FEDERAL RESERVE BANK
OF ST. LOUIS
AUGUST 1969

REVIEW

ST. LOUIS LOUISVILLE

EIGHTH DISTRICT

MEMPHIS

LITTLE ROCK

CONTENTS

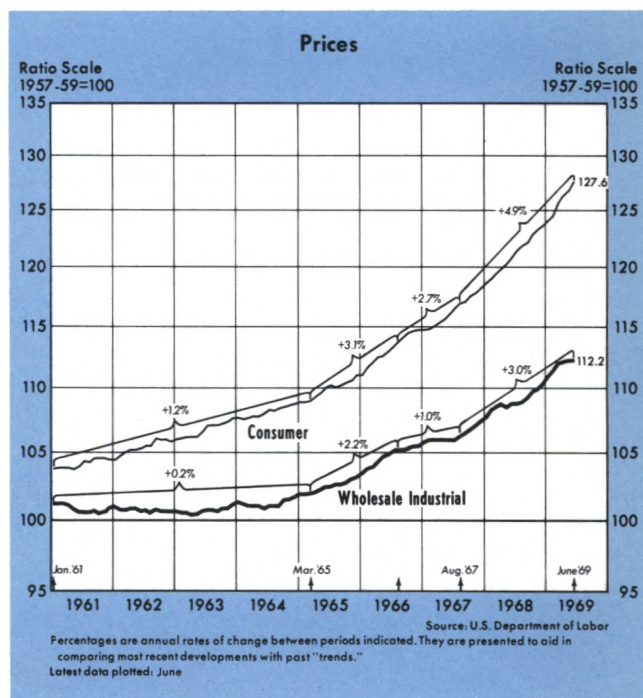## Vol. 51, No. 8

Inflation Continues

INFLATION has been a major concern of public policy for well over two years. In the first half of 1967 the Administration suggested passage of an income surtax to curb mounting inflationary pressures, and as early as December 1967 monetary authorities indicated a desire to restrain the overly exuberant economy. Yet, effective restrictive action was long delayed, and the persisting inflation has actually accelerated. Consumer prices have risen at more than a 6 per cent annual rate since last December, up from the 1968 rate of 4.7 per cent. This compares with a 3 per cent average annual increase in 1966 and 1967, and a 1.4 per cent trend rate from 1957 to 1965.

This article attempts to provide some insight into the problem of inflation by focusing on a few key questions. What is inflation? How does inflation affect the economy? What has caused the inflation since 1965? How can it be combated? What has been done in recent months to halt inflation? And, when may we expect moderation of inflation to be achieved?

What is Inflation?

Inflation is a rise in the general level of prices, or stated differently, a decline in the overall purchasing power of the dollar. Inflation does not necessarily involve an increase in the price of every good or even of every group of goods. Increases and decreases in prices of particular goods or services, which reflect changes in supplies or demands, are essential for the smooth operation of an efficient economy. Rising prices in one sector may be accompanied by declining prices elsewhere, and the changes in relative prices give incentive for transferring resources to areas where demands are greatest.

How then can we know how much inflation has occurred? The rate of inflation is difficult to measure accurately since there are myriad prices, some of which are rising and others falling, and since there are continuous changes in the quality and composition of goods and services offered for sale. The standard measures of the rate of inflation are derived from changes of prices of fixed "baskets" of goods and services. This assumes that changes in quality, tastes, and relative prices are either insignificant, or that adequate adjustments can be made for them. Frequently used measures include the

Prices

Ratio Scale 1957-59=100

127.6
+4.9%
+2.7%
+3.1%
+3.0%   112.2
+1.2%
Consumer
+1.0%
+2.2%
+0.2%
Wholesale Industrial

Jan.'61   Mar.'65   Aug.'67   June'69
1961 1962 1963 1964 1965 1966 1967 1968 1969

Source: U.S. Department of Labor

Percentages are annual rates of change between periods indicated. They are presented to aid in comparing most recent developments with past "trends."
Latest data plotted: June

Consumer Price Index, the Wholesale Price Index, and the Implicit Price Deflator.

The Consumer Price Index, which is compiled by the Bureau of Labor Statistics, is a measure of changes in prices of selected goods and services purchased by urban wage earners and clerical workers. The index covers the prices of most things people buy — food, clothing, automobiles, homes, furnishings, drugs, doctor expenses, repair costs, transportation fees, and others.

The Wholesale Price Index, also compiled by the BLS, is a measure of the composite price movements in primary markets. The index is based on price quotations for approximately 2,300 commodities selected to represent all commodities sold in primary markets in the United States.

The Implicit Price Deflator is computed by the Department of Commerce as a part of the national income statistics. It is gross national product in current dollars divided by gross national product in 1958 prices and thereby measures the change in prices of all goods and services weighted by amount spent on each item. The deflator is available quarterly, and the consumer and wholesale measures are available monthly.

Effects of Inflation

Inflation in the American economy causes redistributions of wealth and income and creates inefficiencies, injustices, and uncertainties. Inflation has different effects on the economy and on individuals, depending on the extent to which it has been anticipated and the extent to which these anticipations have been acted upon. Unexpected inflation causes a redistribution of wealth from those who have extended credit to those who have borrowed. For a loan at 5 per cent interest for a year when prices rise 6 per cent, the lender receives a net real yield of minus one per cent, since he is repaid with dollars that will buy fewer goods than when he made the loan.

If the degree of inflation were exactly anticipated and provided for by everyone, there would be no redistribution of wealth or income, since adjustments for the anticipated rate of price level increases would be built into contracts. If both the borrower and lender anticipated the 6 per cent inflation in the previous example, and the funds were worth a real net 5 per cent to the borrower, the contract would have been made for an 11 per cent nominal rate of interest.[1]

Of course, there is much uncertainty about the course of future prices, and all people are not capable of making contracts against such contingencies, especially when the rate of inflation varies. Returns on money holdings (since money is non-interest bearing) cannot be adjusted for reduced purchasing power. Many long-term contracts such as mortgage loans are already in existence, and cannot be changed until they mature. Others cannot be modified by the participants; changes in Social Security benefits, for example, are at the discretion of the Government.

There is evidence that adjustments to the present rate of inflation have not been complete. Many long-term loans, pensions, and annuities are returning the lender less purchasing power than he had at the time of the agreement. Even though growth in output per man hour has probably slowed only slightly from its trend of 3 per cent or more per year, hourly wages of nonagricultural workers rose 6 per cent in the past twelve months, while consumer prices went up 5.5 per cent. By comparison, in the previous year wages rose 6.4 per cent and prices 4.2 per cent.

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[1]Income tax considerations would make the actual rate higher, since the borrower is able to deduct from his income the amount of interest paid, and the lender must include as income the greater amount of interest received.

One adjustment to expected inflation is higher interest rates. An adequate adjustment in rates is impossible in some sectors, however, since it would conflict with legal ceilings. This is generally most harmful to small borrowers and savers who rely principally on the regulated financial institutions, and are most hindered by state usury laws. For example, it has been impossible for small consumers even to maintain the purchasing power of their savings accounts in banks. The legal maximum on these accounts is 4 per cent, but consumer prices have gone up at a 6 per cent rate since December. Moreover, consumers must pay income taxes on these "earnings." Those who deal in larger amounts are able to borrow or lend desired funds with fewer restrictions.

Inflation in conjunction with a progressive tax system contributes to an expansion of the Federal Government. Rising price levels raise nominal incomes and move taxpayers into higher tax brackets. As a result the Government receives a greater percentage of total real, as well as nominal, income. On the other hand, local governments, which rely heavily on property taxes for revenue, usually suffer a decline in real income during periods of inflation, since assessed valuations are relatively fixed.

Inflation also affects international payments balances. Higher interest rates in this country than in others tend to cause a surplus in this nation's capital account as long as there is no widespread anticipation of a change in exchange rates. Higher prices in this country adversely affect our trade balance.

Inflation greatly increases incentives for economizing cash balances. With rapid price increases it is advantageous for individuals and businesses to spend more effort in keeping money balances at a minimum.

In theory, only if the rate of inflation were stabilized, with all the public fully anticipating it and acting upon the anticipations intelligently and costlessly, would the rate of inflation be immaterial. But, under present conditions of uncertainty, nonuniform expectations, and lack of flexibility, inflation is highly undesirable, and it is the stated policy of the Government to eliminate it.

What Causes Inflation?

Inflation results mainly from a greater dollar demand for goods and services than the economy is able to produce at existing prices. At the onset of a period

of rapid spending growth, real product and employment may increase rapidly for a time and prices relatively little. But, as employment of resources approaches capacity and bottlenecks appear, price increases accelerate and the growth rate in real output moderates.

From 1961 to 1964 the U.S. economy was recovering from a situation of under-utilization of resources. Real product grew at a 5.4 per cent annual rate, well in excess of the trend growth rate of production, and prices increased at a 1.3 per cent rate. But since 1964, production has been at or near capacity most of the time, and total spending has continued to grow at rates about twice that of production. As a


Demand and Production
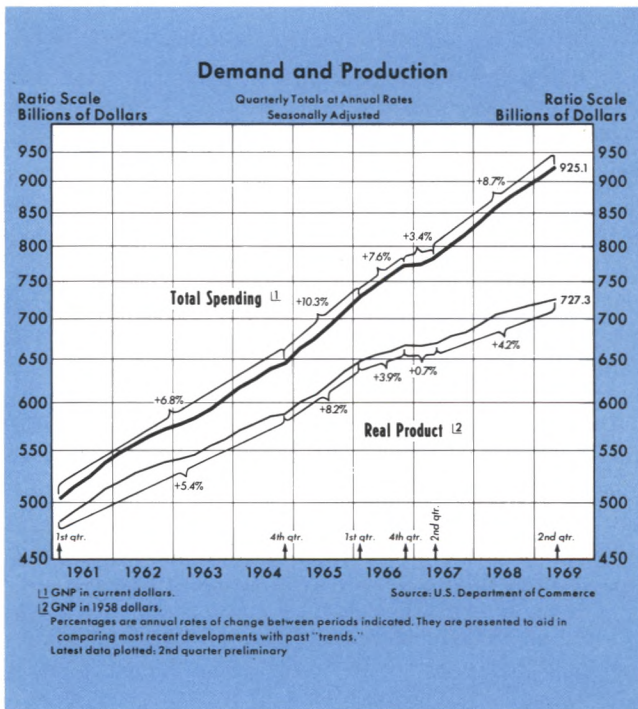
result, prices have risen rapidly. During the past year the GNP price deflator has gone up at a 4.5 per cent rate, and real product has grown at about a 3 per cent rate.

Possible Causes of Recent Inflation

A major disagreement about inflation centers on its causes and cures. Three main schools of thought may be distinguished: fiscal, monetary, and institutional.

The Fiscal View

Some observers ascribe the inflation since 1965 chiefly to the course of Federal spending and taxation. One analytical measure of the thrust of fiscal actions is an estimate of the national income accounts

Federal Budget Influence*
Stimulus or Restraint
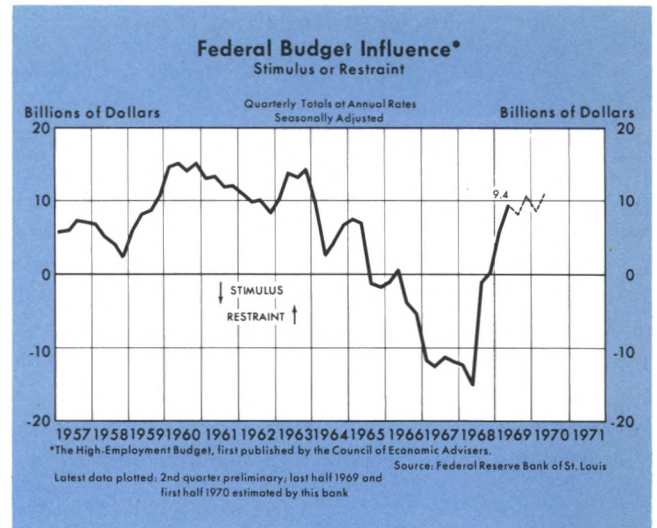
budget which would prevail at a constant rate of resource use, the so-called "high-employment" budget. By eliminating the effect of changing levels of economic activity on Government receipts and expenditures, the high-employment budget is believed to indicate the impact of changes in tax laws and in legal provisions for expenditures.[2] A surplus of receipts over expenditures is presumed to be indicative of Governmental restraint on total spending, and, conversely, greater expenditures than receipts imply Governmental stimulus to total spending.

The high-employment budget surplus declined from an annual rate of $12 billion in 1960-63 to about balance in the last half of 1965, as taxes were reduced and Government spending rose rapidly. The high-employment budget then moved to a deficit of more than a $12 billion annual rate from early 1967 to mid-1968.

Government expenditures taken alone are another possible indicator of the fiscal impact on the economy, and have been used to explain the recent inflation. The expansion of the Vietnam conflict, together with rapid growth of non-defense expenditures, resulted in rapid acceleration of total Government outlays. Federal expenditures rose at a 15 per cent annual rate from mid-1965 to mid-1968, after rising at a 6 per cent rate from 1957 to 1965.

Fiscal views of the cause of inflation imply that if these expansionary developments had not taken place, the excessive growth of total spending might have been avoided, or at least limited. These views were the basis for the long-debated proposals for a tax increase and/or Government expenditures restraint,

[2] See "Estimates of the High-Employment Budget: 1947-1967", this *Review*, June 1967.

which culminated in the 10 per cent surtax in mid-1968 and some cuts in proposed spending. Passage of the tax bill resulted in moving the high-employment budget to a surplus of about an $8 billion seasonally adjusted annual rate in the first half of 1969. Government expenditure growth also slowed. Expenditures increased 6 per cent in the last twelve months, after growing at the 15 per cent rate in the preceding three years.

A review of economic developments during recent years raises some question as to the influence of fiscal actions on total spending. In the 1961-63 period the country experienced rapid growth of total spending, real product, and employment, though the high-employment surplus was large and the rise in Government spending was not exceptionally rapid. In early 1967 growth of total private and Government spending decelerated markedly, though the high-employment deficit and Government outlays increased rapidly from mid-1966 to mid-1967. Again, the substantial tightening of the budget after June 1968 appears to have exercised little observable restraint on spending. Total spending on goods and services has grown 7.7 per cent in the past year, similar to the 8.3 per cent rate in the previous three years.

The Monetary View

Monetary developments provide an alternative or supplementary explanation of changes in total spending and of inflation. While specialists differ on how to measure monetary actions, we may roughly distinguish two main current views on how monetary developments are measured: money market conditions and monetary aggregates.

The course of the money stock, the most frequently used monetary aggregate, may be viewed as explaining in large measure the general course of total spending. The acceleration of money growth from the 1953-61 average annual rate of 1.4 per cent to a 3 per cent rate from 1961 to early 1965 was accompanied by recovery and expansion in the early Sixties. From the spring of 1965 to the spring of 1966 money rose 6 per cent, and both spending and inflationary pressures accelerated. The nine-month pause of monetary growth in 1966 was followed by a deceleration of spending growth in early 1967. Resumption of rapid growth of money in early 1967 appears to be related to the acceleration of total spending growth and of inflation since mid-1967.[3]

[3]These relations have been demonstrated with greater statistical precision by "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," this *Review*, November 1968.

Many analysts feel that money market conditions, measured possibly by interest rates, are a more reliable indicator of the monetary authorities' impact on the economy. According to this view, monetary restraint is indicated by high or rising interest rates, and expansive policy is denoted by low or declining interest rates. However, the record offers little evidence of the reliability of interest rates as an indicator of monetary influences.[4] Interest rates are determined, as are other prices, by demand and supply. The Federal Reserve can influence the price charged and paid for loan funds in the short run by influencing the supply of credit, but it can do little, if anything, to influence the demand for credit within a short period. On the other hand, in the longer run the monetary authority affects interest rates importantly by its influence on the demand for credit.
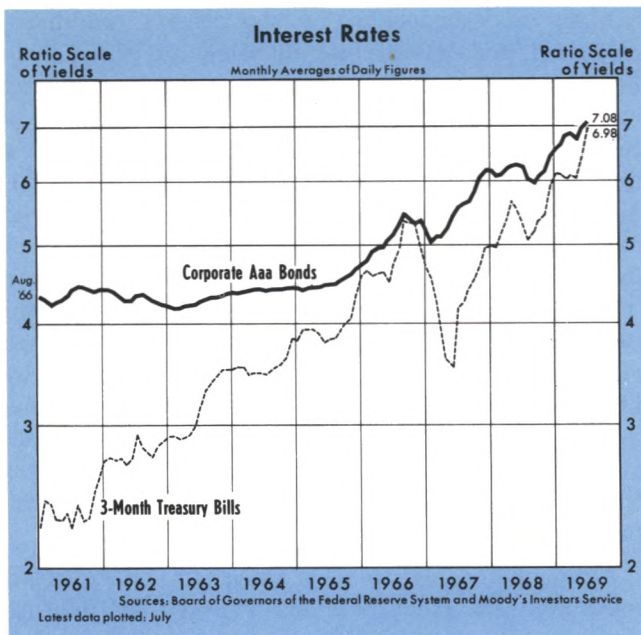
Although the high interest rates of 1968 indicated tight money market conditions, they did not indicate restrictive monetary actions. Growth of Federal Reserve credit and the monetary base accelerated during 1968, and inflationary pressures intensified. An interpretation consistent with both Federal Reserve actions and economic developments concludes that the high interest rates were the result of increased demand for loan funds which, in turn, was stimulated by an earlier rapid monetary expansion.

The Institutional View

A third view, which emphasizes imperfections in the economy, feels inflation is caused by the sellers of goods and services, including labor, who are continually trying to get a larger share of overall revenue. But continued cost-push inflation, while maintaining high employment, is possible only if the Government validates the attempts by sellers to get higher prices by pursuing an inflationary policy.

Cost-push inflation is usually a delayed response to an earlier excessive demand. Cost-push forces are usually most intense in periods following a rapid rise in total spending and the accompanying "demand-pull" price increases. At these times there are usually inflationary anticipations and inequities caused by lags in adjustments of some wages and other prices. Those emphasizing cost-push as the chief cause of inflation are more willing than others to accept the inefficiencies of wage and price controls to moderate inflationary excesses. Such controls are difficult to administer, cause inequities, misallocate resources, impinge on freedom, and reduce the flexibility needed to reach equilibrium.

[4]See "Interest Rates, 1945-1965", this *Review*, October 1965.

Interest Rates
Monthly Averages of Daily Figures

Ratio Scale of Yields

Corporate Aaa Bonds

3-Month Treasury Bills

7.08
6.98

1961 1962 1963 1964 1965 1966 1967 1968 1969
Sources: Board of Governors of the Federal Reserve System and Moody's Investors Service
Latest data plotted: July

Recent Actions to Halt Inflation

In recent months, both fiscal and monetary actions have become more restrictive. Efforts to obtain the renewal of the surtax and cancellation of tax investment credit represent attempts to maintain the fiscal stance. But if primary reliance were to be placed upon fiscal measures to restrain total spending, it might be held that the steps which have been taken in the past year have probably not been of an adequate magnitude. The annual rate of surplus of the high-employment budget in the first half of 1969, of $8 billion, compares with an average of $12 billion in the 1960-63 period when the economy recovered from recession. In order for the current budgetary surplus to stand in the same relation to total spending that it did in 1961-63, it would need to be at a $20 billion annual rate rather than the current $8 billion rate. And, if the budget influence were thought of in terms of movement rather than the level of high-employment surplus or deficit, it may be observed that little change is currently planned from second quarter of 1969 through the first half of 1970. By conventional interpretation of the influence of the budget on growth of total spending, the current situation may be interpreted as about "neutral" rather than either expansive or contractive.
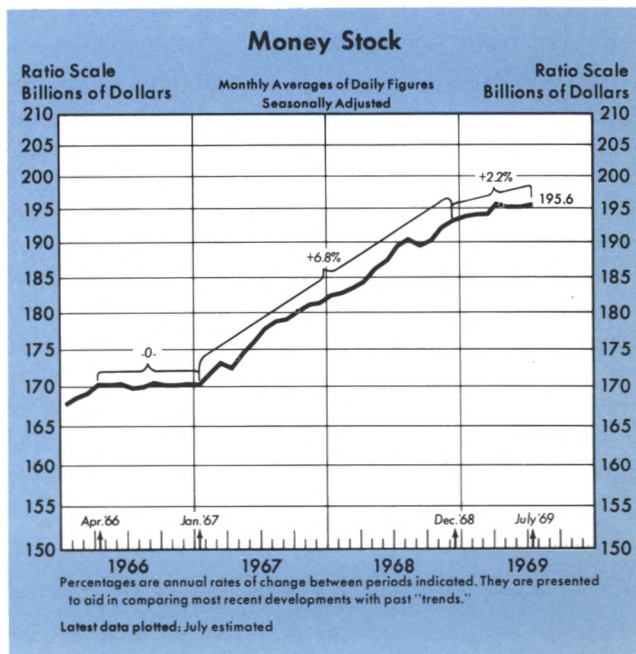
Monetary policy has been much less stimulative since last December relative to the preceding two years, no matter what indicator is examined. Both short- and long-term market interest rates have risen sharply. Yields on three month Treasury bills have risen from 5.94 per cent last December to 6.98 per

cent in July, and rates on highest-grade corporate bonds have gone up from 6.45 per cent to 7.08 per cent.

Growth of monetary aggregates has also slowed. Money stock has increased at a 2.2 per cent annual rate since December 1968, after rising at a 6.5 per cent rate in the two previous years; the demand deposit component has risen at a 1.0 per cent rate, compared with a 6.4 per cent rate in the earlier period; bank credit has grown at a 3.6 per cent rate, down from an 11.4 per cent rate, and money plus time deposits has decreased at a 2.6 per cent rate, against an earlier 10 per cent rate of increase.

It might be noted, however, that the degree of monetary restraint in the past seven months, as a whole, may have been less than it has been in some other comparable periods in recent history. The recent seven month increase of money at a 2.2 per cent rate, down from an earlier 6.5 per cent rate, compares with a nine month period of no change in 1966 following a 6 per cent rise in the previous year. In 1962, money was about unchanged for seven months, and in 1959-60, when it might be concluded that restraint became too great, money declined 2.3 per cent in a twelve month period.

In the past three months, however, strategic monetary magnitudes have declined or their rate of growth has sharply decelerated. Total member bank reserves have fallen from about $27.8 billion in May and early June to $26.8 billion in the last four weeks. These reserves had shown little net change

Money Stock
Monthly Averages of Daily Figures
Seasonally Adjusted

Ratio Scale Billions of Dollars

+2.2%
195.6
+6.8%
-0-

Apr.'66   Jan.'67   Dec.'68   July '69
1966   1967   1968   1969
Percentages are annual rates of change between periods indicated. They are presented to aid in comparing most recent developments with past "trends."
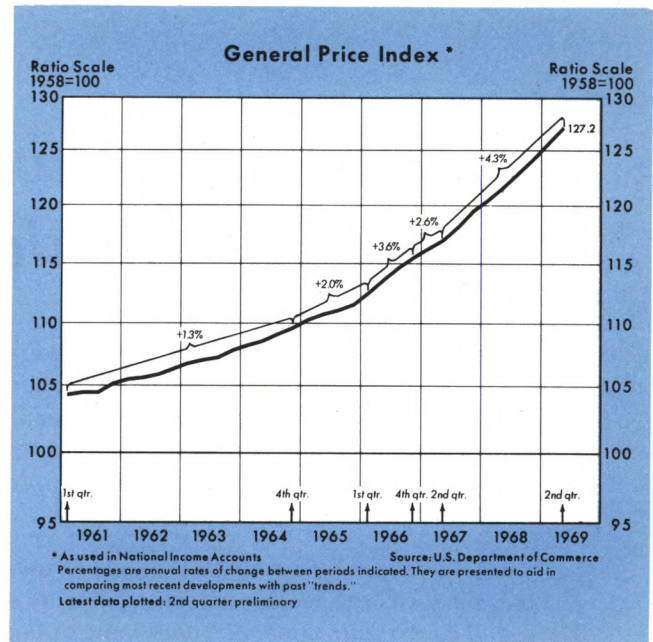
Latest data plotted: July estimated

from early January to May. The money stock has shown little net change on balance since the beginning of April. From December to April, money had increased at a 4 per cent annual rate. The demand deposit component of money has declined at about a 3 per cent annual rate in the last three months, after increasing at about a 4 per cent rate from December to April. Money market conditions as measured by changes in interest rates tightened markedly in May and June. Since late June, interest rates appear to have leveled off in spite of continued monetary restriction.

Effect on the Real Sector

The slower monetary expansion since last December may have already had some effect on total spending, but experience indicates that the major effects are likely yet to come. Retail sales, housing starts, and employment appear to have slowed, although frequently short-term movements in these series are misleading. Retail sales have recently shown little net change, compared with a 7 per cent increase in 1968; housing starts have declined for five consecutive months, and total employment has been on a plateau since February. On the other hand, industrial production has continued to increase at about the 5.7 per cent annual rate of the past two years, personal income has continued its strong advance, and unemployment has remained at an unusually low level.

Preliminary second quarter GNP figures indicate continued excessive total spending and inflation. Total

General Price Index *

* As used in National Income Accounts
Percentages are annual rates of change between periods indicated. They are presented to aid in comparing most recent developments with past "trends."
Latest data plotted: 2nd quarter preliminary
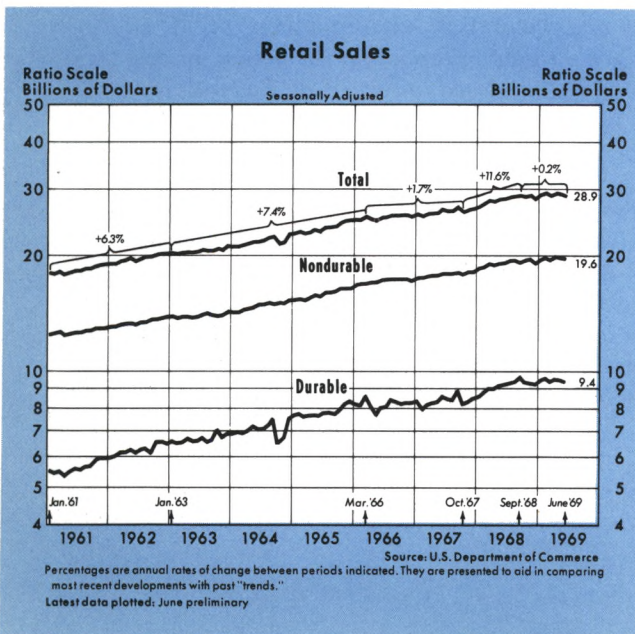Source: U.S. Department of Commerce

spending grew at a 7.4 per cent annual rate from the first to second quarter, slower than the 8.7 per cent rate of the past two years but still more rapidly than the estimated 4 per cent rate of growth of productive potential. Price increases have not slowed, with the general price index rising at a 4.9 per cent rate in the second quarter, compared with the 4.3 per cent rate of the past two years.

Real GNP has grown at a slower annual rate each quarter since the second quarter of 1968, rising at a 2.3 per cent rate in the second quarter of this year, 2.6 per cent rate in the first quarter, 3.2 per cent rate in the fourth quarter last year, 4.0 per cent rate in the third quarter and 7.4 per cent in the second. This slowing occurred as the economy approached capacity and could not maintain the earlier rapid pace. Further, if the inflation is to be moderated and the interest rate trend reversed, growth of real production must probably decelerate before resuming a growth rate comparable to the growth of productive potential.

When Will Price Rises Slow?

In the past, real economic growth has generally slowed prior to a reduction in the rate of price advances. Usually after demand growth has slackened, there are continued price and wage advances as part of a delayed reaction to the previous economic environment. In accordance with the usual time sequence, we are not likely to see a significant deceleration of price increases until the growth of total spending has been moderated for a considerable period.

Retail Sales

Seasonally Adjusted

Percentages are annual rates of change between periods indicated. They are presented to aid in comparing most recent developments with past "trends."
Latest data plotted: June preliminary
Source: U.S. Department of Commerce

The Influence of Economic Activity on the Money Stock

This bank has, on previous occasions, presented arguments and evidence with respect to what has been called the "strong" monetarist position — that changes in the money stock are the best indicator of monetary influences on the economy, and that these influences have a significant impact on the course of economic activity over the business cycle. It is further contended that through its control of the monetary base, the Federal Reserve dominates movements in money.

One of the major counter-arguments presented against the strong monetarist position is the so-called "reverse-causation" argument. This states that actions of the public, as they respond to current economic conditions, so influence observed movements in the money stock that measurements of the relation between money and economic activity give no evidence with respect to the direction of causality. Therefore, it has been contended that the close statistical relation observed between money and economic activity, which is one of the major empirical bases supporting the strong monetarist position, is spurious.

The following three articles deal with various aspects of the reverse-causation argument. The first article, "Comments on the 'St. Louis Position'" by Emanuel Melichar, Economist, Board of Governors of the Federal Reserve System, states this argument, and maintains that the evidence presented in support of the strong monetarist position leads to erroneous conclusions. Melichar contends that once the money stock is made statistically free of reverse-causation influences stemming from the behavior of the public, this "neutralized" money stock gives an entirely different and more accurate interpretation of Federal Reserve actions than the actual money stock.

Michael Keran's "Reply" analyzes the statistical and theoretical underpinnings of Melichar's argument. He concludes, on the basis of Melichar's own criteria, that the actual money stock is superior to the neutralized money stock as an unbiased measure of Federal Reserve actions. In addition, because no rationale is given linking the neutralized money stock to the rest of the economy, he states it is not possible to interpret its significance.

The third article, "Additional Empirical Evidence on the Reverse-Causation Argument" by Leonall C. Andersen, investigates some other aspects of the reverse-causation argument. He presents empirical evidence that although the reverse-causation argument cannot be rejected, it is of relatively minor importance in explaining movements in the money stock. Moreover, to the extent that reverse-causation can be measured, it is due to Federal Reserve behavior rather than to behavior of the public. Andersen concludes that the statistical evidence relating changes in GNP to changes in the money stock cannot be viewed as spurious.

These three articles are available as Reprint No. 44.

COMMENTS ON THE "ST. LOUIS POSITION"

by EMANUEL MELICHAR*

OVER THE PAST YEAR or so, the *Review* of the Federal Reserve Bank of St. Louis has provided a forum for exponents of a "monetary view" of economic activity and stabilization. A number of articles, both theoretical and empirical, have discussed indicators of monetary policy, relations between monetary policies and the money stock, and relations among the money stock, Gross National Product, and components of GNP such as residential construction. With an assist from the press, the general nature of the view consistently expressed in these articles has become widely known.[1]

The purpose of this note is to suggest that empirical research published in the last few years increasingly discredits a central proposition in the analytical framework set forth and employed in these articles. This research has received scant recognition thus far in the *Review*. In his guest article, in fact, Karl Brunner decried the lack of empirical research by others, specifically Federal Reserve respondents, on the crucial propositions underlying his "monetarist's" position; in countercritique of his and other previous

critical research, various Federal Reserve writers were said to have merely produced:

> . . . an array of specific conjectures advanced without analytical or empirical substantiation. Also, not a single paper of the countercritique developed a relevant assessment of the Monetarist's empirical theories or central propositions.[2]

To this observer, the research situation seems much different; or perhaps Brunner's net was not large enough. In the same interval other Federal Reserve economists were publishing, after years of effort, substantial and relevant empirical evidence. This evidence, while supporting some contentions of the monetary view, tends to reveal a major defect in the analytical framework of that view, and thereby in procedures and conclusions of empirical analyses using that framework.

The Crucial Issue

Much of the theoretical framework constructed by contributors to the *Review*, and thus their empirical approach as well, depends on the answer that is given to a seemingly simple question: to what extent are observed cyclical fluctuations in the growth of the money stock the result of action by the monetary authority, and to what extent are they the result of cyclical changes in other factors?

* Emanuel Melichar is an Economist in the Division of Research and Statistics, Board of Governors of the Federal Reserve System. Views expressed in the paper are those of the author and do not necessarily concur with those of other members of the research staff or with those of the Board of Governors.

[1] For instance, "Banks and Economics: First National City and Chase Involved Ironically in Economists' Raging Debate," by Albert L. Kraus, *The New York Times*, December 4, 1968, pp. 65 and 67.

[2] Karl Brunner, "The Role of Money and Monetary Policy," this *Review*, July 1968, p. 11.

Contributors to the *Review* claim that:

. . . System actions through their impact on high-powered money (or monetary base) can have a significant bearing on movements in the money stock.[3]

. . . the behavior of the monetary authorities dominates movements in the money stock over business cycles.[4]

But their Federal Reserve opponents, according to Brunner:

. . . contend that cyclical fluctuations of monetary growth cannot be attributed to the behavior of the Federal Reserve authorities. . . . the money stock and bank credit are dominated by the public's and the bank's behavior. . . . cyclical fluctuations of monetary growth result primarily from the responses of banks and the public to changing business conditions. . . . the persistent association between money and income could be attributed to a causal influence running from economic activity to money.[5]

Brunner and Andersen claim that empirical studies completely reject these contentions of their opponents:

. . . preliminary investigations yield no support for the contention that the behavior of banks and the public dominates cyclical movements in the money stock. . . . our present state of knowledge rejects the notion that the observed association [between money and income] is essentially due to a causal influence from income on money.[6]

. . . three studies conclude that behavior of the public (except for its behavior regarding currency) is of minor importance in explaining short-run movements in money.[7]

The validity of this empirical answer to our crucial question, reached by the contributors to the *Review*, is vital to the validity of the further empirical work they have published. It can be recognized readily, for instance, that the validity of using the actual money stock or monetary base as an indicator of the direction and degree of monetary policy depends directly on this answer.[8] Similarly, some models used in *Review* articles to study relationships between money and other economic variables are appropriate only if this conclusion is valid, that is, if the business cycle does not affect the money stock.

Extensive new work favors an alternative view. Hendershott has published a detailed empirical investigation of our crucial question and its implications.[9] He concludes that both the monetary authority and the business cycle exerted significant and important influences on the course of the money stock during 1952-64. The same conclusion appears to be reached implicitly by the builders of the Federal Reserve-MIT econometric model.[10] The equations of this model reveal significant effects of monetary policy actions on money and other financial stocks as well as on interest rates, of these stocks and rates on various components of GNP, and also of GNP on money and other financial stocks as well as on interest rates.

From these extensive studies, this observer, at least, concludes that neither extreme view expressed in the preceding quotations from the *Review* can be accepted. Inquiries using models that ignore *either* the influence of the monetary authority *or* the influence of the business cycle make, in effect, a specification error that leads to erroneous conclusions. A *Review* article that erred by ignoring the latter influence is examined next.

Money and Housing

In June 1968, the *Review* published a "tentative analysis" by Norman Bowsher and Lionel Kalish, which found that post-accord monetary restraint did not exert the depressing effect on residential construction that most people think it did.[11] The analytical

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[3] Leonall C. Andersen, "Three Approaches to Money Stock Determination," this *Review*, October 1967, p. 12.
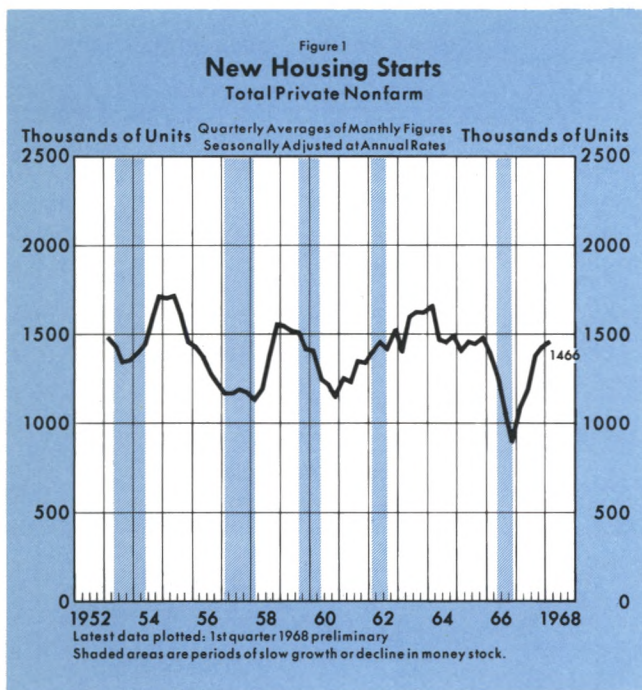
[4] Brunner, p. 9.

[5] *Ibid.*, pp. 9, 13, and 20.

[6] *Ibid.*, pp. 18 and 20.

[7] Andersen, p. 13.

[8] For instance, Friedman states, "In principle, 'tightness' or 'ease' depends on the rate of change of the quantity of money supplied compared to the rate of change of the quantity demanded excluding effects on demand from monetary policy itself. However, empirically demand is highly stable, if we exclude the effect of monetary policy . . ." Milton Friedman, "The Role of Monetary Policy," *The American Economic Review*, March 1968, p. 7.

[9] Patric H. Hendershott, *The Neutralized Money Stock: An Unbiased Measure of Federal Reserve Policy Actions*, Richard D. Irwin, Inc., Homewood, Illinois, 1968. Early results were presented to the Econometric Society in December 1964, while the author was employed by the Board of Governors. A useful summary of Hendershott's work is also found in George Horwich, "The Proper Role of Monetary Policy," *Compendium on Monetary Policy Guidelines and Federal Reserve Structure*, Committee on Banking and Currency, House of Representatives, December 1968, pp. 294-304.

[10] Frank de Leeuw and Edward Gramlich, "The Federal Reserve-MIT Econometric Model," Federal Reserve *Bulletin*, January 1968, pp. 11-40.

[11] Norman N. Bowsher and Lionel Kalish, "Does Slower Monetary Expansion Discriminate Against Housing?", this *Review*, June 1968, pp. 5-12.

Figure 1
New Housing Starts
Total Private Nonfarm

Latest data plotted: 1st quarter 1968 preliminary
Shaded areas are periods of slow growth or decline in money stock.

procedure of the article was to compare cyclical turning points in growth of the money stock with cyclical turning points in housing, based on examination of the chart reproduced here as Figure 1. Using a money stock consisting of demand deposits and currency:

> The shaded areas are periods of relatively slow (or negative) money growth. . . .Throughout . . . this article these periods are considered to be ones of monetary restraint.[12]

Examination of Figure 1 reveals that:

> . . . relatively slow rates of monetary growth do not cause excessive cutbacks in spending for homes. . . . All marked and sustained declines in housing starts began in periods of monetary expansion. In several cases the decline in starts was reversed after three to six months of monetary restraint, and the number of housing starts actually increased.[13]

The generalized conclusion is:

> During the first three to six months of a period of slow monetary expansion, the housing sector has tended to continue its relative decline begun during a previous period of monetary expansion; but then as monetary restraint continued, housing tended to level off or start rising relative to other activities.[14]

However, Hendershott shows that because of the business cycle's influence on the money stock, periods of restrictive monetary policy actions do not neces-
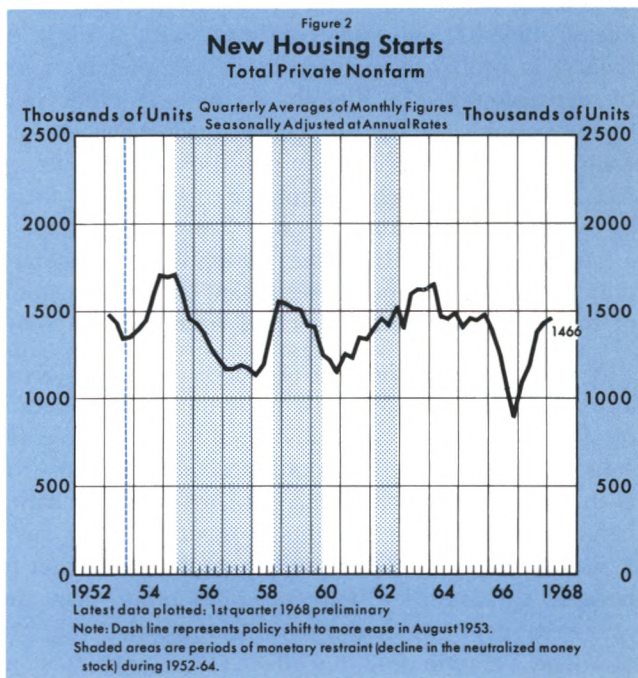
[12]*Ibid.*, p. 6.

[13]*Ibid.*, pp. 6 and 7.

[14]*Ibid.*, p. 6.

sarily coincide with periods of slow or negative monetary growth. When current policy is neutral, the money stock tends to increase if business is expanding and to contract if business is declining.

To develop an unbiased indicator of current policy actions, the influences of the business cycle (including the effects of past monetary policy) were quantified for 1952-1964, and these influences were removed from the actual money stock. Turning points in the resulting series, which Hendershott labels the "neutralized money stock," reflect turning points in current monetary policy. This indicator shows, as periods of policy restraint, those periods in which current actions by the monetary authority were effectively restraining growth of the money stock. Periods of monetary ease are indicated as those in which the monetary authority was effectively promoting growth in money.

An opportunity is thus presented to contrast the Bowsher-Kalish housing results with those of a similar analysis using a more appropriate measure of monetary policy actions — neutralized money — a measure based on the revised framework that allows for influences from real to financial variables as well as from financial to real variables.

Figure 2
New Housing Starts
Total Private Nonfarm

Latest data plotted: 1st quarter 1968 preliminary
Note: Dash line represents policy shift to more ease in August 1953.
Shaded areas are periods of monetary restraint (decline in the neutralized money stock) during 1952-64.

The shaded areas in Figure 2 indicate periods of restrictive monetary policy actions during 1953-64, as determined by Hendershott.[15] The simple rela-
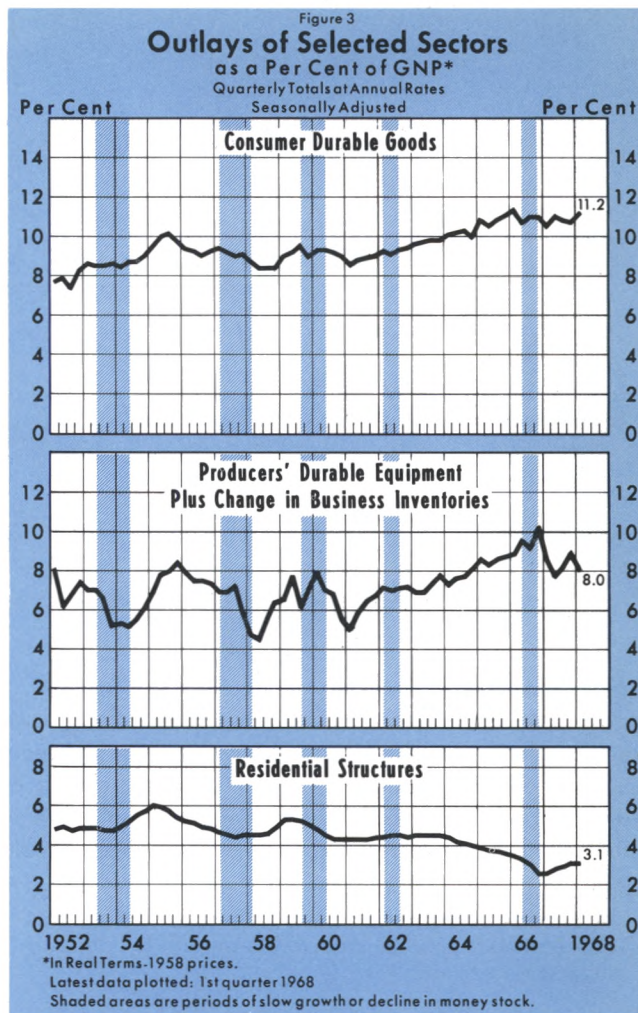
[15]Hendershott, pp. 120-123. Turning points in monetary policy actions during 1957-64 are shown as revised by Hen-

tionship between shifts in policy and turning points in housing starts is close and relatively consistent. In the two major housing declines during the period covered, starts fell soon after monetary policy shifted from ease to restraint and did not recover until after effective policy shifted back to ease. Hendershott also identifies a policy shift to "significantly more" ease in August 1953, and this shift also coincides with an upward move in housing starts. Housing activity continued upward during a short period of moderate restraint in 1962, and later fell somewhat in 1964, during monetary ease, probably because some areas were temporarily overbuilt. Another severe housing decline did not begin until 1966, which may be presumed to have been a period of restrictive policy actions, although the neutralized money stock series has not been calculated beyond 1964.

One hesitates to draw conclusions from this simple analytical procedure without further investigation. This housing model, like that of Bowsher and Kalish, provides no place, for instance, for expression of the effects of changes in the demand for housing or in institutional arrangements that govern the flow of funds into housing. But a simple relationship as strong and consistent as that found between turning points in housing starts and in the neutralized money stock during 1953-64, and also consistent with a body of theory, is probably unlikely to be completely upset by expansion of the analysis to include other pertinent variables. Thus, in contrast to Bowsher and Kalish, one might tentatively conclude that monetary restraint exerted such a strong depressing influence on residential construction, and monetary ease such a strong stimulus, that the direction of monetary policy was a principal determinant of the direction of housing activity in the period from 1953 to 1964.

A more general criticism of Bowsher and Kalish is also implied above. When a preliminary examination of simple relationships yields essentially negative results inconsistent with generally accepted theory, it is incumbent upon the analyst to investigate further before announcing a revision of theory. In this case, it was necessary that the authors explain variation in housing satisfactorily with variables other than the rate of money growth before concluding that the rate of money growth had no effect. It is entirely conceivable, for instance, that cyclical changes in the demand for housing could, in the simple model, have masked the effect of money growth on housing.

dershott in "A Quality Theory of Money," presented at the Money and Banking Breakfast of the Midwest Economics Association, Chicago, April 18, 1969.

Figure 3
Outlays of Selected Sectors
as a Per Cent of GNP*
Quarterly Totals at Annual Rates
Seasonally Adjusted

*In Real Terms-1958 prices.
Latest data plotted: 1st quarter 1968
Shaded areas are periods of slow growth or decline in money stock.

Bowsher and Kalish are aware of these considerations. Observe their lack of compassion for others who blunder in the economic maze:

> The widespread belief that housing has been seriously hurt by monetary restraint probably has resulted from mistakenly identifying rising market interest rates with monetary restraint. Interest rates, unadjusted for price developments and for Government borrowing, and unrelated to changing profit expectations of businesses, are usually a poor guide to either the rate of monetary expansion or its impact on economic activity.[16]

Thus are condemned those whose naive analysis founders on the reefs of the procyclical bias in rates of interest. But it is just as easy to come to grief on the shoals of the procyclical bias in the money stock.

Monetary Policy and the Business Cycle

Bowsher and Kalish, in Figure 3, also examine the behavior of expenditures for consumer durables and

[16]Bowsher and Kalish, p. 12.

for business equipment and inventories during periods of monetary ease and restraint. They observe that, for these sectors,

> . . . declines or slower rates of increases during periods of slow money growth have been roughly equal to those in [residential construction]. Also, declines in the other two sectors sometimes actually began during the periods of slow monetary expansion. It appears that housing has not been any more adversely affected during periods of relatively slow monetary growth than have these other sectors.[17]

This may be about all that one can glean from Figure 3. But contrast these slim pickings with the insights transmitted by Figure 4, in which unbiased periods of policy ease and restraint are delineated.

One can see how monetary policy shifted to restraint after the proportion of outlays on business equipment and inventories had increased, accompanied by a shift of consumer spending into durables or housing, or both. One can almost sense the inflationary strains resulting from these spending shifts after productive resources become relatively fully employed. (Charts of spending totals, employment rates, and prices would help here. One can also ponder whether restraint appears to have been imposed too early in the 1958-59 upswing.) One can see that restraint hits housing first; a turnaround in the proportion of outlays spent on business equipment and inventories and on consumer durables takes more time, and a significant reduction takes even longer. But when the big drop in business spending does come, its speed is alarming, and one can visualize the monetary authorities bailing out of restraint and into ease as the fall is detected — and then waiting quite a while for the turn to come in relative outlays for both business and consumer durables. Is not a significant portion of the cyclical policy story of 1952-64 found in these simple charts?
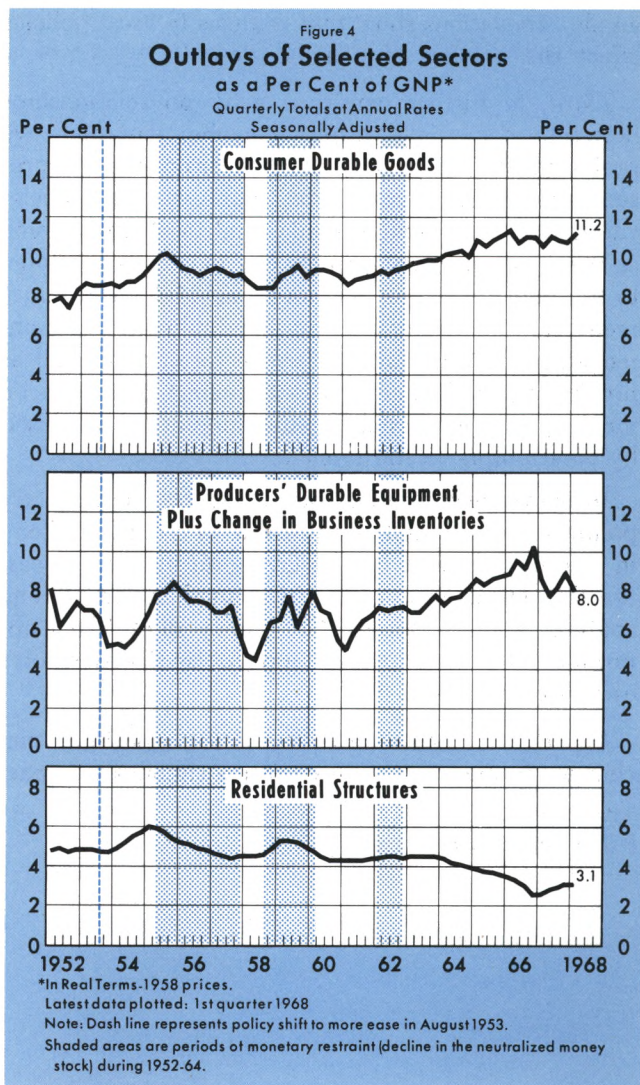
Brunner asks a question of "our monetary policymakers, their advisors and consultants: How do you justify your interpretation of policy, and how do you actually explain the fluctuations of monetary growth?"[18] The neutralized money stock would seem to be a useful pedagogical tool.

Review of the Issues

On the issues frequently raised by contributors to the *Review*, what are the views that seem consistent with results of the recent empirical efforts we have cited?

[17]*Ibid.,* p. 9.

[18]Brunner, p. 24.

Figure 4
Outlays of Selected Sectors
as a Per Cent of GNP*
Quarterly Totals at Annual Rates
Seasonally Adjusted

*In Real Terms-1958 prices.
Latest data plotted: 1st quarter 1968
Note: Dash line represents policy shift to more ease in August 1953.
Shaded areas are periods of monetary restraint (decline in the neutralized money stock) during 1952-64.

First, we agree with *Review* contributors that the monetary authority can exert and has exerted significant influence over fluctuations in the growth of the money stock. For instance, Hendershott's neutralized money stock exhibits large movements during 1952-64 that resulted mainly from current actions of the monetary authority.[19] Also, simulation of a monetary policy action in the FRB-MIT model yields a quick and strong effect on demand deposits.[20]

Second, in contrast to the *Review* position, the business cycle is also thought to exert significant influences tending to affect the growth of the money stock. Hendershott found large changes in money attributable to these influences. The FRB-MIT model provides implicit confirmation of such effects. For ex-

[19]Hendershott, p. 120. But also see cautionary note on pp. 105 and 106.

[20]De Leeuw and Gramlich, pp. 15, 16, and 27.

ample, simulations show that changes in fiscal policies affect the volume of demand deposits.[21]

Third, in further empirical work on relationships between money and other economic variables, we prefer to start with models that provide for representation of the effects of real variables on financial variables. These models would tend to attribute some of the simple correlation between money and income to the influence of income on money. This procedure seems to leave more scope for findings that non-monetary variables also influence income, as well as for findings of longer lags in the effect of money on income, than is possible in the simpler models used by contributors to the *Review.*

In some investigations of the effects of monetary policy actions, it might be possible to retain simplicity in the models used by employing an unbiased measure of such actions, as was attempted in the housing analysis reported herein. The money stock is not appropriate for such use, as judged by Hendershott's evidence from 1952-64.

Fourth, we agree with the *Review* position that changes in monetary policy exert a significant impact

on GNP. With the FRB-MIT model, simulations of changes in monetary policies showed significant eventual effects on GNP.[22]

Fifth, in looking for an indicator of the direction of monetary policy, the money stock and the monetary base are viewed with reservations similar to those that contributors to the *Review* express about interest rates. Further work on updating and refinement of an unbiased measure is needed.

Sixth, we note Hendershott's conclusion that the monetary authority was effectively able to translate a desire for monetary ease or restraint into an actual condition of ease or restraint, with discrepancies few in number and short in duration during 1952-64.[23] Brunner's notion that the monetary authority was unable or incompetent to carry out the direction of its policy wishes during most of this period is rejected.[24] This conclusion, however, leaves ample scope and need for study of the timing and magnitudes of policy actions, as recent events continue to demonstrate.

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[21]*Ibid.,* pp. 27-29.

[22]*Ibid.,* p. 27.

[23]Hendershott, p. 134.

[24]Brunner, p. 21.

The Reply to this Comment begins on next page.

REPLY

by MICHAEL W. KERAN

THIS REPLY is divided into three parts: first, a review of the empirical work by Patric Hendershott,[1] which Melichar relies upon in the preceding "Comment" to justify his analysis and conclusions; second, a critique of the relevance of this empirical work; and third, an evaluation of the theoretical underpinnings of Melichar's analysis. Following this approach makes it unnecessary to deal point by point with some of the more narrowly conceived issues raised by Melichar.

A Summary of Hendershott's Analysis

The issue raised by Hendershott is how to construct an unbiased measure of Federal Reserve policy actions. The importance of this issue is obvious. Without such a measure it is not possible to evaluate the appropriateness of Federal Reserve behavior.

The criterion Hendershott uses for determining whether a monetary variable is an unbiased measure is that its value be dominated by Federal Reserve actions, and therefore not directly influenced by actions of the private sector of the economy. Hendershott asserts that any monetary variable would be an unbiased measure of monetary policy if it satisfied this "dominance" criterion.

Unfortunately, movements in most monetary variables, such as interest rates, the money stock, or bank credit, are determined by a mixture of both Federal Reserve and private actions. One of the major

criticisms leveled against interest rates as a measure of Federal Reserve actions by those who favor the money stock "measure" is that changes in the observed level of interest rates are dominated by private rather than Federal Reserve actions. However, Hendershott considers that the money stock also suffers from this problem, being simultaneously determined by public and monetary authority behavior. According to Hendershott, if the influence of the public can be removed, any monetary variable will give the same unbiased interpretation of Federal Reserve actions.[2] Because of the complexity of the process of removing public influences, Hendershott performs a "neutralization" procedure on only one variable — the money stock.

To make the money stock an unbiased measure of Federal Reserve actions over the business cycle, he proposes to remove the influence of the public from the cyclical movements in the money stock. To accomplish this he derives a money stock identity which has fourteen terms. Each term is constructed from components of the sources and uses of member bank reserves, and a multiplier based on average reserve requirements on demand deposits. He found that six of these components (float, excess reserves, time deposits, currency held by the public, member bank borrowings from the Federal Reserve, and the gold stock) were substantially influenced by the behavior of the public. That is, their value could be

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[1]Patric Hendershott, *The Neutralized Money Stock: An Unbiased Measure of Federal Reserve Policy Actions*, Richard D. Irwin, Inc., Homewood, Illinois, (1968).

[2]*Ibid.*, p. 3. "Which indicator is neutralized is probably unconsequential because after the impact of the business cycle has been removed, the indicators should have similar cyclical patterns; the only systematic cyclical influence remaining in any of them is due to Federal Reserve actions."

satisfactorily predicted on the basis of current and lagged values of GNP, market interest rates, and other indicators of economic activity.

Of the remaining eight components, seven[3] were either small enough so that their influence on the observed money stock was negligible, or they were little influenced by the actions of the public. The remaining component (Federal Reserve holdings of Government securities) was taken to be under the complete control of the monetary authorities and, therefore, for statistical purposes, considered exogenous.[4]

Using standard statistical procedures, Hendershott estimated the degree of public influence on the first six components of member bank reserves discussed above. With these statistical results he was able to remove the effect of the public's actions, and construct a cycle-free value for each component. When the six cycle-free and eight observed components of member bank reserves are inserted into the money identity, they produce Hendershott's "neutralized" money stock. The influence of the public on four of these components (time deposits, excess reserves, float and currency in the hands of the public), although significant, tends to work in offsetting directions on the money stock, that is, it tends to be self-neutralizing. Only member bank borrowings and gold flows were found to be highly procyclical. The adjustment of these two items explains most of the difference between the actual and the neutralized money stock.[5]

A Critique of Hendershott's Analysis

An evaluation of the neutralized money stock can be conducted on both a theoretical and an empirical level. This section considers the relevant empirical issues, and the following section considers some theoretical issues.

Hendershott contends that the way to eliminate the influence of public actions on the money stock is to develop measures of their influence and then subtract them from those components of the money stock which the public has been observed to influence. This

procedure is not easy or straightforward. Hendershott devotes two-thirds of his book to this task and shows considerable ingenuity in measuring the influence of the public on certain components of the money stock identity. He considers that this process is sufficient to neutralize the money stock and make it an unbiased measure of Federal Reserve actions.

This conclusion is valid, however, only if variations in those components which the public influences are *independent* of variations in the values of the other components of the money identity. If it is desirable to eliminate the influence of the public from some components, then it is also desirable to consider whether other components in the money identity behave in a way which offsets or reinforces these public influences. If such behavior exists, then the neutralization process used by Hendershott will no longer lead to an unbiased measure of Federal Reserve actions.

The possibility of a systematic interdependence between the components of member bank reserves, and thus between the terms of the money stock identity, is strong because a large share of changes in Federal Reserve holdings of Government securities (open market operations) are designed to "stabilize money market conditions." Operationally, this means that some Federal Reserve purchases and sales of government securities are designed to offset irregular seasonal and cyclical movements in member bank reserves. Hendershott acknowledges that the Federal Reserve most likely does offset such flows when they are the result of international transactions, and therefore constructs a "modified-neutralized" money stock which implicitly treats gold flows as if they are offset by Federal Reserve actions.[6]

There is no reason why Hendershott should have stopped with allowing only for offsetting actions with respect to gold. There are a wide range of other financial flows which also influence money markets, and which the Federal Reserve could offset if it chose to do so.[7] We tested the possibility that some Federal

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[3]Treasury currency, vault cash of nonmember banks, Treasury cash holdings, U.S. Government deposits at member banks, foreign deposits at Federal Reserve Banks, Federal Reserve Accounts not elsewhere classified, and nonmember bank demand deposits.

[4]Hendershott, p. 13. "The money stock is considered as responding to a change in the Federal Reserve's portfolio of government securities and some minor member-bank reserve components rather than to a change in the adjusted monetary base, which is equivalent to the sum of the Federal Reserve's portfolio, Federal Reserve float, the U.S. gold stock, and the same minor reserve components."

[5]*Ibid.*, p. 117.

[6]Hendershott gives two reasons for constructing a "modified-neutralized" money stock: (1) to make it comparable with "policy statements" (which refer to actions net of offsetting gold movements); and (2) "neutralization of gold stock is the most tenuous . . . due to the complexities of the balance of payments and the somewhat heroic assumptions made regarding foreign central bank behavior."

[7]Hendershott argues (page 94) that such offsetting behavior is, for whatever reason, still Federal Reserve actions which should be measured in terms of their independent effect on the money stock. This is not a valid position to hold if (as is pointed out in the text) these actions are *induced* by movements in other components of the money identity.

Reserve actions, measured by changes in its government securities holdings (adjusted for changes in reserve requirements)[8], were designed to offset movements in other items in the money identity. We were particularly interested to see if the Federal Reserve acted to offset these components which Hendershott found were influenced by actions of the public.[9] To make the test as comparable as possible with Hendershott's, the coefficients were estimated by ordinary least squares regressions using first differences of monthly data (not seasonally adjusted) from January 1952 to December 1964 (the same period used in Hendershott's study).[10]

$$\Delta S_A = .038 - 0.88 \ \Delta G - 0.35 \ \Delta F - 1.18 \ \Delta B$$
$$\quad (2.11) \ (10.69) \quad\quad (4.19) \quad\quad (7.81)$$

$$+ \ 1.29 \ \Delta C_t + 0.69 \ \Delta O + 1.18 \ \Delta C_o \quad R^2 = \ .72$$
$$\quad (1.84) \quad\quad (9.74) \quad\quad (16.92) \quad\quad D\text{-}W = 2.03$$

Δ = month-to-month changes in each series.

S_A = Federal Reserve holdings of government securities adjusted for changes in reserve requirements.

G = United States gold stock.

F = Federal Reserve float.

B = Borrowings of member banks.

C_t = Currency and coin issued by United States Treasury.

O = Other Federal Reserve accounts (mainly Treasury and foreign deposits) and Treasury cash holdings.

C_o = Currency in the hands of the public.

Numbers in parenthesis are "t" statistics which indicate that all coefficients are estimated to be significant at the one percent level, except Treasury currency and coin (ΔC_t).

These results indicate that adjusted open market operations (ΔS_A) tend to offset the movements in the other components.[11] For example, an increase in the gold stock would, *ceteris paribus,* cause the money stock to increase, but because the Federal Reserve reduces it holdings of government securities by almost the same amount, the actual effect on the money stock is negligible. Conversely, an increase in currency in the hands of the public (ΔC_o) would, *ceteris paribus,* reduce the money stock,[12] but because the Federal Reserve increases its holdings of

Government securities, the effect of that change on the money stock is offset.

Seventy-two per cent of the variation in adjusted Federal Reserve holdings of Government securities is directly related to offsetting these specific sources of potential change in the money stock. Considering the important role which "defensive" operations have traditionally played in Federal Reserve actions, these results are not surprising.[13]

Hendershott found that, of the six items in the money stock identity which were influenced by the public, only member bank borrowings and gold were important in causing the discrepancy between the actual and neutralized money stock. Thus, as a practical matter, if the influence of borrowings and gold on the money stock are offset by variations in Federal Reserve Government security holdings, then the actual money stock will be a less-biased measure of Federal Reserve actions than the neutralized money stock. Our regression test shows this is exactly what happened. Federal Reserve holdings of Government securities tended on the average to offset $1.18 of every $1.00 of member bank borrowing and $.88 of every $1.00 of gold flows in the same month in which they occurred.

On the basis of the criteria which Hendershott himself established, and which Melichar accepts, the actual money stock is superior to the neutralized money stock as a measure of Federal Reserve Actions. Thus, any analysis or conclusions drawn with respect to Federal Reserve actions on the basis of the neutralized money stock are misleading.

Federal Reserve Actions and Monetary Influences

The preceding empirical investigation established that the observed money stock is a better measure of Federal Reserve actions than the neutralized money stock. However, what if open market operations had not been conducted in a way to offset the influence of borrowings and gold on the money stock? In that case, Hendershott's neutralized money stock would have been a superior measure of Federal Reserve actions. However, even then, Melichar's analysis and conclusions are not necessarily valid, because he ig-

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[8]The reserve adjustment was added to Federal Reserve holdings of government securities so that this one variable can simultaneously measure both open market operations and changes in reserve requirements.

[9]Time deposits and excess reserves were not included in this regression because the link between them and open market operations cannot be portrayed with the simple one-to-one correspondence used here.

[10]These are the same symbols used by Hendershott except for the sum variable O and the reserve adjustment on S.

[11]The sign of the coefficient in the Treasury currency variable is positive, while an offset would be negative. However, this coefficient is not statistically significant and no economic interpretation can be or is made on this basis.

[12]An increase in currency (which is a component of the money stock) will cause a decrease in the money stock, because without an offset it would reduce bank reserves, forcing a multiple contraction in demand deposits.

[13]This discussion should not be taken to imply that all Federal Reserve actions are defensive in nature. Given suitable measures of Federal Reserve objectives, they could be included in the regression. For an example of this, see "An Explanation of Federal Reserve Actions (1933-68)" by Michael Keran and Christopher Babb, this *Review,* July 1969.

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nores an important theoretical consideration. He implicitly assumes that the least-biased measure of Federal Reserve actions is also the best indicator of monetary influences on the economy. This assumption is not necessarily true.

Consider the period before 1914 when the Federal Reserve did not exist. Does the absence of a central bank mean that there were no monetary influences on the economy? No, obviously such influences did exist. The absence of a central bank only means that the *discretionary* powers which the Federal Reserve now exercises could not be utilized to control the money stock.

In the pre-Federal Reserve era the dominant influence on the money stock was the balance of payments, because of the consequences this had on the domestic stock of gold which supplied the base for the money stock. Because the balance of payments, and therefore the supply of gold, depended to a large extent upon conditions in the United States over the business cycle, movements in the money stock were strongly influenced by domestic economic conditions. This mechanism in no way precluded changes in the money stock from influencing domestic economic activity. Indeed, to the extent that the gold standard was successful in the pre-World War I era, it was due to this essential double link from income to money and from money to income.

The monetary influence on the economy can operate quite independently of the source of the monetary change, irrespective of whether or not the change is the result of discretionary central bank actions or induced movements in the gold stock. A statistical problem related to interpretation of the regression coefficients may arise in a single equation model, however, where income may be influencing the money stock. A statistically significant coefficient relating changes in money to changes in income will not provide statistical proof that the direction of causality goes from money to income, unless the factors determining the movement in the money stock can be shown to be statistically independent of income in

the contemporaneous period (see the companion article by Leonall C. Andersen for a more thorough consideration of this issue.)

Even if the neutralized money stock were an unbiased measure of Federal Reserve actions, it would not necessarily be an accurate measure of monetary influences on the economy. Such a measure can only be derived within the context of a validated economic theory, which specifies the mechanics of the monetary influence. A statistical evaluation of the theoretical link between the monetary variable and the economy is an integral part of the evaluation procedure.

There are two well-specified theories relating monetary influences to the rest of the economy: A neo-Keynesian theory which measures the influence of monetary variables through variations in interest rates, and a modern quantity theory which measures monetary influences through variations in the money stock and related monetary aggregates. No economic theory has been presented either by Hendershott or Melichar which links a neutralized money stock to economic activity.[14] At the very least, such a model would have to show how those changes in the money stock, which were induced by public action, had a different effect on economic activity than those changes in the money stock induced by Federal Reserve actions.

Melichar's use of the neutralized money stock in his analysis of monetary influences on economic activity is inadequate on two counts: first, the neutralized money stock is not an unbiased measure of Federal Reserve actions, and second, no evidence has been presented which supports the position that the neutralized money stock is a good indicator of monetary influences on the economy.

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[14]This should not be taken as a comment on Hendershott's book because his interest is in measuring Federal Reserve actions, not monetary influences on the economy. However, when one uses the neutralized money stock in an analysis of economic activity (as Melichar does), some model linking it to economic activity is called for.

See the companion article beginning on the
next page for statistical evidence relating
to other aspects of the reverse-causation argument.

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Federal Reserve Bank of St. Louis

ADDITIONAL EMPIRICAL EVIDENCE ON THE REVERSE-CAUSATION ARGUMENT*

by LEONALL C. ANDERSEN

A COMMON CRITICISM of studies which relate changes in gross national product (GNP) to changes in the money stock is the contention that the money stock is so influenced by economic activity that it is very difficult to identify and interpret the response of GNP to changes in money. Those who argue along this line assert that regression coefficients relating changes in GNP to changes in money, particularly in the current quarter, may be nothing more than a reflection of the response of money to changes in economic activity. In other words, the question arises as to whether the money stock can be treated as an exogenous variable.

This reverse-causation argument has frequently been made with respect to the recent study reported by Jerry L. Jordan and the author.[1] That study tested three hypotheses regarding the response of GNP to monetary and fiscal actions. These hypotheses were: "The response of economic activity to fiscal actions relative to that of monetary actions is: (I) greater, (II) more predictable, and (III) faster." In order to test these hypotheses, test statements were presented in the form of single-equation, reduced-form relationships relating changes in GNP to changes in frequently used summary measures of monetary and fiscal actions. Results were reported for tests based on money (narrowly defined) and the monetary base as summary measures of monetary actions, and various high-employment budget concepts as summary measures of fiscal actions. The results of the tests led to the rejection of all three hypotheses.

The reduced-form equation found most useful was one with quarterly changes in nominal GNP as the dependent variable and quarterly changes in the money stock and in high-employment Government expenditures as exogenous variables (Table I).[2] The

[1] Leonall C. Andersen and Jerry L. Jordan, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," this *Review,* Federal Reserve Bank of St. Louis, November 1968, and available as Reprint No. 34.

Table I

REGRESSIONS OF CHANGES IN GNP ON CHANGES IN MONEY AND FEDERAL EXPENDITURES (I/1953 - I/1969)

	ΔM	ΔE
t	1.51*	0.41
t-1	1.55*	0.50*
t-2	1.44*	—0.06
t-3	1.30*	—0.70*
Sum	5.79*	0.16
Constant	2.33*	
R^2	0.64	
S.E.	3.92	
D-W	1.77	

*Coefficients statistically significant at 5 per cent level.

Note: Coefficients estimated using Almon lag technique with a fourth degree polynomial; first differences in quarterly seasonally adjusted data are used. S.E. is the standard error of the estimate, and D-W is the Durbin-Watson statistic.

[2] High-employment receipts of the Government were found to have little explanatory power and were, therefore, excluded from the equation. High-employment expenditures include both outlays for goods and services and transfer payments.

Almon lag procedure was used, with the lag period for both exogenous variables consisting of observations for the current and three preceding quarters. This equation has been updated for this article to include the first quarter of 1953 through the first quarter of 1969.

As indicated in Table I, current period GNP responds positively to changes in the money stock in the current quarter and in each of the three preceding quarters. The total response to a given change in money is 5.8 times the change, which is found by summing the coefficients. On the other hand, current period GNP responds positively to changes in Government expenditures during the first two quarters and negatively during the last two, with a total response not significantly different from zero (sum of ΔE coefficients in Table I).

This article reports the results of testing the general proposition that the money stock can be treated as an exogenous variable in empirical research. The results indicate that the response of money to economic activity is very small, and that this response does not significantly affect the estimated response of changes in GNP to changes in money in the Andersen-Jordan equation. The reverse-causation argument, to the extent that it may produce serious bias in this equation, is not supported by the evidence presented in this article.

Summary of Channels of the Influence of Economic Activity on the Money Stock

The question of the influence of economic activity on the money stock can be examined best within the context of a specified money stock function. One such function has been developed and subjected to considerable analysis by Karl Brunner and Allan Meltzer.[3] The narrowly defined money stock (M) is presented as the product of a money multiplier (m) and the monetary base (B):

$$M = mB$$

The money multiplier is defined as follows:

$$m = \frac{1 + k}{r(1+t+d) + k}$$

In the above, k is the ratio of currency held by the nonbank public to private demand deposits; t is the ratio of private time deposits to private demand deposits; d is the ratio of Government deposits at commercial banks to private demand deposits; and r is

the ratio of total commercial bank reserves to total bank deposits.[4]

Changes in the multiplier reflect, among other factors, actions of the public regarding their desired holdings of currency, demand deposits and time deposits, and actions of the commercial banks regarding desired holdings of excess reserves. These decisions are usually postulated to depend on GNP, market interest rates, and expectations about the future.

Changes in the monetary base summarize Federal Reserve actions involving open-market transactions, changes in the discount rate, and changes in reserve requirements.[5] Changes in the base may also affect interest rates, thereby inducing changes in the money multiplier.

Critics of the Andersen-Jordan study have postulated that movements in GNP directly (and indirectly through interest rates) exert such an influence on the money stock that there is a positive association between changes in money and GNP,[6] and therefore, they assert, the estimated influence of changes in money on GNP is overstated. These critics are particularly concerned about the estimated relationship between contemporaneous changes in GNP and the money stock.

Within the context of the Brunner-Meltzer money stock framework, if economic activity induces changes in the money stock, it must operate through induced changes in the multiplier and/or in the monetary base. This article, therefore, investigates the influence of economic activity on these two variables.

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[3] See Albert Burger, "An Analysis and Development of the Brunner-Meltzer Non-Linear Money Supply Hypothesis," Working Paper No. 7, Federal Reserve Bank of St. Louis, May 1969.

[4] Member bank reserves plus vault cash of nonmember banks, adjusted for changes in reserve requirements of member banks.

[5] For a discussion of the monetary base see: Leonall C. Andersen and Jerry L. Jordan, "The Monetary Base — Explanation and Analytical Use," this *Review*, August 1968.

[6] With regard to these criticisms of the original Andersen-Jordan article, see Walter W. Heller's comments in his New York University debate with Milton Friedman, November 14, 1968. A transcript of this debate appears in *Monetary Versus Fiscal Policy*, W. W. Norton and Co., N. Y., 1969. Also see: Frank de Leeuw and John Kalchbrenner, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization — Comment," this *Review*, April 1969. Also, see: Lyle Gramley, "Guidelines for Monetary Policy — The Case Against Simple Rules," a paper delivered at the Financial Conference of the National Industrial Conference Board, New York, February 21, 1969.

For other recent discussions of the influence of economic activity on the money stock see: Emanuel Melichar, "Comments on the St. Louis Position," this *Review*, August 1969. Also, Patric Hendershott, *The Neutralized Money Stock: An Unbiased Measure of Federal Reserve Policy Actions*, Richard D. Irwin, Inc., Homewood, Illinois, 1968. For a discussion of both of these works, see: Michael Keran, "Reply" to Melichar's article, this *Review*, August 1969.

Test of Hypotheses

Four hypotheses are tested to examine the validity of the proposition that changes in the money stock are caused primarily by changes in total spending (GNP), and that the Andersen-Jordan relationship between changes in GNP and changes in money reflects mainly this reverse causation. Ordinary least-squares regressions are used in these tests, based on quarterly data for the period from the first quarter 1953 through the first quarter 1969.

Hypothesis I

The first hypothesis is that changes in GNP have a greater influence on changes in money than do changes in the monetary base. This is tested by regressing ΔM on current and three lagged values of both ΔGNP and ΔB.[7] The response of money to changes in GNP is statistically significant for only the third lagged quarter, and in this case the relationship is negative (Table II), contrary to the positive relationship postulated by the critics. On the other hand, there is a statistically significant positive relationship between ΔM and ΔB in the first (contemporaneous) quarter.

Table II
REGRESSIONS OF CHANGES IN MONEY ON CHANGES IN GNP AND THE MONETARY BASE
(1/1953 - 1/1969)

Lags	Regression Coefficients		Beta Coefficients	
	ΔGNP	ΔB	ΔGNP	ΔB
t	0.02443	1.83071*	0.15	0.66*
t-1	0.00418	0.65911	0.03	0.23
t-2	−0.00230	0.39597	−0.01	0.14
t-3	−0.03695*	−0.60500	−0.22*	−0.20
Sum	−0.01064	2.28079*	−0.05	0.83*
Constant	0.07275			
R²	0.70			
S.E.	0.62			
D-W	1.72			

*Coefficients statistically significant at 5 per cent level.
Note: Coefficients estimated using ordinary least squares technique; S.E. is the standard error of the estimate, and D-W is the Durbin-Watson statistic.

The beta coefficients in Table II allow one to compare directly the contribution of each variable to variations in money in the test period.[8] The beta coefficients for ΔB are much larger than those for ΔGNP for the contemporaneous and the first two lagged periods, and they are about equal for the last lagged period. Over the four quarters (measured

by the sum of the beta coefficients) the response of money to ΔB clearly dominates that to ΔGNP. Since these results are inconsistent with Hypothesis I, the hypothesis is not confirmed.

Hypothesis II

As mentioned earlier, one channel by which economic activity may influence the money stock is through the money multiplier. Also, in the money stock framework used in this article, ΔB influences market interest rates and thereby influences the money multiplier. Hypothesis II holds that the effect of ΔGNP on m dominates the effect of ΔB.

Table III
REGRESSIONS OF CHANGES IN THE MONEY MULTIPLIER ON CHANGES IN GNP AND THE MONETARY BASE
(1/1953 - 1/1969)

Lags	Regression Coefficients		Beta Coefficients	
	ΔGNP	ΔB	ΔGNP	ΔB
t	0.00044	−0.01582*	0.22	−0.48*
t-1	0.00006	0.01378*	0.03	0.41*
t-2	0.00001	0.00786	0.01	0.23
t-3	−0.00075*	−0.00838	−0.37*	−0.23
Sum	−0.00024	−0.00256	−0.11	−0.08
Constant	0.00066			
R²	0.36			
S.E.	0.01			
D-W	1.67			

*Coefficients statistically significant at 5 per cent level.
Note: Coefficients estimated using ordinary least squares technique; S.E. is the standard error of the estimate, and D-W is the Durbin-Watson statistic.

The regression results reported in Table III are similar to those reported in Table II. Changes in m have a statistically significant relationship to ΔGNP only in the third lagged quarter, and the relationship is negative, while the coefficients for ΔB are statistically significant in the first two quarters.

According to the beta coefficients, the response of m to ΔB dominates the response to ΔGNP in all quarters except the last one. The sum of the coefficients indicates that over four quarters neither variable exerts much influence on the money multiplier.[9] Since the regression results are not consistent with Hypothesis II, it is not confirmed.

Hypothesis III

Another frequently postulated source of the influence of economic activity on the money stock oper-

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[7] Read the symbol Δ as "change in."

[8] For an explanation of beta coefficients see: Arthur S. Goldberger, *Econometric Theory*, John Wiley and Sons, Inc., New York, December 1966, pp. 197-200.

[9] This result does not imply that ΔGNP and ΔB have no influence on any of the components which enter into the multiplier. Instead, it implies that they have little net effect on the multiplier.

ates indirectly through its influence on changes in the monetary base. As a result, it is usually contended that a positive relationship between movements in GNP and in the base will be found in a regression analysis.

One frequently mentioned indirect channel is that changes in GNP cause changes in some of the sources of the monetary base, and that changes in these sources dominate the influence of Federal Reserve open-market purchases and sales of Government securities. As a result, it is contended that the monetary base, a chief determinant of the money stock, responds to economic activity. The most frequently mentioned sources responding to changes in GNP are borrowings from Federal Reserve Banks, the gold stock, and Federal Reserve float.[10] Another indirect channel is that GNP influences changes in the monetary base through an implicit Federal Reserve reaction function involved in the formulation and implementation of its monetary policy. The proposition is usually advanced that by following a money market condition guide (market interest rates or free reserves), Federal Reserve actions are such as to cause pro-cyclical movements in the monetary base and money.[11]

To test Hypothesis III — that the monetary base responds in a significant manner to ΔGNP — current quarter changes in the base were regressed on current quarter changes in GNP. Only contemporaneous changes were used because such changes are most frequently cited by those who invoke the reverse-causation argument.

The test period was divided into two sub-periods, based on two Federal Government administrations which held different views regarding economic stabilization policy (such a division is important for testing Hypothesis IV). The first subperiod, I/1954 to IV/1961, corresponds with the Eisenhower budget years, during which there was a conservative view regarding stabilization policy. The second subperiod, I/1962 to I/1969, corresponds with the Kennedy-Johnson budget years; this subperiod represents one of active discretionary stabilization policy, particularly the use of fiscal actions. Each subperiod was started two quarters after the start of a new administration's fiscal year, allowing for a period of adjustment in assuming full responsibility for economic stabilization.

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[10]De Leeuw and Kalchbrenner. The argument presented in this paper was answered by Andersen and Jordan in their "Reply," this *Review*, April 1969.

[11]Heller, pp. 83 and 84, and Gramley.

Table IV

REGRESSIONS OF CHANGES IN THE MONETARY BASE ON CHANGES IN GNP

| | ΔBase is Dependent Variable | | |
| | 1954-61 | 1962-68 | 1954-68 |
	ΔGNP	ΔGNP	ΔGNP
t	0.00772	0.02428*	0.03563*
Constant	0.14274	0.46117	0.14287
R²	0.04	0.19	0.35
S.E.	0.21	0.25	0.31
D-W	1.42	1.48	1.18

*Coefficients statistically significant at 5 per cent level.
Note: Coefficients estimated using ordinary least squares technique; S.E. is the standard error of the estimate, and D-W is the Durbin-Watson statistic.

The Chow test indicates that there was a significant shift in the relationship between contemporaneous changes in GNP and the monetary base between these two subperiods; the F-statistic for the Chow test was 48.9, which is statistically significant beyond the 1 per cent level.

The regression results (Table IV) indicate a positive but varying relationship between contemporaneous changes in GNP and in the monetary base. A $1 billion change in GNP is associated with an $8 million change in the monetary base in the first subperiod, and with a $24 million change in the second. The equation explains only 4 per cent of the variance in changes in the base in the first subperiod and 19 per cent in the second, leaving most of the variance explained by other factors.

The regression results show a contemporaneous relationship between ΔB and ΔGNP, but the direction of causation is not clear. However, the results are consistent with Hypothesis III that the monetary base responds to changes in GNP, implying that money may also respond in a similar manner in contemporaneous quarters.[12]

Hypothesis IV

Given the results of testing Hypothesis III, an extreme version of the critics' point under examination would imply that there should be a significant change between these two subperiods in the response of changes in GNP to changes in money. Hypothesis IV is that the response of GNP to changes in money would be greater in the second subperiod when there

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[12]Michael Keran and Christopher Babb, "An Explanation of Federal Reserve Actions (1933-68)," this *Review*, July 1969, present empirical evidence that the channel of this response of the monetary base is the Federal Reserve's reaction function, and not movements in some of the sources of the base which are related to economic activity.

Table V

REGRESSIONS OF CHANGES IN GNP ON CHANGES IN MONEY AND FEDERAL EXPENDITURES

ΔGNP is Dependent Variable

	1954-61		1962-68		1954-68	
	ΔM	ΔE	ΔM	ΔE	ΔM	ΔE
t	2.21	0.45	2.08*	0.23	1.94*	0.26
t-1	0.83	0.45	−0.26	0.28	0.26	0.43
t-2	1.11	0.67	3.08*	−0.17	2.65*	0.11
t-3	2.20	−1.12*	0.67	−0.43	0.83	−0.69*
Sum	6.35*	0.45	5.57*	−0.09	5.68*	0.11
Constant	2.19		3.87		2.86	
R²	0.48		0.78		0.70	
S.E.	4.69		2.70		3.72	
D-W	1.76		2.45		1.95	

*Coefficients statistically significant at 5 per cent level.

Note: Coefficients estimated using ordinary least squares technique; S.E. is the standard error of the estimate, and D-W is the Durbin-Watson statistic.

was a greater response of the base to changes in GNP than in the first.

Regressions of ΔGNP on current and lagged changes in money and Government expenditures for these two subperiods do not confirm this hypothesis (Table V). The regression coefficients for current changes in money are almost identical in both periods, as are the sums of the coefficients. Moreover, the Chow test rejects the proposition that there was a shift in the relationship; the F-statistic equals .45 and is not statistically significant at the 5 per cent level. Although there is support for the proposition that the monetary base responds to changes in GNP, variations in the strength of this relationship are not accompanied by corresponding changes in the regression coefficients relating changes in GNP to changes in the money stock.

Conclusion

The evidence presented in this article supports the view that changes in the money stock are dominated by changes in the monetary base and are therefore largely under the direct control of the Federal Reserve. As a consequence, money may be treated as an exogenous variable. Although evidence was presented consistent with the hypothesis that there is some response of the monetary base (the major determinant of the money stock) to economic activity, this possible response does not appear to influence in any appreciable manner regression coefficients relating changes in GNP to changes in money and Government expenditures.

There is recent collaborating evidence supporting the view that money is little influenced by economic activity. Richard G. Davis has recently conducted a thorough study of the Andersen-Jordan equation.[13] With regard to the reverse influence of economic activity on money, he concludes:

> The specific variable GNP, however, seems to contribute rather little extra to explaining the variance in monetary changes beyond what is explained by the policy variables. Hence, only a relatively modest part of the gross relationship between money and GNP exhibited in the St. Louis equation may reflect a feedback effect from GNP to money.[14]

David I. Fand has found that allowing for feed-backs from the real sector to the money stock does not materially affect the response of the money stock to Federal Reserve controlled variables. He examined many money supply models which have been subjected to statistical measurement and concludes that:

> . . . the available evidence, meager though it may be, does not point to any superiority of M.S. IV [fully specified feed-backs] over M.S. I [no feed-backs], and does not appear to favor a real view over a monetary view. Those who take the view that money is passive, responding to the real economy, have to recognize that this is an assumption rather than a proposition derived from empirical evidence.[15]

This article has presented evidence which leads to a rejection of the extreme version of the reverse-causation argument — that the money stock responds to changes in economic activity to such an extent as to cast considerable doubt on the validity of the St. Louis equation. It is now incumbent upon those who would conclude, as did one critic, that ". . . they [Andersen-Jordan] should have concluded that something was rather badly wrong about their method,"[16] to produce empirical evidence supporting their contention of the overwhelming importance of the reverse-causation assumption in monetary research.

[13]Richard G. Davis, "How Much Does Money Matter?", *Monthly Review*, Federal Reserve Bank of New York, June 1969.

[14]*Ibid.*, p. 129.

[15]David I. Fand, "Some Implications of Money Supply Analysis," *American Economic Review*, May 1967, p. 392.

[16]Gramley, p. 7.

The above three articles are available as Reprint No. 44.

Meat Prices

by CLIFTON B. LUTTRELL

THE SHARP INCREASE in meat prices during recent months reflects some reduction in the marketing of livestock and the continued acceleration in demand for meat. Red meat supplies dipped below year-earlier levels in May and remained slightly lower through June and July.[1] In the absence of a sharp increase in demand, it is unlikely that this small decline in supply would cause such a major rise in meat prices as we have had.

Since December 1968 average prices for red meat, poultry, and fish have risen sharply, increasing at an annual rate of 20 per cent, while food prices and the consumer price index have increased at annual rates of 7 and 6 per cent, respectively (Table I). Meat

Table I

SPECIFIED PRICE CHANGES

	Compounded Annual Rates of Change		
	1957/59 to 1965	1965 to 1968	Dec. 1968 to June 1969
Meat*	0.7%	2.7%	20.0%
Food at Home	1.0	2.6	7.6
All Food	1.2	3.1	7.2
All Consumer Items	1.4	3.3	6.4
Prices Paid by Farmers	0.7	2.0	3.7**
Farm Labor Cost (per hour)	3.2	8.4	10.8***
Prices Received by Farmers for Livestock Products	0.2	3.3	23.5

*Includes poultry and fish.
**Jan.-June 1968, to Jan.-June 1969.
***Average of Jan., April and July 1968, to average of Jan., April and July 1969.

Sources: USDA, *Agricultural Prices*, 1967, 1968 and 1969; *Farm Cost Situation*, 1963 and 1969; and *Farm Labor*, 1966 and 1969. Also, USDL, *Monthly Labor Review*, Dec. 1967, and *Consumer Price Index* releases.

accounts for about one-fourth of all food purchases which, in turn, account for about one-fourth of personal consumption expenditures in the nation. Consequently, fluctuations in meat prices have a major impact on the consumer price index as well as on total food costs.

Excluding the impact of the slowdown in livestock marketing this year, recent short-run factors have generally been favorable to meat production. Weather conditions on farms and ranches have been normal or better. Following severe droughts, cattle herds are restocked and fewer female cattle are sent to feedlots, but no unusual restocking has been noted in recent months.

Feed grain supplies are more than adequate this year. Total feed grain supplies of 217 million tons at the beginning of the current marketing year were above levels of a year earlier and well above the 1962-66 average.[2] Carry-over stocks at the end of the current year are expected to total 48.5 million tons, somewhat above average carry-over for the past three years, but less than average for the 1962-66 period.

The current situation with respect to livestock cycles (cattle and hog cycles) is also favorable to meat production. Cattle marketings usually reach a low point during the early phase of the herd build-up, when large numbers of heifers are assigned to the breeding herd. With little emphasis on herd build-up in recent months, the cattle cycle appears favorable to cattle marketings. Cyclical factors have also been favorable to hog production this year.

Cattle cycles in this century have ranged in duration from 9 to 16 years (see chart below). Recent cycles have been shorter than earlier ones, pointing to the possibility that improved market information and the reduced age of marketed animals have had an

CATTLE ON FARMS, BY CYCLES

[1]Red meat supplies include beef, veal, pork, and lamb and mutton.

[2]Marketing year begins October 1 for corn and sorghum grain.
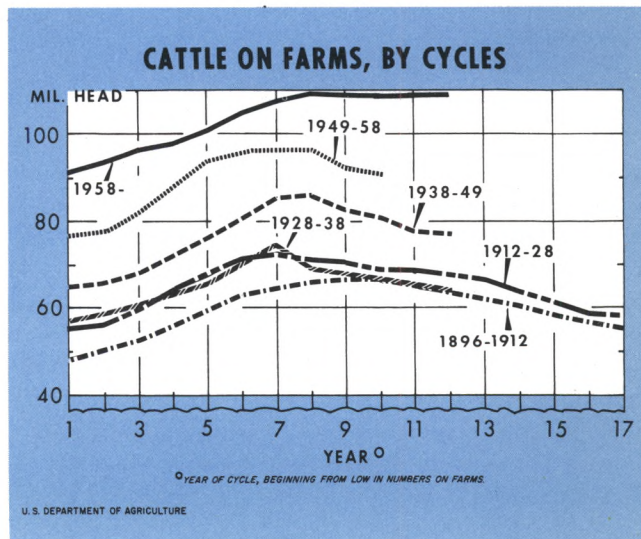
impact on adjustments by farm producers. Building cow herds is a relatively slow process compared with increasing the size of chicken flocks or the number of breeding hogs. Market conditions can change substantially between planning and achievement of larger herds. This lag explains the cattle cycle—high prices for cattle provide incentive for farmers to increase herds; the increased herds provide a larger beef supply, causing prices to decline and, in response to lower prices, farmers begin to reduce herds. Supply and price thus move around equilibrium positions rather than along equilibrium lines

The current cattle cycle has not followed the usual pattern. Cattle numbers turned up in 1958 and typically would have reached a peak and turned down in 1963 or 1964. In 1965, however, total cattle numbers stabilized rather than declined (see chart below). Dairy cattle declined somewhat in each of the four succeeding years, but the loss was largely offset by the increase in beef cattle. By 1964 steer prices had declined about 20 per cent from 1958 levels. Nevertheless, price prospects remained sufficiently good to provide incentive for some further beef herd enlargement. Prices of steers were somewhat higher by 1965 and have generally continued up since then. To date there is no indication of a major change in beef cow numbers from the modest uptrend of recent years. Thus, the cattle cycle offers no clue to the recent rise in meat prices.

Cyclical hog patterns, likewise, offer few clues to the recent upsurge in meat prices. A period of rela-
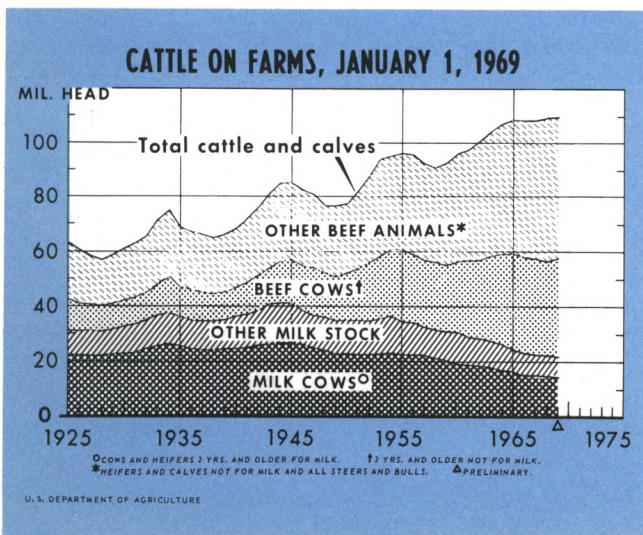
Table II

MEAT CONSUMPTION

	Total			Compounded Annual Rates of Change	
	1957/59 (Bil. Lbs.)	1965 (Bil. Lbs.)	1968 (Bil. Lbs.)	1957/59 to 1965	1965 to 1968
Beef and Veal	15.3	20.0	22.1	3.9%	3.4%
Hogs	10.8	11.2	12.8	0.5	4.6
Lamb and Mutton	0.8	0.7	0.7	−1.9	0.0
Poultry	5.8	7.8	8.9	4.3	4.5
TOTAL	32.6	39.8	44.6	2.9	3.9
	Per Capita				
	(Lbs.)	(Lbs.)	(Lbs.)		
Beef and Veal	89.2	104.5	113.0	2.3%	2.6%
Hogs	63.0	58.5	66.0	−1.1	4.1
Lamb and Mutton	4.4	3.7	3.7	−2.4	0.0
Fish	10.5	10.9	11.0	0.5	0.3
Poultry	33.5	40.8	45.0	2.9	3.3
TOTAL	200.6	218.4	238.7	1.2	3.0

Source: USDA, *National Food Situation,* May 1969; *Livestock and Meat Situation,* March 1969; *Agricultural Statistics, 1968;* and *Poultry and Eggs Situation,* June 1969.

tively unfavorable corn-hog price ratios is usually followed by reduced pork production. Relatively favorable hog prices prevailed during most of last year; thus the cyclical factor was favorable for a gain in pork output in the first half of 1969. However, the actual gain was nominal, if any, and the March-May farrowings were down an estimated 8 per cent, well below farrowing intentions and expectations based on earlier corn-hog price relationships. Current price relationships, however, provide sufficient incentive for some increase in planned farrowings in the autumn months and perhaps larger pork production in 1970.

Accelerated Meat Demand

In recent years demand for meat has increased at an accelerated rate. During the 1957/59-65 period consumer purchases of meat rose from 32.6 to 39.8 billion pounds, an annual rate of 2.9 per cent, and prices rose 0.7 per cent per year (Tables I and II). In the 1965-68 period consumption rose from 39.8 to 44.6 billion pounds, an annual rate of 3.9 per cent, and prices rose at an annual rate of 2.7 per cent. Despite a more rapid increase in price, pounds of meat consumed rose at a faster rate during the latter period, which indicates an accelerating increase in total demand. Meat consumption per person averaged 201 pounds in 1957-59, 218 pounds in 1965, and 239 pounds in 1968. The annual rates of increase were 1.2 per cent from the late 1950's to 1965 and 3 per cent since 1965.

CATTLE ON FARMS, JANUARY 1, 1969

MIL. HEAD
Total cattle and calves
OTHER BEEF ANIMALS*
BEEF COWS†
OTHER MILK STOCK
MILK COWS○
1925 1935 1945 1955 1965 △ 1975
○COWS AND HEIFERS 2 YRS. AND OLDER FOR MILK. †2 YRS. AND OLDER NOT FOR MILK.
*HEIFERS AND CALVES NOT FOR MILK AND ALL STEERS AND BULLS. △PRELIMINARY.
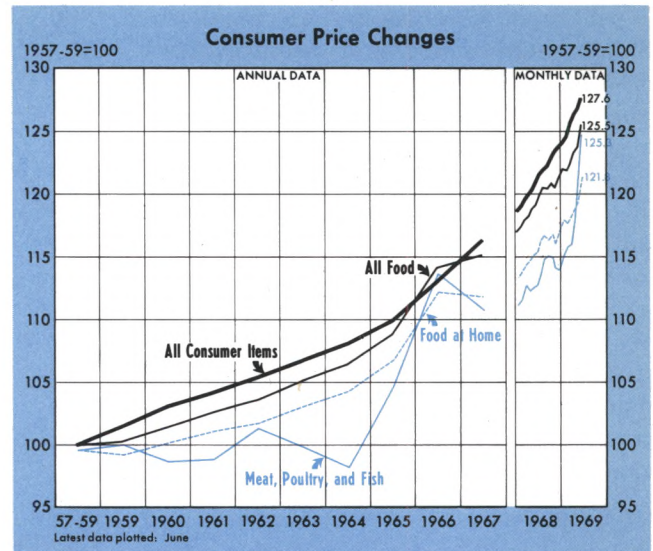U.S. DEPARTMENT OF AGRICULTURE

The accelerated increase in demand for meat in the 1965-68 period has apparently continued in 1969. Output of red meat during the five months January through May was 1 per cent above output in the same months a year earlier. Poultry output was up about 6 per cent and meat imports were up 4 per cent during the January-April months.[3] Total meat supplies were up almost 2 per cent, as poultry production and meat imports account for about 20 and 5 per cent respectively of total meat supply. Despite the increased supply, prices averaged 4.3 per cent above year-earlier levels. The fact that meat production this year rose at a somewhat slower rate than in the 1965-68 period, while prices rose faster, indicates the continued willingness of consumers to purchase larger quantities of meat at higher prices.

A shift in consumer preference to beef from other types of meat was a factor tending to increase the price of meat in the 1957/59-65 period. Beef and veal constituted 47 per cent of all meat consumed in the 1957/59 base period and 50 per cent in 1965. Since 1965 the proportion of beef to total meat consumed has remained fairly stable. Beef prices have historically averaged somewhat higher than pork. During the years 1964-68 inclusive, the retail price per pound of choice beef averaged $0.83 and veal $0.90, while pork averaged $0.66. These price differences reflect the higher production costs of beef and veal compared with pork.

Increasing Meat Output

During the years 1957/59-65 stable prices provided meat producers sufficient incentive to market a larger quantity of meat in successive years. Total meat and poultry production rose from 32.6 to 39.7 billion pounds, an annual rate of 2.9 per cent (Table III). Imports accounted for a small but increasing portion of the total supply, averaging 1.0 billion pounds in 1957/59 and totaling 1.3 billion pounds in 1965. During the period 1965-68 production rose from 39.7 to 44.0 billion pounds (an annual rate of 3.5 per cent), imports rose from 1.3 to 2.1 billion pounds, and farm prices for livestock products rose at the rate of 3.3 per cent.

During the years 1957/59-65 each increase in demand intersected the supply curve at a relatively stable price, indicating a long-run horizontal supply curve at these

Consumer Price Changes

1957-59=100   1957-59=100
ANNUAL DATA   MONTHLY DATA
All Food
All Consumer Items
Food at Home
Meat, Poultry, and Fish
57-59 1959 1960 1961 1962 1963 1964 1965 1966 1967   1968 1969
Latest data plotted: June

rates of increase in demand (see the Consumer Price chart above). New meat production technology offset the impact on production costs of the higher prices paid by farmers for production items. Reflecting the generally rising demand for factors of production, farm wage rates rose 3.2 per cent per year and prices paid by farmers for other production inputs rose at the rate of 0.7 per cent. Although most farm operators are also farm workers, alternative opportunities foregone for earning labor income are a cost to the operator.

After 1965 the supply curve for meat apparently changed from horizontal to upward sloping, so that successive increases in demand from 1965 to 1968 intersected the supply curve at higher average price levels. Prices rose 2.7 per cent per year in this period in contrast to almost stable prices in the earlier period. The uptrend in prices of farm inputs quickened as a result of excessive demand in resource markets. Farm wages rose at the annual rate of 8.4 per cent and prices of other farm inputs at a 2.0 per cent rate. Costs to farmers were rising at a faster rate than

Table III					
MEAT PRODUCTION					
		Total		Compounded Annual Rates of Change	
	1957/59 (Bil. Lbs.)	1965 (Bil. Lbs.)	1968 (Bil. Lbs.)	1957/59 to 1965	1965 to 1968
Beef and Veal	14.9	19.7	21.4	4.1%	2.8%
Hogs	11.0	11.1	12.9	0.1	5.1
Lamb and Mutton	0.7	0.7	0.6	0.0	−5.0
Poultry	5.9	8.2	9.1	4.8	3.5
TOTAL	32.6	39.7	44.0	2.9	3.5

Source: USDA, *National Food Situation*, May 1968; *Livestock and Meat Situation*, March 1969; and *Poultry and Eggs Situation*, June 1969.

[3]USDA, *Agriculture Outlook Digest*, July 1969.

efficiency in meat production. Producers faced with a rising marginal cost curve found it profitable to produce the quantitites demanded by consumers only at higher price levels.

The slope of the supply curve may have steepened this year. As indicated earlier, meat output from January through May was up 2 per cent from the same period a year ago. Prices to producers for livestock products rose at an annual rate of 23.5 per cent from December through June. Both beef cattle and hog prices rose at rates in excess of 50 per cent per year and chickens rose at a 30 per cent rate. Factor costs to farmers continued to increase sharply. Wage rates paid in early 1969 were 11 per cent above year ago levels, and other prices paid were 4 per cent higher.

Prices

Although underlying price-making forces in the meat industry have increased as a result of the general price inflation since December, they have risen at a much slower rate than meat animal prices. This wider spread between costs and prices received by producers indicates that short-run prices for meat animals may be above the long-run equilibrium price and that current prices provide incentive for some expansion of meat production.

As indicated earlier, part of the recent increase in meat animal prices reflects reduced supplies resulting from irregular marketing of livestock. Marketings were down somewhat in May, June, and early July from year-earlier levels. This reduction in slaughter does not reflect a decline in long-run incentive to produce. Livestock marketings are expected to be up this fall. On July 1, cattle on feed in major feeding states were up 15 per cent from a year ago. Beef supplies are expected to be 11 per cent greater during the July-September period. Hog marketings in the second half of 1969 may be down about 2 per cent from a year ago, but an increase in summer and fall farrowings points to larger pork supplies in early 1970. Marketings of poultry throughout the rest of 1969 are expected to be larger than a year ago.

The number of basic breeding animals has not been significantly increased to date. Such increases, however, usually occur only after a time lapse.

Meat prices since 1957/59 have been maintained above equilibrium levels by government restraints on both domestic feed grain crops and imports of meat. Import restrictions provide for quotas when yearly imports of meat exceed 110 per cent of an adjusted base quota. Although these quotas have been invoked infrequently, if at all, the threat of quota restrictions has probably served to restrain meat imports.

The objective of the Feed Grain Program is to divert acreage from feed production to other uses in order to restrict supplies. About 37 million acres were diverted from feed grain use through the program this year. Farmers are provided incentive to participate in the program, both through government price supports for feed grain crops and through acreage diversion payments.

These programs, which tend to be inflexible, may have retarded the response of producers to the higher meat prices in recent years. Import controls also have had their impact primarily since 1965. Meat imports have averaged somewhat greater since 1965 than in the 1957/59-65 period. On the other hand, without the threat of quota restrictions, larger imports might have retarded the rate of increase in meat prices.

Summary

Sharply higher meat prices have been an important factor in consumer price increases since December 1968. Part of the rise in meat prices in late May and June reflects irregular marketings of livestock. Marketings from May through July were down slightly from year-earlier levels. The greater portion of cattle marketings for 1969 will apparently occur in the second half of the year. With little meat kept in storage, the gap in livestock marketed in the late spring and early summer probably resulted in livestock prices well above the longer-run trend. With larger meat marketings in prospect for the second half, meat prices may be below the long-run trend.

Not all of the recent increase can be attributed to marketing irregularities or short-run cyclical factors. The long-run trend in prices for 1965-68 probably continued this year at an accelerated rate.

Demand for meat has increased more rapidly in recent years than in the early 1960's. The high rate of increase in demand for meat has continued in 1969. While demand was increasing at a slower rate in the early 1960's, efficiencies in production were sufficient to offset rising factor costs. Major efficiency gains have continued, but due to such demand factors as general price inflation and rising consumer preference for meat, prices have continued to increase.

Recent movements in meat prices could be considered as a catching-up process. Meat prices have increased less than all consumer items since 1957/59.

Excessive demand for all goods and services has, however, penetrated the farm cost structure and, with a time lag, prices in agriculture must adjust to the created excesses.

Government crop production control programs and meat import quotas have contributed to higher meat prices. The crop programs have maintained feed prices above free market levels, and the quotas have inhibited imports, tending to retard meat supply increases in response to the higher prices.

When demand for all goods and services is reduced, equilibrium meat prices will probably stabilize along with other prices. Demand for meat will probably continue to rise after general price inflation subsides, but at a slower rate than in recent years. Some of the underlying meat production costs will also stabilize and efficiency growth will offset the rising costs. Part of the recent meat price gains, however, may represent a further upward adjustment in returns to resources in agriculture, bringing such returns closer to equality with returns to resources in other sectors of the economy. To the extent that higher returns are necessary to attract resources into agriculture, no major reduction in meat prices relative to other prices is in prospect.

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