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Parity — Is It The Answer?

By C. Edward Harshbarger and Marvin Duncan

All is not well down on the farm. Net farm income has dwindled from an alltime high of $30 billion in 1973 to about $20 billion in 1977, which underscores the financial difficulties that many farmers are facing. Although the farm income picture has recently improved somewhat due to higher market prices and additional Government benefits, a number of farm operators are still struggling to put their financial affairs in order.

Several approaches can be used to solve a farm income problem. During the early months of 1978, for example, a group of protesting farmers advocated one particular solution that was very interesting: parity. In simple terms, these farmers were saying that the prices they receive for their products should change in step with changes in the prices of goods and services which they buy. Therefore, they said, a policy of parity prices was needed.

Although many people were introduced to parity for the first time as a result of the farm strike, the concept is not new. It has been an integral part of farm policymaking for a long time. During the post-World War I period, some observers saw a deteriorating relationship between agriculture and the U.S. economy and decided to examine the situation more closely. Government statisticians had been collecting data on the prices of farm products and other commodities for a number of years, and the existence of these data, together with the studies that followed, ultimately led to the parity concept.

A person who contributed importantly to the development of parity was George Peek, a manufacturer of farm machinery. In 1922, Peek was disturbed about the growing inability of farmers to buy tractors and other production inputs, and thus he advanced the idea that the purchasing power of farmers needed to be protected through the prices they received for their products.[1] His idea was originally named "fair exchange value," and it basically meant that for each bushel, pound, or bale of whatever farmers sold on the market, they should be able to buy as many inputs and consumption items as they had done in an earlier period. Thus, the purchasing power of farm products would remain the same over time.

Not surprisingly, Peek's parity concept was popular with farmers. Moreover, parity quickly became a political issue during the farm protests of the 1920's that ultimately produced the McNary-Haugen farm bills. In 1933,

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[1] A brief history on the evolution of parity can be found in John D. Black, *Parity. Parity, Parity* (New York: Da Capo Press, 1942), pp. 45-66.

Congress approved a farm program that officially adopted the parity concept and over the years it has continued as a permanent fixture in all new farm legislation. However, in recent years the idea has been more symbolic than real as a policy goal.

As a concept, parity connotes fairness and equality. But the concept also raises a number of legitimate questions. For example, are parity prices truly fair for farmers, consumers, and taxpayers alike? Are 100 per cent parity prices really comparable with similarly computed prices for earlier years? How would parity prices affect the future structure of agriculture, retail food prices, and Government outlays? From the debates in Congress and articles in newspapers, one can conclude that few people really understand the parity concept. Thus, the purposes of this article are twofold: to define parity in a meaningful way and to analyze its implications for agriculture and for the general economy.

HOW PARITY IS CALCULATED

Parity is an equity concept. To illustrate the concept: if the proceeds from the sale of 50 bushels of wheat were sufficient to purchase one ton of fertilizer during the 1910-14 base period; then with parity pricing, the same relationship should hold today. The U.S. Department of Agriculture (USDA) has attempted to quantify this equity concept of parity by comparing the ratio of price indexes at the present time to the ratio of the same indexes during the 1910-14 base period. Two measures of parity are commonly calculated and widely used—they are the parity ratio and parity prices for specific farm commodities.

The parity ratio is simply the ratio of the Index of Prices Received by Farmers to the Index of Prices Paid by Farmers for Commodities and Services, Interest, Taxes, and Farm Wages. Using January 1978 data, the calculation of the parity ratio is as follows:

$$\text{The Parity Ratio} = \frac{\text{The Index of Prices Received by Farmers}}{\text{The Index of Prices Paid by Farmers}}$$

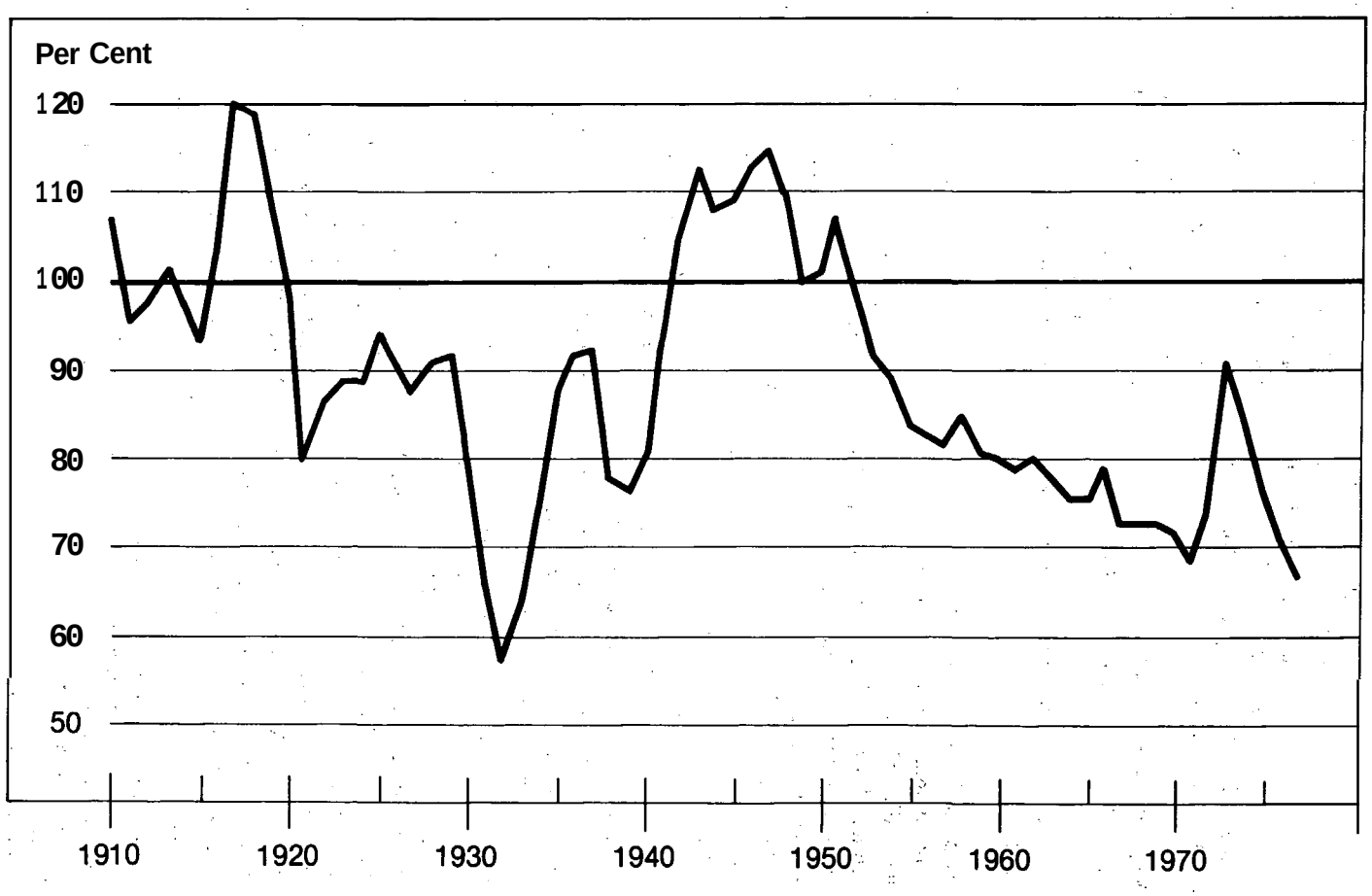
$$65 \text{ per cent} = \frac{465 \text{ per cent [with 1910-14 = 100]}}{710 \text{ per cent [with 1910-14 = 100]}}$$

An adjusted parity ratio is also computed and published by USDA in Agricultural Prices. This adjusted ratio incorporates into the Index of Prices Received by Farmers supplementary income from Government farm programs. Consequently, whenever such supplementary income is being received by farmers the adjusted parity ratio is somewhat higher than the unadjusted parity ratio.

Though widely used as a general barometer of agriculture's well being, the parity ratio is a measure of price relationships and nothing more. It does not measure farm income, farmer purchasing power, or farmer welfare. Because any index series must be predicated on a base period, the 1910-14 period was chosen as the base for the parity ratio because the relationship between agriculture and the rest of the economy seemed to be in proper balance then. If indeed this was true, Chart 1 shows that this standard has not been achieved at any time during the intervening years except during periods of war.

Parity prices are calculated for a wide range of individual agricultural commodities. These parity prices have often been used in the past to determine Government support prices for farm commodities—as is presently the case with milk: The parity price for a commodity was originally calculated in the following way. A "base price" for a commodity—the average

Chart 1
ANNUAL PARITY RATIOS FOR U.S. AGRICULTURE
(1910-14 = 100)



SOURCE: Agricultural Statistics, U.S. Department of Agriculture, 1967, p. 508, and 1977, p. 458.

price for the 60 months from August 1909 to July 1914--was multiplied by the "parity index"—the percentage change in the Index of Prices Paid by Farmers since 1910-14.[2] For example, the July 1949 parity price for wheat was calculated as follows:

The Parity Price = [The Base Price] x [The Parity Index (1910-14 = 100)]

$2.16 per bushel = ($0.884 per bushel) x (244 per cent)

The parity price is calculated in terms of prices received by farmers in the local markets in which they ordinarily sell.[3]

Over time, however, the original parity formula was regarded as increasingly dated. Thus, to better reflect current commodity prices in the formula, the Agricultural Act of 1948 provided that a "new parity" formula would be used beginning on January 1, 1950. The "new parity" formula incorporated only one major change from the old formula: an "adjusted base price" was calculated using a moving 10-year average of prices received. Thus, the average price for the commodity in question for the most recent 10-year period was divided by the average of the Index of Prices Received by Farmers for the same 10 preceding years to obtain the adjusted base price.

This new formula was phased into use over a number of years so that the adjustment from the "old parity" price to the "new parity" price was gradual in those cases in which the new formula resulted in lower prices than the old formula.' For many commodities the new parity price was lower, but for some it was higher. The parity price for wheat in 1950—$2.20 per bushel under the old formula—declined to $2.13 under the new formula. But in the case of milk, the parity price rose from $3.98 to $4.31 per hundredweight with the new formula.

Parity prices for all farm commodities are now calculated using the same two-step formula. To illustrate, the parity price computation for corn based on January 1978 data is as follows:[5]

A) Adjusted Base Price = $\frac{\text{120-month (January 1968 - December 1977) Average of Prices Received by Farmers for Corn}^{6}}{\text{Average Index of Prices Received by Farmers for the same 120-month period (1910-14 = 100)}}$

Adjusted Base Price = $\frac{\$1.88}{380}$ = $0.495 per bushel.

B) Parity Price = [Adjusted Base Price] x [The Parity Index (1910-14 = 100)]

Parity Price = ($0.495 per bushel) x (706 per cent) = $3.49 per bushel.

The Indexes of Prices Received and of Prices Paid by Farmers have also been periodically adjusted to more accurately reflect the current mix of products produced and of inputs used in farm production. Agricultural commodities have been added to the Index of Prices Received as they have become commerciaily important. Other products have been dropped from the index or combined under different

2 The base prices for certain other commodities, such as tobacco and .some fruits and vegetables, were based on somewhat different time periods.

3 *Agricultural Prices,* U.S.Department of Agriculture, July 1949, pp. 23-25.

4 *Agricultural Prices,* January 1950, pp. 49-53.

5 *Agricultural Prices.* January 1978, pp. '25-26.

6 Both 120-month averages have been adjusted to allow for unredeemed loans and other supplemental payments resulting from price support operations.

product designations. The Index of Prices Paid has also been updated over time to include farm wages, taxes on farm real estate, and interest on farm real estate debt. The index numbers reported for each of the two indexes are weighted averages of the prices for the various index components. Consequently, it has been necessary to update the weighting of the index components a number of times since 1933. The two indexes presently reflect the relative importance of products and inputs from a 1971-73 sample period. Since January 1977, however, the Consumer Price Index (CPI) for Family Living has replaced the family living section of the Index of Prices Paid by Farmers.[7] Table 1 contains the components included in both the Indexes of Prices Received and Prices Paid by Farmers along with the weighting mechanisms developed from the most recent base period (1971-73).

WHAT PARITY IS AND ISN'T

The subject of parity has periodically caused lively debate. Central to these debates has been the question of what parity really is—in other words, what does the concept (and formula) actually measure? In theory, it should be relatively simple to reach agreement on this question but, in reality, it has been impossible. For example, farm groups and their supporters have often clung to interpretations of parity that are at odds with the official definitions and generally accepted interpretations. Consequently, it is useful once again to review what parity is—and what it is not.

The parity price for a commodity is that price which would give a unit of that commodity the same relative purchasing power—in terms of goods and services bought by farmers—that it had during 1910-14—if, **and only if,** everything else remained unchanged. In other words, parity assumes no geographic changes in production patterns, no changes in farm size, and no technological changes that alter production processes or the productivity of resources over time.

But dramatic changes have occurred in agriculture since the 1910-14 base period. The resources used in production are often different and frequently more productive than they were during the base period. Additionally, the productivity of some crops has increased more rapidly than others. Table 2 indicates changes in yields per acre that have occurred since 1910 for some major crops. It is important to remember that the parity price formula does not explicitly account for these productivity changes in agriculture. Moreover, such changes are not accounted for implicitly by the parity price in any well defined or consistent manner.

The most serious criticism of the parity formula is that it does not account for the changes in agricultural productivity. And the changes have been substantial. Table 2 illustrates a 234 per cent increase in the average yield per acre for corn from 1910-14 to 1972-76. It must be recognized, of course, that the resource mix presently used in corn production has changed since the 1910-14 base period. More machine power and agricultural chemicals are used now, along with far less animal power and manhours of labor. Nonetheless, the vast changes in plant breeding, farm equipment design, chemical technology, and other production techniques have also combined to make the present resources more productive. What has happened in corn production is not unique. All of U.S. agriculture is more productive and efficient than in 1910-14.

The significance of these gains in productivity is lost in the parity formulations, however. Clearly, if productivity is increasing, the price that a farmer receives for his product

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[7] *Agricultural Prices.* January 31, *1977,* p. 44.

Table 1
COMMODITY GROUP WEIGHTS FOR FARM PRICE INDEXES

Relative Importance of Commodities in Indexes of Prices Received bv Farmers

Commodity Group	1971-73 Weights Per Cent
Food grains	7.2
Feed grains and hay	12.1
Cotton	2.9
Tobacco	2.4
Oil-bearing crops	9.2
Fruit	4.5
Commercial vegetables	4.1
Potatoes, sweet potatoes, and dry edible beans	1.8
All crops	44.2
Meat animals	37.2
Dairy products	11.1
Poultry and eggs	7.5
Livestock and livestock products	55.8
All farm products	100.0

Relative Importance of Commodities in Indexes of Prices Paid bv Farmers

Commodity Group	1971-73 Weights* Per Cent
Family living	30.4
Food and tobacco	6.4
Clothing	2.2
Housing	7.8
Autos and auto supplies	5.2
Medical and health care	2.1
Education, recreation, and other	6.7
Production	57.6
Feed	11.8
Feeder livestock	11.7
Seed	1.8
Fertilizer	4.2
Equipment and supplies	5.2
Motor supplies	2.2
Motor vehicles	2.5
Farm machinery	7.2
Building and fencing materials	3.6
Farm services and cash rent	7.4
Total commodities and services	88.0
Interest	4.0
Taxes	2.8
Wage rates	5.2
Commodities-and services, interest, taxes, and cash wage rates	100.0

'Weights used currently and for revisions starting January 1965.
SOURCE: U.S. Department of Agriculture.'

does not have to rise proportionately with the prices he pays for inputs in order to maintain his purchasing power. Stated differently, it is possible for resources to earn rates of return comparable to those in a base period with progressively lower parity price levels. Supporting this assertion, Professor B. H. Robinson of Clemson University notes:

Table 2
AVERAGE CROP YIELDS PER ACRE
1910-14, 1972-76"

	1910-14	1972-76	Per Cent Change
Corn (bushels/acre)	26.0	86.7	234
Wheat (bushels/acre)	14.3	30.6	114
Cotton (pounds/acre)	200.3	477.2	138
	1924-28		
Soybeans (bushels/acre)	11.9	26.6	124

'Soybean yields are for 1924-28 and 1972-76.
SOURCE: U.S. Department of Agriculture.

> If a total net farm income index is calculated using the 1910-14 period as a base, . . . one finds that as the gap between parity prices and market prices has. increased—(parity prices moving up and market prices moving down)—the index of total net farm income has also increased. The relationship suggests that other factors have changed and that the .official parity price calculations may be misleading.[8]

Furthermore, Professor Luther Tweeten of Oklahoma State University reports that:

> Adequate-size, well-managed farms now on the average require approximately 75 per cent of 1910-14 price parity to cover all costs of production including land at its current value and a rather generous return to the operator and family for labor, risk, management, and equity.[9]

Parity prices do not measure total farm purchasing power or farmers' economic welfare. For example, the personal income of farm people includes a substantial and increasing amount of nonfarm income. In fact, almost 60 per cent of the total earnings accruing to all U.S. farm people in 1976 came

8 Congressional Research Service, *Parity Prices for American Agriculture.* The Library of Congress, Washington, D.C., February 21, 1978, Appendix I, Statements by Dr. B. H. Robinson, Clemson University; and Dr. Luther Tweeten, Oklahoma State University.

9 Ibid.

from off-farm sources.[10] Off-farm income is an increasingly important component of personal income for commercial farmers. as well as for part-time and small farmers. Farms with annual sales of $40,000-$99,999 received almost 30 per cent of their income from nonfarm sources and among the largest farms (those with annual sales of $100,000 or more) the figure was 19 per cent.

Farmers are correct in asserting that parity prices do not necessarily guarantee a profit to all producers. The cost structure of agriculture varies widely from one farm to the next as well as over time, depending upon the efficiency of the farm operation, the farmer's tenure in business, the size of the debt load that must be serviced, and weather conditions. Of course, when a farmer has little product to sell—as a result of drought or hail, for example--parity prices will not guarantee a profit. The other side of this argument is that the larger and more efficient the farm, the more beneficial parity pricing is likely to be. A small farmer may need prices substantially greater than parity to achieve an equality of income with a city counterpart having comparable education and business investment. On the other hand, the larger farmer will likely discover parity prices will yield an income substantially in excess of a city counterpart with comparable education and business investment.[11]

On balance, parity pricing presently has serious problems in both interpretation and implementation. The formulations are becoming increasingly dated and can be seriously faulted for not accounting for changes in agricultural production patterns or technological developments. Although parity prices probably have some modest validity as a general barometer of farm price relationships, they are subject to much misuse and misinterpretation. These problems often result in incorrect public policy formulation and further depreciate the limited usefulness remaining in the parity pricing concept.

THE IMPACT OF PARITY PRICING

Circumstances this past winter forced public policymakers to seriously consider—for the first time since the early 1950's—the implications of legislation providing farmers with 100 per cent of parity. According to some proposals, farmers who elected to idle up to half of planted acreage would be guaranteed 100 per cent of parity. Under other proposals, this guarantee would have been mandated and accompanied by compulsory quotas and production controls. On the surface, the proposals seem so appealing that people may be tempted to forego thoughtful analysis. This would be a serious mistake. For despite the intuitive appeal, these proposals carry the seeds of serious future problems for both farmers and consumers.

Admittedly, a policy providing a guarantee of 100 per cent of parity would have an immediate and substantial impact on both gross and net farm income. Cash receipts could increase by over $40 billion and realized net farm income might rise as much as $20 billion above current levels by 1982-83. However, most of this increase in income would go to a small number of larger farmers. In 1976, less than 6 per cent of the nation's farms received 60 per cent of the cash receipts from farming, 39 per cent of the realized net income, and 36 per cent of the direct Government payments.

The USDA estimates that if target prices were raised to 100 per cent of parity, about $15 billion in Government payments would be

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10 *Agricultural Outlook*, U.S. Department of Agriculture, Washington, D.C., September 1977, pp. 16-21.

11 Luther Tweeten, *Foundations of Farm Policy* (Lincoln: University of Nebraska Press, 1970), pp. 163-67.

required for just corn, wheat, and cotton.[12] If the 6 per cent of farms with sales over $100,000 received the same 36 per cent of direct Government payments under a 100 per cent parity regime, the average payment per farm would be $35,300. The 2 million farms with sales under $20,000 would receive 24 per cent of the payments, or $1,773 per farm. The fact remains, therefore, that 100 per cent of parity will not solve the income problems of most American farmers because they do not market enough to benefit from either greatly higher product prices or target prices.

The National Economy

The farm economy is only one part—albeit an important one—of the national economy. Thus, farm policy must be analyzed in the context of its impact on national economy. Parity pricing for farm products would have unfortunate short-term and long-term effects on the national economy. The USDA estimates that retail food prices would rise about 20 per cent during the first year of parity pricing and after that would return to a lower rate of increase, but nonetheless would increase each year as parity prices and various marketing costs rose. The impact of higher food prices would likely reduce the real gross national product growth rate and raise the rate of price inflation from what they otherwise would be by about half a per cent per year in 1978 and 1979. Unemployment would likely rise modestly with parity pricing as well, up by about half a per cent by the end of 1979.[13] While food consumption would decline somewhat, the consumption of red meats would be reduced to the lowest level since the mid-1960's. Similar projections are made by Data Resources, Inc.—an economic forecasting firm.[14] Their model results indicate that, for the years 1978-80, full parity pricing would result in a CPI increase of 8 per cent over the forecast base, employment cuts of 800,000 with an unemployment increase of 0.6 per cent, and a reduction in real disposable income of $22 billion.

Export Markets

U.S. farmers have enjoyed remarkable growth in export sales for their products during recent years. Indeed, about one-third of the harvested acres in the United States have been used to supply this market. Parity pricing would bring about marked declines in agricultural export volumes for most important agricultural exports—as much as 13 per cent in each of the first two years of parity pricing, according to USDA estimates. Although volume would decrease at first, it would begin to recover within five years, assuming that production adjustments in other parts of the world would take place within that time. Consequently, after 1982 U.S. farmers would begin once again to share in increases in world agricultural trade. The USDA estimates that the value of U.S. agricultural exports would likely increase by as much as $10 billion over the current level by 1982-83.[15] However, most experts are not so sanguine about the effect of parity pricing on export markets.[16] Dr. D. Gale Johnson, at the University of Chicago, sums up the concern shared by others when he notes: "It

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12 Congressional Research Service, pp. 22-24.

13 "Analysis of American Agricultural Movement Proposal," *Issue Briefing Paper*, prepared by Economics, Statistics, and Cooperative Services, U.S. Department of Agriculture, Washington, D.C., March 3, 1978.

14 Congressional Research Service, Appendix I, Statement by Otto Eckstein, President of Data Resources, Inc.

15 USDA *Issue Briefing Paper*, pp. 8-11.

16 Congressional Research Service, pp. 38-39 and Appendix I.

is simply wrong to assume that we could retain our export markets—if our export prices reflected 100 per cent of parity." An added complication for U.S. farmers is likely. Prohibiting the entry of agricultural products into the United States at less than 100 per cent of parity prices—quivalent to the European Economic Community's variable levies—would no doubt result in a proliferation of trade barriers against U.S. agricultural exports.

Land Values

Parity pricing for farm commodities—with sharply higher farm earnings—would result in returns being earned by farmland in excess of those needed to keep land in production. Depending on the commodity in question and the production quotas established, some land owners would fare much better than others. Little imagination is required to describe the outcome of such a situation. Farmland prices would rise rapidly as the increased earnings are bid into the value of farmland. The USDA suggests that with 100 per cent of parity, land values could increase as much as 12 to 14.5 per cent per year over the next five years.[17] These rates are well in excess of the'historical rates of increase in farmland values—the rate of price inflation plus 1 or 2 per cent. Thus, a disturbing cycle could be set in motion in which higher land prices mean higher production costs, necessitating still higher farm product prices. Furthermore, recent experience suggests that farmland values would increase at rates greater than those projected by the USDA. Land values increased at a 13 per cent or greater rate in several major agricultural states last year, despite problems with drought and depressed farm prices."

Clearly, parity pricing would yield substantial windfall gains to present land holders as farmers and nonfarm investors bid up the price of farmland. Tenant farmers would benefit immediately from parity pricing as well, but over time would lose much of that benefit as rental rates for farmland (both share and cash) increased to provide landlords a market return on the rapidly increasing value of farmland. Just over half of the nation's current crop acreage is tenant farmed. Separation of ownership and operation of farmland would likely increase as high land prices make it increasingly difficult for new entrants and tenant farmers to purchase farmland. Dr. Tweeten sums up the problem in this way: "The benefits (of land appreciation as a result of parity pricing) would be received by landowners, many of whom are wealthy. The result would be-substantial transfer of wealth from low-income consumers and taxpayers to high-income landowners."[19]

Output, Farm Size, and Individual Freedom

Any policy that pegs prices at artificially high levels will ultimately have a significant impact on the levels of production and consumption as well as on the structure of the industry. If farm prices were raised to parity levels through Government edict, producers would be encouraged to increase output even though supplies are already burdensome. Furthermore, the quantities demanded by consumers at home and abroad would decline as prices go up, thereby exacerbating the imbalance between market supplies and demand. Left alone, stockpiles would obviously grow by large

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17 USDA *Issue Briefing Paper,* pp. 12-17.

18 *Farm Real Estate Developments.* Economics, Statistics, and Cooperative Services, the U.S. Department of Agriculture, Washington, D.C.. March 1978.

19 Congressional Research Service, Appendix I, Statement by Professor Luther Tweeten, Oklahoma State University.

amounts. The solution to this problem is equally obvious: restrictions on production would have to be imposed.

The USDA estimates that nearly 75 million acres of cropland would need to be idled by 1982 to bring supplies in line with expected demand at parity prices.[20] This reduction would be about 27 per cent of the 275 million acres planted in wheat, feed grains, cotton, and soybeans in 1977. Although part of this adjustment reflects the need to correct the burdensome supply situation that presently exists, most of the land would have to be removed from production because of the new price levels. If the USDA's figures are accurate, planted wheat acreage in 1982 would fall to about 45 million acres from the 75 million acres planted in 1977. Feed grain and cotton acreage would also have to drop sharply—perhaps 20 and 60 per cent, respectively—to support parity prices. However, soybean acreage would not have to fall much below the 1977 level of 60 million acres to sustain prices at 100 per cent of parity.

The impact of these policies on livestock production should also be acknowledged. The cattle industry, which has recorded relatively few profits since 1973, is now nearing the completion of a liquidation program that has reduced inventory numbers by 16 million head during the past three years. If grain prices were to suddenly go to 100 per cent of parity levels, feed costs would soar and force cattle feeders to curtail their feeding programs. Ranchers would discover that herd sizes would require further liquidation. The hog industry would also be faced with a similar situation. Although these production adjustments would push livestock prices to profitable levels over time, the hardships suffered in the short run would be severe.

Will farmers make these adjustments voluntarily? Livestock producers will have little choice but to do so because of the price-cost squeeze resulting from parity grain prices. If earlier programs are any indication, crop farmers will voluntarily idle some of their land in return for certain economic considerations. But it is unlikely that they will, on their own, set aside 75 million acres for 100 per cent of parity. At these price levels, the temptation to expand output would be too difficult to resist. Thus, a mandatory form of controls would be required to reduce output to desired levels. Several alternatives are available, including production quotas, marketing certificates, and acreage restrictions, but inevitably most producers would be giving up some of their decisionmaking prerogatives.

In the final analysis, the parity concept contains a number of paradoxes, not the least of which pertains to the structure of U.S. agriculture. While claims are made that parity prices will preserve family farming, the truth is that they will probably have the opposite effect. Why? Because parity prices would be tantamount to guaranteed profits for many farmers, especially the more efficient ones, and, in this situation, these operators—together with nonfarm investors—would move very quickly to buy up land. Although the number of part-time farm operations could increase, most of the small- and medium-sized farms would ultimately disappear, since they would be at a competitive disadvantage in bidding for resources.

CONCLUSION

Parity, with its connotations of fairness and equality, has considerable appeal as a precept of farm policy, but as a working tool, it has many shortcomings. The base period 1910-14 is so remote that it no longer has much value as an economic barometer for agriculture. Also,

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20 *USDA Issue Briefing Paper, see* **footnote 13.**

too many things have changed over the past 60 years for agriculture to rely upon a 'fixed formula that totally ignores so many important developments.

Yet parity is not likely to disappear from farm policy jargon. Therefore, if parity is to be more than a symbol in farm policy, some changes must be' made. For example, the practice of expressing parity in terms of prices is often criticized. Several researchers have suggested that income parity would be more meaningful. While there are several potential problems associated with this approach, an income standard that compares rates of return on resources used in agriculture with the earnings of similarly employed resources outside of agriculture is likely to be more representative of farmers' economic well-being than parity prices. Resources that fail to generate adequate earnings in one activity should be shifted to 'those areas where the income potential is higher. Adopting a parity standard that recognizes the basic fundamentals of a market economy would be a positive step in farm policymaking.

Though the advocates of parity prices have good intentions, it is clear that farm policy cannot--or at least should not—be formulated on the basis of a few statistics and simplistic formulas. Agriculture is much too complex to have all of its ills cured by a single prescription. Professor Harold F. Breimyer has issued a useful warning about the proper role of parity as a policy goal. He states that, "To build a farm program on it [parity] in mechanical fashion would be to disregard all that has been learned since 1933 about how carefully farm programs must be tailored to circumstances of any given time."[21] The lessons from the past should not be forgotten. In the 1950's and 1960's, farm prices were supported at artificially high levels, with the result that too many resources were committed to the production of too much food. The stockpiles were finally reduced in time, but only at substantial cost to taxpayers. If policymakers and farm leaders become enamored once more with the idea of solving the farm income problem with parity prices, the mistakes of the past are destined to be repeated.

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21 Harold F. Breimyer, *"Parity—That Word Again," Economic and Marketing Information for Missouri Agriculture, University of Missouri-Columbia, Vol. 21, No. 2, February 1978,* p. 4.

Velocity: Money's Second Dimension

By Bryon Higgins

"Money has a 'second dimension, namely, velocity . . . ." Arthur F. Burns in Congressional Testimony.

Understanding the effects of monetary growth on the economy is of crucial importance in formulating monetary policy. Monetary growth that is insufficient to sustain a high level of economic activity can impair economic growth, and monetary growth in excess of the ability to expand real output can intensify inflationary pressures. Although it is generally agreed that the growth in the money supply is an' important determinant of economic performance, there is seldom a consensus regarding the rate of monetary expansion most conducive to attainment of policy goals.

The relationship between the supply of money, the price level, and real output has been the subject of extensive debate among economists, policy analysts, and other observers for well over 100 years. The predominant view prior to the 1930's was that the sole determinant of the aggregate price level was the quantity of money. The belief that the growth rate of the money supply uniquely determines the rate of price inflation was the cornerstone of the quantity theory of money. The simple version of the quantity theory lost favor during the 1930's as a result of worldwide economic turmoil. It was generally believed at the time that policy prescriptions deriving from existing economic theories were inadequate to deal with the problems resulting from the Great Depression.

In the crisis 'atmosphere surrounding policy discussions at the depth of the Great Depression, a new theory of employment and prices was developed by John Maynard Keynes. Keynes alleged that the simple quantity theory of money was deficient in a number of important respects, and he offered an alternative framework for analyzing the relations between money, prices, and economic activity. Policymakers and economic analysts were receptive to Keynes' theory because it offered an explanation for the apparent failure of conventional policies to remedy the dismal economic situation that existed and it proposed alternative solutions. Keynesian economic theory supplanted the quantity theory of money as the predominant method for analyzing aggregate economic relationships.

In the past two decades, however, there has been a resurgence of interest in the quantity theory of money. Beginning with Milton Friedman and his students and colleagues from the University of Chicago, monetarists challenged the validity of a number of the basic tenets of Keynesian economic theory. Recent experience has rekindled interest in the relationship between the growth of the money supply and the rate of inflation, with the monetarists being the chief proponents of the

view that excessive monetary growth is the primary cause of inflation.

Much of the debate about the most useful framework for analyzing aggregate economic relationships has centered on the relationship between aggregate spending and the money supply. The ratio of total spending to the money stock is commonly called the velocity of money. This article analyzes the concept of the velocity of money and discusses the importance of understanding the determinants of velocity. The quantity theory of money is presented, and Keynes' criticism of the quantity theory of money is discussed. Empirical and theoretical considerations relating to the determinants of velocity are reviewed, the postwar rise in velocity is discussed, and the recent behavior of velocity is examined.

VELOCITY AND THE QUANTITY THEORY OF MONEY

The Concept of Velocity

The income velocity of money is defined as the ratio of nominal income (that is, the dollar value of income at current prices) to the money stock.[1] If Y represents the real quantity of goods and services produced and P, the average price paid for these goods and services, then PY is the value of nominal income and V [=PY/M] is the income velocity of money, where M represents the money stock.[1] Income velocity measures the average number of times in a given period each dollar is spent for currently produced goods and services.[1] If the value of current output, PY, is $100 and the money supply is $20, then the income velocity of money is 5 (=$100/$20). In these circumstances, each dollar of money is used to finance an average of $5 worth of currently produced goods and services.[1]

The Equation of Exchange

The concept of the velocity of money was used by proponents of the quantity theory of money to express the relation between the growth rate of the money stock and the rate of inflation. The belief of the quantity theorists that the rate of inflation is determined by the rate of growth of the money supply was based in part on the "equation of exchange," which can be derived from the definition of velocity. Multiplying both sides of the equation defining velocity (V = PY/M) by the money stock yields the equation of exchange, MV = PY.

The equation of exchange itself is merely a convenient way of expressing the identity between the dollar flow of expenditures and the market value of output. Since the two sides of the equation of exchange are merely alternative

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1 For a summary of the literature on the quantity theory, see Edwin Dean (editor), ***The Controversy*** Over ***the Quantig Theory of Money*** (Boston: D.C. Heath and Company, 1965).

2 An alternative measure of velocity was often used by quantity theorists. If T, the total number of purchases financed by monetary exchange, rather than Y is used as the measure of transactions, the transactions velocity of money can be defined as V' = P'T/M, where P' is the average price of all transactions. The focus in this article is on the effect of the money supply on income and economic activity. For this purpose, the income velocity of money, V, is more useful than the more inclusive transactions velocity of money, V'.

3 For simplicity, taxes, depreciation charges, and retained earnings are ignored. Thus, it is implicitly assumed that the value of total output is equal to the level of personal income.

4 It should not be inferred that the velocity of money actually corresponds to the number of times individual dollars are used to finance expenditures. Most money (defined in this article to include currency and demand deposits held by the nonbank public) is held in checking accounts, and it is impossible to distinguish one dollar of checking account money from another. Thus, it is impossible to trace each dollar and count the number of times it is used to finance expenditures.

ways of viewing the same transactions, they must be equal by definition. One can derive inferences regarding the causal relationship between inflation and the money supply only by making additional assumptions about the behavior of one or more of the variables included in the equation of exchange. It is the willingness to make certain assumptions about variables in the equation of exchange that distinguishes adherents of the quantity theory of money from those who find the equation of exchange merely a useful device for organizing information about economic relationships.

Quantity theorists assumed that total physical output and the income velocity of money are unaffected by changes in the money stock and can safely be assumed to remain constant in the short run.[5] For given values of Y and V, the equation of exchange indicates that a change in the money stock of a certain percentage must result in a change in the price level of the same percentage. Thus, a necessary inference from the quantity theory assumptions regarding the insensitivity of the level of output and the income velocity of money to changes in the money stock is that the rate of price inflation is determined by the rate of change of the money stock and the "natural" growth rate of real output.[6]

Quantity theorists believed that the level of output in the economy is determined by the availability and productivity of land, labor, and capital and was not affected by the money stock. The view that "money is a veil" that merely disguises the real functioning of the economy was expressed succinctly by a leading proponent of the quantity theory, Irving Fisher:

> . . . except during transition periods, the volume of trade, like the velocity of circulation of money, is independent of the quantity of money. An inflation of the currency cannot increase the product of farms and factories, nor the speed of trains or ships. . . . The whole machinery of production, transportation, and sale is a matter of physical capacities and technique, none of which depend on the quantity of money . . . .[7]

Thus, Fisher assumed that the potential output of the economy is not affected in the short run by changes in the supply of money. In general, proponents of the quantity theory believed that the actual level of output is normally equal to the potential level of output. They denied that a situation in which there were unemployed resources could persist except during "transition periods" to full employment equilibrium. Thus, the quantity theorists' assumption that real output is unaffected by changes in the money supply resulted from their belief that the ability to increase output is at all times constrained by physical capacity. limitations and the existing technology of production.

The assumption that the velocity of money is constant was deemed valid by the proponents of the quantity theory because the rate of turnover of money balances was believed to depend on economic and social relations that are

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5 It should be noted that some of the quantity theorists distinguish between the ultimate impact of a change in the money stock and the temporary effects that characterize the transition to the new equilibrium. The emphasis was always on the long-run effects of changes in the money supply, however.

6 The "natural" growth rate of real output can be thought of as the growth rate that results from increases in the labor force and improvements in productivity, assuming that all productive factors are fully employed at all times.

7 Irving Fisher, The Purchasing Power of Money (New York: The Macmillan Company, 1911), p. 155.

unaffected by changes in the money stock. Again quoting Fisher:

> The average rate of turnover . . . will depend on the density of population, commercial customs, rapidity of transport and other technical conditions, but not on the quantity of money.[8]

Given the various constraints imposed by the economic and social organization, the quantity theorists assumed that there is a fixed relation between total expenditures and the amount of money held to finance those expenditures. Thus, the demand for money was believed to depend only on the level of income and on social customs and institutional relationships.

The Cambridge Version of the Quantity Theory

A number of economists from Cambridge University in England changed the focus of the quantity theory of money without changing its underlying assumptions. The Cambridge version of the equation of exchange focuses on the fraction, k, of income held as money balances. Thus, the Cambridge version can be expressed as $M = kPY$. The k in the Cambridge equation is merely the inverse of V, the income velocity of money balances, in the original formulation of the quantity theory. The Cambridge version of the equation of exchange is important, however, because it directs attention to the determinants of the demand for money rather than the effects of changes in the supply of money. Assuming that total output and the desired fraction of income held as money balances are unaffected by changes in the money stock, the Cambridge version of the equation of exchange indicates that the price level is proportional to the supply of money; with the factor of proportionality being $(1/kY)$. Increases in the money stock in excess of the amount economic units desire to hold at the prevailing price level must lead to equiproportional changes in the price level in order to equate the supply of and demand for money. Thus, the result that the rate of inflation equals the growth in the money supply less the "natural" rate of increase in real output is the same regardless of which formulation of the equation of exchange is used. In both versions,, the result follows inexorably from the assumptions that the velocity of money balances (or equivalently, the desired fraction of income held as money balances) and the rate of growth of real output are independent of changes in the money supply.

KEYNES' CRITICISMS OF THE QUANTITY THEORY

One of the most important criticisms of the validity of the assumptions underlying the quantity theory was made by John Maynard Keynes, an economist whose name had once been associated with the "Cambridge school" of economists that reformulated the quantity theory. Keynes alleged that the quantity theory framework was too rigid for analyzing the effect of changes in the money supply on expenditures and the price level. He proposed a more complex theoretical framework for analyzing aggregate economic relationships.

Keynes developed his theory during the early 1930's, a period when policymakers and economists alike were becoming increasingly disenchanted with a theory based on the assumption that unemployment could persist only during temporary transition periods to the "normal" conditions of full employment equilibrium. With massive unemployment and

8 Fisher, p. 153.

declining real output in most industrial nations, the economics profession and the public at large were receptive to a new economic theory that seemed more consistent with observed phenomena.

Liquidity Preference and Velocity

Keynes rejected the notion that households and businesses want to hold a constant fraction of their incomes in cash balances. Instead, Keynes said, the income velocity of money depends on "many complex and variable factors," and analysis based on the presumption of constant velocity merely disguises the "real character of the causation."[9] Keynes identified three distinct motives for holding money balances:

> (1) to bridge the gap between receipt of income and planned expenditures—the transactions motive;
>
> (2) to provide a reservoir of purchasing power that can be used to finance unanticipated expenditures—the precautionary motive; and
>
> (3) to satisfy the desire to hold wealth in the most liquid form if one expects interest rates on ,alternative assets to rise, thereby causing capital losses—the speculative motive.

Keynes adopted the traditional Cambridge view that money held to finance expenditures, including both transactions and precautionary balances, is a constant fraction of the level of income. However, Keynes believed that money is held for purposes other than as a medium of exchange. The speculative motive for holding money is not directly related to expenditures, according to Keynes, but depends instead on the "liquidity preference" of asset holders. The amount of money held in speculative balances, Keynes hypothesized, depends on the anticipated direction and magnitude of prospective changes in market interest rates. If individuals believe that market interest rates are likely to increase in the future, they have an incentive to hold their wealth in the form of liquid assets in order to avoid the capital losses on long-term assets that would accompany the expected increase in interest rates. Those who hold money because they believe the yield on money balances will exceed the yield on alternative assets are said to exhibit liquidity preference.[10] Keynes hypothesized that more individuals expect a future increase in market interest rates when the current level of interest rates is low than when the current level of interest rates is high. Thus, liquidity preference and the speculative demand for money are hypothesized to be inversely related to the current level of interest rates.

Keynes' liquidity preference theory cast doubt on the quantity theory assumption of a constant income velocity of money. If money is held as a store of value as well as a medium of exchange, there need not be a fixed relation between the money stock and the level of expenditures. The determinants of the demand for money held to satisfy liquidity preference—the degree of risk aversion and the expected yield on alternative financial

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9 John Maynard Keynes, The General Theory of Employment, Interest, and Money (New York: Harcourt, Brace and World, 1964), p. 299.

10 In this context, the total expected yield on an asset is equal to the interest payment minus the expected capital loss, each expressed as a percentage of the market price of the asset.

assets—are not directly related to expenditures or income. It is possible, therefore, that the income velocity of money could change from one period to the next because of changes in expectations of future interest rate movements or attitudes toward risk. Moreover. Keynes argued. changes in the money supply can themselves lead to changes in velocity. The initial effect of an increase in the money supply. according to Keynes, is a drop in interest rates. The fall in interest rates leads to an increase in liquidity preference and a consequent decline in the velocity of money.

Keynes' original formulation of the theory of liquidity preference implies an "all-or-nothing" choice between money and other financial assets. An investor could maximize the expected return on his portfolio of financial assets by holding only long-term bonds if he expects market interest rates to fall and by holding no long-term assets if he expects market interest rates to increase, provided the increase in rates is sufficiently large to make the expected yield on long-term assets less than the yield on money. It is generally believed, however, that most investment portfolios include a wide variety of financial assets, each with a different yield and term to maturity.

James Tobin offered an alternative theory of liquidity preference that is more nearly consistent with observed portfolio behavior.[11] Tobin assumed that investors are concerned both with the expected yield and the riskiness of alternative assets and that most investors are willing to accept a somewhat lower yield on their portfolio if, by doing so, they can also reduce its risk. Even if the expected yield on money balances is less than the expected yield on alternative assets, investors may choose to hold part of their financial wealth in cash balances as a means of reducing the risk on their total portfolio of assets. The higher are the expected yields on alternative assets, however, the more costly it is to obtain a reduction in the riskiness of a portfolio by holding money balances. Thus, Tobin's theory of liquidity preference predicts portfolio diversification, with the fraction of financial wealth held in money balances being inversely related to the expected yield on alternative financial assets.

Keynes' Analysis of the Relation Between Output and Expenditures

The second major difference between Keynesian theory and the quantity theory is that Keynes did not assume that departures from full employment were temporary aberrations that could safely be ignored in economic analysis. It is possible in these circumstances that an increase in the level of expenditure caused by an increase in the money supply would lead to a rise in real output and employment rather than being dissipated entirely in higher prices. Keynes suggested analyzing the conditions that determine how increased expenditures will be divided between changes in real output and changes in prices rather than assuming at the outset, as the proponents of the quantity theory did, that the level of output is determined independently of the level of expenditure.

Implications of Keynesian Analysis

In summary, Keynes rejected the quantity theory conclusion that an increase in the money supply necessarily leads to an increase in the price level of the same proportion. He argued that the extent to which an increase in the money supply leads to higher spending depends on the numerous factors determining the

11 James Tobin, "Liquidity Preference as Behavior Toward Risk," Review of Economic Studies, Vol. 25, No. 67 (February 1958).

income velocity of money—factors such as the degree of liquidity preference and the interest elasticity of various kinds of expenditures. Moreover, Keynes asserted that increased expenditures do not lead inexorably to commensurate increases in the price level. Since resources can be less than fully employed for sustained periods, the level of real output can be influenced by aggregate demand. Thus, according to Keynes, the relation between changes in the money supply and changes in the price level is not as simple and direct as the quantity theory implied but depends on a myriad of real and financial conditions, each of which must be taken into account when analyzing the prospective inflationary impact of increases in the money supply.

There is now general agreement among economists and other observers that Keynes was correct in asserting that changes in aggregate demand do not necessarily result in commensurate changes in the overall price level. Theoretical and empirical considerations have led most economists to conclude that the rate of inflation accompanying a given growth in aggregate expenditures depends on the degree of utilization of productive resources, anticipations concerning inflation, and perhaps other factors.[12]

There is also general agreement among economists that the quantity theory assumption of a constant income velocity of money is an oversimplification. Variability in the income velocity of money does not necessarily imply that changes in the money supply do not have a predictable influence on aggregate spending, however. If the factors affecting velocity can be identified and the magnitude of their effects determined, it would be possible to estimate the size of prospective changes in velocity and to adjust monetary policy accordingly.

Unexpected changes in velocity would thwart attainment of the goals of monetary. policy, however, if the monetary authorities use the growth in the money supply as a measure of the impact of monetary policy on the economy. If unpredictable changes in velocity are both frequent and large, it may be desirable to use something other than growth in the money supply (interest rates, for 'example) to gauge monetary policy.[13] Thus, reliance on the growth rate of the money supply as an indicator of the effect of monetary policy on the economy presupposes that the determinants of velocity can be identified.

THE CURRENT VIEW OF THE DETERMINANTS OF VELOCITY

A number of theoretical models have been developed to explain the determinants of velocity. Many of these models are based on the inventory approach to the demand for money developed by William- Baumol and James Tobin.[14] In general, inventory models of cash

12 See, for example, Leonall C. Andersen and Keith M. Carlson, "A Monetarist Model for Economic Stabilization," Federal Reserve Bank of St. Louis Review, Vol. 52, No. 4, April 1970.

13 See J. A. Cacy, "The Choice of a Monetary Policy Instrument," Federal Reserve Bank of Kansas City Economic Review, May 1978, for a discussion of the factors affecting the choice between interest rates and the money supply as a gauge of monetary policy.

14 William J. Baumol, "The Transaction Demand for Cash: An Inventory Theoretic Approach," Quarterly Journal of Economics, Vol. 66, No. 4 (November 1952); and James Tobin, "The Interest Elasticity of Transactions Demand for Cash," Review of Economics and Statistics, Vol. 38, No. 3 (August 1956).

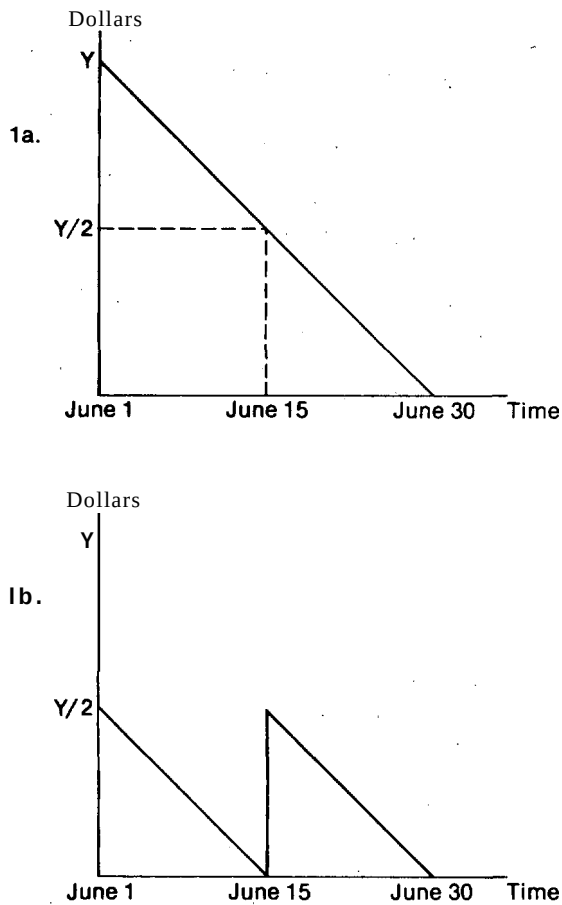
A number of alternative models of the demand for money have been developed. The demand for money functions advocated by most monetarists are more general than the inventory models. Monetarist models view money as one of many forms in which wealth can be held. The demand for money is thus postulated to depend on total wealth and the yields on money and other assets. At a very abstract level, there is no conflict between monetarist models (or portfolio balance models as they are sometimes called) and inventory

management view money balances as reservoirs or "inventories" of purchasing power that can be drawn upon as needed to finance expenditures. Earning assets are considered alternatives to money balances as temporary repositories of funds held to bridge the gap between receipt of income and its subsequent expenditure.

The Inventory Model of Cash Management

It is useful to analyze a simple inventory model to understand the implications of such a model for the determinants of the demand for money.[15] Assume that an individual receives a lump sum income payment of $Y at the beginning of every month and spends this income at a constant rate throughout the month, with all expenditures being financed by checks drawn on the individual's demand deposit. If the entire income payment is deposited directly in the checking account at the beginning of the month, the demand deposit balances will exhibit the profile demonstrated in Chart la, declining steadily from $Y at the beginning of the month to $0 at the end of the month.[16] The average daily

Chart 1
MONTHLY PROFILE OF MONEY BALANCES



models of the demand for money. The distinguishing characteristic of inventory models is the presumption that the level of expenditures is an important determinant of the fraction of wealth held in money balances. For an introduction to monetarists' views on velocity and the demand for money, see Milton Friedman (editor), Studies in the Quantity Theory of Money (Chicago: University of Chicago Press, 1956).

15 The exposition of the inventory model that follows is essentially the same as that presented in Baumol.

16 The profiles in Chart 1 are simplified slightly to demonstrate the essential characteristics of the inventory models. Since demand deposit balances are computed only at the end of each banking day, the measured balance in the demand deposit would decrease by equal amounts each banking day, yielding a "stairstep pattern" for the balance rather than the smooth decline pictured in the charts. This simplification does not alter the analysis, however.

balance in these circumstances is **$Y/2**, and the income velocity of funds held in the checking account is 2 per month [that is, **(Income)/(Average** Balance) = **($Y** per month) **/($Y/2** = 2 per month].

The individual can reduce the average amount held in his demand deposit by investing part of his paycheck temporarily in interest-earning assets. Assume, for example, that one-half of the monthly income payment is deposited directly in a demand deposit and the other one-half is invested in a short-term interest-earning asset. The beginning balance in this case is **$Y/2**, and the balance declines at a steady rate until reaching $0 in the middle of the month. At this point, the individual must redeem the interest-earning asset purchased at the beginning of the month and deposit the proceeds in his demand deposit if he is to maintain the same expenditure pattern as in the previous example.[17] Deposit of the funds from redemption of the interest-earning asset results in an increase of the checking account balance to **$Y/2**, which decreases at a steady rate for the duration of the month and reaches $0 at the end of the month. The pattern of the checking account balance corresponding to this sequence of events is demonstrated in Chart 1b. The average daily balance in the checking account is reduced to **$Y/4** by the temporary investment of one-half of each month's income in interest-earning assets, and the income velocity of demand deposit balances is increased to 4 per month [that is, **($Y** per **month)/($Y/4)** = 4 per month].

The reduction in the average demand deposit balance and the consequent increase in interest income is not costless, however. The individual incurs a cost in transferring funds from interest-earning assets into his demand deposit. Assuming that there is a fixed brokerage fee, **$b**, associated with such transfers, the decision to invest 50 per cent of the monthly income receipt would increase interest income net of **transactions** costs if the incremental interest income exceeds **$b.** If an individual finds it worthwhile to invest one-half of his income in short-term assets at the beginning of each month and makes one subsequent transfer of funds in the middle of the month, he might consider the possibility of investing two-thirds of his income initially and making two intramonthly transfers (after one-third of the month and two-thirds of the month had elapsed) into his checking account. In fact, an individual will find it profitable to increase the proportion of funds invested in interest-earning assets up to the point where the cost of making an additional transfer of funds into his checking account from other assets just offsets the incremental income from reducing the amount held in money balances.

Implications of the Inventory Model

Inventory models of cash management imply that the amount of cash held in transactions balances is inversely related to the yield on alternative assets. Thus, the interest sensitivity of the transactions demand for money provides a reason for expecting the income velocity of money to vary directly with the level of interest rates, a result that reinforces the liquidity preference effect of higher interest rates on velocity that was posited by Keynes. The incentive to economize on cash balances by holding funds in interest-earning assets must be weighed against the cost incurred in

[17] **For simplicity, it is assumed that interest earned on the funds invested temporarily in short-term assets is reinvested rather than being spent immediately. It is also assumed that transfers of funds from interest-earning assets are always of the same dollar amount as the original deposit in the demand deposit. For a proof of this proposition, see James Tobin, "The Interest Elasticity of Transactions Demand for Cash."**

transferring funds to determine the optimal allocation between money and other assets.

In addition to the implication of an interest-sensitive demand for transactions balances, the inventory approach to the demand for money implies that the velocity of money tends to increase as income rises. This tendency results from economies of scale in managing transactions balances, which is implied by the inventory models. Economies of scale exist if economic units desire to increase their cash balances less than proportionately to increases in the level of expenditures. The formal solution to the simple inventory model indicates that the optimal amount of money balances held for transactions purposes increases proportionately less than anticipated expenditure because it becomes practical to hold a larger percentage of working balances in interest-earning assets as the scale of expenditure increases.[18]

Extensions of the Inventory Model

The assumption of the simple inventory models that the timing of withdrawals from checking accounts is known with certainty is somewhat unrealistic. For many individuals and businesses, the magnitude and timing of many expenditures are somewhat unpredictable. Moreover, the time that elapses between the day a check is written and the day the corresponding funds are withdrawn from the demand deposit is subject to a number of random elements. It may be prudent, in these circumstances, to keep a cushion of liquidity in cash balances to ensure against insufficiency of immediately available funds. The desire to maintain a cushion of liquidity in the form of cash balances to meet unforeseen contingencies is what Keynes called the precautionary motive for holding money. Many of the same principles that govern management of transactions balances also apply to management of precautionary balances.[19] Alternative sources of liquidity are available for precautionary purposes. The cost of holding precautionary cash balances is the interest income foregone on alternative liquid assets, and the larger is the scale of anticipated expenditures, the greater is the reward for holding a portion of precautionary balances in interest-earning assets rather than money. In addition, the likelihood of having a large percentage of cash disbursements occur unexpectedly within a given time period is inversely related to the number of expenditures since stochastic elements tend to average out as the frequency of expenditures increases.[20] Thus, the theoretical framework for analyzing the precautionary motive for holding money implies that the amount held in precautionary balances is inversely related to the yield on alternative assets and increases less than proportionately to the level of expenditures.

THE POSTWAR RISE IN VELOCITY

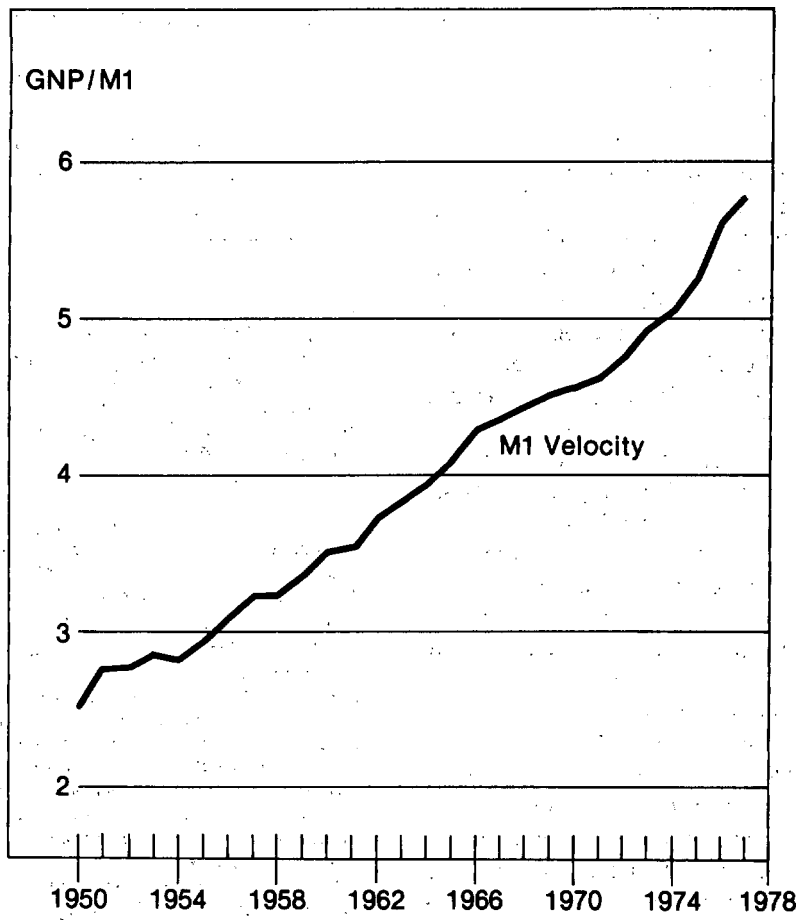
The ratio of gross national product (GNP) to the narrowly defined money stock (M1), which is the ratio most commonly used to measure the income velocity of money, has risen steadily in the postwar period (Chart 2). The analysis of the transactions, precautionary, and speculative motives for holding money outlined earlier

18 For a more complete exposition of the formal derivation of the income and interest rate elasticities implied by the inventory model, see the Appendix on p. 30.

19 See S. C. Tsiang, "The Precautionary Demand for Money: An Inventory Theoretical Analysis," Journal of Political Economy (January-February 1969), for an analysis of factors affecting the .amount held in precautionary money balances.

20 For a detailed analysis of the effect of uncertainty on the demand for money, see Don Patinkin, Money, Interest, and Prices (New York: Harper and Row, 1965), Chapters 5 and 6.

Chart 2
THE POSTWAR TREND OF M1 VELOCITY



is generally consistent with the upward trend in velocity for the past 30 years. The various theoretical considerations previously discussed imply, for instance, that the demand for money decreases as the level of interest rates rises. The upward trend in interest rates in the postwar period helps to explain the secular increase in the income velocity of money.

The implication of the simple inventory model—that the amount of money held to finance expenditures increases less than proportionately to the level of expenditures—provides an additional explanation for the upward trend in income velocity. Real income and expenditure have grown steadily in the postwar period, and the relatively slower growth of the money stock indicates the plausibility of the hypothesis of economies of scale in cash management.

The growing availability of money substitutes has probably also contributed to the rise in velocity in the postwar period. The inventory models imply that the cost of converting interest-earning assets into money is a significant determinant of the fraction of income held as cash balances. It is unlikely,

however, that the multitude of factors affecting the ease of transferring funds is adequately captured by the assumption of a constant brokerage fee. A variety of new types of financial assets have been developed over the past 30 years, and the effect of many of these financial innovations has been to make it easier for firms and individuals to maintain a larger fraction of their liquid balances in earning assets. The growing importance of nonbapk financial intermediaries has been particularly important in expanding the types of money substitutes available to the household sector. Many of these liquid assets are such close substitutes for demand deposits and currency that a number of analysts have suggested the concept of money be broadened to include time and savings deposits.[21] Virtually all analysts agree that the various financial innovations in the past three decades have lowered the effective cost of converting earning assets into money and have thereby contributed to the upward trend in the income velocity of the narrowly defined money supply.

In summary, many factors have contributed to the rise in the income velocity of money in the postwar period. Inventory models of cash management provide a useful framework for analyzing the impact of higher interest rates, economies of scale, and financial innovation on the income velocity of money. The implications of the inventory models are ,consistent with postwar experience in a qualitative sense, but it is only by empirical estimation of the quantitative impact of various influences on the demand for money that definitive conclusions can be drawn regarding the importance of each factor for the behavior of the income velocity of money.

A number of empirical studies have attempted to determine the important parameters of the aggregate demand for money function.[22] The equation to be estimated typically specifies the demand for real money balances as a function of the yield on one or more alternative assets and some measure of real income.[23] It is often assumed that

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21 See Milton Friedman and Anna J. Schwartz, **Monetary Statistics of the United States** (New York: National Bureau of Economic Research, 1970), for a comprehensive discussion of the issues involved in choosing the types of assets to be included in "the" money supply.

22 For ease of exposition, the term "demand for money function" will be used to refer to functions with either the quantity of money balances or the income velocity of money (or its inverse) as the variable to be explained. A velocity function can easily be converted to an explicit demand for money function by simple algebraic manipulation. Thus, a particular specification of a velocity function implies a unique specification of the demand for money function and vice versa.

For a summary of much of the empirical work on the demand for money, see Edgar L. Feige and Douglas K. Pearce, "The Substitutability of Money and Near-Monies: A Survey of the Time-Series Evidence," **Journal of Economic Literature,** Vol. 15, No. 2 (June 1977).

23 Milton Friedman, "The Demand for Money: Some Theoretical and Empirical Results," **Journal of Political Economy** (August 1959), advocates use of a long-run concept of income in specifying a demand for money function. Friedman argues that individuals adjust their desired money balances in line with the sustainable level of income over a prolonged period, a concept which he calls "permanent income." Karl Brunner and Allan H. Meltzer, "Predicting Velocity: Implications for Theory and Policy," **Journal of Finance, Vol. 18,** No. 2 (May 1963), prefer to include wealth rather than either current or permanent income in the demand for money function.

If something other than current income is included as the scale variable in specifying a demand for money function, the derivation of a velocity function requires that the relation between current income and the included scale variable be specified. The necessity to specify the relation between current income and either permanent income or wealth, neither of which can be measured directly, introduces the possibility of compounding errors in specifying the demand for money function and errors in measuring the independent variables used to explain the demand for money. In addition, it is difficult to see the relevance of concepts such as permanent income and wealth for the demand for money by the business sector. To avoid these conceptual problems, the discussion in this article focuses on the traditional specification of the demand for money function, with measured income as the scale variable.

individuals and businesses do not adjust their actual cash balances to desired levels instantaneously. This assumption is incorporated by including past values of income and interest rates in the equation explicitly or by inferring the speed of adjustment to desired values from the coefficient on the lagged value of the money stock.

The results from empirical estimation of the demand for money function differ substantially according to the statistical techniques used, the period for which the equation is estimated, and the precise specification of the form of the function. In general, though, the empirical results are generally consistent with the predictions from the inventory models outlined earlier.[24] Most studies find that the demand for money increases less than proportionately to the level of income, that yields on alternative assets have a significant negative impact on the desired level of cash balances, and that the introduction of new types of liquid assets results in slower growth in the quantity of money demanded.

In the judgment of many analysts, empirical estimates indicate that the demand for money function has exhibited substantial stability and that unexpected changes in the income velocity of money are therefore unlikely to invalidate the use of the money supply or its growth rate as the primary indicator of monetary policy. A number of economists consider the evidence on the stability of the demand for money function so persuasive that they advocate reinstitution of a revised version of the quantity theory of money as the primary framework for analyzing macroeconomic relations. The monetarists, as the new advocates of a revised quantity theory are called, assign a primary role to growth in the money stock as a determinant of the growth in total spending. Indeed, most monetarists deny that factors other than the growth in the money supply, such as fiscal policy, exert any systematic influence on income or inflation except, perhaps, in the very short run.[25]

The consensus regarding the relative stability of the demand for money and velocity functions that emerged from the numerous empirical studies mentioned has had a significant impact on the implementation of monetary policy. The Federal Reserve has increasingly emphasized the importance of monetary growth for economic performance in the past several years. The general climate of opinion seemed, until recently, to have come full circle—from the constant velocity assumption of the original quantity theory, through the deemphasis of velocity resulting from the economic experience in the 1930's and Keynes' criticism of the quantity theory, to the apparent empirical verification of a stable demand for money function and the belief that unpredictable changes in velocity are unlikely, to have a significant impact on income and inflation. The assumption of a constant income velocity as a basis for analyzing aggregate economic relations was replaced by the presumption that velocity was predictable, though not necessarily constant.

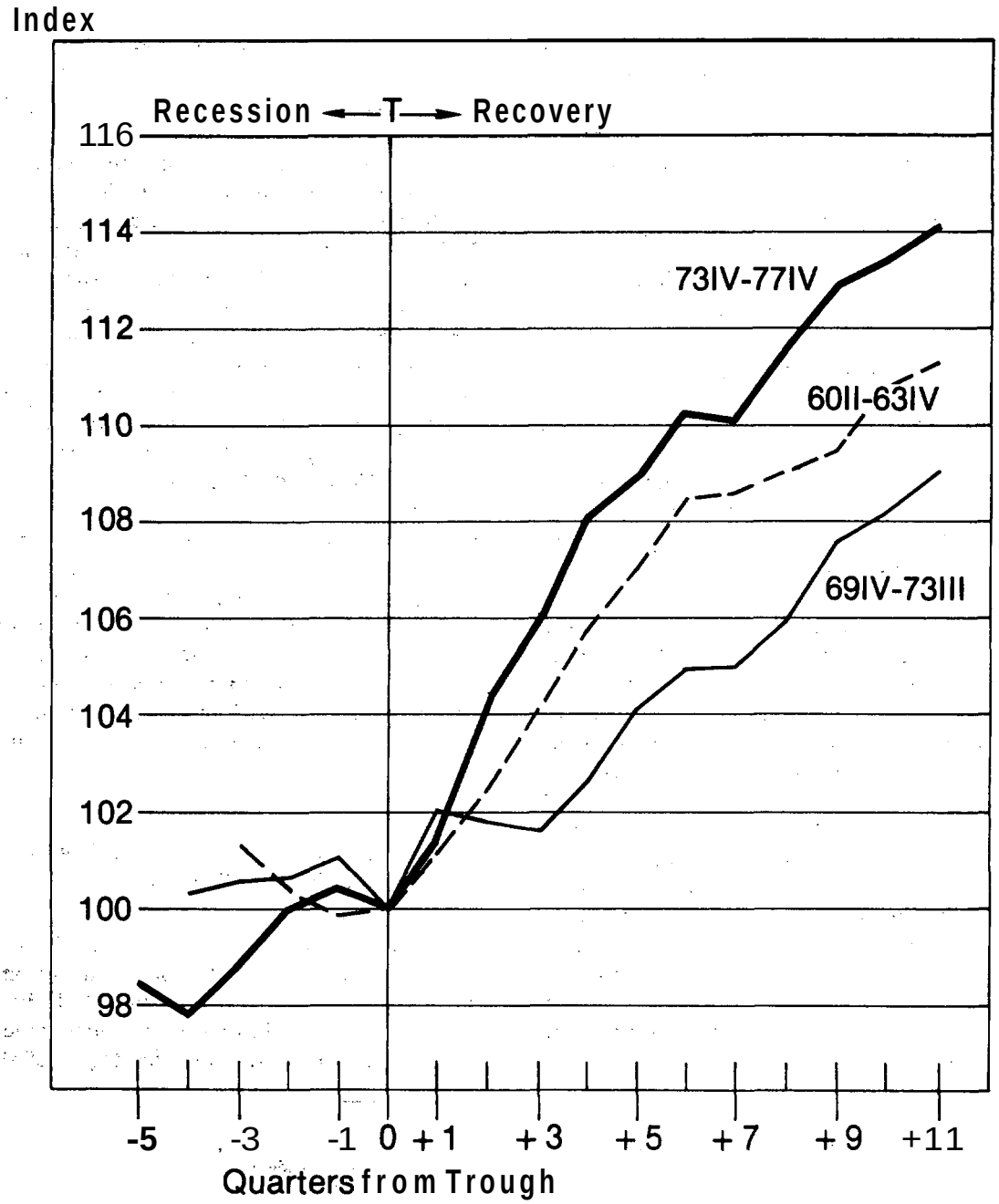
THE BEHAVIOR OF VELOCITY IN THE CURRENT RECOVERY

Recent experience has led some analysts to question whether the behavior of the income velocity of money is predictable. Velocity—especially for M1—has increased quite rapidly in the past three years, and the degree of the

24 Empirical estimates of the income and interest elasticities of the demand for money from numerous studies are reported in Feige and Pearce.

25 See Andersen and Carlson for an example of the model of the economy considered relevant for macroeconomic analysis by two well-known monetarists.

Chart 3
CYCLICAL BEHAVIOR OF M1 VELOCITY



rise in velocity, particularly in 1975 and 1976, seems to many to be inconsistent with past experience. Although the income velocity of money typically increases substantially during economic upturns, the rapidity and duration of the most recent rise in velocity has been exceptional. (See Chart 3.) The rapid growth in M1 velocity for the past three years is particularly surprising when one considers the accompanying pattern of increases in market interest rates. One of the primary factors contributing to the normal increase in velocity during periods of economic expansion is the rise in market interest rates that typically accompanies rapid economic growth. Businesses and households intensify their efforts to economize on cash balances as the opportunity cost of holding money rises. A substantial portion of the increase in velocity during the current expansion occurred in 1975 and 1976, however, a period in which market rates were generally declining. Thus, the interest sensitivity of the demand for money does not provide a complete explanation of the behavior of velocity in the current recovery.

The quickened pace of financial innovation in the 1970's accounts for a portion of the apparent downward shift in the demand for money function in recent years. A number of regulatory and legal decisions have permitted financial institutions to offer plans that have resulted in a decline in desired M1 balances relative to income. Thrift institutions, for example, have begun to offer interest-bearing accounts that can be used to make payments in much the same way as can checking accounts. Commercial banks have responded by making it easier for their customers to transfer funds out of interest-earning deposits into checking accounts. In addition, businesses and state and local government units have been authorized to hold some of their funds in savings deposits. All of these and other innovations have undoubtedly contributed to the reduction in the desire to hold funds in checking accounts. The total impact of all of these financial innovations can explain only a small fraction of the recent shortfall in the demand for money, however.[26]

Even after taking account of the probable impact of financial innovation, most empirical studies have found that the behavior of M1 velocity in recent years cannot be explained by traditional demand for money functions. A great deal of additional empirical work will be needed to resolve what one author has called "The Case of the Missing Money."[27]

Resolution of the puzzling behavior of velocity in recent years has important implications for monetary theory and policy. If the recent behavior of velocity can be explained within the general framework of traditional economic analysis, predictions based on the presumption of a stable velocity function will

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26 For an estimate of the impact of financial innovation on the demand for money, see Jared Enzler, Lewis Johnson, and John Paulus, "Some Problems of Money Demand," Brookings Papers on Economic Activity, 1976:1.

27 Stephen M. Goldfeld, "The Case of the Missing Money," Brookings Papers on Economic Activity, 1976:3. Goldfeld tried to explain the rapid increase in velocity in recent years using a number of alternative specifications of the demand for money function. While some specifications proved to be slightly better than others, none were capable of satisfactorily explaining the recent behavior of velocity. Goldfeld concluded that "Specifications that seem most reasonable on the basis of earlier data are not the ones that make a substantial dent in explaining the recent data" and that his efforts to solve the puzzle of the shortfall in the demand for money had been unsuccessful (p. 725).

Michael Hamburger, "Behavior of the Money Stock: Is There a Puzzle?" Journal of Monetary Economics, Vol. 3, No. 3 (July 1977), claims to have solved the puzzle of the recent behavior of velocity. The primary differences between the demand for money functions specified by Goldfeld and Hamburger is that Hamburger includes the yields on a wider variety of assets and constrains the income elasticity of the demand for money to be 1. The constraint on the income elasticity, although not uncommon, seems difficult to justify on either theoretical or empirical grounds. It remains to be seen, therefore, whether the solution to the money demand puzzle posited by Hamburger provides a basis for confidence in predictions of the future course of velocity.

continue to be important determinants of the course of money policy. It is possible that the rapid increases in velocity in the last few years can be satisfactorily explained by economic determinants that have not previously been incorporated into theoretical and empirical studies of the relation between the money supply and the level of income. Incorporation of these determinants could yield a velocity function that is sufficiently stable to be valuable for economic and policy analysis. If, on the other hand, the factors causing the atypical behavior of velocity in recent years cannot be identified, economic analysis based on the predictability of the income velocity of money might result in future policy errors that impair economic performance. Thus, questions regarding determinants of the velocity of money are certain to continue to play a dominant role in discussions concerning the future course of inflation, income, and employment.

CONCLUSIONS

A central assumption of economic analysis is that there are certain key relations in the economy that are stable enough over time to warrant confidence in predictions based on economic models that incorporate those relations. One of the central relations on which economists and policymakers have traditionally relied in analyzing aggregate economic activity is the connection between the money supply and the level of income. The concept of the velocity of money has been both lauded and scorned at various stages in the development of economic theory. This article has discussed the evolution of macroeconomic theories that have affected the attitudes toward the concept of velocity and the empirical evidence that supports these attitudes. Although there is not now, nor has there ever been, complete agreement regarding the determinants of the income velocity of money, the concept of velocity will almost certainly remain a subject of extensive debate among policymakers, economists, and other analysts. As economic theory and data availability have become more refined, understanding of the behavior of velocity has advanced substantially. Continued effort will be required, however, to ensure that knowledge about the factors affecting velocity is keeping pace with the changing economic and social environment in which policy decisions are made.

APPENDIX

In the inventory models of the transactions demand for money, the interest incentive to economize on cash balances is counterbalanced by the cost of transferring funds from interest-earning assets into money as necessary to finance expenditures. Although it is traditionally assumed that the primary cost of converting earning assets into cash is the fixed brokerage fee associated with transferring funds, it seems likely that the major cost for individuals of transferring funds is the opportunity cost of the time necessary to effect such a transfer. Particularly if funds are held temporarily in time and savings deposits at financial intermediaries rather than in money balances, a major factor contributing to the perceived cost of transferring funds out of interest-earning assets into cash is the reduction in leisure time resulting from careful management of cash balances. For a more complete exposition of this point, see Dean S. Dutton and William P. Gramm, "Transactions Costs, the Wage Rate, and the Demand for Money," **American Economic Review,** Vol. **63,** No. 4 (September 1973). The same study provides a possible explanation for the discrepancy between the income elasticity of the demand for money estimated empirically and the scale elasticity implied by simple inventory models.

It is informative in this regard to reformulate the inventory model to take account of both the substitution effect and the scale effect of a change in income resulting from a change in the real wage. If in addition to a fixed brokerage fee (b) for transferring funds from one type of asset to another, there is an opportunity cost of time equal to a proportion (g) of the individual's real wage, then the total cost (X) of maintaining a cash balance needed to finance transactions is:

$$X = r(C/2) + (Y/C)(b + gw)$$

where

Y = total expenditures per time period;
C = the size of transfers from interest-earning assets into cash;
w = the real wage per period;

and

r = the opportunity cost per period of holding funds in noninterest-bearing form.

Differentiating this expression with respect to C and setting the result equal to zero, we find that the cost function is minimized by holding an average balance C/2 equal to the square root of [Y(b + gw)/2r]. The elasticity of the average cash balance with respect to the volume of expenditures is +1/2 as in the Baumol formulation.

But since an increase in the real wage increases the opportunity cost of time necessary to effect transfers into or out of money, an increase in income resulting from an increase in the real wage has an effect on the demand for money which is independent of the level of expenditure. The magnitude of this effect can be found by differentiating the expression for average cash balances with respect to w and multiplying the result by [w(C/2)]. This yields an expression for the (partial) elasticity of the demand for money with respect to the wage rate which, when simplified, is 1/2[1/(1 + b/gw)]. This "pure income effect" due to the substitution possibilities between leisure and income in regard to managing active money, balances will be closer to +1/2 the larger is the percentage of the total cost of transferring funds attributable to the opportunity cost of the individual's time. If, therefore, income is used to measure both the scale of expenditure effect and the substitution effect, one would expect the measured income elasticity to be in the interval (+1/2, +1). Thus, a measured income elasticity close to +1 does not, as is often alleged, refute the hypothesis of economies of scale in cash management.