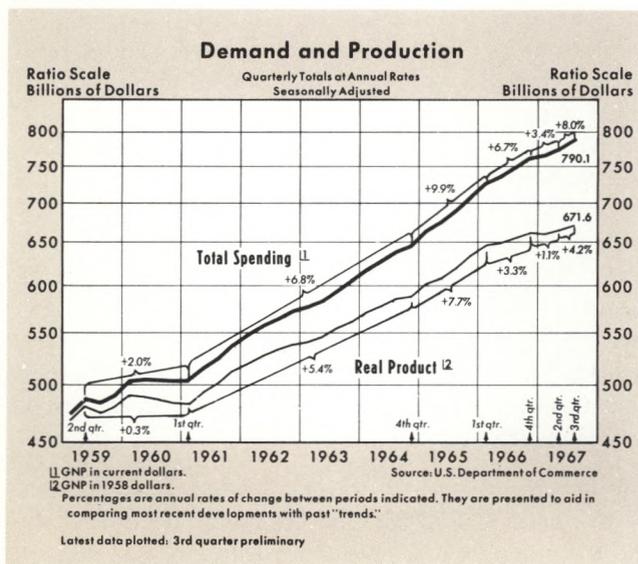
Long-term interest rates on both corporate and Government securities have been rising since early spring and are now well above the highs of a year ago. Yields on short-term securities have risen since mid-year, but are still below 1966 peaks. Since mid-June, yields on intermediate-term securities have been higher than on either short or long-term obligations. This same relationship existed during the period of rising rates in the spring and summer of 1966. The implication of this condition may be that the market has been expecting rates on new issues of short-term securities to rise in the near-term, but subsequently to return to a lower level.¹

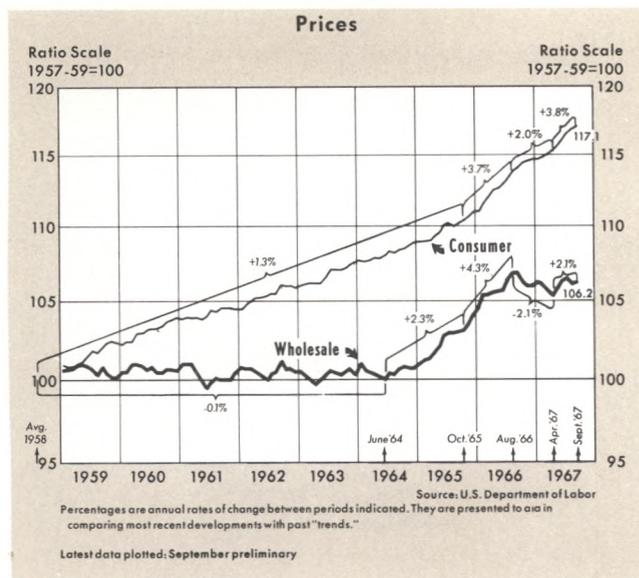
One Theory of Forces Affecting Interest Rate Levels²

In financial markets, interest rates are the prices at which the quantity supplied and the quantity demanded of particular financial assets are equated. The way in which the money stock is related to the demand for any supply of some financial assets is somewhat complex. On the one hand, an increase in the money supply and bank credit adds directly to the supply of

¹For a discussion of the term-structure of interest rates see "Changing Structure of Interest Rates" in the June 1967 issue of this Review.

²For an attempt to estimate empirically the forces affecting interest rates see W. E. Gibson and G.G. Kaufman, "The Relative Impact of Money and Income on Interest Rates: An Empirical Investigation," *Staff Economic Study Number 26*; Board of Governors of the Federal Reserve System.





lendable funds. An increase in money results in the bidding up of the prices of financial assets, causing interest rates to be lower than they otherwise would be.

On the other hand, some argue that a rise in the money supply and bank credit also has expansionary effects on the total demand for goods and services. If dollar balances and credit are increased rapidly, given existing assets, incomes, prices, and interest rates, people will attempt to exchange the "excess money" for goods, services, or other financial assets. Any increase in demand for goods and services will result initially in the running down of inventories and, subsequently, a rise in production and an increase in credit demands. If the increased demands for credit which result from a large monetary expansion are greater than the supply of credit created, net upward pressure on interest rates will result after some lag.

If the rates of increase in money supply, credit, and total demand are faster than the rates at which output can be increased, prices will rise. Rising prices also cause increased demands for credit, since more funds are needed to finance a given volume of goods. With expectations of inflation, borrowers are willing to pay higher rates since they expect to repay with cheaper dollars, and lenders charge higher rates in order to net the same real return in the process of allocating limited funds.

According to this view, marked and sustained changes in monetary growth have opposite short and long-run effects on interest rates. Rapid increases of the money supply will cause interest rates to be lower over an immediate short period than they otherwise would be. However, the effects of sustained

changes in rates of monetary growth over several months or longer work indirectly in the opposite direction. Prolonged increases in the money supply, at rates greater than the growth in the demand for money to hold, cause increases in the demand for goods, services, credit, and ultimately in prices. As a result, market rates of interest will be adjusted upward as a response to more vigorous credit demands and to compensate for the rise in prices and consequent decrease in the purchasing power of money.

In summary, this theory suggests that the shorter and longer-run effects may, at times, work against each other. At other times, as may have been observed during different periods of the past year and a half, these forces can both be pushing interest rates in the same direction.

Interest Rate Movements In the Last Two Years

The strength of monetary forces and the responsiveness of spending, prices, and interest rates to these forces has been given a rigorous test over the past two years. The rapid monetary growth of 1965 and early 1966 was suddenly halted in the spring of 1966 only to be fully resumed since the beginning of the current year. Compared with a 3.2 per cent trend rate of growth from 1961 to 1965, money rose 6 per cent from the spring of 1965 to the spring of 1966, remained about unchanged the remainder of that year, and subsequently has risen at an 8 per cent rate. Interest rates, output, and prices responded to both of these sharp reversals of monetary growth in a manner consistent with the theory outlined above.

The advanced rate of monetary growth during 1964 and early 1965 contributed to increases in output and employment, but increases in total demands for goods, services, and credit did not proceed at rates greater than the growth in production. Consequently, prices and interest rates remained relatively stable. Toward the end of 1965 and in early 1966, the expansion in economic activity fostered an increase in the demands for credit, producing increasing upward pressure on interest rates. This force on rates was moderated to some extent in the short-term by rapid increases in the money supply and bank credit. However, it is argued that the rapid growth in money caused still further stimulation of spending and credit demands, resulting finally in additional upward pressure on interest rates.

When the growth in the money supply was halted in the spring of 1966, this argument continues, the short-run impact was reversed, reinforcing the upward

pressure on interest rates. At the same time, the longer-run impact of previous money injections continued to be upward for several months. The rapid monetary growth of 1965 and early 1966 provided an expansionary force on spending and output, creating upward pressure on prices into the fall of the year. Thus, interest rates were influenced by both the continuing impact of the previous period of rapid monetary expansion and the immediate effect of the reduced rate of growth in money. Sharply rising interest rates throughout the summer and into the early fall of 1966 were the result.

By the fall of 1966, when the public protests against rising prices and interest rates were loudest, a major source of the inflationary pressure (rapid monetary expansion) had long since disappeared, and economic forces were well advanced in the reversal process. Some economic analysts were already pointing out that the lack of monetary growth since spring would have delayed contractionary effects which would soon be felt.³ The thrust of economic expansion began to weaken in late 1966 despite the most stimulative Federal budget in twenty years. With demand for goods slowing, credit demands eased, causing a definite downward trend in interest rates in late 1966 and early 1967.

Shortly after the turn of the year came the second sharp reversal in monetary growth in less than a year. For the first few months, as in the previous summer, short and long-run effects worked in the same direction. The rapid growth in the money stock and available credit produced downward pressure on interest rates, supplementing the trend caused by easing credit demands and reduced pressure on prices.

Following the rapid growth of money early in the year, economic activity gained momentum in the late spring. At this time, most interest rates reached lows for the cycle discussed and began rising. Since then the short-run effect of monetary growth on interest rates has still been downward as the money supply and bank credit continue to grow at rapid rates. However, the upward longer-run effects, via stimulation of spending and credit demands, have again been dominant, as they had been in late 1965 and early 1966. On balance, this is causing upward pressure on interest rates once again.

Expectations of renewed price inflation have in-

creased as upward price trends accelerated during the summer. Adherents to this theory might conclude that the rapid monetary growth through October of this year may have been sufficient to place strong upward pressure on prices and interest rates for some time into the future. So long as the rate of monetary expansion continues to be relatively high, the theory indicates that there will continue to be strong forces leading to higher prices and interest rates. However, if the rate of monetary growth is sharply curtailed with the intention of eventually stopping inflation and achieving lower rates, the short-run effects of the reduced volume of funds would result in even higher interest rates over the near future. This analysis indicates that the economy, as in the spring of 1966, must be willing to bear the temporary cost of higher interest rates in the near term if goals of sustainable growth in total demand, relative price stability, and a lower level of interest rates are subsequently to be achieved.

“The Differential Impact” of Stabilization Policy

An interest rate is a price, and as is true of all prices, interest rates serve a rationing function.⁴ Interest rates are the price that allocates available funds between businesses and households. At the same time, they serve to divide the funds among different businesses and among different households. Expected profitability of alternative uses of funds is one of the factors affecting businesses’ decisions concerning the amount of funds they demand at various levels of interest rates. Similarly, households’ decisions concerning credit purchases and saving are affected by their income constraint and willingness to delay some consumption desires.

In a period of economic expansion, it is reasonable to expect that anticipated profits from investment opportunities in plant and equipment, inventories, land, and housing will improve, but each by different amounts, and that financial assets such as bonds will be sold in order to take advantage of these favorable opportunities. With a given supply of funds, the price of bonds will fall (yields will rise) to the point where the marginal investor is indifferent between the return on bonds and the anticipated return from other investment opportunities.

⁴We usually talk about interest rates with reference to marketable securities, but it is important to remember that the interest rate applies to all goods. The rate of interest reflects the price or cost of the convenience of earlier availability, natural preference for more certain rather than less certain consumption rights, and the economy’s ability to use resources to increase total output.

³“Monthly Economic Letter”, First National City Bank of New York, September, 1966. And, Karl Brunner, “U.S. Economy in Cross-Currents Between Monetary and Fiscal Policy: A Reconsideration of the New Economics”, *Bulletin of Business Research*, (Ohio State University, February, 1967). (Publication of a previously delivered speech)

In the process, some business and household units are "priced out of the market". This could be called a "differential impact", a term which applies equally well to any pricing or allocation mechanism. Any change in price or method of allocation may be undesirable to some individuals or sectors of the economy. A tax increase, on personal or corporate incomes, on sales or on property, also will be painful to those who must pay more. Less disposable income constrains the volume of purchase, but prices will change in response.

If there are not monetary actions constraining the volume of available funds, or fiscal actions constraining disposable incomes or government expenditures, then prices and interest rates will rise as the market mechanism allocates scarce resources. Inflation causes reallocation of both wealth and command over real output. This is harmful to certain groups of the economy. Finally, allocation by any non-market means, such as price controls and rationing, is undesirable to some.

In a free market economy, interest rates act to al-

locate money balances—which represent command over real output—among individuals, firms, and the government sector. A rising interest rate, and possibly a decreasing supply of funds at each level of interest rates, at a time that restraint is initiated, forces certain individuals and firms to reduce their command over real output. This is very disturbing to those adversely affected. However, these temporary ill effects should be weighed against the real benefits for the whole economy from reducing inflationary pressures in the longer-run. In addition, as this theory suggests, the adverse allocation of funds from certain groups will only be temporary since rates are expected to decrease once inflation is controlled.⁵

⁵For other recent discussions of the present financial situation which employ similar theoretical analysis, see A. James Meigs, "A Monetary View," prepared for a session of the National Association of Business Economists, Detroit, Michigan, September 29, 1967. Also, Ralph F. Leach, "Marking Treasury Issues With Conversion", *The Weekly Bond Buyer*, October 23, 1967, pp. 9-11, and Roy L. Rierson, "Fed's Dilemma . . .", *The Weekly Bond Buyer*, October 23, 1967, pp. 12-14. Also see "Trends and Recent Relationships in Yields on U.S. Government Securities", in the October 1967 issue of *Economic Review*, Federal Reserve Bank of Cleveland.



Monetary Policy, Balance of Payments, And Business Cycles

The Foreign Experience

AT BOTH the academic and policy level, the study of business cycles has been eclipsed in recent years. This development probably stems from the fact that in the industrial countries of the world, deep or prolonged recessions have not been a serious problem since World War II. In the less developed countries, the issue of economic growth holds the dominant position in theoretical and policy discussion.

Although the urgency to understand and correct the business cycle, which characterized professional and government thinking some years ago, is no longer present, it is still a subject worthy of inquiry. In the first half of 1967 there were slowdowns of varying degree in the economies of the United States, United Kingdom, France, and Germany. Only Italy and Japan, among the major industrial countries, grew at a satisfactory rate.¹

This article is another step in the long history of attempts to explain the business cycle. In simple terms, this explanation of the cycle is as follows: An increase in the money supply eventually causes income and imports to increase. The rise in imports leads to a decline in the balance of payments, forcing the monetary authorities to contract the money supply. Although the purpose of this contraction is to strengthen the balance of payments by reducing imports, it also has the effect of reducing domestic income. The decline in imports will eventually correct the balance of payments and allow the authorities to switch again to an easy monetary policy. The resulting increase in money leads again to income and imports growing. As long as this sequence continues, there will be periodic fluctuations

in income, imports, the balance of payments, and money. If monetary policy were directed at containing domestic inflationary pressures (rather than waiting for balance-of-payments problems to appear), this sequence of events would be broken, and cyclical fluctuations in income might be moderated in amplitude and frequency.

It is the proposition of this article that monetary policy followed by most of the countries of Europe and Japan has been sensitive to balance-of-payments problems and that this is the major cause of most of the business cycle fluctuations in the postwar period. The remainder of this article is designed to substantiate this proposition. First a model is presented which explains the observed economic behavior. (The model is presented in a more technical form in the Appendix.) The bulk of the article consists of an examination of recent business cycles in Japan, Italy, Germany, France, and the United Kingdom, to see if the model is consistent with that experience.

The Business Cycle Model

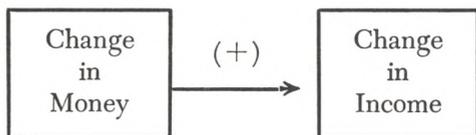
A model which attempts to explain any phenomenon must be based on the behavior of the elemental decision-making units in that area. In economics, these are the consuming household, the producing firm, and the government authorities who make policy decisions. There are four assumptions in this model regarding behavior of the economy's elemental decision-making units.

(1) **Money and Economic Activity.** First, it is assumed that in any economy which has experienced rapid growth, expectations of households and firms about the future are optimistic, which gives them strong incentives to invest and consume. In this context, short-term growth in production and income depends upon the rate at which money and credit are made available to the private sector. The rate of growth in money, therefore, determines the short-term growth rate in the economy, and if there are fluctuations in the growth of

¹The major difference between postwar business cycles and prewar cycles is in the degree of severity. During the 1930's the peak-to-trough decline in per capita income was 25 per cent in some countries, while in the 1950's and 1960's cyclical declines in per capita income have been measured in fractions of a per cent. Put in another way, the prewar business cycle can best be visualized in terms of changes in the *level* of income, while postwar cycles can best be viewed in terms of changes in *rate of growth* of income. Reflecting this difference between prewar and postwar business cycles, the description of cycles in this article will be in terms of rates of change in income rather than in terms of the level of income.

money, there will also be fluctuations in the growth of income and production.

The relationship between income and money can be formulated as follows:



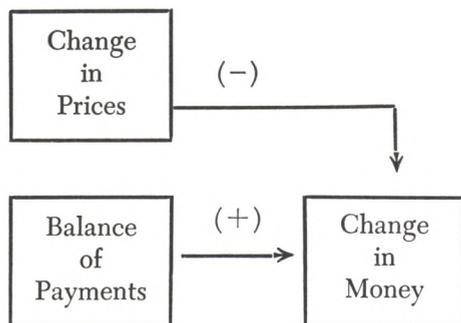
Change in money leads to a change in income. The arrow indicates the direction of causality. The plus sign above the arrow indicates that the relationship is positive; i.e., an increase in money will lead to an increase in income, or a decrease in money will lead to a decrease in income. This relationship must not be considered as occurring instantaneously. It is quite reasonable to expect that there will be some time lag between the change in money and the resulting change in income. It typically takes some time before investment and consumption plans are reflected in actual spending flows.

Although this resembles the modern quantity theory of money it differs from the usual presentation in that it is based on a more restrictive set of assumptions. If the forces which create strong private demand should disappear, i.e., loss of optimistic expectations by firms and households, the rate at which money is made available to the economy may not result in a predictable change in income.

(2) **Monetary Policy.** The second assumption is in regard to the behavior of the monetary authorities who control growth in the money stock. Their policy targets are either:

- a. to prevent inflation, i.e., stabilize the price level².
- b. to correct balance-of-payments deficits.

These relationships may be visualized as follows:



²Alternative domestic policy targets like economic growth or full employment are assumed to be dealt with by fiscal policy and other stabilization tools.

The monetary authorities will respond to an increase in prices with a *decrease* in the growth in money, i.e., the relationship is negative. On the other hand, they will respond to a balance-of-payments surplus with an *increase* in the growth of money, i.e., the relationship is positive. The length of time which it takes for either prices or the balance of payments to affect these policy decisions is a measure of the time lag between the emergence of a problem and the decision of the authorities to take corrective actions.

An important policy issue is whether the monetary authorities should respond primarily to external problems, such as balance-of-payments deficit, or to internal problems such as a rise in prices. In general, the monetary authorities have not been restrictive in the face of moderate domestic inflation because of the fear it would interfere with growth. Instead, monetary policy has commonly become restrictive when there was a balance-of-payments deficit, because the only way to maintain a desired stock of international reserves (short of devaluation) has been by taking restrictive actions. For simplicity of explanation, it is assumed here that the authorities in charge of monetary policy respond either to price changes or to the balance of payments, but not to both at the same time. (This assumption will be considered in more detail below.)

(3) **Balance-of-Payments Determinants.** The third relationship postulated does not represent a statement about behavior of decision-making units in the usual sense of the word. Rather, it provides a convenient method of isolating the influences on the balance of payments. The balance of payments can be defined as follows:

$$\text{Bal. of Pmts.} \equiv \text{Exports} - \text{Imports} + \text{Net Capital Inflow.}$$

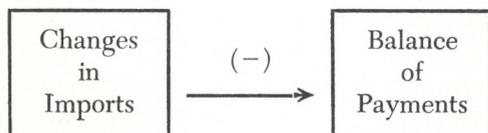
In the short run (with which this business cycle analysis is concerned) exports depend largely upon external factors, such as the level of total demand in foreign countries.³ Imports are dependent upon the level and growth in domestic income, while net capital movements are influenced by both foreign and do-

³Some economists believe exports are influenced by business cycle factors, growing slowly in periods of boom and rapidly in periods of recession. There is little evidence to support this position. But over a longer period than generally associated with a 3-to-5 year business cycle, domestic factors probably play a major role in the growth of exports. Changes in domestic relative to foreign prices can have a very important impact on both exports and imports. However, in the absence of devaluation, such price changes are gradual. Other factors, such as the size of the capital plant, the productivity of labor, the degree of innovation of the business community, etc., are also of considerable importance in the long-term growth of exports. However, in the fairly short run, export growth is largely dependent upon total demand conditions in the rest of the world.

mestic factors.

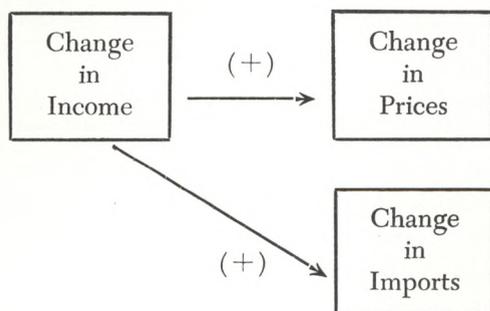
A basic assumption of this model is that the balance of payments is dominated by fluctuations in imports and that exports and capital movements play a subsidiary role. This allows us to say that cyclical balance-of-payments problems are largely due to domestic factors and not to external factors.

Under such circumstances, the relationship between changes in imports and the balance of payments can be visualized as follows:



The balance of payments will be negatively related to the change in imports because a *rise* in imports must be paid for by drawing *down* foreign exchange reserves, creating a deficit in the balance of payments. The time lag in this case is a measure of how long imports would have to rise before they exceeded the level of exports and net capital inflow and therefore resulted in a deficit in the balance of payments.

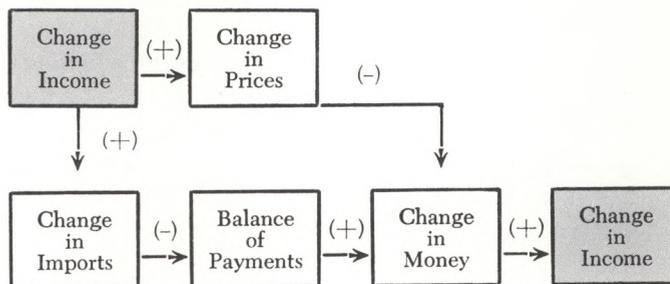
(4) **Price and Import Determinants.** The final behavioral assumption in this model is that changes in imports and prices depend upon changes in domestic income.⁴



Changes in imports and prices are assumed to be positively related to changes in income. When income rises, there is an increase in the demand for all goods and services, including those from abroad. The increased income also puts upward pressure on prices. In this case there is not likely to be much of a time lag between changes in income, and changes in prices and imports.

⁴A change in relative prices will also affect imports. However, in the absence of devaluation, such changes are usually moderate in the short run.

The Model. The preceding four statements represent a very simple set of assumptions about economic behavior. If all four relations are presented together, it would look as follows:



There are two alternative transmission mechanisms by which this model of economic behavior could operate. If monetary policy is responsive to price considerations, the upper channel would operate. An increase in income would lead to an increase in prices. The price rise would induce the authorities to take a restrictive monetary policy, causing income to decline, reducing the pressure on prices, and allowing the authorities to initiate an easy money policy.

If monetary policy is responsive to the balance of payments, the lower channel would operate. A rise in income in one time period will cause imports to increase and, after some time lag, the balance of payments to deteriorate. A weak external sector will cause the authorities to implement a tight money policy, which in time will reduce income. (Thus, an *increase* in income in a previous period will lead to a *decrease* in income in the present period.)

The decrease in income will cause imports to decrease and the balance of payments to improve. The authorities will now end the tight money policy, and income will increase. (Thus, a *decrease* in income in the present period will lead to an *increase* in income in some future period.)

In formal terms, both of these channels would lead to cyclical fluctuations in income. However, as a practical matter, the channel which operates through the balance of payments has a much sharper impact on the cyclical fluctuations in income. This is true for two reasons. First, price increases can usually be observed to occur earlier than balance-of-payments weakness in response to a rise in imports, inducing an earlier monetary response. Second, when a balance-of-payments weakness occurs, it requires strong monetary actions to prevent international reserves from falling below

some minimum desired level.⁵ A country which takes frequent but moderate adjustments in money policy, in the face of price increases, is less apt to have sharp fluctuation in the growth in income than a country which has less frequent but more abrupt changes in policy.

This is illustrated by the business cycle experience of Germany and Japan, both of which have grown rapidly in the last fifteen years. Germany has had only one business cycle decline, while Japan has had four. This is because the Germans have been very concerned even about moderate domestic inflation, and have taken prompt but modest, monetary actions when faced with price increases. As a result, the growth in real product has been relatively smooth. On the other hand, Japan has taken restrictive monetary actions only when faced with a serious balance-of-payments problem. To be successful in this case required a sharply restrictive monetary policy which would contract income and imports.

The Evidence

The recent business cycle experience of several industrialized countries will be considered to see how well the model explains actual business cycle developments.⁶ This examination excludes the United States. Monetary policy in the United States has, at different times, been responsive to both domestic price problems and to the balance-of-payments constraint. However, the size of the United States and the role of the dollar as the major reserve currency make a simple application of this model difficult. Future studies along the lines of this article will deal explicitly with the United States.

In the accompanying charts, quarterly observations of four strategic variables are presented for each country. Monetary policy is measured by quarterly per cent changes in the money supply. The balance of payments

is measured by the customs trade balance⁷, i.e., exports minus imports. Real output is measured by quarterly per cent changes in industrial production (quarterly GNP figures are not available in most cases), and imports are measured as quarterly per cent changes in the customs value of imports.

The peaks and troughs in the trade balance are indicated by stars. The time between a peak and a trough is a period of trade-balance weakness, and the time between a trough and a peak is a period of trade-balance improvement or strength. The starred turning points in the money time series indicate changes in monetary policy which are assumed to be in response to changes in the trade balance. A peak in the money series represents a change toward tight money policy, while a trough represents a change toward an easy money policy. Changes in monetary policy, which are strictly in response to domestic factors, are not starred. For example, Germany did not have a serious weakness in the trade balance from 1951 to the second half of 1964. In this period monetary policy was obviously not responsive to external factors. However, policy was periodically tightened to contain domestic inflationary conditions.

The stars on the production series represent the turning points in domestic production which are postulated to be in response to the starred changes in monetary policy. The import series is not starred; however, it can be observed that the cyclical pattern of imports is much the same as that of production.

⁷The trade balance is taken as a proxy for the overall balance of payments because the figures are easily and quickly available to both policy makers and the general public. The obvious weakness of this procedure is that it disregards several significant components of the overall balance. For instance, a deficit on the trade account might be offset by surplus on the invisibles and/or capital account, and what would otherwise show up in our analysis as a decline in a country's international reserves would, in reality, be nothing of the sort.

While recognizing this possibility, it should be remembered the trade balance is the most volatile component of the balance of payments. The balance on invisibles tends to remain rather constant from one period to the other. To the extent it has a cyclical pattern, it is the same as that of the trade balance. Likewise, long-term capital flows tend to move in response to international differences in real rates of return on productive factors and, consequently, does not exhibit much short-term variance on the basis of business cycle factors.

Finally, short-term capital movements, while volatile, arise primarily in response to international differences in interest rates and cannot, therefore, be counted on with any degree of certainty to counteract a deterioration of the trade balance for an extended period. Consequently, a weakness in the trade balance, regardless of whether it is accompanied by an immediate decline in the stock of international reserves, is indicative of weakness in the overall balance of payments. It should be kept in mind, however, that it is not the level of the trade balance but the direction in which it is moving that is important.

⁵It can be observed that in general, the desired level of reserves is below the actual level for countries with an experience of increases in reserves (France, Italy, and Germany). Thus, no matter how large the stock of international reserves, a substantial decline is considered undesirable by most monetary authorities.

⁶While the evidence presented in this article is impressionistic, based on casual observations of certain economic time series for each country, statistical tests have also been applied and have yielded encouraging results. A more comprehensive analysis of the Japanese case has also provided quite satisfactory results. Copies of a Japanese study, *Monetary Policy and the Business Cycle in Postwar Japan*, are available on request from this Bank.

Japan

The model explains the Japanese business cycle quite well. Japan has had three cyclical downturns in production since 1956. Japan has also had three periods when the trade balance deteriorated sharply and three periods when monetary policy was tight. The timing of these developments is consistent with the assumptions in our theoretical model. A sharp rise in imports in the late boom phase of the business cycle, when domestic sources of supply become scarce, leads to a rapid deterioration in the trade balance with a two-to-three-quarter time lag. The deterioration in the trade balance (tier 3 on the chart) was followed by a tightening in monetary policy (tier 2 on the chart) and with a short time lag, to deceleration in production and imports (tier 1 on the chart).

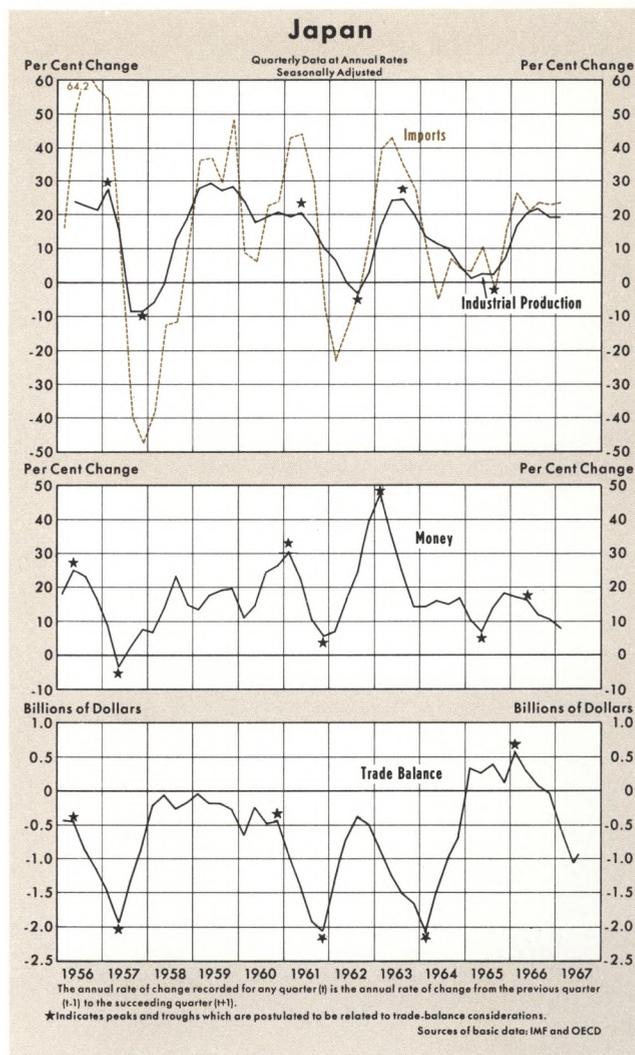
The decline in imports results in an improvement in the trade balance. This permits the monetary authorities to ease their tight money policy, and production and imports are allowed to resume their growth rate. Monetary policy continues to be easy until another balance-of-trade problem emerges.

As can be seen in the following table, the average growth rate of the money stock was twice as rapid between 1960 and 1964 than in the previous four-year period.⁸ This acceleration of the money stock put a considerable amount of pressure on the economy which could not be met by domestic production which increased at the same rate in each period. As a result, prices and imports accelerated sharply. (Note the similarity in the cyclical and secular patterns of money and imports.) This acceleration in imports caused international reserves to decline moderately at a time when Japan's international transactions almost doubled.

	3rd quarter 1956 to 3rd quarter 1960 (per cent change)	3rd quarter 1960 to 3rd quarter 1964 (per cent change)
Money	60	120
Production	70	70
Prices	5	26
Imports	37	65
International Reserves	72	- 10

As a result of this generally easier monetary stance, there were two periods of balance-of-payments weakness and two corresponding business cycle declines in

⁸This period corresponds to the tenure of Mr. Ikeda as Prime Minister of Japan. His major political slogan was to Double National Income In Ten Years. In pursuit of this goal, he followed an aggressively easy monetary policy.



the 1960-64 period. In contrast, during the 1956-60 period of generally more restricted growth in money, there was only one period of balance-of-payments weakness and one business cycle decline. This implies not only that monetary policy directed at the balance of payments will lead to business cycle fluctuations, but that the more expansionary the secular tone of policy, the more frequent the cyclical downturns are likely to be. (A more technical exposition of this process is given in the Appendix under the discussion of difference equations.)

This point may be clarified by examining the most recent Japanese business cycle downturn in some detail. In 1962, a period of recovery in the trade balance, the monetary authorities introduced an easy policy in order to encourage recovery of domestic production. In late 1962 and early 1963, however, the growth in the money stock was increased at a 40 per cent annual rate. In previous periods of early cyclical upswing, it was rarely permitted to increase above 20

per cent. Production responded to this easing of monetary policy about as quickly as in previous upturns. However, imports, following the pattern of the growth in money, accelerated more rapidly than in previous upturns. This caused the trade balance to deteriorate during 1963 and early 1964. The monetary authorities were compelled again to restrain actively the growth in the money supply, which pushed domestic production down after only a very short period of growth.

It is fairly obvious that if the Japanese authorities had continued this type of expansionary policy, it would have led to additional fluctuations in the trade balance and sharp and frequent cyclical movements in domestic production. However, the 1963-64 experience apparently made them realize that an easy money environment made business cycle fluctuations sharper.⁹

When the trade balance started to improve in the last half of 1964 and into 1965, the monetary response was very cautious and the degree of easing was far more moderate than in the past. Although it took longer for industrial production to pick up than in the past, when it did so, it did not lead to rapid emergence of domestic inflationary pressures. Thus, imports grew only moderately in 1965 and 1966.

In the first half of 1967, Japan enjoyed a period of rapid economic expansion, with industrial production rising markedly. In spite of that domestic boom, imports did not accelerate. However, because of weakness in several of Japan's major foreign markets, export growth has temporarily weakened and has caused the trade balance to decline moderately. Monetary policy became less expansionary in early 1967 and the discount rate was increased in August. The trade account stopped deteriorating in the third quarter of 1967. The model would imply that monetary policy will start easing again and domestic production will exhibit only a modest deceleration in early 1968.

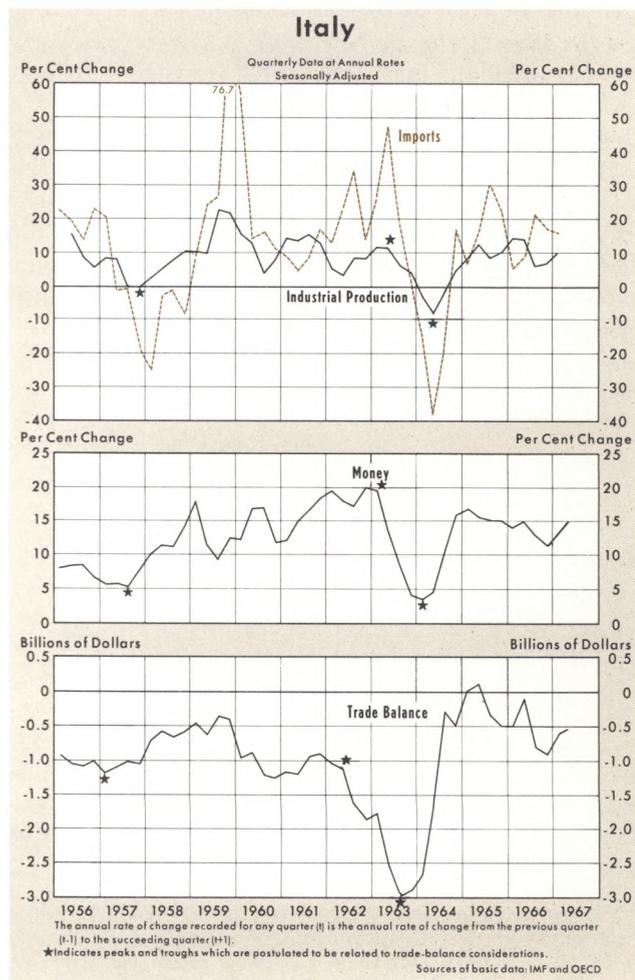
Italy

The Italian experience in the last decade is also consistent with the relationships postulated in this model. Italy has had two business cycles since 1956 and also two periods of weakness in the trade balance. The timing of these events is consistent with our model. The first cycle started in 1956 with a moderate weakening in the trade balance which, in turn, led to a moderate tightening of monetary policy and to a moderate deceleration in domestic production. This mini-

recession was sufficient to push imports down, leading to moderate improvement in the trade balance from the middle of 1957, and substantial improvement in 1958. As a result, monetary policy eased toward the end of 1957 and the domestic economy started to resume its growth rate from early 1958.

The Italian monetary authorities followed a relatively moderate policy through early 1961. However, from the middle of 1961 until early 1963, monetary policy became more expansionary, perhaps because of the emergence of a new political coalition in the government. Domestic production had been growing at a very satisfactory 12 per cent annual rate from 1959 to 1961, and the expansionary policy was not able to increase that growth rate. As a matter of fact, growth in domestic production was somewhat slower during the period of expansionary monetary policy. However, total demand pressures generated by easy money pushed imports up sharply in 1962 and the first half of 1963, forcing the trade balance into substantial deficit.

The 1962-63 decline in the trade balance was much larger than from 1956 to 1957, and, as a result, the



⁹This expansionary policy could have also reduced the long-term growth rate. Fluctuations in production reduced the sales and profits of Japanese business and their incentives to undertake new investments.

authorities seemed to have felt that monetary policy also had to be more restrictive. The money supply, which at its peak in the first quarter of 1963 was growing at a 20 per cent annual rate, declined to a 4 per cent annual growth rate by the fourth quarter of the year.

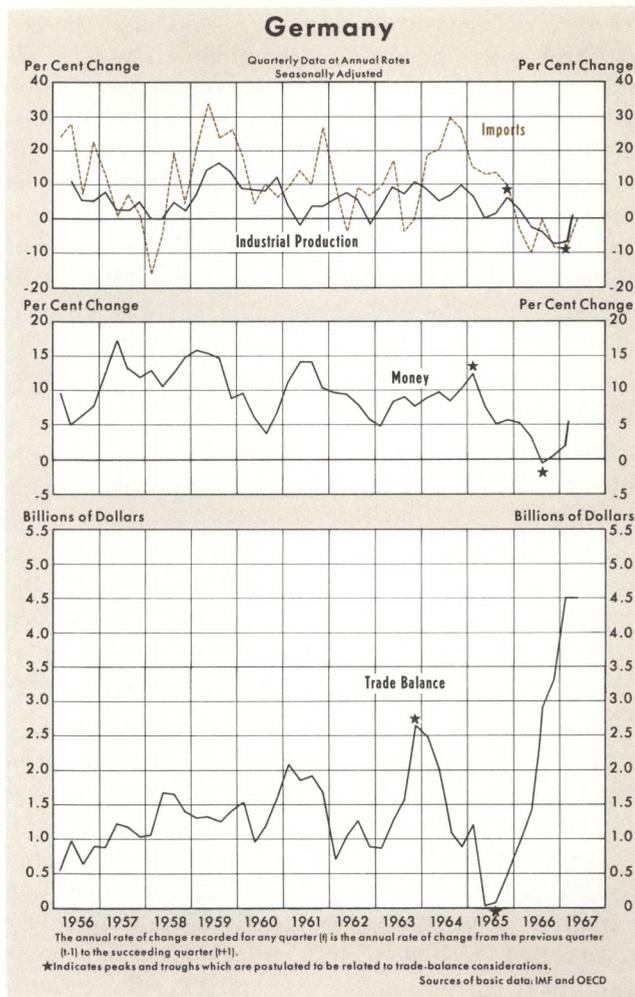
The sharp decline in the growth of money had a substantial effect on domestic production, which fell from an 11 per cent increase in the second quarter of 1963 to a 9 per cent rate of decrease in the second quarter of 1964. This was associated with a more than proportional decline in imports, which led to an improvement in the trade balance from the first half of 1964, and allowed the authorities to ease monetary policy from the second half of 1964.

This easier money policy was not as excessive as in 1962 and early 1963. The growth in the money supply was kept significantly below what it had been prior to the decline in the trade balance in 1963. In spite of this more conservative monetary policy, domestic production responded promptly and resumed a 10-12 per cent growth rate in 1965 and 1966. Although imports responded to the growth in production, it was not as sharp as in previous periods of early cyclical upswing. As a result, the trade balance continued strong through the middle of 1967.

In several important respects the monetary policy experiences of Japan and Italy were similar in the last cycle. In each country a more expansionary policy than usual was initiated (prior to the most recent cycle) which did nothing to stimulate the real growth rate but did trigger an acceleration in imports and a decline in the trade balance. In each country the monetary authorities seemed to have concluded that an unusually expansionary policy could not contribute to the real growth rate, but only add to the instability of the economy. As a result, the policies followed in the last two years or so have been relatively more moderate in each country.

Germany

In the German case, the policy authorities were more sensitive to domestic price increases than was the case in Japan or Italy. The model would imply that under such circumstances Germany would be less subject to business cycle fluctuations. This has been the case. Germany is now in the midst of its first cyclical downturn in sixteen years. From 1951 until 1964, Germany did not experience any serious weakness in its balance of trade or unusually sharp cyclical movements in production. The success at keeping the economy from overheating, prevented an acceleration



of imports and kept the trade balance from weakening. As a result, Germany was able to avoid the necessity of a sharply restrictive monetary policy. Thus, a policy which was not explicitly directed at achieving external stability, turned out, in fact, to make an important contribution to such stability.

With the trade position in reasonable balance,¹⁰ it is obvious that monetary policy did not need to be sensitive to external consideration. It was unnecessary for the German economy to be subject to sharp periodic deflationary policies. By taking small corrective actions early, large corrective actions were not necessary at a later date.

In spite of the continuation of a conservative monetary policy during the middle of the 1960's, imports accelerated and the trade balance deteriorated in 1964 and 1965.

Even though Germany's holdings of international

¹⁰ "Reasonable balance" in the sense that there was little deviation from the secular trend.

reserves were unusually large (\$7.9 billion at the end of 1964), she responded to a deterioration in her trade balance with the same vigor as Japan, whose international reserves were clearly inadequate (\$2.0 billion at the end of 1964). The time lag between the deterioration of the trade balance and the tightening of monetary policy was a relatively long one. This lag in response is probably due to the fact that the decline in the trade balance started from an historic high trade surplus, and during the first few quarters was considered a healthy adjustment. When the trade surplus slid below its normal range of about \$1.5 billion, the monetary authorities became concerned.

There was a sharp deceleration in the money supply in early 1965. As would be expected from this model, the rate of growth of both industrial production and imports declined substantially in the face of tight money, and by the middle of 1965 the decline in the trade balance had been halted. The deterioration, however, had carried the trade balance to its lowest level in ten years, and a restrictive monetary policy was maintained through mid-1966.

This experience again illustrates the priority given balance-of-payments considerations by many foreign monetary authorities. Even with a large level of international reserves, Germany accepted a substantial decline in the rate of growth in domestic output to correct a deterioration in the trade balance. Only in late 1966 and early 1967, after the trade balance was again in substantial surplus, did the authorities allow the money supply to increase. Our model would indicate a continuing easy monetary policy throughout this year, which should stimulate the renewed growth in domestic output and employment in 1968.

France

France has experienced two business cycles since 1958 and is probably now entering its third cyclical decline. In each case, the behavior of industrial production, the trade balance, and the money supply have conformed to the pattern postulated in the theoretical analysis.

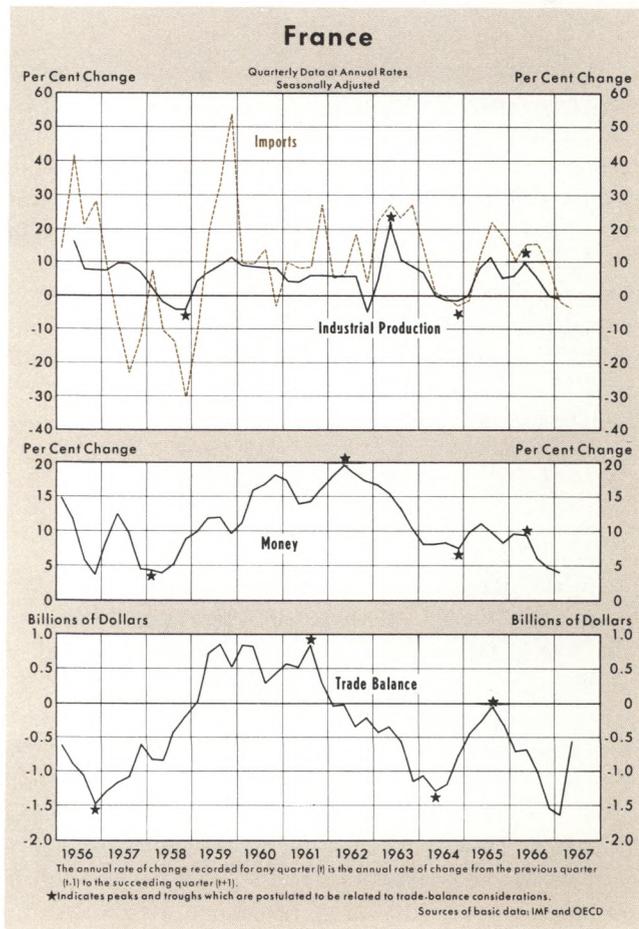
After the franc devaluation¹¹ in late 1958, the French trade balance, facilitated by a rapid advance in exports, moved from deficit to substantial surplus. The money supply expanded rapidly as the inflow of foreign exchange substantially broadened the reserve

¹¹A devaluation, even though a discretionary policy available to the monetary authorities, is considered to be exogenous under the system postulated by this model. As such, the model makes no attempt to explain or predict such an event.

base of the banking system. Prices began to rise, and both industrial production and imports rose rapidly. By the end of 1961, definite softness began to develop in the trade balance. While the monetary authorities had followed a relatively passive discretionary policy, the operation of a mechanism similar to the international gold standard largely determined the growth in money. Passively allowing changes in the international reserve to dominate growth in the money stock accomplished the same result as if the Bank of France had followed a discretionary policy in response to the balance of payments.

The gradual weakening in the French trade position from late 1961 was accompanied by a gradual tightening of monetary conditions beginning in mid-1962. As would be expected, production and imports decelerated by late 1963, leading to an improvement in the trade balance beginning in mid-1964.

Monetary policy was moderately easier after recovery in the trade balance in late 1964 and 1965, and industrial production rose sharply. However, the limited monetary expansion kept inflationary pressures contained, and imports failed to increase as rapidly as in previous periods of early cyclical upswing. Despite



this relatively mild increase in imports, poor performance in exports during 1965 and 1966 caused the trade balance to soften, and a decline was initiated which continued through the first quarter of 1967.

In response to this most recent weakening in the trade balance, French authorities have operated, since mid-1966, to decelerate the money stock. The tighter money conditions have resulted in a deceleration in industrial production and imports.

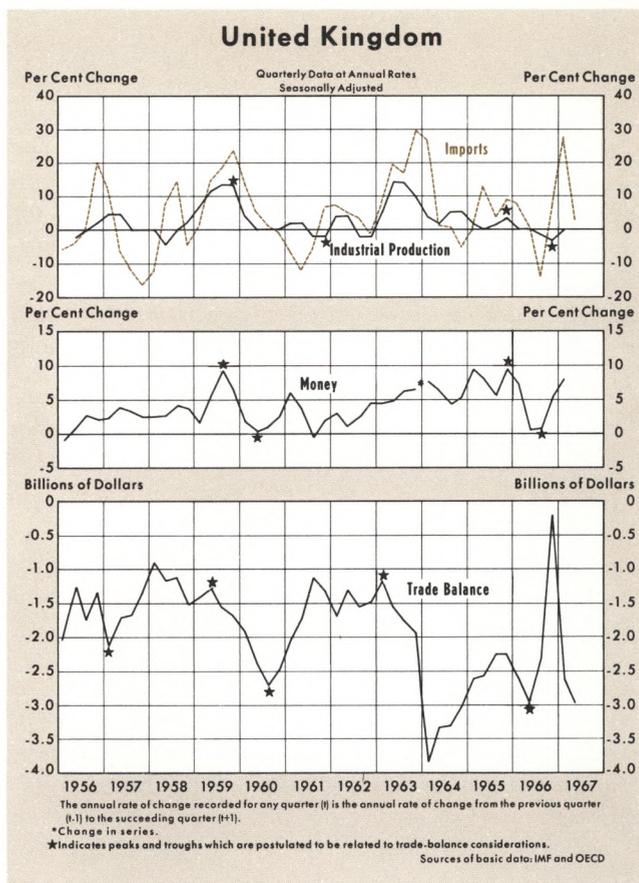
The trade deficit improved significantly in the second quarter of 1967, recovering more than half of the loss suffered in the previous six quarters of decline. On the basis of the model, one would expect monetary policy to now be easy and production to recover in the near future.

United Kingdom

The U.K. experience does not conform to the behavioral assumptions of the model as well as the other countries considered. Specifically, the monetary authorities have not consistently responded to a weakness in the trade balance with a policy of tight money.¹² However, this piece of contrary evidence with respect to the behavior of the model actually strengthens its reasonableness. The monetary response to the trade balance is a discretionary action by most monetary authority and not an automatic response. They could have decided to ignore the external position in determining policy. The fact that the authorities in most countries did not ignore the international trade position while the United Kingdom attempted to ignore it, shows the relative consequence of both acts. The other countries have had only temporary balance-of-payments problems, while the United Kingdom has experienced serious weakness in her trade balance and speculative attacks against her currency for the last three years.

The U.K. trade balance has shown weakness three times in the last decade: in 1957, 1960, and most recently from 1964 through 1967. There have also been three cyclical declines in the U.K. domestic production. The 1957 weakness in the trade balance did not induce a restriction in the money supply, although there was a cyclical decline in industrial production and imports which was presumably brought on by a restrictive fiscal policy.

¹²The average postwar growth rate of the United Kingdom has been less than that of any of the major industrial countries. This has affected the expectations of consumers and producers. They are not as optimistic about the future as the other Europeans, Japanese, or even Americans. Thus, the basic economic behavior which links money to income may not hold with respect to the United Kingdom.



In 1960 a restrictive monetary policy was introduced because of a deterioration in the trade balance, causing domestic production and imports to decline. The trade balance improved rather promptly in late 1960 and 1961. Monetary policy eased and production recovered, but grew at a very modest rate through 1962.

There was considerable controversy within the United Kingdom in the early 1960's about the appropriateness of what was called a "stop-and-go" policy, allowing the balance of payments tail to wag the domestic economic dog. The resulting fluctuations in income, prices, and interest rates were alleged to have weakened the secular growth in domestic production. For this reason, monetary policy received considerable criticism.

Perhaps in response to this criticism the money supply accelerated beginning in mid-1962. Production and imports accelerated beginning in early 1963 causing the trade balance to start weakening in late 1963. This weakness has continued through 1967. Public debate has attributed the unusual length of this trade weakness to the policy makers' decision to avoid applying restrictive policies. The deterioration in the U.K.'s trade position was obvious as early as the first quarter of 1964, while the introduction of a restrictive monetary policy cannot be observed until the first quarter of

1966. This is about a two-year lag in the response of monetary policy to a weakness in the trade position.¹³ The "Tory" Government, which was in power until October 1964, was probably reluctant to take restrictive actions because of impending general elections. The succeeding Labor Government, in the past as the opposition party, criticized the Tory Government for "stop-and-go" economic policy. The new labor government hoped to avoid a substantial slowdown in the domestic economy by attempting to correct the balance of payments by means which would not require contracting the whole economy.

The first action of the Labor Government was to impose an additional 15 per cent duty on almost all imports in November, 1964. The initial effect of this action was, as expected, a reduction in imports. However, because domestic demand had not been significantly restrained, production continued at only a slightly reduced rate, and import growth was resumed in the second quarter of 1965.

Although a ceiling was imposed on bank credit in 1965, this did not start to cramp the liquidity position of firms and households until the first quarter of 1966. Monetary policy was unusually restrictive in the second and third quarters of 1966. Industrial production and imports began to show some weakness in the first half of 1966, and decline in the second half of the year.¹⁴ This softness in imports, combined with an impressive growth in exports in the last half of 1966, substantially strengthened the trade balance in the fourth quarter of 1966. This improvement, however, proved very temporary, as the trade position again weakened sharply in the first half of 1967.¹⁵

¹³The real lag in the response of monetary policy may have been more or less than two years. Data on U.K. money supply are only published for four days of the year since 1964. They are: March 31, June 30, September 30, and December 31. Data for all other countries are available at least once a month, and for the United States, daily. Because data for any one day can be biased either up or down by random events, percentage changes in the U.K. money stock show a strong saw-toothed movement which makes it difficult to pick turning points.

¹⁴A drastic and widely reported set of administrative restrictions were imposed in 1966. In the April budget message, a selective employment tax was proposed to go into effect in the fall. In July, an absolute freeze was imposed on wages, other income sources, and prices. As drastic as these actions were, they took place when production and imports were already weakening.

¹⁵Foreign confidence in the value of the British pound sterling has moved in line with the strength of the trade balance. When the trade balance deteriorated sharply in 1964, there was a large speculative attack against sterling which was met by a large drawing from the IMF plus support from foreign central banks. There was a moderate renewal of the speculative attack in 1965 because the improvement in the trade balance was not progressing as fast as had been expect-

Improvement in the trade position in the last half of 1966 led to some easing in monetary policy, as indicated by an acceleration in the money stock from the fourth quarter of 1966. The central bank discount rate was reduced in three successive stages from 7 per cent in January 1967 to 5.5 per cent in May. Industrial production, which had declined in the second half of 1966, responded to the stimulus with a modest improvement toward the middle of 1967.

Although imports have fluctuated sharply in late 1966 and early 1967, they have shown a moderate net increase in the twelve months ending September 1967.¹⁶ Exports, on the other hand, have declined in recent months. This was an important cause of the softening in the trade balance in the first three quarters of 1967.

The recent economic experience of the United Kingdom presents an interesting exception to the model. The most recent softening in the U.K. trade balance has been only partially due to a rise in imports. A major factor has been the fall in export demand. The model assumes a steady growth in exports, because the post-war experience of most industrial countries has been of this nature. Until now, the cyclical decline in income of most industrial countries has been relatively moderate, and, therefore, developments in no one country have caused serious disruption in the export performance of other countries. However, in late 1966 and 1967 there were simultaneous weakenings in the economies of the United States, France, and Germany, as well as the United Kingdom. Although the cyclical decline in each case has been moderate, the cumulative impact has had a significant effect on the exports of the United Kingdom, which trades very heavily with these countries.

Conclusion

In general, the business cycle developments abroad, which are reviewed above, can be understood reasonably well on the basis of the highly simplified model

(Continued from Col. 1)

ed. The weakening in the trade balance in the middle of 1966 resulted in a very heavy speculative attack against sterling, which required substantial support from other foreign central banks. The sharp improvement in the trade balance in the last half of 1966 caused a reversal in speculation against sterling in the early months of 1967. This allowed the Bank of England to repay most of the loans to the foreign banks by May of 1967. When the trade balance showed another sharp deterioration in the first half of 1967, speculation again developed against sterling in the summer.

¹⁶Imports decelerated in the months preceding removal of the import surcharge in November, and accelerated rapidly immediately after the tax was dropped. This event would be considered as exogenous to the workings of our model.

developed in the first part of the article. However, it should be kept in mind that this model does not fit all countries or all business cycle movements. It is most useful when monetary policy is intimately linked with the target of balance-of-payments equilibrium, and when fluctuations in the balance of payments are due largely to internal rather than external causes. Whether this model will continue to provide a useful framework for understanding future business cycle developments depends upon whether the special assumptions made in the model continue to be applicable.

1. If the optimistic expectations about the future which have characterized investment and consumption decisions are impaired, then the tremendous thrust of private demand forces which have made monetary policy so important will not be present. In that case, the relationship between money and income may no longer hold, and a more complex set of economic factors would have to be considered in determining the short-run movements in income and production. In a period of depressed private expectations, a national income analysis along more traditional Keynesian lines may be more appropriate.

2. If the present system of fixed exchange rates should be abandoned, this would free monetary policy from explicitly responding to balance-of-payments considerations. Although one can never predict what is in store tomorrow, such a development is not given serious consideration by current policy leaders.

3. If fluctuations in the balance of payments are caused by external rather than internal factors, the balance of payments will no longer be dominated by import changes. In the last fifteen years, fluctuations in imports (and therefore domestic factors) have dominated the balance of payments in the countries considered in this article, while exports have experienced a relatively steady growth. This favorable export experience will continue as long as two factors are present.

- (a) The major industrial countries of the world experience only mild business cycles. This will keep their imports from declining over a long period, and the exports of other coun-

tries will grow with relative stability.

- (b) The business cycle patterns of a large group of industrial countries have generally not moved simultaneously with one another. If the pattern should coincide in the future, then even if the cycle in each country is mild, the cumulative impact on another country's exports could be substantial. This seems to have been a major factor in the most recent weakness in the U.K. trade position. It may also have been a contributory factor in the recent weakness in the trade balance of Japan and France.

There are two major implications of this model: (1) A monetary policy which is responsive only to balance-of-payments factors will lead to fluctuations in domestic income and to larger fluctuations in the balance of payments than would be the case if monetary policy was directed toward achieving domestic price stability. The reason for this is fairly obvious. If fluctuations in the balance of payments are caused by domestic factors, then a policy which directly stabilizes the domestic economy would also stabilize the balance of payments. (2) The more expansionary the monetary policy, the sharper the fluctuations in income and in the balance of payments.

Recent Japanese and Italian experiences confirm this second result. In each country an expansionary monetary policy led immediately to deterioration in the balance of payments and to the need to reimpose restrictive policy, causing a contraction in domestic production. An expansionary monetary policy within the context of this model is highly unstable.

If monetary policy, however, is responsive to domestic inflationary pressures, as well as to the balance-of-payments factors, it may well avoid the cycle which is inherent in the model. This can be seen from the German experience over the last decade and a half. Monetary policy was made moderately restrictive on frequent occasions in order to contain domestic inflationary pressures. Although this led to some moderate fluctuations in production, they were not sharp enough to be labeled as business cycle downturns until 1966.

MICHAEL W. KERAN

The Appendix to this article begins on next page.

APPENDIX

*The underlying structure and rationale for this model
is presented in more technical terms in this Appendix.*

Money and Economic Activity In formulating our theoretical model, short-term changes in income are postulated to depend on the rate at which money is made available to the private sector. This relationship is expressed by the following structural equation.¹

$$1. \dot{Y}_t = a_0 + a_1 (\dot{M})_{t-m}$$

The reason for adopting the quantity theory of money approach rather than the more conventional income-expenditure is because it is believed to correspond more accurately to the observed developments in the postwar period.

Most industrial countries have enjoyed a prolonged period of relative prosperity since 1950, free from protracted declines in income or severe inflationary pressures. As a result of this solid pattern of experience, the expectations of households and firms, concerning the future, have become generally optimistic. With interest rates higher than in prewar years, the speculative and precautionary demand for cash balances has become minimal. The incentive of households and firms to maintain a strong liquidity position in expectation of future losses of income is no longer very strong.

Under these circumstances the public's desired cash balances tend to be largely based on transactions needs, which make the demand for money a function of such economic variables as income and wealth. Assuming that the authorities can control the supply of money, if actual cash balances are changed by monetary policy, the public will be forced to hold a different stock of money than it desired at present levels of income and interest rates. In their efforts to reestablish a desired cash balance, households and firms will change their spending decisions. This will affect the demand for goods, and, therefore, production and income as well as the demand for securities and interest rates.

If future growth in income and production should be slower than in the last fifteen years, or if a major worldwide recession were to develop, perhaps the assumptions which underlie this version of the quantity theory would no longer apply. In such a case, the Keynesian income-expenditure approach might be a superior method of determining the level of income in the short run.

Determinants of Monetary Policy The authorities in charge of monetary policy are assumed to respond either to domestic price changes or to balance-of-payments considerations. It is assumed that policy cannot simultaneously be utilized to achieve both objectives. Thus, in periods

when the balance of payments (B) dominates policy, it could be described as follows:

$$2a. \dot{M}_t = b_0 + b_1 (B)_{t-n}$$

If price changes (\dot{P}) dominate policy, it would be stated as follows:

$$2b. \dot{M}_t = b_2 - b_3 (\dot{P})_{t-o}$$

This is not to imply that achievement of one goal, such as price stability, would not contribute to achieving the other goal, or that the authorities could not shift goals. It only implies that they are concerned with one goal at a time. The evidence presented with this model indicates that the authorities in the countries considered are mainly concerned with the balance of payments. Within the context of price rises in the past fifteen years, most of these authorities have not been overly concerned with price increases.

Equations 2a and 2b are expressions of the preferences of the monetary authorities. As such, they may not only shift between policy objectives, but also may respond to the same policy objective in different ways at different times. Such changes in emphasis are exogenous to the model. An example may help clarify this point. In the case of Japan, monetary policy was more expansionary in the 1960-64 period than in the 1956-60 period (60 per cent versus 120 per cent increase in money) because an expansionist minded prime minister was in office. This change to a more expansionary monetary policy did not mean that the balance-of-payments constraint was ignored. It did mean that the values of (b_0) and (b_1) were larger in the expansionary period than in the less expansionary period. This can be seen from the following regressions taken from Japanese data: (Figures in parenthesis are standard errors).

1956-60 (16 quarters)

$$\dot{M}_t = 2.7 + .09 (B)_{t-1} \quad r^2 = .37$$

(.02)

1960-64 (16 quarters)

$$\dot{M}_t = 5.6 + .34 (B)_{t-1} \quad r^2 = .88$$

(.03)

In general, the more expansionary the policy, the larger the value of (b_1), because the policy authorities must be even more sensitive to balance-of-payments deterioration in such periods.

Balance-of-Payments Determinants The balance of payments is usually defined by the following identity:

$$\text{Balance of Payments} = \text{Exports} - \text{Imports} + \text{Net Capital Inflow.}$$

In this analysis, however, the balance of payments is postulated to depend only upon the direction and rate of change in imports.

$$3. B_t = c_0 - c_1 (\dot{I}m)_{t-p}$$

¹Time lags in this and subsequent equations indicate the fact that relationships between an independent variable (like \dot{M}) and a dependent variable (like \dot{Y}) are not instantaneous. The exact duration of time lag can only be determined by a statistical analysis of each case. If the equation reads $\dot{Y}_t = a_0 + a_1 (\dot{M})_{t-2}$, it should be interpreted as follows: If \dot{Y}_t is third quarter of 1967, then $t-2$ would be the first quarter of 1967. \dot{Y}_t will increase by an amount equal to a_0 plus a_1 times $(\dot{M})_{t-2}$. If (\dot{M}) increased by 5 per cent, then \dot{Y}_t will increase by $a_0 + a_1(5)$.

An increase in imports leads to a balance-of-payments deficit; i.e., the relationship is negative. The definitional relationship between the balance of payments and imports is of course, in the same time period. However, the behavioral relationship postulated in equation 3 between the balance of payments and imports has a time lag. This time lag is a statistical artifact. It results from comparing rates of change in a flow (imports) with the level of a residual (the balance of payments). A time series, which is otherwise synchronous to another time series, would appear to lead if measured as a rate of change.

Price and Import Determinants Changes in national income are assumed to affect both prices and imports in a positive way. This would be stated as follows:

$$4a. \dot{I}m_t = d_0 + d_1 (\dot{Y})_t$$

$$4b. \dot{P}_t = d_2 + d_3 (\dot{Y})_t$$

When income rises at its full-employment growth rate or less, the pressure for price increases is weak. Thus, the price coefficient (d_3) is assumed to be less than (1.0). On the other hand, the value of the coefficient (d_1) is assumed to be greater than (1.0) as both the income and substitution effects tend to push imports up with a rise in income and to push imports down with a fall in income.

Difference Equation This model of business cycle developments can be analyzed in formal mathematical terms by the use of difference equation techniques. The solution of the difference equation traces out a path over time. This path may have a cyclical pattern, depending upon the values of the coefficients in the model. Because monetary policy is postulated to respond either to balance-of-payments considerations or to changes in prices, there are two alternative versions of this model. The first version in which monetary policy responds to the balance of payments can be expressed formally with four structural equations drawn from the previous discussion.

$$1. \dot{Y}_t = a_0 + a_1 (\dot{M})_{t-m}$$

$$2a. \dot{M}_t = b_0 + b_1 (B)_{t-n}$$

$$3. B_t = c_0 - c_1 (\dot{I}m)_{t-p}$$

$$4a. \dot{I}m_t = d_0 + d_1 (\dot{Y})_t$$

The reduced form of this system of equations is as follows:

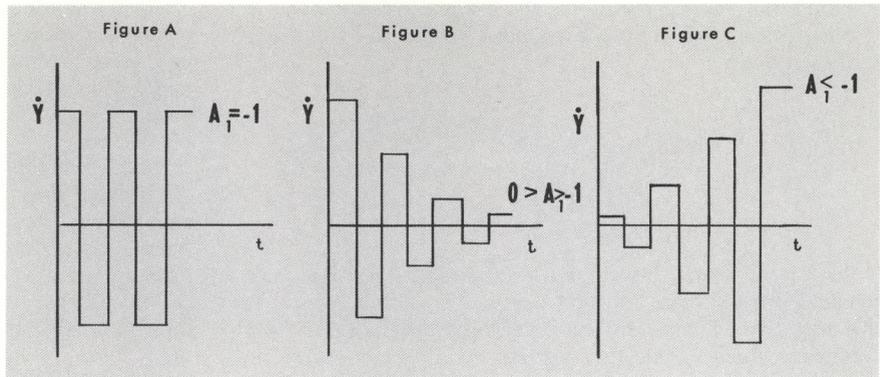
$$\dot{Y}_t = A_0 - A_1 (\dot{Y})_{t-z}$$

$$\text{where } A_0 = a_0 + b_0 a_1 + c_0 b_1 a_1 + d_0 c_1 b_1 a_1,$$

$$A_1 = a_1 b_1 c_1 d_1,$$

$$\text{and } z = m + n + p.$$

The rate of change in income (\dot{Y}) in any time period (t) depends upon the rate of change in income in some previous time period ($t-z$). In these circumstances the expression for $(\dot{Y})_t$ will have the properties of a homogeneous first order difference equation because whatever the size of



the time lag ($t-z$), the value $A_1(\dot{Y})_{t-z} + A_0$ uniquely determines the value of \dot{Y}_t . The value of A_1 determines the cyclical properties of the model.

If the value of A_1 is positive, i.e., greater than zero, then the rate of change in income (\dot{Y}) will not have a cyclical pattern. If the value of A_1 is negative, the time path of (\dot{Y}) will oscillate in a regular cyclical pattern. In this latter case there are three possible types of cycles. If the value of A_1 is equal to minus one (Figure A), the cyclical path of (\dot{Y}) will be of constant amplitude. If the value of A_1 is less than zero but greater than minus one (Figure B), the cyclical path of (\dot{Y}) will be damped with the fluctuations becoming smaller. If A_1 is less than minus one (its absolute value is greater than minus one), the cyclical path of (\dot{Y}) will be explosive, with the fluctuations becoming larger in each succeeding period (Figure C).

On a *priori* grounds, we can postulate that the value of A_1 in our model of the business cycle will be negative. This is because in equation 3 the value c_1 is negative. An increase in imports will decrease the balance of payments. As the coefficients in all the other equations are positive, the product of ($a_1 b_1 c_1 d_1 = A_1$) will be negative.

From the experience of the postwar period, we know that there have been no explosive business cycles; thus, the value of A_1 for all of the countries considered in this model is most likely between zero and minus one. (Figure B) The reason that the actual postwar business cycles have not damped toward zero is that exogenous events, like currency devaluation, international crises, natural disasters, etc., also affect imports, balance of payments, and income.

If monetary policy becomes more expansionary, the value of the coefficient b_1 will be larger; that is, there will be a larger increase in the money supply for any given improvement in the balance of payments. A larger value for b_1 will increase the absolute value of A_1 . As the absolute value of A_1 becomes larger and approaches the value of minus one, the business cycle will also exhibit a larger amplitude. Thus, the more expansionary is monetary policy, the sharper the fluctuations in income.

The second version in which monetary policy is dominated by domestic price considerations, can be expressed in three structural equations.

$$1. \dot{Y}_t = a_0 + a_1 (\dot{M})_{t-m}$$

$$2b. \dot{M}_t = b_2 - b_3 (\dot{P})_{t-o}$$

$$4b. \dot{P}_t = d_2 + d_3 (\dot{Y})_t$$

Using the same process of algebraic substitution as in the first case, this could be reduced to the following difference equation:

$$\dot{Y}_t = A_2 - A_3 (\dot{Y})_{t-z}$$

where $A_2 = a_0 + b_2 a_1 + d_2 b_3 a_1$,

$$A_3 = a_1 b_3 d_3,$$

and $z = m + o$.

In formal terms this version of the model has the same cyclical properties as the first version; i.e., both A_1 and A_3 are negative. There are, however, several important differences which make this version of the model exhibit considerably less cyclical movement. First, the lag structure is shorter in this model. In a formal sense this is true, because there are only two lags in this version ($z = m + o$), while there are three lags in the previous version ($z = m + n + p$). In an economic sense, the shorter time lag is due to monetary policy responding directly to changes in prices, while in the first version it responds to an in-

crease in imports only, after the consequences of this increase are reflected in a deterioration in the balance of payments. Second, the response mechanism in the second version is smaller than in the first version; i.e., the absolute value of A_3 will be closer to zero than the absolute value of A_1 . This is because the value d_3 will be smaller than the value of d_1 for reasons which have already been mentioned. Also, the value of b_3 will be less than the value of b_1 because the policy response to a domestic problem which has been recognized and dealt with in its early stages can be more moderate than the policy response to an external problem toward which the authorities are very sensitive for international reasons.

Because the absolute value of A_3 is typically smaller than the absolute value of A_1 , the cyclical fluctuations in income will be smaller if monetary policy responds to price changes than if it responds to balance of payments considerations. A monetary policy which takes prompt but moderate action, will have a smaller effect on the business cycle than a policy which takes infrequent but sharp actions.

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