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Reprint Series

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Meat Prices – Too High or About Right?

by CLIFTON B. LUTTRELL

THE SHARP increases in retail meat prices in recent months have been the subject of much discussion. The increases have had a major impact on total consumer outlays since meat expenditures account for about one-third of the average family food budget. Reflecting their disappointment at these higher costs, some people have accused farmers, meat packers, and grocery stores of "gouging consumers" by forcing meat prices up. These views are generally stated without a full understanding of the underlying economic processes involved in price determination.

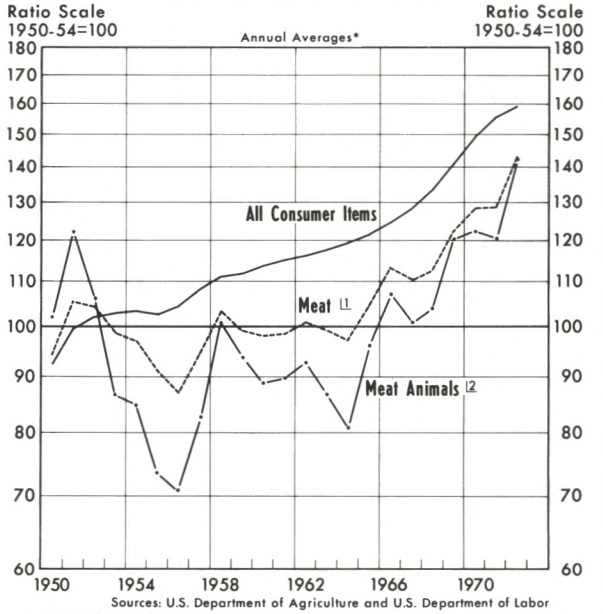
This article presents an economic analysis of the forces which have led to meat price increases both this year and over a longer-run period. The analysis emphasizes the function of the market system in pricing meat, in allocating meat products to consumers, and in allocating resources to meat production. As pointed out by Kenneth Boulding in rhythmic form, the production and allocation of food involves both humane and incentive considerations.

> The young, the old, the sick, the crazy
> Even the shiftless, and the lazy,
> Eat at the common human table
> Spread by the Active and the Able.
> The problem is, to organize
> This monumental enterprise
> So that — to see that all are boarded —
> Both Need and Virtue get rewarded.[1]

The consumer price index for all meat[2] in the first eight months of this year averaged 9 percent above the average for the same period a year ago. This, however, was just one episode in the upsurge of meat prices. With the exception of one minor setback, average meat prices have risen since 1964 (Chart I). Average consumer prices for meat rose at a 12.9 percent annual rate from late 1964 to early 1966. They declined slightly in late 1966 and early 1967, rose somewhat from late 1967 to early 1969 when they accelerated again, rising at a 10.4 percent rate until April 1970. They held almost stable from April 1970 to early 1971 when the recent acceleration began.

Chart I

Price Trends - Meat, Meat Animals, and All Consumer Items



Sources: U.S. Department of Agriculture and U.S. Department of Labor

[1] Includes beef and veal, pork, lamb and mutton, poultry, and fish.

[2] Includes beef cattle, hogs, and sheep.

*1972 based on average of first six months.

Economic Analysis of Price Determination

An economic approach to factors determining prices of meat or any other commodity is developed briefly

[1] Kenneth E. Boulding, *Principles of Economic Policy* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1958), p. 233.

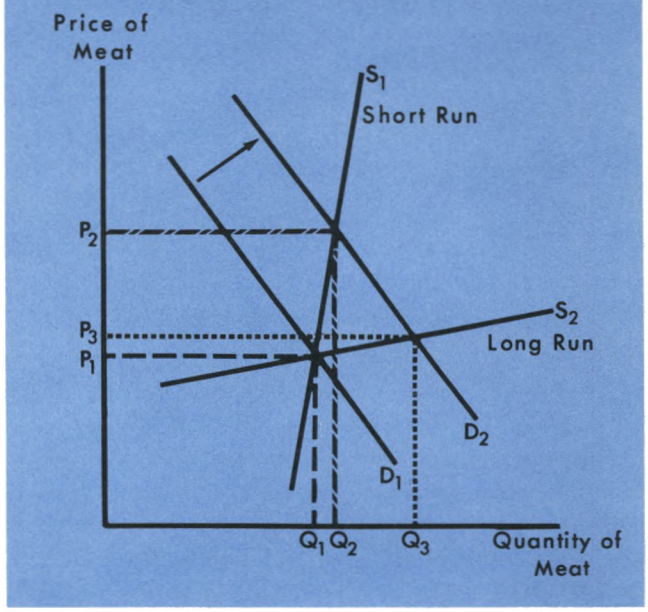
[2] Beef and veal, lamb and mutton, pork, fish, and poultry.

in this section. The analysis holds that changes in meat prices at grocery stores result from a series of economic factors rather than arbitrary decisions by farmers, meat packers, wholesalers, and retailers. Behind retail price increases is often found greater consumer demand as indicated by a rising volume of sales. When the demand for a commodity increases, the first change one typically observes is a higher sales volume which results initially in a reduction of inventories. In order to restore depleted inventories retail grocers increase their meat orders from packers hoping to continue selling a larger volume at the prevailing price. Upon receiving increased orders for meat the packers in turn increase their rate of meat slaughter and seek to restore meat animal inventories by additional purchases from farmers. Since the prevailing price only provides sufficient incentive for producing the current number of animals, additional animals are not available for immediate delivery at current prices. As packers compete among themselves in an attempt to obtain more animals, they raise their offering prices to farmers.[3]

In the short run the number of animals available for marketing is relatively fixed. The number of animals on farms cannot be increased rapidly and the increase in meat production per animal is relatively limited. In other words, the supply of meat is "inelastic" with respect to price in the short run; only a small percent increase in quantity will be forthcoming with a relatively large percent increase in price. Such a short-run supply curve is indicated by the relatively steep upward sloping line S_1 in Figure I. With the demand for meat represented by the curve D_1 and supply represented by S_1 the price is P_1. An increase in demand to D_2 results in a relatively sharp short-run price increase as shown by the D_2-S_1 intersection at P_2.[4]

Over the longer run, however, the supply of meat is more "elastic," meaning that with each incremental increase in price, a larger quantity will be offered than in the short run. This situation is illustrated by the supply curve S_2, wherein a small increase in price provides incentive for a relatively large increase in production. Given sufficient time, farmers and ranchers find it profitable to expand their meat animal

Figure I
A Supply and Demand Analysis



breeding herds and produce additional animals for slaughter. The fact that the long-run meat supply curve is more elastic than the short-run supply curve means that a given increase in demand for meat has a smaller impact on prices after passage of some time. For example, the rise in demand from D_1 to D_2 would result in the relatively small price increase from P_1 to P_3 in Figure I after farmers have adjusted meat animal production to the new demand conditions. Nevertheless, with an upward sloping supply curve any upward shift in the demand for meat involves a rise in the price paid by consumers. The higher price equates the larger amount demanded with the amount supplied.

Conversely, advancements in production technology which tend to increase supply (shift the supply curve to the right), or declines in meat demand, result in lower prices. More meat animals are offered to packers and more meat to consumers than can be sold at previous prices. Prices are thus marked down by retail grocers until the quantity of meat demanded by consumers equals the amount supplied.

Demand for Meat has Increased

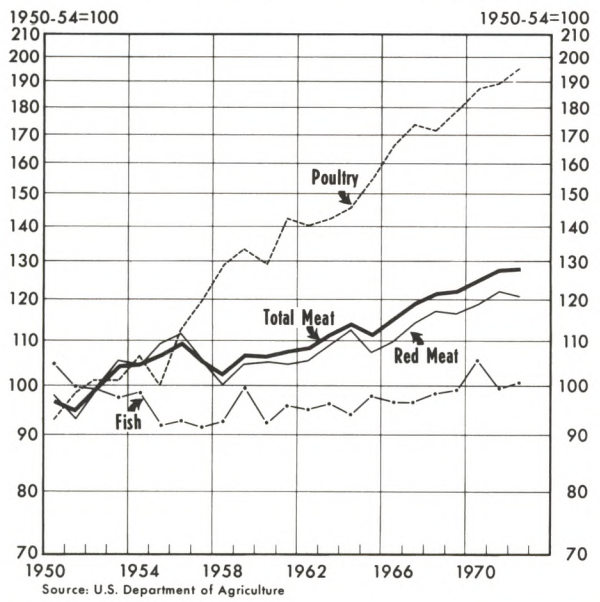
Demand for meat has increased substantially in recent years, as evidenced by the fact that consumers have purchased larger quantities of meat at higher prices. Factors contributing to the greater demand include rising per capita incomes, increased food subsidy programs, and a larger population.

[3]See Armen A. Alchian and William R. Allen, *University Economics*, 3rd ed. (Belmont, California: Wadsworth Publishing Company, Inc., 1972), pp. 95-97, and Kenneth Boulding, "A Liquidity Preference Theory of Market Prices," *Collected Papers – Boulding* (Boulder: Colorado Associated University Press, 1971), pp. 135-143.

[4]The shift of the demand schedule from D_1 to D_2 indicates that consumers have registered in the market a willingness to purchase larger quantities of meat at each price.

Chart II

Trends in Per Capita Meat Consumption



Source: U.S. Department of Agriculture

Both Consumption and Prices Have Risen

During the period of rapid increase in average meat prices from 1964 to 1971 as shown in Chart I, total meat consumed rose from 42 to 52 billion pounds, an increase of 22 percent. Per capita consumption rose from 224 to 253 pounds, an increase of 13 percent. The rise in per capita consumption was at a faster rate during this period of rapid price increase than during the previous 14 years (1950-64) when prices were relatively stable. In the recent period total meat consumption per capita rose at an annual rate of 1.8 percent, whereas from 1950 to 1964 per capita consumption rose at the rate of 1.6 percent (Chart II). According to the United States Department of Agriculture per capita consumption of meat will increase slightly again this year. An estimated decline of one percent in red meat consumption will be more than offset by a four percent increase in poultry.

The fact that meat consumption has increased reveals little about meat demand without information on prices.[5] Meat consumption, like consumption of any other commodity or service, depends in part upon its price. Given no change in the demand schedule (line D_1 in Figure I), a decline in meat prices will induce consumers to purchase a larger quantity. For example, a larger volume of meat production caused by livestock cycles or by unusually favorable weather conditions will increase the supply and result in lower prices. The lower prices will induce some consumers to purchase larger quantities of meat. This is indicated by the downward slope of the D_1 line in Figure I. Conversely, a cyclical or seasonal decline in meat output will cause an increase in meat prices, which will in turn cause some consumers to substitute other types of food for meat and reduce their meat purchases. These short-run shifts in supply can cause price changes without a shift in demand. For example, a shift of the supply curve S_1 to the left will intersect the demand curve D_1 at a higher price. Such short-run shifts in supply have no doubt been a factor in the irregular upward course of meat prices since 1964. However, consumers have purchased larger quantities of meat at higher prices per pound indicating that demand has increased.

Personal Incomes Have Accelerated

While numerous factors contribute to rising meat demand, rising per capita personal income is perhaps the most important. In numerous studies research analysts have found that rising demand for meat results from gains in per capita income.[6] Per capita consumption of beef, veal, lamb, pork, and poultry have all been positively associated with income. All studies confirm the common explanation that as personal incomes rise people spend more for food.

Personal incomes have accelerated since the mid-1960s. Disposable personal income rose at the average annual rate of 5.9 percent from 1950 to 1955, at 4.9 percent from 1955 to 1960, and 6.2 percent from 1960 to 1965. With the rising rate of inflation, personal income growth accelerated to 7.8 percent per year from 1965 to 1970 and has continued at a relatively high 6.9 percent rate since 1970 (Table I). While the acceleration in personal income growth has been primarily in nominal rather than real terms, it has added

[5]Economists explain a larger quantity of a good being purchased in two different ways. One way is for the *demand schedule to shift* to the right, indicating a greater quantity will be taken at each price. The other way is a *movement along a given demand schedule,* indicating that price changes are the result of a shift in the supply schedule. The latter means that larger quantities are purchased only at lower prices.

[6]For examples of such studies see Edward Uvacek, Jr., "A New Look at Demand Analysis for Beef," *American Journal of Agricultural Economics* (November 1968), p. 1505; Willard Williams, "The Meat Industry," *Market Structure of Agricultural Industries,* ed. John R. Moore and Richard G. Walsh (Ames: The Iowa State University Press, 1966), p. 40; Larry Langemeier and Russell G. Thompson, "Demand, Supply, and Price Relationships for the Beef Sector, Post-World War II Period," *Journal of Farm Economics* (February 1967), p. 179; Frederick Lundy Thomsen and Richard Jay Foote, *Agricultural Prices* (New York: McGraw-Hill Book Company, Inc., 1952), p. 362; and Russell G. Thompson, J. Michael Sprott, and Richard W. Callen, "Demand, Supply, and Price Relationships for the Broiler Sector, with Emphasis on the Jack-Knife Method," *American Journal of Agricultural Economics* (May 1972), p. 247.

Table I

Disposable Personal Income and Inflation

(Annual Rates of Change)

	Disposable Personal Income	Inflation*
1950-1955	5.9%	2.5%
1955-1960	4.9	2.6
1960-1965	6.2	1.4
1965-1970	7.8	4.1
1970-1972	6.9**	4.2***

*Based on GNP price deflator
**II/1970 to II/1972
***Estimated from 1972 Report of Council of Economic Advisers
Source: U.S. Department of Commerce

to meat demand by providing more dollars for the family budget.

The contribution of rising personal incomes to the higher demand for meat is indicated by the pattern of consumer expenditures. While the share of total consumer expenditures spent on meat declined substantially in the early post World War II years, it leveled off in the mid-1960s (Table II). In 1950 purchases of red meat, poultry, and fish accounted for 7.4 percent of total consumer expenditures, but by 1965 such purchases had declined to 5.6 percent of the total. Since 1965 the share of total consumer expenditures spent on meat has held constant and total outlays for meat have risen at the same rate as outlays for other purposes.

Table II

Estimated Meat Expenditures as Percent of Total Consumer Outlays

(Dollar Amounts in Billions)

	Total Personal Consumption Expenditures	Total Meat Expenditures	Meat as Percent of Total
1950	$191.0	$14.2	7.4%
1955	254.4	16.4	6.4
1960	325.2	20.0	6.2
1965	432.8	24.1	5.6
1970	616.8	35.0	5.7
1971	664.9	36.5	5.5

Source: Calculated from U.S. Department of Agriculture and U.S. Department of Labor data

Among the foods, the proportion of expenditures on meat has turned upward in recent years. In 1965 all meats accounted for about 35 percent of the total expenditures on food consumed at home (Table III). By 1970 the meat portion of food-at-home expenditures had increased to 39 percent, and the quantity of meat consumed per capita had increased sharply. Furthermore, evidence indicates that the higher proportion of such expenditures for meat has continued into 1972. Per capita consumption of red meat in the first six months was about one percent less than a year ago, but the decline was more than offset by a six percent increase in poultry consumption. This increase in consumption of red meat and poultry combined, along with the sharp rise in prices, points to a continuation of the upward trend in demand for meat and in consumer expenditures for meat in relation to other foods.

Table III

Importance of Meat in the Food-At-Home Budget

(Percent of Food-at-Home Outlays)

	Red Meat	Poultry	Fish	Total
1960	28.3%	4.1%	2.9%	35.2%
1965	27.8	4.1	2.9	34.7
1970	31.1	4.3	3.3	38.7
1971	31.3	4.2	3.4	38.9

Source: Calculated from U.S. Department of Agriculture and U.S. Department of Labor data

Food Subsidies Have Increased

Larger Government issues of food stamps to the lower income groups and increased donations of meat products to schools, institutions, and low-income families occurred during the recent upswing in meat prices. Total issues of food stamps rose from less than $1 billion in 1969 to more than $3 billion in 1971 and to an annual rate of $3.4 billion in the first two quarters of 1972. Federal outlays on the school lunch program have more than doubled during the last two years, rising from $227 million in 1969 to $594 million in 1971. Food distributions to low-income families, institutions, and others also have increased, but at a lower rate than the school lunch programs. Total cost of the Federal food programs, including food stamps, food distribution, and money donated for food purchases, rose from $1.2 billion in 1969 to $3.1 billion in 1971 and to an annual rate of $3.5 billion in the first half of 1972. In 1969 Government outlays for these programs amounted to only 1.4 percent of the total costs of food used at home by all consumers. By 1971 these outlays amounted to more than 3 percent of total food-at-home costs, and this year they may total 3.7 percent.

An important effect of the food stamp program has been to shift the recipients to higher income brackets for food consumption purposes. As indicated earlier, studies of meat demand show that such a shift produces a sizable increase in meat consumption, which may be partially offset by a reduction in consumption of some other types of foods such as dried beans,

cereals, and fresh potatoes.[7] In addition to the increased demand for meat resulting from the food stamp program, the share of meat in direct Government food donations has been rising sharply in recent years. In constant dollar terms, donations of all livestock products rose 11 percent from 1970 to 1971 and donations of meat rose by one-third.[8]

Although the food stamp program and other Government food donations are intended to improve the diets of the lower income groups, it is unlikely that total food expenditures rise by the same dollar amount as such donations. Some of the recipients will likely use less of their own earnings for food purchases as a result of the programs. Nevertheless, the programs may have added one or two percent to total food expenditures since early 1971 and a somewhat greater percentage to total meat expenditures.[9] This increase in food subsidies was a factor contributing to the recent increase in demand for meat.

Impact of Population Growth

An increasing population has certainly been a factor in the rising demand for meat, but it has been less important during the sharp increases in meat prices since 1964 than in earlier years. The nation's population grew from 192 million in 1964 to 207 million in 1971, an annual growth rate of 1.1 percent. This, however, was well below the 1.7 percent annual population growth rate from 1950 to 1964 when meat prices were relatively stable. Also, during the sharp increase in meat prices since last year population has increased at less than a one percent rate.

Meat Supply

Over the longer run, production technology and imports have tended to increase the nation's meat supply and offset part of the impact on prices of the rising demand for meat. As shown in Charts I and II, meat production plus net imports have risen at a sufficient rate to provide consumers with increasing quantities at less than average price increases for other consumer items. From 1950 to 1971, red meat and poultry production combined rose from 25.9 to 48.4 billion pounds per year, a 3 percent annual rate of gain. Production of red meat rose from 22.1 to 37.8 billion pounds, an annual rate of 2.7 percent, while output of chickens almost tripled. Meat imports in 1971 were equivalent to 6 percent of domestic red meat production, whereas imports were insignificant in 1950. Meat import controls were relaxed this year, and if they are not reimposed, rising meat production in other nations, along with rising domestic meat production efficiency, should have an even more favorable impact on the nation's meat supply in future years.

Between 1950 and 1971, when meat consumption was increasing rapidly, prices of meat animals rose less than one percent per year, and red meat prices rose only 1.8 percent per year. Poultry prices declined about one percent per year. In comparison, the consumer and general price indexes rose at average annual rates of 2.5 and 2.8 percent, respectively.

As indicated earlier, the long-run supply curve S_2 in Figure I, which assumes no change in technology, is relatively elastic, indicating that a small increase in price provides sufficient incentive for a sizable gain in production. In addition, over the very long run rapid gains in technology increase the efficiency of crop and livestock production causing the supply curve to shift to the right, assuming general price stability for other goods and services. The man-hours of labor used for crop production are now less than one-third the number in 1950, and labor used for livestock production has declined more than 50 percent. Efficiencies in feed utilization have increased substantially for poultry. Overall, the productivity index for agriculture (output per unit of input) rose 36 percent from 1950 to 1971.[10] These efficiency gains tended to offset the price effects of rising meat demand and reduce meat prices from the early 1950s until the mid-1960s.

In the mid-1960s, however, accelerated monetary growth led to general price inflation which had adverse effects on the supply of meat. Inflation, which had averaged less than 2 percent per year in the early 1960s, accelerated to more than 4 percent per year after 1965 (Table I). This higher rate of monetary growth raised the demand for all goods and services and for productive resources. Meat producers were thus faced with rising production costs and the meat supply curve S_2 shifted to the left (Figure I). In other words, at each level of meat prices following the inflation, producers were willing to produce less meat than previously because of higher production costs. The accelerated monetary growth was thus a major factor in the sizable increase in average meat prices. It contributed to an increase in the demand

[7]United States Department of Agriculture, *National Food Situation* (May 1969).

[8]*Ibid.* (August 1972).

[9]This assumes that the gain in meat consumption by the lower income groups is not offset by a reduction caused by the increased taxes on the higher income groups.

[10]United States Department of Agriculture, *Changes in Farm Production and Efficiency.*

The analysis in the accompanying article assumes that all phases of the meat industry are reasonably competitive. The following quotes from studies by the National Commission on Food Marketing published in 1966 tend to confirm this view.

The meat industry involves mainly three large groups — the farmers, ranchers, and feeders who grow the livestock; the packers who slaughter the animals and turn them into dressed meat; and the retailers who sell meat to consumers.[1]

Livestock producers are numerous and widely scattered. Each markets only a small share of livestock sold, even though average firm size has increased markedly, especially in cattle feeding.[2]

Concentration in meat packing declined markedly after World War II. Census data show the largest four companies accounted for 41 percent of the value added by manufacture in 1947 and 31 percent in 1963. The total number of slaughtering firms rose from 1,999 to 2,833 in this period.[3] Earning rates for large meat packers have averaged lower than rates for leading firms in most other branches of the food industry since World War II. The largest four packers (ranked according to red meat sales in 1963) consistently reported net income after taxes at around 5 or 6 percent of net worth from 1948 through 1963.[4]

Between 1958 and 1963, . . . The market position of the largest four retail (food) chains declined approximately 1.7 percentage points while the market share of the largest eight firms combined declined about 1 percentage point. The market share of the largest 20 companies remained constant. These data again illustrate the more rapid growth of smaller firms when compared to the largest food retailers. It also indicates that while the largest retailers are growing, they are not growing as rapidly as the food market expands.[5] For the industry as a whole, net profit as a percent of sales has followed an irregular but slightly downward trend since 1950.[6] Profits of retail food chains were high relative to other industries during most of the postwar period. This high level of profits resulted from a rapid rise in the popularity of the supermarket. In response to this increase in demand, many thousands of supermarkets were built. As this rapid building program caught up with demand around 1960, profits for food retailers returned to levels comparable to other industries.[7]

Corporate profits after taxes averaged 11.4 percent of stockholders' equity in all of private manufacturing, 11.3 percent in nondurable goods manufacturing, and 9.8 percent in the manufacture of food and kindred products.[8]

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[1]National Commission on Food Marketing, *Food From Farmer to Consumer* (June 1966), p. 21.

[2]*Ibid.*

[3]National Commission on Food Marketing, *Organization and Competition in the Livestock and Meat Industry* (June 1966), p. 7.

[4]*Ibid.*, p. 59.

[5]National Commission on Food Marketing, *Organization and Competition in Food Retailing* (June 1966), p. 39.

[6]*Ibid.*, p. 277.

[7]*Ibid.*, p. 304.

[8]National Commission on Food Marketing, *Food from Farmer to Consumer* (June 1966), p. 99.

for meat through its impact on personal incomes (in nominal terms) and at the same time tended to reduce the meat supply. Its impact, along with other factors contributing to a growing meat demand, thus tended to submerge the impact of factors increasing the supply of meat since 1964.

Concluding Comments and Summary

The data indicate that meat prices in recent years have been determined largely by basic supply and demand conditions. As indicated by reports of the National Commission on Food Marketing, the meat industry is reasonably competitive (see screened insert). With the exception of the Government crop control and price support programs and import restrictions, the meat industry has generally operated in a competitive free enterprise atmosphere.

The meat industry meets a major competitive test of easy entry and exit. The industry is not hampered by rules and regulations such as chartering, licensing or long periods of apprenticeship. Virtually all are free to enter all phases of meat production and distribution. It has numerous participants in all stages of production and distribution. The efficient prosper and the inefficient fail. This incentive has permitted the price mechanism to bring into equality the quantity of meat supplied and demanded at a relatively high level of consumption per capita and at prices which have risen only moderately compared with other consumer items.

If people want more meat they will bid up the price and the higher prices of meat will provide the incentive for increased production. Productive resources will flow freely to this sector when anticipated returns are attractive. The higher meat prices in recent years have been necessary to attract the additional resources used in producing the larger volume of meat demanded by consumers. If prices had been set arbitrarily at a lower level a smaller volume would have been produced and some consumers would have had less meat. Therefore, in the absence of a

responsive price system in which the quantity supplied and the quantity demanded are equated, the available quantity must be rationed among consumers by some other means.

In summation, the fact that meat prices have increased sharply since last year and have generally risen since 1964 is not a sufficient reason for the belief that the consumer is being taken advantage of or that the meat industry is callous or inefficient. The meat industry is reasonably competitive and takes advantage of developing technology. Meat production has increased at a high rate since the upward trend in meat prices began in 1964.

Excessive monetary growth and other forces which led to a sharp increase in demand for meat and a slower growth in supply have been the chief factors contributing to the higher prices since 1964, rather than basic problems in the industry. Consumers have demanded a higher level of meat production per capita and have paid a higher price for the increased output.

The higher prices were necessary to provide incentive for producers to supply the amount of meat demanded. Without the higher prices output would have been less. Unforeseen events such as livestock cycles and unusual weather conditions may cause livestock and meat prices to fluctuate around their long-run equilibrium levels. However, given the generally competitive conditions in the industry, the market price of meat is always near that level required to match production with consumer demand. The recent price increases were probably no exception to this general rule.

Money Stock Control*

by ALBERT E. BURGER

In early September 1972 the Federal Reserve Bank of Boston sponsored a conference entitled "Controlling Monetary Aggregates II: The Implementation." A series of articles was presented which analyzed problems arising from the implementation of monetary policy. The following article is an abridged version of one paper presented at this conference. Much of the technical material has been omitted from this abridged version with the intent of conveying in concise form the main ideas and conclusions of the article. The complete article, including comments by the discussant, Professor James Duesenberry, will be published in 1973 by the Federal Reserve Bank of Boston as part of its Monetary Conference series. The forthcoming publication also will contain the other papers presented at the Conference.

THE FEDERAL RESERVE stated in 1960, when it began publishing a separate and distinct money stock series, that:

> The amount of money in existence and changes in this amount influence the course of economic developments . . . .
>
> The Federal Reserve System has primary responsibility for regulating the total volume of money available to meet the public's demands.[1]

Over the next ten years a major controversy developed over whether the Federal Reserve recognized or placed enough emphasis on its responsibility for controlling the growth of the money stock. The related question of which operating strategy to follow in controlling the money stock was pushed to the background.

Economists can argue at great lengths over the extent to which the Federal Reserve tried to control money in the past. However, one thing is clear; since early 1970, the Federal Open Market Committee (FOMC) has moved in several stages to a position of placing more emphasis on controlling the money stock, relative to other intermediate objectives, than had previously been the case.[2] Along with this development, there has been increased scrutiny of alternative short-term operating strategies and analysis of problems involved in controlling growth rates of monetary aggregates.

In this paper the control of one monetary aggregate, the money stock, is considered. It is assumed that the Federal Open Market Committee has chosen a growth path for the money stock that is expected to be consistent with its policy objectives for output, employment, and prices. All the problems relating to how this growth path for money was chosen are ignored. The control problem is to use open market operations to achieve that growth path for money. This involves predicting the effects of open market operations on the money stock. Because of information lags and random weekly fluctuations in money, the Federal Reserve does not aim open market operations directly at the money stock, but picks an operating target intermediate between open market operations and the money stock. The two main candidates for this operating target have been money market conditions, chiefly represented by the Federal funds rate, and some reserve aggregate.

The Control Procedure

A general reserve aggregate-multiplier approach is used here to derive a control procedure the Federal Open Market Committee could use to achieve a given growth path for money. The link between the

*The author wishes to express his appreciation to Anatol Balbach and Robert Rasche for their many comments on this study.

[1] "A New Measure of the Money Supply," Federal Reserve *Bulletin* (October 1960), p. 1102.

[2] The Federal Open Market Committee consists of the seven members of the Federal Reserve Board of Governors and five of the twelve Federal Reserve Bank Presidents. The President of the New York Federal Reserve Bank is a permanent voting member of the Committee and is its Vice-Chairman. All other Federal Reserve Bank Presidents attend the meetings and present their views, but votes may be cast by only four of these Presidents, who serve as voting members for one-year terms on a rotating basis. The Committee meets about every four weeks to discuss economic trends and to decide upon the future course of open market operations. The decisions on the exact timing and amount of daily buying and selling operations of securities in fulfilling the Committee's directive are the responsibility of the Account Manager at the Trading Desk of the New York Bank.

reserve aggregate – total reserves, nonborrowed reserves, the monetary base, or some variant of these – and the money stock is called a multiplier. The money stock control procedure involves predicting the effect on the money stock of setting the reserve aggregate at a given value.[3]

The determination of the money stock is summarized in a multiplier-base expression of the following form:[4]

$$M_1 = mB$$

where "M_1" is the money stock (demand deposits plus currency held by the nonbank public), "B" is the net source base, and "m" is the money multiplier. The net source base (B) can be controlled by Federal Reserve open market operations. Sometimes this base concept is referred to as the nonborrowed base to denote that member bank borrowings are excluded. *The net source base is taken as the control variable in the procedure set forth in this article.* In its day-to-day operations this would be the variable toward which the Desk would primarily direct its open market operations.[5]

Table I

Sources and Uses of the Net Source Base
August 1972*
(millions of dollars)

Sources		Uses	
Federal Reserve holdings of Government securities	$71,936	Member bank deposits at Federal Reserve Banks less loans	$27,018
Federal Reserve float	3,347	Currency held by banks	7,426
Gold stock plus special drawing rights	10,810	Currency held by the public	55,300
Treasury currency outstanding	8,137		
Other Federal Reserve assets	957		
Less:			
Treasury cash holdings	319		
Treasury deposits at Federal Reserve Banks	2,025		
Foreign deposits at Federal Reserve Banks	171		
Other deposits at F. R. plus other F. R. liabilities and capital	2,928		
Equals:		Equals:	
NET SOURCE BASE	$89,744	**NET SOURCE BASE**	$89,744
Plus:		Plus:	
Loans at Federal Reserve Banks	439	Loans at Federal Reserve Banks	439
Equals:		Equals:	
Source base	$90,183	Source base	$90,183
Plus:		Plus:	
Reserve adjustment	3,904	Reserve adjustment	3,904
Equals:		Equals:	
Monetary base	$94,087	Monetary base	$94,087

*Preliminary data, not seasonally adjusted.

On a daily basis, the Federal Reserve has information on the value of the previous day's net source base (B). This information comes from totaling the sources of the base, as shown in Table I. Special care should be taken to distinguish between the sources and uses of the base. In order to measure the base, the Desk does not have to estimate excess reserves and currency. This would be the case only if the Manager of the System Open Market Account had to rely solely on information about the uses of the base. By collecting data on the sources of the base, which come from the books of the Federal Reserve and the Treasury, a more accurate estimate can be obtained on a short-run basis.

The money multiplier (m) is the connecting link between the net source base and money stock. Changes in the multiplier reflect portfolio decisions by banks and the public, Treasury actions, and Federal Reserve policy actions such as changes in reserve requirements and the discount rate. The multiplier is not constant. Therefore, under this proposed procedure, the Federal

[3]This is not the only approach that could be used to address the problem of controlling the money stock. Other economists within the Federal Reserve have attacked the problem from a different approach. James Pierce and Thomas Thompson have studied the problem with their monthly money market model using the Federal funds rate as the control variable. See James L. Pierce and Thomas D. Thompson, "Some Issues in Controlling the Stock of Money" (paper prepared for the Federal Reserve Bank of Boston Conference on "Controlling Monetary Aggregates II: The Implementation"). Richard Davis has used a reduced form relationship that takes the demand deposit component of the money stock as the variable to be explained. His reduced form equation includes nonborrowed reserves (or alternatively the Federal funds rate), business sales, Government deposits and a variable to capture the effects of Regulation Q. His results are discussed in the Pierce-Thompson paper.

[4]The specific procedure presented in this paper is designed within the framework of a non-linear money supply hypothesis developed by Karl Brunner and Allan Meltzer:

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

where k, t, and d, respectively, are the ratios of currency held by the public, time deposits, and U. S. Government demand deposits at commercial banks to the demand deposit component of the money stock. The variables r and b, respectively, are the ratios of bank reserves and member bank borrowings to commercial bank deposit liabilities (excluding interbank deposits). See Karl Brunner and Allan H. Meltzer, "Liquidity Traps for Money, Bank Credit, and Interest Rates," *Journal of Political Economy* (January/February 1968), pp. 1-37, and Albert E. Burger, *The Money Supply Process* (Belmont, California: Wadsworth Publishing Company, 1971).

[5]The Manager of the System Open Market Account may be referred to as the "Account Manager" or the "Desk," meaning the Trading Desk of the New York Federal Reserve Bank.

Reserve must estimate the multiplier to determine how much base to supply to achieve a desired path for the money stock.

Forecasting the Money Multiplier

The procedure used in this paper to forecast the money multiplier takes as inputs only those variables that the Federal Reserve could be assumed to know without error. The two major independent variables used to forecast the next month's money multiplier are the lagged 3-month moving average of the multiplier and the percent change in the Treasury bill rate in the previous month.[6] This procedure is an extension of the procedure used in a previous article co-authored with Lionel Kalish and Christopher Babb. The major modification is to remove the reserve adjustment magnitude and include the lagged percentage change in the Treasury bill rate.[7]

In essence, this is a very mechanical method that does not attempt to incorporate any information the Federal Reserve might have concerning expected movements of key factors such as Treasury deposits in the forecast month. Therefore, the results of simulations based on this procedure should not be viewed as an indication of the best control the Federal Reserve could attain. Instead, they provide a standard against which other procedures could be evaluated. Any alternative procedure should be able to perform at least as well as this simple, mechanical method.

Simulating the Control Procedure

The forecasting horizon and the net source base target period are set at one month. For example, at the start of each month, a money multiplier for that month is forecast, and a new setting for the net source base is determined. This procedure was simulated over the 96-month period, 1964-71. The forecasted multiplier times the actual net source base for each month gives the money stock the Federal Reserve would have expected to achieve if it had been using this procedure.[8] The results of this exercise and statistics relevant for evaluating these results are given in the Appendix at the end of this article. Since no forecasting errors are involved in the independent variables, the results of these simulations indicate how well the procedure would have worked over the 1964-71 period.

The evaluation of the performance of a money stock control procedure should not be based solely on monthly errors. For example, a one-half percent error in one month, converted to an annual rate becomes a 6 percent error. This does not necessarily imply that using this method would result in that magnitude of error over a relevant control period. Errors resulting from the simulation do not tend to accumulate, and positive errors are offset by negative ones. The mean forecasting error is $140 million and the mean percent forecasting error is less than 0.1 percent; this indicates that the procedure, on average, does not substantially over- or underestimate the money stock associated with a set value of the net source base.

Comparing consecutive 3-month moving averages of the money stock resulting from simulating the control procedure to actual money over the 1964-71 period results in a mean percent error of .07 percent and an absolute mean percent error of 0.31 percent. In other words, if the desired level of the money stock can be expressed as a moving average for 3-month periods, the procedure should permit its achievement with only small errors.

Another means of analyzing the effectiveness of the control procedure is to compare the expected growth rates of the money stock resulting from simulating the control procedure with actual growth rates of the money stock. The simulated monthly values of the money stock are what the FOMC would have expected from setting the net source base at its historical values if it had been using this procedure to forecast the money multiplier.

In this way, an analysis can be made of the effectiveness of the control procedure at times when there were marked reversals in the growth rate of the money stock. During the period 1964-71 there were at least 6 marked changes in the growth rate of the money stock. Table II presents a comparison of actual growth rates of money and the growth rates that the

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[6]The regression equation used to forecast the multiplier was estimated using not seasonally adjusted data. The coefficients used to forecast each month's multiplier were estimated by least squares using the previous 36 months' observations. Each month the coefficients were re-estimated by adding the most recent month and dropping the first month of the previous 36 observations. In making the forecasts ρu_{t-1} was added, where u_{t-1} is the lagged value of the error in the estimate of the money multiplier and ρ is the correlation coefficient for consecutive error terms in the equation during the sample period.

[7]Albert E. Burger, Lionel Kalish III, and Christopher T. Babb, "Money Stock Control and Its Implications for Monetary Policy," this *Review* (October 1971), pp. 6-22.

[8]The forecasted not seasonally adjusted money multiplier was multiplied by the actual not seasonally adjusted net source base to obtain not seasonally adjusted money (NSAM). Then NSAM was multiplied by the implicit seasonal factor for that month (computed by dividing seasonally adjusted money by not seasonally adjusted money) to obtain the seasonally adjusted money stock.

Table II

Actual Compared to Expected Rates of Money Growth[1]

Average of 3 Months Ended	Actual Growth Rate of Money[2]	Growth Rate of Money Expected Using the Control Procedure[3]
May '66 - Dec. '66	0.2%	1.1%
Dec. '66 - Jan. '69	7.2	7.1
Jan. '69 - Feb. '70	3.4	3.7
Feb. '70 - Dec. '70	5.4	5.0
Dec. '70 - July '71	9.4	9.5
July '71 - Dec. '71	2.4	3.2

[1]Periods were chosen on the basis of a significant change in the growth rate of the money stock.

[2]Simple annual rates.

[3]Computed by comparing 3-month average of actual money in the initial period to 3-month average of forecasted money in the terminal period.

FOMC would have expected if it had been using the control procedure over these periods.

For example, beginning in mid-1966 the growth rate of money slowed markedly. By setting the net source base at its historical values, the FOMC would have expected, given the forecasts of the money multiplier, that the money stock would have grown at a 1.1 percent annual rate from the average of 3 months ending May 1966 to the average of 3 months ending December 1966. The actual growth rate of the money stock over this same period was 0.2 percent. In early 1967 the FOMC moved to a much more expansionary policy. Simulating the control procedure results in an expected growth rate of the money stock of 7.1 percent from the average of 3 months ending December 1966 to the average of 3 months ending January 1969. The actual growth rate of money associated with setting the net source base at its historical values was 7.2 percent over this period.

As shown in Table II, the FOMC would also have been able to achieve the growth path of money through the slowdown in 1969, the renewed growth in 1970, the acceleration in the first half of 1971, and the sharp slowdown in the last half of 1971. These results indicate that even if the FOMC sought very marked reversals in the growth of money, over at least a 6-month period it could quite accurately achieve the growth of money it desired by using the procedure presented in this article.

Impediments to Money Stock Control

The 1964-71 period presented an especially difficult period for money stock control. A significant part of this difficulty was introduced by Federal Reserve actions. During this 8-year period there were several major reversals in the direction of the influence of Federal Reserve policy actions on the money stock.[9] In addition, reserve requirements were changed 7 times and lagged reserve requirements were introduced in this period. The Federal Reserve also permitted Regulation Q ceiling rates to frequently restrain banks from responding in a competitive manner to changes in market rates.[10]

The money stock control procedure outlined above is not designed to capture the *initial* effects of these actions by the Federal Reserve. Since a lagged 3-month moving average of the multiplier is used, a sharp reversal of policy may cause a change in the multiplier that is not immediately captured by the procedure used to forecast the multiplier. For example, at times of sharp reversals in the growth rate of the money stock relatively larger errors occur for a short period. After mid-1966 the forecasting procedure substantially over-estimates the multiplier; the opposite occurs in early 1967. Also, a similar tendency seems to have been in effect in 1971 as forecasting errors tended to be negative in the first half of the year and positive in the second half. The exact size and direction of this effect depends upon a number of factors. However, given the characteristics of the procedure for forecasting the money multiplier, it does seem likely that a substantial change in the thrust of policy actions on the money stock will introduce additional problems for accurately predicting the initial influence of open market actions on the money stock.

The results shown in Table II indicate that through the use of this procedure the FOMC could quite accurately achieve sharp changes in the growth path of money over a longer period of time. The same results point out that, in the initial stages of a marked change in the desired growth rate of the money stock, the Federal Open Market Committee should not abandon the procedure just because they initially observe larger than average monthly errors. However, given that the policymakers are also concerned with large movements in short-term interest rates, large monthly

[9]Policy actions resulted in an acceleration of the base from late 1965 through mid-1966 followed by a deceleration of the base through the end of 1966. This was followed by a renewed acceleration during 1967-68, followed by a deceleration in 1969, then a more rapid growth in 1970. A rapid acceleration in the growth rate of the base over the first half of 1971 again was followed by a rapid deceleration in the second half of 1971.

[10]The secondary market yield on large 6-month CDs exceeded the Regulation Q ceiling rate in the 8-month period from June 1966 through January 1967, the 9-month period from November 1967 through July 1968, and the 24-month period from November 1968 through October 1970.

errors may make the task of returning to the desired money stock path more difficult. The author conjectures that most methods would tend to show relatively larger errors at times when the target growth of money is markedly changed. Again, the point should be emphasized that it is the performance of the procedure over a period of several months or longer that is crucial.

With regard to reserve requirements, there is clear evidence that reserve requirement changes create substantial difficulties for predicting the growth path of money with this technique. The root mean square forecasting error for months when reserve requirements were changed and the following month is about 63 percent larger than for the whole sample period, $1.74 billion compared to $1.07 billion.[11]

If reserve requirements are raised, the money multiplier is reduced, and hence the money stock resulting from simulating this procedure would be expected to exceed actual money, resulting in positive errors. In July and September 1966 reserve requirements were raised and the period July - October 1966 encompasses some of the largest positive errors of the sample period. Likewise, large positive errors occur following the raising of reserve requirements in mid-January 1968 and mid-April 1969. Several of the largest negative errors followed lowering of reserve requirements in March 1967 and October 1970.

Although the exact magnitude of the influence of Regulation Q ceilings is difficult to isolate empirically, it can be conjectured from a theoretical analysis that this impediment added to the errors in money stock control. For example, as market interest rates rise above Regulation Q ceiling rates, this results in a rapid decline in the growth of time deposits, hence affecting the t-ratio in the money multiplier, and therefore influencing the growth of the money stock.

Comparison of RPDs and the Net Source Base as Operating Targets

Prior to 1972 a key element of open market strategy had been use of a configuration of measures of money market conditions as operating guides for the Manager of the System Open Market Account. At the start of 1972 the Federal Open Market Committee began a series of steps that moved open market operating strategy decidedly closer to a reserve aggregate approach. At the February 15 FOMC meeting, the Committee adopted, as its reserve aggregate target, reserves available to support private nonbank deposits (RPDs), defined specifically as total member bank reserves less those required to support Government and net interbank deposits.[12]

The move toward guiding open market operations more by an RPD target than an interest rate target is a major constructive development, especially to those individuals who emphasize the System's role in controlling the growth of the money stock. However, RPDs are only one among several reserve aggregates that might serve the same purpose.

In choosing a reserve aggregate as an operating target for controlling money it seems desirable to select one that (1) has the most predictable relationships to money stock and (2) is easiest for the Desk to track in its day-to-day operations. The first criterion concerns the selection of a target path for the reserve aggregate. The second criterion concerns how well the Desk can stay on that path.[13]

Choosing a Growth Path for an Operating Target — Although the Federal Reserve has not made public the method used in selecting the RPD path, there are at least two ways this path could be chosen. One approach would be to predict the RPD-money stock multiplier, a procedure very similar to the one discussed in this paper. The simulation of this money stock control procedure was repeated wherein an RPD-money multiplier was predicted in the same manner as a base-money multiplier. Not seasonally adjusted RPDs were used as the control variable instead of not seasonally adjusted net source base. The results with RPDs were substantially worse. For example, the root mean square forecasting error for money over the 1964-71 period was $1.60 billion using RPDs, compared to $1.07 billion with the net source base as the control variable.

[11]Most reserve requirement changes occurred in the middle of a month. Hence, their potential influence carried over to the following month. The dates of reserve requirement changes and the amount of reserves released or absorbed are as follows: July 1966 ($420 million), September 1966 ($445 million), March 1967 (—$850 million), January 1968 ($550 million), April 1969 ($660 million), introduction of a 10 percent marginal reserve requirement on certain foreign borrowings by banks in October 1969 ($400 million), October 1970 (–$500 million).

[12]Deposits subject to reserve requirements include all time and savings deposits, and net demand deposits, which are defined as total demand deposits less cash items in process of collection and demand balances due from domestic commercial banks. Net interbank demand deposits include all demand deposits due to domestic and foreign commercial banks and due to mutual savings banks, less demand balances due from domestic commercial banks. In the April 1972 revision of the reserve series, net interbank deposits were revised to reflect the netting of a portion of cash items in process of collection against interbank deposits. Formerly, all cash items were netted against other private demand deposits.

[13]See Charlotte E. Ruebling, "RPDs and Other Reserve Operating Targets," this *Review* (August 1972), pp. 2-7.

An alternative procedure stresses that RPDs are reserves used to support private member bank deposits, one component of which, member bank private demand deposits, is a part of the money stock. This alternative first takes a projected value for GNP over the forecasting horizon. It then assumes that the effect of alternative growth rates of money on financial conditions could be worked out without any effects on GNP during the forecasting period. A relationship between M_1 and interest rates is then developed, and this relationship, along with other factors, is used to project a pattern of member bank time, demand, government, and interbank deposits.[14] From these results a path for RPDs could then be developed.

RPDs can be determined in the following expression:

$$RPDs = TR - rD^G - rD^{IB} = rD + r^tT + ER$$

where TR = total member bank reserves
D^G = member bank U.S. Government demand deposits
D^{IB} = member bank net interbank demand deposits
D = member bank private demand deposits
T = member bank time deposits
ER = excess reserves
r = reserve requirement against D^G, D, D^{IB}
r^t = reserve requirement against time deposits

Therefore, to select a path for RPDs consistent with the member bank demand deposit component of the money stock (D), which, given the projected values of the currency and nonmember bank deposit components of money, would result in the desired money stock, requires that the Federal Reserve estimate the path of time deposits (T) and member bank excess reserves (ER). At present there are no means to evaluate how accurately the Federal Reserve can make forecasts of the nonmember bank deposit component of the money stock, currency, member bank time deposits, and excess reserves.

Predicting the relationship between any reserve aggregate and the money stock involves explicitly or implicitly predicting a multiplier relationship. Therefore, some evidence on the stability of the overall relationship between RPDs, other reserve aggregates, and money can be obtained by comparing the stability of the multiplier relationships. An examination of regressions relating the current values of the RPD-money multiplier and the net source base-money multiplier to a lagged 3-month moving average of these multipliers did not provide any basis for conjecture that there has been a more stable relationship between the money stock and RPDs than between the net source base and money.[15]

These results are not conclusive evidence on the relative predictability of base-money relationships versus RPD-money relationships. There may exist a method of relating RPDs to money which past evidence indicates would have permitted the Federal Reserve to have more accurately predicted the effect of an RPD target on money than the results in this paper indicate for a base target. Also, there may be other money stock control procedures in which both the net source base and RPDs perform better.

Tracking an Operating Target – The second criterion for selecting an operating target concerns the information required by the Desk to track its reserve aggregate on a daily basis. RPDs require information that would appear to be considerably more difficult to project than the net source base data. Referring to the previous formula for RPDs, it can be seen that the following have to be estimated to track RPDs: Government demand deposits, interbank demand deposits, member bank borrowings, currency demands of the public and nonmember banks, and float.[16] Referring back to Table I, it can be seen that all the data for tracking the net source base comes from the daily records of the Federal Reserve and the Treasury. The most troublesome component on a daily basis, which is common both to RPDs and net source base, would be Federal Reserve float.[17]

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[14]For a discussion of this type of procedure see Steven H. Axilrod and Darwin L. Beck, "Role of Projections and Data Evaluation with Monetary Aggregates as Policy Targets," (paper prepared for Federal Reserve Bank of Boston Conference on "Controlling Monetary Aggregates II: The Implementation").

[15]The regressions used the appropriate reserve aggregate multiplier as the dependent variable and a 3-month moving average of past values of the multiplier and the lagged percent change in the Treasury bill rate as independent variables. The sample period was 1966-71. Since RPDs, nonborrowed reserves, and total reserves include only member bank reserves and exclude currency, these multipliers were computed on the basis of the member bank component of the money stock. The base-money multipliers were computed on the basis of the total money stock. All equations were run with seasonally adjusted data. The coefficients of variation show that the standard error of estimate is much larger relative to the mean of the RPD multiplier than for the base multiplier. These results are shown in detail in the complete version of this paper to be published by the Federal Reserve Bank of Boston.

[16]Richard G. Davis discusses the characteristics of short-run operating targets in "Short-Run Targets for Open Market Operations," *Open Market Policies and Operating Procedures – Staff Studies* (Washington, D. C.: Board of Governors of the Federal Reserve System, 1971), pp. 37-69. He points out additional difficulties that may arise when, in addition to the operating transactions, behavior of factors such as Treasury deposits at commercial banks must be forecast and other factors such as member bank borrowing and excess reserves, which are functionally related to open market operations, must be forecast.

[17]Proposed changes in the Federal Reserve's check collection procedures are expected to reduce substantially the average level of Federal Reserve float, from about $3 billion to around $1 billion. The only sizable component that would

Conclusions

A simple procedure for determining the effect on the money stock of setting the net source base at a given value was presented. This proposed method was not intended to be the definitive answer to the money stock control problem. It does, however, provide a useful framework within which several aspects of money stock control can be analyzed.

The results of simulating the procedure over an 8-year period suggest that, using a method for forecasting the net source base-money multiplier which relies only on past, known data, the Federal Open Market Committee could exercise close control over the trend growth of the money stock. The simulation results indicate that errors resulting from using this method to determine the effect on the money stock of setting the net source base at a given value do not tend to accumulate, signifying that use of this procedure would not result in "loss of control over money" for a prolonged period. An analysis of errors for 3-month moving averages and periods of marked shifts in policy support the conclusion that the growth of the money stock could be set at about the rate desired by the Federal Open Market Committee.

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remain would be transportation float. One would expect that even this component would be predictable, within limits, by monitoring such factors as weather conditions and rail or truck strikes. For a discussion of this change, see "Recent Regulatory Changes in Reserve Requirements and Check Collection," Federal Reserve *Bulletin* (July 1972), pp. 626-630.

APPENDIX

Monthly Forecasting Errors of the Money Stock Control Procedure: 1964-1971

(Dollar Amounts in Billions)

Date		Forecasted NSA Multiplier	Actual NSA Multiplier	Forecasted SA Money	Actual SA Money	Forecasted Minus Actual	Percent Forecasting Error[1]
1964	J	2.949	2.943	$154.409	$154.100	$ .309	0.2%
	F	2.924	2.906	155.470	154.500	.970	0.6
	M	2.885	2.871	155.772	155.000	.772	0.5
	A	2.906	2.896	155.714	155.200	.514	0.3
	M	2.851	2.836	156.708	155.900	.808	0.5
	J	2.835	2.823	157.055	156.400	.655	0.4
	J	2.816	2.832	156.573	157.500	−.927	−0.6
	A	2.828	2.834	158.072	158.400	−.328	−0.2
	S	2.850	2.850	159.096	159.100	−.004	0
	O	2.873	2.871	159.851	159.700	.151	0.1
	N	2.896	2.873	161.573	160.300	1.273	0.8
	D	2.885	2.879	160.829	160.500	.329	0.2
1965	J	2.925	2.921	161.113	160.900	.213	0.1
	F	2.888	2.869	162.308	161.200	1.108	0.7
	M	2.848	2.852	161.473	161.700	−.227	−0.1
	A	2.878	2.882	161.759	162.000	−.241	−0.1
	M	2.822	2.807	163.111	162.200	.911	0.6
	J	2.801	2.813	162.403	163.100	−.697	−0.4
	J	2.805	2.805	163.663	163.700	−.037	0
	A	2.802	2.803	164.149	164.200	−.051	0
	S	2.816	2.836	164.001	165.200	−1.199	−0.7
	O	2.847	2.848	166.326	166.400	−.074	0
	N	2.866	2.848	167.919	166.900	1.019	0.6
	D	2.865	2.861	168.217	168.000	.217	0.1
1966	J	2.902	2.903	169.122	169.200	−.078	0
	F	2.861	2.850	170.374	169.700	.674	0.4
	M	2.834	2.850	169.544	170.500	−.956	−0.6
	A	2.866	2.886	170.520	171.700	−1.180	−0.7
	M	2.813	2.805	172.023	171.500	.523	0.3
	J	2.812	2.819	171.245	171.700	−.455	−0.3
	J	2.814	2.763	174.146	171.000	3.146	1.8
	A	2.802	2.765	173.405	171.100	2.305	1.3
	S	2.804	2.779	173.421	171.900	1.521	0.9
	O	2.792	2.778	172.215	171.400	.815	0.5
	N	2.807	2.769	173.502	171.200	2.302	1.3
	D	2.774	2.782	171.210	171.700	−.490	−0.3
1967	J	2.816	2.785	173.290	171.400	1.890	1.1
	F	2.727	2.734	172.748	173.200	−.452	−0.3
	M	2.703	2.753	171.626	174.800	−3.174	−1.8
	A	2.745	2.774	172.289	174.100	−1.811	−1.0
	M	2.687	2.726	173.301	175.800	−2.499	−1.4
	J	2.718	2.753	175.085	177.300	−2.215	−1.2
	J	2.717	2.741	177.084	178.700	−1.616	−0.9
	A	2.738	2.746	179.222	179.800	−.578	−0.3
	S	2.772	2.763	181.488	180.900	.588	0.3
	O	2.779	2.771	182.198	181.700	.498	0.3
	N	2.777	2.774	182.593	182.400	.193	0.1
	D	2.790	2.793	182.872	183.100	−.228	−0.1
1968	J	2.826	2.811	184.870	183.900	.970	0.5
	F	2.767	2.746	186.351	184.900	1.451	0.8
	M	2.757	2.755	186.003	185.900	.103	0.1
	A	2.787	2.794	186.089	186.600	−.511	−0.3
	M	2.725	2.749	186.888	188.500	−1.612	−0.9
	J	2.764	2.766	189.922	190.100	−.178	−0.1
	J	2.737	2.752	190.322	191.400	−1.078	−0.6
	A	2.746	2.740	192.960	192.500	.460	0.2
	S	2.769	2.764	193.727	193.400	.327	0.2
	O	2.779	2.762	195.518	194.300	1.218	0.6
	N	2.771	2.781	195.289	196.000	−.711	−0.4
	D	2.797	2.812	196.383	197.400	−1.017	−0.5

Date		Forecasted NSA Multiplier	Actual NSA Multiplier	Forecasted SA Money	Actual SA Money	Forecasted Minus Actual	Percent Forecasting Error[1]
1969	J	2.841	2.833	$198.937	$198.400	$ .537	0.3%
	F	2.783	2.784	199.432	199.500	−.068	0
	M	2.797	2.802	199.909	200.300	−.391	−0.2
	A	2.832	2.834	200.867	201.000	−.133	−0.1
	M	2.783	2.749	203.870	201.400	2.470	1.2
	J	2.776	2.783	201.692	202.200	−.508	−0.3
	J	2.767	2.784	201.666	202.900	−1.234	−0.6
	A	2.760	2.753	202.933	202.400	.533	0.3
	S	2.774	2.774	202.746	202.700	.046	0
	O	2.773	2.776	203.022	203.200	−.178	−0.1
	N	2.773	2.764	204.133	203.500	.633	0.3
	D	2.794	2.776	204.991	203.700	1.291	0.6
1970	J	2.801	2.806	205.126	205.500	−.374	−0.2
	F	2.745	2.736	205.371	204.700	.671	0.3
	M	2.748	2.757	206.048	206.700	−.652	−0.3
	A	2.787	2.777	209.043	208.300	.743	0.4
	M	2.725	2.715	209.750	209.000	.750	0.4
	J	2.755	2.736	210.799	209.400	1.399	0.7
	J	2.728	2.732	210.027	210.300	−.273	−0.1
	A	2.709	2.700	212.295	211.600	.695	0.3
	S	2.734	2.709	214.761	212.800	1.961	0.9
	O	2.714	2.725	212.179	213.100	−.921	−0.4
	N	2.722	2.732	212.852	213.600	−.748	−0.4
	D	2.741	2.744	214.553	214.800	−.247	−0.1
1971	J	2.765	2.741	217.184	215.300	1.884	0.9
	F	2.687	2.690	217.425	217.700	−.275	−0.1
	M	2.696	2.705	218.929	219.700	−.771	−0.4
	A	2.730	2.732	221.044	221.200	−.156	−0.1
	M	2.690	2.679	224.688	223.800	.888	0.4
	J	2.705	2.718	224.401	225.500	−1.099	−0.5
	J	2.722	2.714	228.057	227.400	.657	0.3
	A	2.699	2.703	227.683	228.000	−.317	−0.1
	S	2.707	2.697	228.426	227.600	.826	0.4
	O	2.711	2.699	228.705	227.700	1.005	0.4
	N	2.710	2.700	228.505	227.700	.805	0.4
	D	2.720	2.715	228.624	228.200	.424	0.2

[1] $\frac{\text{Forecasted} - \text{Actual}}{\text{Actual}} \times 100$

NOTE: SA and NSA refer to seasonally and not seasonally adjusted data, respectively.

Summary Results

Levels	1964	1965	1966	1967	1968	1969	1970	1971
Mean Square Forecasting Error	$.4747	$.4359	$2.2479	$2.6592	$.8710	$.8942	$.8299	$.7744
Root Mean Square Forecasting Error	.6890	.6602	1.4993	1.6307	.9333	.9456	.9110	.8800

Summary Results for Selected Periods

Levels	1964-1971	1966-1971	1969-1971	1970-1971
Mean Square Forecasting Error	$1.1483	$1.3795	$.8328	$.8021
Root Mean Square Forecasting Error	1.0716	1.1745	.9126	.8956
Mean Error	.1404	.1114	.2743	.2865
Absolute Mean Error	.8273	.9220	.7379	.7725

Percent Forecasting Error	1964-1971	1966-1971	1969-1971	1970-1971
Mean Error	.0760%	.0514%	.1306%	.1375%
Absolute Mean Error	.4469	.4875	.3528	.3625

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continued . . .

(Continued from previous page)

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