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The Relationship Between Monetary Base and Money: How Close?

ALBERT E. BURGER

LATELY, there has been considerable discussion about setting targets for the growth rate of money. However, of those proposing such targets for monetary growth, none has stated the probability that the actual growth rate of money will fall within the bounds they have suggested. Clearly, the Federal Reserve cannot guarantee with 100 percent certainty that it will achieve any specific growth rate of money, and Congress should not expect the Federal Reserve to do so. There always exists a probability greater than zero that the growth rate of money will exceed or fall short of its targeted rate by some amount. If investors and businessmen are going to use publicly announced targets for the growth rate of money in their investment decisions, it would be helpful to them to be able to determine the probability that such a growth rate will be achieved.

The operational procedure the Federal Reserve uses to achieve a monetary growth rate is crucial in determining the probability that the announced growth rate for money will be achieved. Using historical evidence, this article develops confidence intervals for the growth rate of money associated with two procedures whereby the Federal Reserve would use its control over the monetary base as the means to achieve a growth path for money. This type of analysis helps answer questions such as the following: if the Federal Reserve announced that it desired the growth rate of the money stock to be 6 percent over a specified future period, say the next twelve months, then based on the historical evidence, what would be the probability that the growth rate of money would fall within some bounds of, say, 5 to 7.5 percent?

The first procedure is one in which the Federal Open Market Committee (FOMC) would direct the Trading Desk to maintain the growth of the monetary base at the same rate as its desired growth rate for money. For example, if the FOMC decided it wanted the money stock to grow at a 6 percent rate over the next twelve months, it would direct the Desk to have the monetary base grow at a 6 percent rate over the next twelve months. The second procedure is one in which the relationship between the monetary base and money (the money multiplier) would be "predicted" each month. Using these predictions of the multiplier, the Desk would supply the amount of monetary base necessary to hit their target value for money.

The Federal Open Market Committee is frequently interested in evaluating the effects of its actions over the next year where the "year" may begin in the month of the FOMC meeting, not necessarily in January. Therefore, throughout this analysis consecutive moving time intervals are used. This permits the analysis to be developed with a large number of observations. For example, there are 216 observations on rates of change of the base and money over consecutive moving twenty-four month intervals included in the sample period spanning the twenty years from 1954 through 1973.[1] The analysis begins with month-to-month observations of the difference between the growth rates of monetary base and money, and then the time interval is progressively lengthened to consecutive twenty-four month intervals. The same procedure is then repeated using quarterly data, where the longest time period considered is eight quarters.

Setting the Growth of Base Equal to the Desired Growth of Money

The mean (average) difference between the growth rates of the monetary base and the money stock provides evidence as to how close the growth rates of these two aggregates have been, on average,

[1]The results were not significantly different if the sample period was altered. For example, essentially the same results held for all length time intervals within a sample period 1954-63 and within a sample period 1964-73, and these results were essentially the same as those for the longer sample period 1954-73.

Table I

Difference Between Annual Growth Rates of Monetary Base and Money: 1954-1973[1]

	Monthly						
	One-Month	Three-Months	Six-Months	Nine-Months	Twelve-Months	Eighteen-Months	Twenty-Four Months
Mean	0.090%	0.124%	0.123%	0.134%	0.141%	0.160%	0.182%
Standard Deviation	3.975	2.117	1.475	1.233	1.092	0.890	0.774
Number of Observations	239	237	234	231	228	222	216
	Quarterly						
	One-Quarter	Two-Quarters	Three-Quarters	Four-Quarters	Five-Quarters	Six-Quarters	Eight-Quarters
Mean	0.128%	0.124%	0.134%	0.141%	0.152%	0.160%	0.182%
Standard Deviation	1.706	1.367	1.173	1.049	0.943	0.866	0.759
Number of Observations	79	78	77	76	75	74	72

[1]All data are seasonally adjusted, and are annual growth rates of monetary base minus annual growth rates of money. Consecutive periods are used. For example, if the first three-month period is December-March, the next period is January-April and the next period is February-May.

over different length time intervals. However, even if the mean difference is very small, there may be considerable variation about this mean. The standard deviation of these differences permits the establishment of confidence intervals on the difference between the growth rates. In this manner, conditional statements can be made about the probability that the growth rate of money will diverge from the growth rate of the base for a time period of specified length.[2]

Some financial analysts prefer to use month-to-month comparisons, while others prefer quarter-to-quarter comparisons. Therefore, Table I presents the mean and standard deviation of the difference between the growth rates of the seasonally adjusted monetary base and money on monthly and quarterly bases, respectively. For all length time periods the mean of the difference is very small, showing that, regardless of the length of the time period, the growth of the money stock was approximately the same, *on average*, as the growth of the monetary base.

However, there are substantial differences with respect to the variation about this mean as the length of the time period is altered. In general, the longer the time interval, the smaller is the variation around the mean. For example, the monthly data show a standard deviation of 4 percentage points for a one-month interval, then the standard deviation steadily decreases as the time interval lengthens, reaching about 0.75 percentage point for twenty-four month intervals.[3] The quarterly data show a similar pattern, though less pronounced than the monthly data. The quarterly data are an average of three months data, hence a considerable part of the very short-run variation between the relative growth rates of money and base is reduced.

The standard deviation can be used to make conditional probability statements about the difference between growth rates of base and money for specified time periods.[4] For example, as shown in Table I, the mean of the difference between the growth rates of base and money over all consecutive twelve-month periods from 1954 through 1973 is 0.141 percentage point, and the standard deviation is 1.092 percentage points. Therefore, based on the historical evidence, one would expect that 95 percent of the observations on the growth rate of money over all twelve-month periods would be between about +2.3 percentage points and −2 percentage points of the growth of the base.

[2]These probability statements are conditioned upon the assumption that future observations are drawn from the same population as the sample observations.

[3]The term "percentage points" is used to denote differences between growth rates which are expressed in percent per annum. For example, if the growth rate of base is 6 percent and the growth rate of money is 5 percent, then the difference between the growth rates of base and money is one percentage point.

[4]Assuming these observations are drawn from a population where the observations are normally distributed, about 68 percent of the observations lie within plus or minus one standard deviation of the mean, and about 95 percent of the observations lie within plus or minus two standard deviations of the mean. The frequency distribution of the observations was examined and Chi-square tests were performed. These tests supported the assumption that the observations were drawn from a normally distributed population.

Since the mean of the differences between the growth rates of base and money is about zero, the most likely result over a twelve-month period is that the growth of money would be approximately the same as the growth of the monetary base. By methodological convention one would say that, based on the historical evidence, it would be very unlikely (in the sense of having occurred only 5 percent of the time) that the growth rate of money would diverge from the growth rate of the monetary base by more than about ±2 percentage points over any given twelve-month period.

These results in Table I indicate the following conclusions:

(1) It is not unlikely that over a short time period the growth of the monetary base will be substantially different from the growth rate of the money stock.

(2) As the time period lengthens, the deviations between the growth of the money stock and the monetary base are reduced significantly. For example, lengthening the comparison interval from month-to-month growth rates to a six-month interval reduces the standard deviation from 4 percentage points to 1.5 percentage points, a reduction of over 60 percent.

These conclusions have practical implications for a situation in which the FOMC would decide that it wanted money to grow at a 6 percent rate over the next twelve months, and then instructed the Trading Desk to operate so as to achieve a 6 percent rate of growth for the monetary base. It would not be unlikely that for the first few months the growth rate of money might be significantly different than 6 percent, even if the growth rate of the base was maintained at a 6 percent rate.

The FOMC should not be "alarmed" at this result, and should not drastically alter its target growth rate for the monetary base as a result of this deviation. Historical evidence suggests that the probability of achieving a 6 percent growth rate of money by a maintained policy of controlling the growth rate of the base at 6 percent increases substantially as the time period lengthens. Historical evidence indicates that with a 6 percent growth rate of the monetary base over a twelve-month period there would be a 95 percent probability that the growth of money over this period would be in the range of 4 to 8 percent.

An Alternative Approach to Controlling Money

The above procedure yields, on average, fairly satisfactory results. However, at certain times, divergences between the growth rates of monetary base and money have been great enough and lasted long enough so that the changed growth rate of money had an undesired influence on economic activity. The period from about mid-1974 into early 1975 was an example of this situation.

Table II

Annual Growth Rates of Monetary Base and Money: 1974 through August 1975[1]

	Growth Rate of Monetary Base	Growth Rate of Money	Difference Between the Growth Rates of Base and Money[2]
Six-Month Periods			
12/73 - 6/74	8.6%	6.4%	2.2%
1/74 - 7/74	8.4	7.1	1.3
2/74 - 8/74	8.1	5.5	2.6
3/74 - 9/74	8.5	4.0	4.5*
4/74 - 10/74	7.3	3.6	3.7*
5/74 - 11/74	8.3	4.4	3.9*
6/74 - 12/74	8.7	3.2	5.5*
7/74 - 1/75	6.0	0.9	5.1*
8/74 - 2/75	6.8	1.4	5.4*
9/74 - 3/75	7.0	3.1	3.9*
10/74 - 4/75	6.3	3.0	3.3*
11/74 - 5/75	4.5	3.5	1.0
12/74 - 6/75	7.3	6.1	1.2
1/75 - 7/75	8.2	8.6	−0.4
2/75 - 8/75	7.5	8.5	−1.0
		Mean	2.81
		Standard Deviation	2.05
Twelve-Month Periods			
12/73 - 12/74	8.6%	4.8%	3.8%*
1/74 - 1/75	7.2	3.9	3.3*
2/74 - 2/75	7.5	3.4	4.1*
3/74 - 3/75	7.8	3.6	4.2*
4/74 - 4/75	6.8	3.3	3.5*
5/74 - 5/75	6.4	3.9	2.5*
6/74 - 6/75	7.9	4.6	3.3*
7/74 - 7/75	7.1	4.7	2.4*
8/74 - 8/75	7.2	4.9	2.3
		Mean	3.27
		Standard Deviation	0.72

[1]All data are seasonally adjusted. These results are based upon money stock data as available in early October, 1975.

[2]An asterisk indicates that the difference exceeds two standard deviations based on the sample period 1954-1973.

Beginning about mid-1974 and carrying into early 1975, the divergence between the growth rates of monetary base and money was unusually large by the historical standard of the period 1954-73.[5] For many of the consecutive six- and twelve-month periods reported in Table II the divergences exceed two standard deviations. For example from February 1974 to February 1975 the monetary base rose 7.5 percent but the money stock increased only 3.4 percent.

[5]See Albert E. Burger, "Explanation of the Growth of the Money Stock: 1974-Early 1975," this *Review* (September 1975), pp. 5-10.

Table III

Mean and Standard Deviation of the Differences Between Actual and Predicted Growth Rates of Money Resulting from Predicting the Money Multiplier[1]

Monthly: December 1953 - December 1973

	One-Month	Three-Months	Six-Months	Twelve-Months	Eighteen-Months	Twenty-four-Months
Mean	-0.145%	-0.040%	-0.022%	-0.018%	-0.017%	-0.012%
Standard Deviation	4.342	1.440	0.724	0.360	0.236	0.178
Number of Observations	240	238	235	229	223	217

Quarterly: IV/53 - IV/73

	One-Quarter	Two-Quarters	Four-Quarters	Six-Quarters	Eight-Quarters
Mean	-0.046%	-0.023%	-0.019%	-0.014%	-0.013%
Standard Deviation	0.144	0.490	0.240	0.157	0.119
Number of Observations	80	79	77	75	73

[1]All data are seasonally adjusted. Predicted growth rates of money were computed for each period using the predicted level in period t, compared with the actual level in period t-1 or t-3, etc.

Therefore, an alternative approach in which the monetary base remains the keystone for control of money is suggested. In this procedure the money stock is expressed as M = mB, where "m" denotes the money multiplier and "B" denotes the monetary base. The multiplier summarizes all those factors not included in the monetary base that influence the money stock. In other words, divergences between the growth rates of money and base reflect fluctuations in the money multiplier.[6]

Are periodic variations in the money multiplier predictable enough to allow for offsetting actions by the Federal Reserve? Could the Federal Reserve improve its control over money by predicting the multiplier and then, using these predictions, supply the amount of monetary base consistent with its targeted value for the money stock?

To help answer this question, a procedure was developed for predicting the money multiplier using only that information available to the Federal Reserve at the time the predictions were made. Each month the money multiplier was predicted and, given this prediction, the money stock likely to result from a given amount of base was determined. The level of the money stock the FOMC desired to achieve was assumed to be equal to the product of the predicted money multiplier and the actual level of the monetary base.

Predicted growth rates of money were computed by comparing the actual level of the money stock in the initial period with the predicted level in the final period. For example, the predicted growth rate of money from December to January was computed by comparing the actual level of the money stock in December with the level of the money stock predicted for January using data through December in the prediction. To compute the predicted growth rate for money over the six-month period from December to June, the actual level of money for December was used. The predicted level for June was computed using data through May. It is assumed that for each month from December through June the Federal Reserve was predicting a money multiplier and then supplying the amount of base consistent with its target level for the money stock. In some months this procedure resulted in money being above target, and some months below target. The comparison of the six-month predicted growth rate of money and the actual growth rate of money indicates how far off target the Federal Reserve would be after six months.[7]

This procedure for controlling the growth of money was simulated for the 1954-73 period. The mean and standard deviation of the differences between predicted and actual growth rates of money are given in Table III. Comparing these results with those reported in Table I it can be seen that for very short periods, such as a month, no improvement results over assuming that the growth rate of money and base will

[6]If the multiplier was constant, then the elasticity of money with respect to the base would be equal to one.

[7]For a more complete explanation of this procedure, see Albert E. Burger, "Money Stock Control," *Controlling Monetary Aggregates II: The Implementation*, Federal Reserve Bank of Boston, pp. 33-55. The procedure used in this paper differs from the procedure explained in "Money Stock Control" only in that seasonally adjusted data have been used in this article.

be equal. The standard deviation is large for one-month periods in both procedures.

However, for periods longer than a month, there is a substantial improvement resulting from using a procedure that requires predicting the money multiplier. For six-month periods the standard deviation between actual and predicted growth rates of money falls to about 0.75 percentage point, compared to 1.5 percentage points under the first procedure whereby the growth of base and money are assumed to be equal (Table I). For one-year periods a further substantial improvement results from predicting the money multiplier as the standard deviation between the actual and the predicted growth rates of money is reduced to 0.4 percentage point.

Suppose the Federal Reserve had used the procedure outlined above in 1974 and early 1975 to predict the money multiplier, and had used the predictions to determine the likely growth path of money resulting from the actual path of the monetary base. Would these predictions of the multiplier have enabled the Federal Reserve to more accurately predict the effects of its actions on the growth rate of money?

Table IV presents the results of predicting the money multiplier and generating predicted growth rates of money throughout 1974 and into mid-1975 in the manner discussed at the start of this section. Comparing these results with Table II, it appears that predicting the money multiplier substantially reduces the size of the errors, especially for the period spanning mid-1974 into early 1975 when there were wide divergences between the growth rates of base and money. Generally, the difference between the actual growth rate of money and the growth rate of money associated with predictions of the multiplier are quite small. The mean difference between actual and predicted growth rates of money resulting from forecasting the money multiplier is about 0.25 percentage point for both consecutive six- and twelve-month periods from mid-1974 through August 1975.

Table IV

Actual Growth Rate of Money and Growth Rate of Money Resulting from Predicting the Money Multiplier

	Actual Growth Rate of Money	Predicted Growth Rate of Money[1]	Actual Minus Predicted
Six-Month Periods			
12/73 - 6/74	6.4%	6.1%	0.3%
1/74 - 7/74	7.1	7.9	-0.8
2/74 - 8/74	5.5	6.7	-1.2
3/74 - 9/74	4.0	5.8	-1.8
4/74 - 10/74	3.6	4.1	-0.5
5/74 - 11/74	4.4	4.3	0.1
6/74 - 12/74	3.2	3.4	-0.2
7/74 - 1/75	0.9	0.9	-0-
8/74 - 2/75	1.4	1.8	-0.4
9/74 - 3/75	3.1	1.8	1.3
10/74 - 4/75	3.0	1.2	1.8
11/74 - 5/75	3.5	0.5	3.0
12/74 - 6/75	6.1	6.5	-0.4
1/75 - 7/75	8.6	6.9	1.7
2/75 - 8/75	8.5	9.1	-0.6
		Mean	0.15
		Standard Deviation	1.28
Twelve-Month Periods			
12/73 - 12/74	4.8%	4.9%	-0.1%
1/74 - 1/75	3.9	4.0	-0.1
2/74 - 2/75	3.4	3.6	-0.2
3/74 - 3/75	3.6	2.9	0.7
4/74 - 4/75	3.3	2.4	0.9
5/74 - 5/75	3.9	2.4	1.5
6/74 - 6/75	4.6	4.8	-0.2
7/74 - 7/75	4.7	4.2	0.5
8/74 - 8/75	4.9	5.2	-0.3
		Mean	0.30
		Standard Deviation	0.63

[1]All data are seasonally adjusted. Predicted growth rates of money were computed for each period using the predicted level in period t, compared with the actual level in period t-6 or t-12. These results are based upon money stock data as available in early October, 1975.

Conclusions

Any statement about a proposed target for monetary growth should be accompanied by a statement about the likelihood or probability that the growth of money will fall within some range about the target rate. Such probability statements depend crucially upon the procedure by which the Federal Reserve attempts to achieve a growth path of money and upon the time period over which it is to be achieved. Unless the method by which money is to be controlled is made explicit, there is no way of determining the probability that the growth rate of money could be held, say, within a 5 to 7.5 percent range. All anyone knows is that the probability is greater than zero and less than one.

Historical evidence of the twenty years from 1954 through 1973 shows that the growth rate of money has been, on average, about the same as the growth rate of the monetary base for all length time periods. Therefore, one method for controlling the growth of the money stock would be to set the growth rate of the monetary base approximately equal to the desired growth rate of money. However, the evidence also shows that the length of the time period considered makes a major difference as to the tightness of this average relationship. Over short periods it has not been uncommon for the growth rate of money to diverge substantially from the growth rate of the

monetary base. Over longer periods of time, such as twelve months, however, the growth of money has adjusted to the growth of the base.

The empirical evidence supports the view that the growth rate of money would adjust to the growth rate of the monetary base if the Federal Reserve would adhere to the following set of guidelines,

(1) decide upon a growth path for money over a twelve-month period;

(2) control the growth of the monetary base at the same rate as the policy determined growth of money;

(3) not react to monthly errors in the growth of money — in other words, hold the growth of the base constant.

Over a twelve-month period, it would be an "unlikely" event for the growth rates of money and base to diverge by more than ±2 percentage points. Therefore, if the Federal Reserve chose a 6 percent growth rate for money over a twelve-month period, there would be a 95 percent probability that it would be in the range of 4 to 8 percent.

The empirical evidence suggests that, the Federal Reserve could reduce the margin of error in achieving its desired growth rate of money if it would adopt an alternative procedure for controlling money whereby:

(1) the FOMC first decided upon a growth rate of money over a twelve-month period and then,

(2) each month the money multiplier was predicted and the amount of base was supplied that was consistent with the desired level of money stock.

For example, the experiment discussed in the last section of this paper indicated that the standard deviation between actual and desired growth rates of money for twelve-month periods would be reduced to about 0.4 percentage point. Hence, it would be "unlikely" for the divergence between the desired and actual growth rates of money to exceed 0.8 percentage point with this procedure, compared to 2 percentage points under a procedure of setting the growth rate of the base equal to the desired growth rate of money. Using this latter procedure, if the Federal Reserve decided upon a 6 percent growth for money over the next twelve months, the Federal Reserve could state that there would be a 95 percent probability that the growth of money would fall in the range of about 5 to 7 percent.

Selection of a Monetary Aggregate For Economic Stabilization

LEONALL C. ANDERSEN

IN recent years there has been growing acceptance of the view that controlling the growth of monetary aggregates is a useful strategy for purposes of economic stabilization. In particular, it is argued that the probability of achieving the desired growth of nominal gross national product (also referred to as income) can be improved by controlling growth of the monetary aggregates. Thus, assuming that in the long run real GNP grows at a constant rate determined by growth of the labor force and productivity, then controlling the long-run growth of nominal GNP would be an effective means of controlling the rate of inflation.

Monetary aggregates consist of various combinations of short-term, highly liquid, financial assets held by the private sector. Exhibit I defines seven of the most prominently mentioned measures. The aggregates labeled M_1 through M_6 have been viewed by various analysts as constituting a temporary abode of purchasing power or as a means for carrying out transactions. The monetary base is generally viewed as both the dominant factor determining M_1 and M_2 and as being under direct control of the Federal Reserve System. Since M_2 constitutes a major portion of M_3 through M_6, the monetary base is a major factor affecting these aggregates, but the relationship is not as close.

Accepting this monetary aggregate view for the conduct of economic stabilization policy, there remains the question of which one of the monetary aggregates has the most predictable effect on nominal GNP. One generally accepted criterion for selecting a monetary aggregate is to choose the one which produces the smallest error in forecasting nominal GNP. Another criterion is to choose the aggregate over which monetary authorities have the best control. In making the ultimate selection, both criteria would have to be considered; this article, however, is concerned only with the first one — forecasting.

Exhibit I

Monetary Aggregates

MB	Monetary base, defined as Federal Reserve Credit, nation's gold stock, and Treasury currency outstanding less Treasury deposits at Reserve Banks, Treasury cash, and other deposits and accounts at Reserve Banks plus reserve adjustment magnitude.
M_1	Demand deposits and currency held by the nonbank public.
M_2	M_1 plus time and savings deposits at commercial banks less large, negotiable certificates of deposit.
M_3	M_2 plus deposits at mutual savings banks and shares of savings and loan associations.[1]
M_4	M_2 plus large, negotiable certificates of deposit.
M_5	M_2 plus large, negotiable certificates of deposit and deposits at mutual savings banks and shares of savings and loan associations.[1]
M_6	Total liquid assets defined as M_3 plus large, negotiable certificates of deposit, commercial paper, savings bonds, short-term U.S. Government securities, and credit union shares.

[1]On April 3, 1975, the Board of Governors of the Federal Reserve System redefined M_3 and M_5 to include credit union shares. The data used in this article conform to the old definitions and do not include credit union shares.

Two approaches have been used in this regard. One examines the relative stabilities among the various ratios of GNP to each aggregate, referred to as income velocities. This indirect approach asserts that the aggregate which has the smallest variability in its income velocity can be expected to forecast nominal GNP with the smallest error. The other approach uses a model of nominal GNP determination. In this approach, forecasts of nominal GNP are made using various aggregates, and the one which forecasts with the smallest error is directly ascertained.

INDIRECT VELOCITY APPROACH

Milton Friedman, using the indirect velocity approach, has argued the case for choosing M_2 over M_1 as the appropriate monetary aggregate for economic stabilization.[1] His analysis runs as follows:

> It is a tautology, or identity, that *Growth Rate of Nominal Income = Growth Rate of Money plus Growth Rate of Velocity*, provided that velocity is defined consistently with whatever concept of money is employed.
>
> If velocity (defined as income divided by the quantity of money) were a 'will-of-the-wisp' that fluctuated all over the lot in an unpredictable fashion — as the naïve Keynesians initially asserted — this tautology would be of no use. However, velocity is not a 'will-of-the-wisp.' It behaves in a consistent and fairly predictable way.

Friedman then analyzed the period from 1948 to 1972:

> . . . the velocity of M_1 has had a decided upward trend throughout the period, though with a sharp deceleration after 1966, and a suspicious acceleration in 1972. Using M_1 to judge desired monetary growth requires forecasting the likely secular growth in its velocity, and we have no very satisfactory basis for doing so.
>
> The velocity of M_2 had a more moderate upward trend before 1962, but has displayed no appreciable trend in either direction since. It has been extraordinarily stable. Of the 44 quarterly values for the years 1962 through 1972, the highest is 2.43, the lowest, 2.29, a difference from high to low of 6%, or $\pm 3\%$ about the mean value of 2.36. In striking contrast, the velocity of M_1 went from 2.19 in 1962 to 4.72 in 1972.

On the basis of this analysis, he concluded:

> The greater stability [long-run] of the velocity of M_2 than of the velocity of M_1 suggests that it is safer to specify monetary objectives in terms of M_2 than in terms of M_1, since doing so requires no allowance for an uncertain secular trend in velocity.

Friedman then observed:

> The advantage of no trend might be offset if the velocity of M_2 were more variable over short periods than the velocity of M_1 after allowance for trend. But this is not the case. Numerous studies we have made for recent years and also for the whole period since 1914 (when reliable estimates of M_1 first became available) demonstrate that, if anything, the velocity of M_2 is less variable over short periods than the velocity of M_1.
>
> Of course, there is no guarantee that the velocity of M_2 will not depart from its recent relatively constant level, but neither theory nor the past historical behavior of the velocity of M_2 gives any reason to expect a sudden or large departure.

Long-run Variability of Velocity

The long-run variability of velocity is ascertained by examining movements in the level of velocity over long periods of time. The accompanying chart presents the ratio of nominal GNP to each monetary aggregate for the period 1952-1973.[2] The beginning date was selected to eliminate the period of the Federal Reserve/Treasury Accord, which was included in Friedman's analysis of M_1 and M_2 velocities.

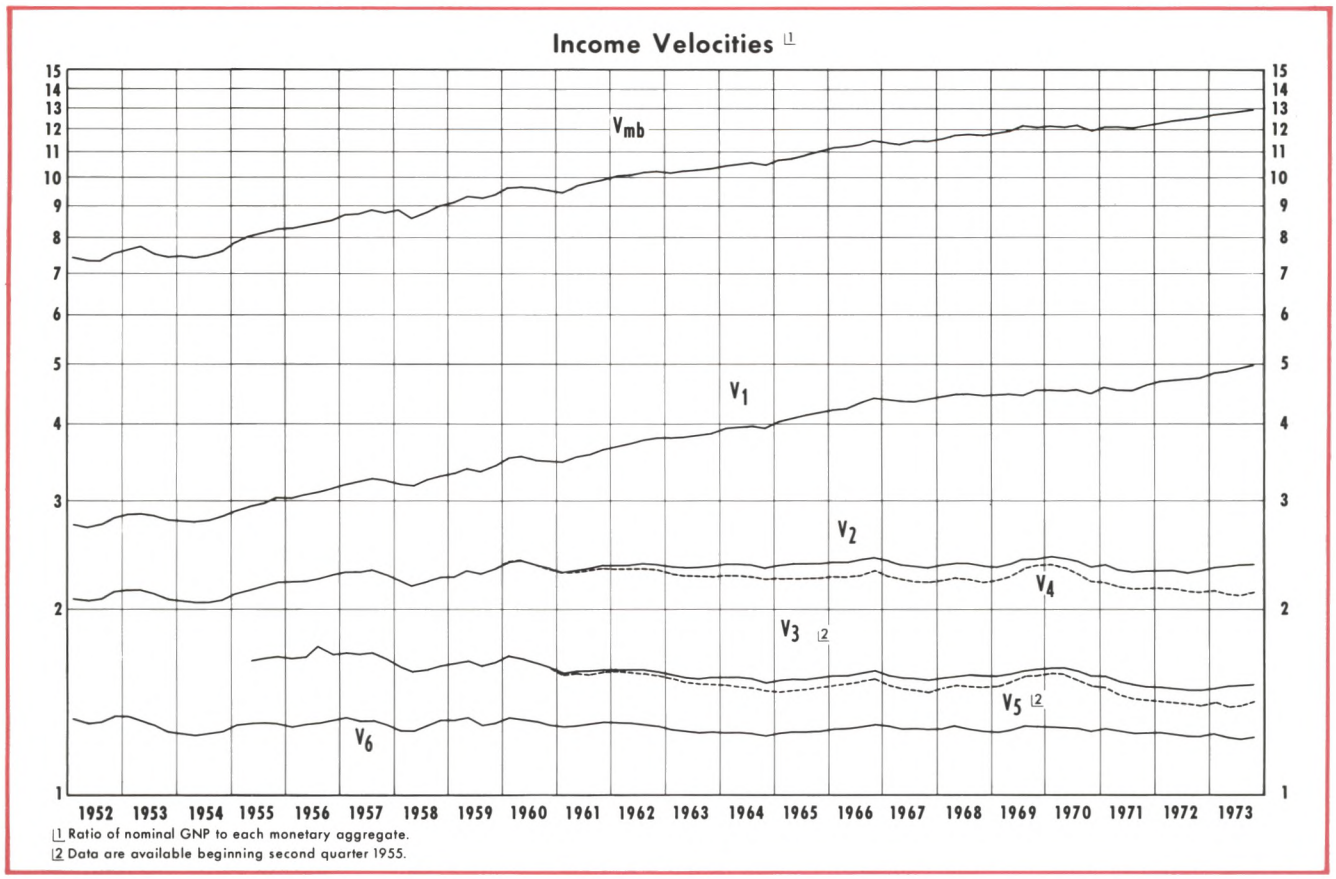
An examination of the chart indicates that V_{mb} and V_1 both have pronounced upward trends over the whole period, but that a break in their trends occurred after the fourth quarter of 1966 (Table I). The trend of V_{mb} changed from an average 3.0 percent annual rate to an average 1.8 percent rate, and the trend of V_1 changed from an average 3.2 percent annual rate to an average 1.8 percent rate. While over the whole period the trend growths of V_2 and V_4 are much less than those of V_{mb} and V_1, a break in their trends also occurred (Table I). V_2 grew at an average 1.2 percent annual rate to the fourth quarter of 1961, and then remained unchanged through fourth quarter 1973. V_4 grew at an average 1.1 percent annual rate to the end of 1961, and subsequently decreased at an average 0.8 percent annual rate. Income velocities V_3, V_5 and V_6 have slightly negative trend growth rates with no discernable breaks.

Two statistical measures of variability of a time series are the standard deviation and the coefficient of variation, which is the ratio of the standard deviation to the mean. This latter measure allows a comparison of the variability of series which have different magnitudes. The larger the values of these measures, the greater is the variability of the series.

Table II presents the long-run variability of these velocity measures for the period 1952 to 1973. According to the coefficients of variation the levels of V_{mb} and V_1 have, by far, the greatest variability for the whole period. The velocity measure with the smallest variability in its level for the whole period is V_6.

[1] Milton Friedman, "How Much Monetary Growth," *The Morgan Guaranty Survey* (February 1973), pp. 5-10.

[2] Except for GNP divided by M_3 and M_5; data for M_3 and M_5 are available only from the second quarter of 1955.



When consideration is given to the changes in the trends of four of the velocity measures the relative rankings of long-run variability are little changed. In the period before the various breaks in the trends, V_6 had the smallest long-run variability and V_{mb} and V_1 the largest. After the break in trend, V_2 had the smallest long-run variability.

The preceding analysis of long-run variability in the levels of various measures of income velocity is misleading because the coefficients of variation are greatly influenced by the existence of trend movements. A measure of velocity with a pronounced trend will have a larger coefficient of variation (the ratio of its standard deviation to its mean) than a measure of velocity with no trend. A more appropriate procedure is to eliminate the trend from the data. The analysis in the next section takes this adjustment into consideration.

Table I

Velocity Growth: Selected Periods
(Compounded Annual Rates of Change)

Velocity	I/1952 to IV/1973	Sub-period One		Sub-period Two	
		Dates	Growth	Dates	Growth
V_{mb}	2.6%	I/52 to IV/66	3.0%	IV/66 to IV/73	1.8%
V_1	2.8	I/52 to IV/66	3.2	IV/66 to IV/73	1.8
V_2	0.6	I/52 to IV/61	1.2	IV/61 to IV/73	0.0
V_3*	–0.5	—	—	—	—
V_4	0.1	I/52 to IV/61	1.1	IV/61 to IV/73	–0.8
V_5*	–0.8	—	—	—	—
V_6	–0.3	—	—	—	—

*Begins II/1955.

Short-run Variability of Velocity

The short-run variability of a measure of velocity is analyzed by using quarter-to-quarter percent changes (at annual rates) and the moving average of these changes over four quarters and eight quarters. The two periods for averaging are selected on the basis of frequently proposed time horizons for economic stabilization. The standard deviations of these three types of change are used as comparative measures of short-run variability. Since the standard deviation measures variability around the mean and since the mean, in the case of percent changes, is the average growth rate, the standard deviation is a measure of the variability

Table II

Long-Run Variability of Velocity

(Levels of Velocity)

Velocity Measure	1952-1973 Standard Deviation	1952-1973 Coefficient of Variation	Sub-period One[1] Standard Deviation	Sub-period One[1] Coefficient of Variation	Sub-period Two[1] Standard Deviation	Sub-period Two[1] Coefficient of Variation
V_{mb}	1.687	.167	1.217	.132	.438	.036
V_1	.675	.178	.475	.139	.170	.037
V_2	.101	.044	.102	.046	.032	.014
V_3[2]	.057	.036	.057	.036	.057	.036
V_4	.084	.038	.101	.045	.066	.029
V_5[2]	.084	.054	.084	.054	.084	.054
V_6	.025	.019	.025	.019	.025	.019

[1]See Table I for delineation of sub-periods for each measure of velocity. There are no sub-periods for V_3, V_5, and V_6; therefore, values for the whole periods are reported.
[2]Begins II/1955.

of percent changes in velocity relative to the trend growth rate.

Table III presents the various standard deviations of quarterly percent changes in the seven measures of velocity. According to the data, V_1 and V_6 have the smallest quarterly variability for the whole period. When the time horizon is extended to four and to eight quarters, the differences in variability among the seven measures of velocity are narrowed considerably. Over a four-quarter period V_1 and V_6 have the smallest average quarterly variability, and over an eight-quarter period V_{mb}, V_1, and V_6 have the smallest average quarterly variability.

When consideration is given to the breaks in the trend growth rates (Table III), V_6 has the smallest short-run quarterly variability in sub-period I, and V_{mb}, V_1, and V_2 have the smallest in sub-period II. When quarterly percent changes are averaged over four quarters, V_6 has the smallest short-run variability in sub-period I, while in sub-period II, V_{mb} and V_1 have the smallest. Averaging over eight quarters the smallest variability occurs for V_1 and V_6 in sub-period I, and for V_{mb}, V_1, V_2, and V_6 in sub-period II.

Conclusions From Analysis of Velocity

As mentioned earlier, it has frequently been asserted that the monetary aggregate with the smallest variability in its income velocity can be expected to forecast nominal GNP with the smallest error. Based on this assertion, the analysis of long-run variability of velocity suggests that M_6 (total liquid assets) would forecast nominal GNP with the smallest error. Its velocity had virtually no trend in the period from 1952 to 1973 and no break in trend. Moreover, in all but one instance, V_6 has the smallest long-run variability. On the other hand, M_1 and the monetary base would be expected to forecast nominal GNP with the largest error, since a substantial break occurred in their trends of velocity and they have the largest long-run variability in velocity. These conclusions, however, are misleading because of trend movements in several of the measures of velocity.

The analysis of the relative short-run variability in the seven measures of velocity, which adjusts for trend, indicates that over intervals of time relevant for economic stabilization, M_6 could be expected to yield consistently smaller errors in forecasting nominal GNP. In all cases but one, V_6 had the smallest short-run variability. There is, however, little superiority of M_6 over monetary base, M_1, and M_2.[3]

[3]Evidence from the period 1952 to 1973 does not support Friedman's contention that at the present time M_2 is preferred over M_1 for economic stabilization. A change in the trend growth of both V_1 and V_2 occurred, but at different dates. In addition, the magnitude of the two changes were almost identical — a reduction of 1.4 percentage points for V_1 and 1.2 percentage points for V_2. It thus appears that the trend

Table III

Short-Run Variability of Velocity

(Standard Deviation of Percent Changes in Velocity at Annual Rates)

Velocity	1952 to 1973 Quarterly Change	1952 to 1973 Average Quarterly Change 4-quarters	1952 to 1973 Average Quarterly Change 8-quarters	Sub-period One[1] Quarterly Change	Sub-period One[1] Average Quarterly Change 4-quarters	Sub-period One[1] Average Quarterly Change 8-quarters	Sub-period Two[1] Quarterly Change	Sub-period Two[1] Average Quarterly Change 4-quarters	Sub-period Two[1] Average Quarterly Change 8-quarters
V_{mb}	4.0%	2.4%	1.2%	4.4%	2.4%	1.6%	3.2%	1.6%	1.2%
V_1	3.6	2.0	1.2	4.0	2.4	1.2	3.2	1.6	1.2
V_2	4.4	2.8	1.6	5.2	3.6	2.0	3.2	2.0	1.2
V_3[2]	4.0	2.4	1.6	4.0	2.4	1.6	4.0	2.4	1.6
V_4	4.8	3.2	2.0	5.2	3.6	2.0	4.0	2.8	1.6
V_5[2]	4.4	2.8	2.0	4.4	2.8	2.0	4.4	2.8	2.0
V_6	3.6	2.0	1.2	3.6	2.0	1.2	3.6	2.0	1.2

[1]See Table I for delineation of sub-periods for each measure of velocity. There are no sub-periods for V_3, V_5, and V_6; therefore, values for the whole period are reported.
[2]Begins II/1955.

Table IV

Estimated Regression Coefficients: I/1952 - IV/1973

	Constant	D1	D2	$\Delta \ln M_t$	$\Delta \ln Y_{t-1}$	$\Delta \ln Y_{t-2}$	$\Delta \ln Y_{t-3}$	$\Delta \ln Y_{t-4}$	R^2	D.W.	S.E.E.
M_1	0.810443*	−2.090492*	2.373832*	0.766833*	−0.621393*	−0.285813*	0.240580	−0.284408*	0.548997	2.194058	0.984013
M_2	0.690135*	−2.033680*	2.249027*	0.473700*	−0.530305*	−0.250326	0.202764	−0.288114*	0.501618	2.130834	1.034409
M_3	0.567848	−2.096168*	2.211760*	0.425942*	−0.523803*	−0.203384	0.194619	−0.282304*	0.505617	1.918353	0.946215
M_4[1]	0.840603*	−2.099962*	2.251406*	0.330737*	−0.516682*	−0.268521	0.221460	−0.290675*	0.485501	2.127847	1.051001
M_5[1]	0.726453	−2.136304*	2.208554*	0.321278*	−0.517067*	−0.216406	0.205449	−0.287788*	0.494804	1.931776	0.956506
M_6[2]	0.463706	−1.940179*	2.198319*	0.931527*	−0.721536*	−0.395751*	0.153216	−0.328165*	0.566716	2.131029	0.965395
MB	1.030204*	−2.031015*	2.095635*	0.541541*	−0.544434*	−0.267499	0.166300	−0.322441*	0.488028	2.192997	1.048418

[1]Begins III/1955.
[2]Begins II/1952.
*Coefficient is significant at the 5 percent level.

At best, the indirect velocity approach is a short-cut to the forecasting question. While the analysis of long-run variability of velocity suggests that M_6 would forecast nominal GNP with the smallest error, the analysis of short-run variability of velocity is inconclusive in this regard.

One additional point should be made — relative stability of velocity does not necessarily indicate that one monetary aggregate will forecast nominal GNP with a smaller error than will any other aggregate because high variability does not preclude predictability. Therefore, the direct forecasting approach would produce a more definitive test for selecting the appropriate monetary aggregate for economic stabilization.

DIRECT FORECASTING APPROACH

A monetary model of nominal income (GNP) determination is used to ascertain the relative forecasting ability of the seven monetary aggregates. The model was spelled out in detail in a previous article.[4] The basic feature of the model is that the change in the rate of change in nominal spending by households and business firms for newly produced goods and services is postulated to respond to the discrepancy between the rates of change in actual and desired nominal money balances. It is therefore distinguished from the more familiar post-Keynesian types of forecasting models. The empirical form of the model consists of three equations, which are presented in Exhibit II.

Exhibit II

(1) $\Delta \ln Y_t^d - \Delta \ln Y_{t-1}^d = b_0 + b_1 \Delta \ln M_t + b_2 \sum_{i=1}^{4} w_i \Delta \ln Y_{t-i} + b_3 \Delta \ln r_t + b_4 D_1 + b_5 D_2 + \varepsilon_t$

(2) $\Delta \ln Y_t = W(t) \Delta \ln Y_t^d + [1 - W(t)] \Delta \ln Z_t$

(3) $W_t = (1-\delta)\frac{Y_{t-1}^d}{Y_{t-1}}$, in which δ is the average ratio of imports to $Y^d + Z$ in sample period.

$\Delta \ln Y_t^d - \Delta Y_{t-1}^d$	=	change in the rate of change in spending by households and business firms for product (measured by consumption plus investment).
b_0	=	response of spending by households and business firms to average rate of change in technical efficiency of the payments system.
$\Delta \ln M_t$	=	rate of change in a monetary aggregate.
$\sum_{i=1}^{4} w_i \Delta \ln Y_{t-i}$	=	weighted sum of past rates of change in nominal income (measured by nominal GNP).
$\Delta \ln r_t$	=	rate of change in nominal short-term interest rate (measured by the 4-6 months commercial paper rate).
$\Delta \ln Y_t$	=	rate of change in nominal income (measured by nominal GNP).
D_1	=	zero-one dummy variable for major strikes. One in 1959-II, 1964-IV and 1970-IV.
D_2	=	zero-one dummy variable. One in quarter following a major strike.
ε_t	=	a random error term.
$\Delta \ln Z_t$	=	rate of change in government spending plus foreign spending on domestic product (measured by National Income accounts for total government purchases of goods and services plus exports).

of V_2 is subject to as much uncertainty as that of V_1. The analysis of short-run changes in velocity also does not confirm Friedman's contention that V_2 is more stable than V_1.

[4]Leonall C. Andersen, "A Monetary Model of Nominal Income Determination," *Review* (June 1975). The model was developed using M_1 and M_2. When applying it to M_3 through M_6, it is postulated that in each case the change in the rate of change in spending responds to the discrepancy between the rate of change in actual and desired stocks. Other models could be developed based on different specifications and could be used to forecast nominal income. Thus, the forecasting results reported here are applicable only to the model presented.

Table V

Percent Errors in Simulated Level of GNP

Fourth Quarter

Simulation Period Beginning I Q	M_1	M_2	M_3	M_4	M_5	M_6	MB
1962	−1.68%	2.37%	0.27%	3.60%	1.08%	0.19%	−0.92%
1963	3.41	2.12	0.96	2.62	1.19	2.94	0.36
1964	−0.09	−1.74	−3.05	−1.49	−2.91	−2.11	−2.23
1965	2.66	3.88	2.57	3.51	2.37	0.26	0.49
1966	−1.20	−1.37	−3.62	−2.06	−3.89	−4.45	−2.02
1967	4.30	2.84	1.35	2.38	0.99	0.65	1.13
1968	1.92	−0.61	−1.85	−1.26	−2.16	−0.50	−1.07
1969	0.49	−1.92	−2.82	−3.46	−3.56	−2.48	−1.14
1970	1.51	0.10	−1.08	0.58	−0.54	−0.74	0.36
1971	3.26	3.66	3.97	2.59	2.53	2.91	1.82
1972	−1.45	−2.25	−2.64	−2.80	−3.23	−0.54	−2.72
1973	−1.93	−2.42	−2.98	−1.65	−2.47	−0.90	−2.15
1974	1.13	0.96	0.18	1.55	0.74	1.22	1.91
RMSE	2.24	2.28	3.69	2.45	2.38	1.99	1.59
Maximum Error	4.30	3.88	3.97	3.60	−3.89	−4.45	−2.72

Eighth Quarter

	M_1	M_2	M_3	M_4	M_5	M_6	MB
1962	1.67	5.59	0.73	8.50	2.54	3.25	−0.62
1963	4.78	0.96	−1.90	1.98	−1.46	0.53	−1.70
1964	1.89	0.50	−2.39	0.41	−2.32	−1.44	−2.70
1965	1.89	1.99	−3.37	0.53	−3.85	−4.33	−2.53
1966	2.25	0.23	−3.21	−0.80	−3.56	−2.72	−1.72
1967	7.28	2.01	−1.22	0.70	−1.96	0.26	−0.19
1968	3.13	−2.21	−4.40	−4.38	−5.38	−2.76	−2.00
1969	2.20	−1.54	−3.63	−2.13	−3.38	−2.26	0.15
1970	4.58	4.23	3.70	3.77	2.51	2.43	2.28
1971	2.08	1.79	2.59	0.10	−0.02	2.42	−0.81
1972	−3.68	−5.36	−6.34	−5.32	−6.63	−1.81	−5.29
1973	−1.56	−2.25	−3.86	−1.16	−2.96	−0.25	−0.95
RMSE	3.50	2.92	3.43	3.48	3.47	2.36	2.21
Maximum Error	7.28	5.59	−6.34	8.50	−6.63	−4.33	−5.29

Twelfth Quarter

	M_1	M_2	M_3	M_4	M_5	M_6	MB
1962	3.13	5.57	−1.50	9.94	−0.14	0.71	−2.66
1963	7.59	4.14	−0.56	5.01	−0.18	2.04	−2.08
1964	1.95	−1.10	−6.65	−2.10	−6.80	−6.30	−5.32
1965	5.86	4.50	−1.59	2.67	−2.10	−2.65	−1.76
1966	5.95	−0.38	−5.39	−2.05	−6.01	−3.97	−2.75
1967	9.43	0.75	−3.31	−2.27	−4.77	−1.96	−0.72
1968	5.01	−1.90	−5.00	−3.09	−5.01	−2.62	−0.78
1969	5.30	2.78	1.95	1.80	0.94	0.71	1.88
1970	3.63	2.27	2.45	1.25	−0.02	1.87	−0.41
1971	0.64	−0.77	−0.65	−1.88	−2.94	1.98	−3.00
1972	−3.52	−5.31	−7.21	−5.10	−7.25	−1.35	−4.52
RMSE	5.30	3.24	4.01	4.14	4.23	2.82	2.77
Maximum Error	9.43	5.57	−7.21	9.94	−7.25	−6.30	−5.32

Forecasting Procedure

The parameters of equation (1) are estimated by ordinary least squares using quarterly data.[5] Seven sets of equations were estimated, one for each monetary aggregate.[6] For each monetary aggregate, the parameters of equation (1) are estimated for the

[5]The interest rate was excluded. It is assumed that the indirect interest rate influence of changes in an aggregate on spending by households and business firms is reflected in the estimated parameters.

[6]The inclusion of the monetary base is justified by the identity $M_t = m_t\ MB_t$, in which m_t is the appropriate multiplier.

period from first quarter 1952 to fourth quarter 1961, except for M_3 and M_5 which begin in third quarter 1955 and M_6 which begins in second quarter 1952. The sample period is then extended by four quarters and the parameters are re-estimated. This procedure continues through the terminating quarter which is fourth quarter 1973. The parameter estimates for the longest sample period are reported in Table IV.[7]

Next, for each monetary aggregate, *ex ante* (beyond each sample period) dynamic simulations are conducted using the complete model. Actual values in the post-sample period of the exogenous variables — each monetary aggregate, total government spending on goods and services, and exports — are used. The lagged $\Delta \ln Y$ terms are generated internally. Of interest to this study are the simulated quarterly levels of nominal GNP. Although these simulations are not forecasts in the strict sense, they may be viewed as forecasts with knowledge of future movements in the three exogenous variables.

Forecasting Results

These simulation exercises are used to ascertain the comparative forecasting capabilities of the seven monetary aggregates using the specified model. Forecasts of nominal GNP using each monetary aggregate are developed for successive post-sample periods of four, eight, and twelve quarters. Forecast errors — the difference between predicted and actual quarterly levels of nominal GNP as a percent of actual GNP — are calculated for the fourth, eighth, and twelfth quarters of each post-sample period. These errors are reported in Table V.

Two types of forecast error are calculated for each monetary aggregate. One is the root-mean-squared error (RMSE) for each of the three sets of terminal quarters. This measure provides an indication of the average forecasting ability of each aggregate; the one with the smallest RMSE forecasts best, on average, the level of GNP. The other measure is the maximum error within each of the three sets of forecasts. The aggregate with the smallest maximum error is best if avoidance of large forecasting errors is desired. These two measures are presented in Table V.

On the basis of these simulations of the specified model, the monetary base appears to forecast the level of nominal GNP the best. Its RMSE is the smallest for each of the three simulated terminal quarters. In addition, it has the smallest maximum forecast error for the fourth and the twelfth quarters, and it has the second smallest maximum error for the eighth quarter.

CONCLUSIONS

This paper investigated one criterion for choosing a monetary aggregate for economic stabilization — the aggregate which forecasts nominal GNP with the smallest error. For time periods of general interest, the indirect income velocity approach produced rather inconclusive evidence regarding the choice of a monetary aggregate. Although this approach would reject M_3, M_4, and M_5, there was little basis for choosing among the other four aggregates. The direct forecasting approach based on the specified model, however, found that the monetary base forecasts the level of nominal GNP with the smallest root-mean-squared error in every case and with the smallest-maximum error in two out of three cases.

[7]The parameter estimates for all of the sample periods are available on request. The procedure of lengthening the sample period differs from another frequently used procedure of maintaining a moving, fixed length sample period. The argument for using this latter procedure is that it better captures changes in structure, that is, basic changes in the regression coefficients. The procedure used in this study is justified on the basis of tests which rejected the structural change hypothesis for equation (1) using M_1 and M_2. See Andersen, "A Monetary Model of Nominal Income Determination."

The Postwar Economic System in Germany: Creation, Evolution, and Reappraisal

by DIETER DUWENDAG

Professor Duwendag is a professor of economics at the University of Speyer (Hochschule für Verwaltungswissenschaften), Speyer, Germany. He received his Ph.D. in economics from the University of Münster and taught at the University of Köln prior to his appointment at Speyer. Professor Duwendag has published numerous articles dealing with stabilization policy in Germany.

The following article is a capsule presentation of the evolution of the German economic system since World War II and of the discussions about the degree of government involvement in the German economy. Since the latter is an issue which is being actively discussed in the United States, it might be helpful to see how this debate has progressed in Germany.

Professor Duwendag is on leave from the University of Speyer and was a visiting scholar at the Federal Reserve Bank of St. Louis from March to mid-July.

A WAVE of pessimism regarding current economic conditions appears to have afflicted many parts of the world. Such pessimism manifests itself in skepticism regarding market type economic systems and democratic forms of government in general. In other words, the extent of government involvement in the functioning of the economy seems to be a major issue.

In the United States, for example, there are those who consider the recent less-than-desirable economic performance to be the result of incorrect and misdirected decisions on the part of the private sector. These critics of free markets, therefore, advocate the replacement of many private sector decisions by more government decisions in the form of government planning.

On the other side there are those who regard current economic problems as a result of too much government involvement in the economic system. They cite, for example, all the government regulations which impinge on the ability of private enterprise to make sound business decisions. In addition, these opponents of government involvement in the economy maintain that attempts on the part of the government to "fine tune" the economy have been counterproductive.

In order to evaluate the merits of the two conflicting viewpoints, it would be useful to examine an economic system that evolved as a result of active consideration of both views. Such an example exists in Germany where, since World War II, the debate over the role of government in a market oriented economic system has made a significant contribution to the economic system which currently prevails.

NOTE: This article was translated from German by Hans Helbling.

PHASES OF EVOLUTION OF THE GERMAN ECONOMY

From its inception at the end of World War II to the present, the economic system in Germany has undergone change. Three phases of change may be identified:

1) establishment of a market economy that remained essentially unchanged throughout the reconstruction period, which lasted until about 1960;
2) reaction of the state to rectify market imperfections since about 1960;
3) reappraisal of the market system's efficiency — the phase which is currently in progress.

The economic system in all three phases may be described as a mixed economy — that is, a system in which both the private and public sectors affect the allocation of resources. The theoretical base for this economic system lies in neo-liberal ideas whose main German-speaking proponents were *W. Eucken, A. von Hayek,* and *A. Müller-Armack.* These economists strongly influenced the "spirit" of the German constitution of 1949 as well as the formulation of economic policy. From the outset there was a consensus among all major political groups regarding the establishment of a market type economic system which was "socially responsible".

In such an environment, the role of government is expanded beyond the basic function of providing a

democratic (legal and institutional) framework which, among other things, protects individual freedoms. Other responsibilities are the *allocation* of resources (providing public goods), the *stabilization* of the economy, and the *redistribution* of income and wealth.[1] By assuming these responsibilities, it is hoped that the government may also be able to prevent the concentration of economic power, promote self-help initiatives, and correct undesirable market induced results in general.

Postwar Reconstruction Phase

After decades of experience with central planning, the introduction of democratic and market system principles after the end of World War II was like a voyage into uncharted waters. A feeling for democracy and for a market oriented economic system had by and large disappeared. Thus, the new system of socio-economic organization was regarded by many as an experiment. Doubt was expressed as to whether the German population would be able to adapt to the new conditions. In retrospect, however, it can be said that the adaptation proceeded more quickly than even optimists had thought possible.

The first postwar phase of the German economy was characterized by reconstruction, the elimination of other war-induced problems, and the absorption of more than 10 million refugees from former German territories in the east. The economic results of the reconstruction phase, until approximately 1960, became widely known as "the German economic miracle." It featured reduction of the unemployment rate from 11 percent in 1950 to 1 percent in 1960, above average economic growth, practically stable prices, and high and increasing export surpluses.

The German economy grew at a rapid rate because ample capacity (capital and labor) existed. With the exception of the agricultural sector, which had come under increasing governmental control after the establishment of the EEC in 1958, many of the remaining government regulations — especially on land and housing — had been lifted by 1960. Thus in the postwar reconstruction phase the economy was essentially a free market system with variability of individual prices and open entry to all economic sectors. Democracy and the market economy had withstood their first crucial test. Stable political conditions and efficient economic results indicated that the decision regarding the establishment of the new system had been appropriate.

Despite the success of the reconstruction phase, some problems remained. Rapid economic growth did not proceed without frictions and excesses. The provision of certain public goods (one of the social elements of the market economy) had been neglected, according to many.[2] (1) Following the breakup of cartels after World War II, new power constellations developed, especially in the heavy industries (iron, coal, and steel), the chemical industry and the banking sector. In addition, new power concentrations arose in the construction industry and the retail sector at the expense of small and medium sized firms. It was felt by some that these developments endangered competition. (2) The functional income distribution remained practically constant from 1950 until 1960 (wage share 0.6; profit share 0.4). (3) Severe cyclical swings in economic growth raised questions concerning the stability of the private sector.

To sum up, the new system of social and economic organization was considered still in its infancy. At this point government guidance was favored as a means of assuring full development of the potential benefits of the newly evolved market system.

State Reaction Phase

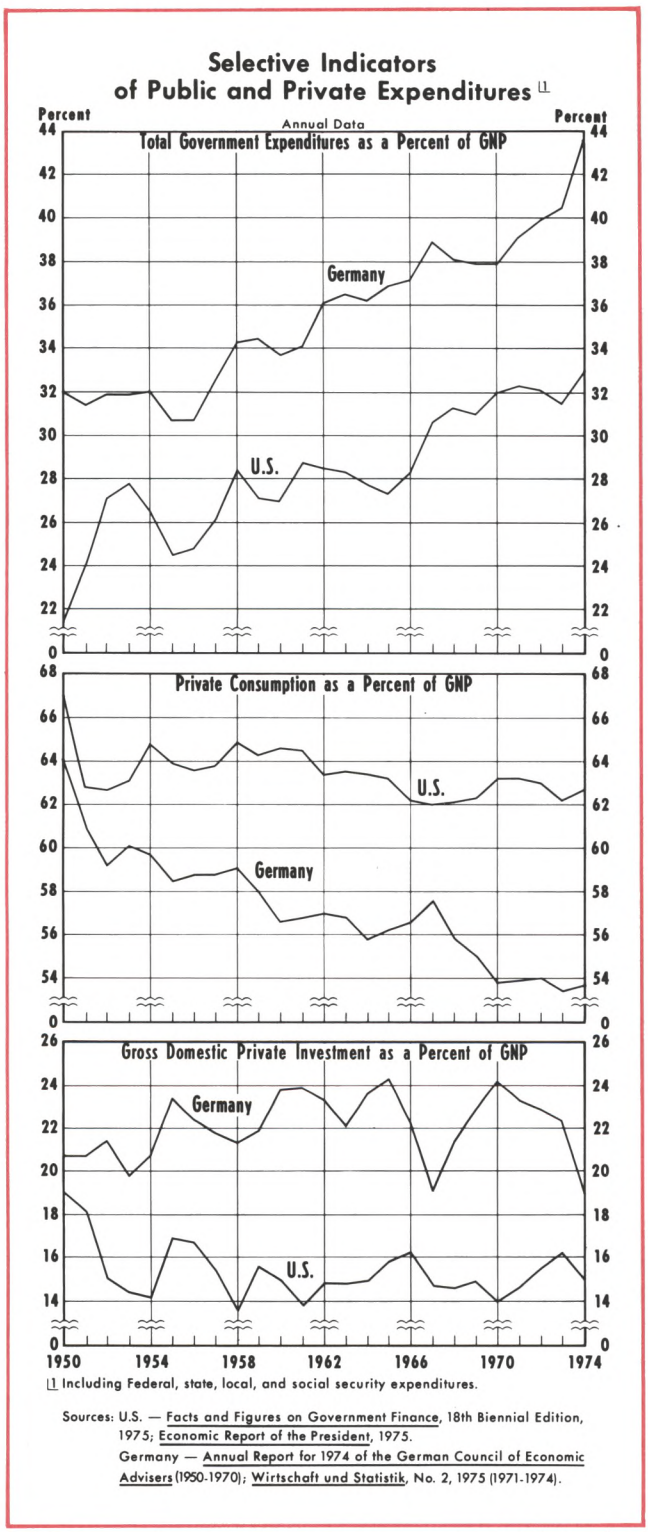
The second phase of the German postwar development extends to the present, and thus overlaps with the third phase. Government reacted to the problems of the first phase in four ways. These reactions, in turn, impinged somewhat on economic freedom.

(1) *Competition and Restrictions on Business:* The law governing cartels was strengthened and firms with market power became subjected to stronger regulations by the Federal Agency for Cartel Supervision (Bundeskartellamt). In spite of these actions, the number of German firms declined by about 300,000 (15 percent) from 1961 to 1970, and this decline affected almost solely small firms (up to 49 employees). In addition, occupational and product safety legislation became more stringent. And in recent times new environmental regulations were devised with the aim of requiring producers to assume (internalize) costs of production which had before fallen on others.

(2) *Progressively Increasing Public Expenditures:* As shown in the accompanying chart, the proportion of GNP accounted for by total Government expenditures

[1]Richard A. Musgrave, *The Theory of Public Finance: A Study in Public Economy* (New York: McGraw-Hill Book Company, Inc., 1959).

[2]For a distinction between private and public goods, see Paul A. Samuelson, "The Pure Theory of Public Expenditure," *The Review of Economics and Statistics* (November 1954), p. 387.



in Germany increased from 32 percent in 1950 to 43.6 percent in 1974. The rising pace of increase in these expenditures is especially remarkable: 1.7 percentage points from 1950 to 1960, 4.2 percentage points from 1960 to 1970, and 5.7 percentage points from 1970 to 1974. Thus, in the last four years alone, the increase in government expenditures amounted to approximately the same absolute increase which occurred during the previous twenty years. As a result, the proportion of GNP accounted for by private consumption decreased noticeably. Developments in the United States show similar tendencies, even though the share of government expenditures of GNP is significantly smaller than in Germany.

The progressively increasing government expenditures are, at least partly, the monetary reflex of changed government responsibilities. They are reflected, on the one hand, by an expanded infrastructure (transportation, communication, education, etc.), a larger supply of public goods in general, and in sectoral and regional policy measures. Such measures were to aid specific regions, to subsidize sectors of national importance (coal, railways, postal service) and to neutralize crowding out effects on small and medium sized firms as a consequence of the newly established economic power constellations mentioned above. Also, increased Government activity occurred in such areas as the social security system (increased contributions), tax laws (tax rate increases for higher income classes, tax rate reductions for lower income groups), and wealth redistribution in the form of subsidized savings programs for lower income groups. Thus, redistribution policies in Germany, together with more active labor unions, led to an increase in the wage share from 60 percent in 1960 to 70 percent in 1973.[3]

(3) *Stabilization Policies:* Toward the end of the 1960s five complete growth cycles had been experienced and inflationary tendencies had manifested themselves with the result that energetic governmental guidance of economic activity ensued. An important force for the ratification of the "Stabilization and Growth Law" of 1967 was the recession of 1966/1967. This law provided for a broad spectrum of anticyclical instruments of tax and expenditure policies to be invoked in case of — as stated by the law — an "impending economic disequilibrium". Until 1967 there was no conscious attempt of using anticyclical policies.

The Stabilization and Growth Law requires that policies of Federal, state, and local governments do not jeopardize overall economic equilibrium. Unlike the U.S. Employment Act of 1946, however, the German central bank is not included in the above requirement. The law defines "economic equilibrium" as a condition in which the goals of price stability, high

[3]Labor unions had become progressively active, demanding not only compensation for inflation but also a higher share of the total income change.

employment, balance of payments equilibrium, as well as continuous and reasonable economic growth are satisfied simultaneously. In case the actual situation deviates from this optimal combination of goals, or in case conflicts between the individual goals arise, the executive branch of the Federal government decides about the type and extent of fiscal measures to resolve the conflicts and to maintain the optimal goal combination.

The instruments of this law, especially public investment programs and changes in the income tax and depreciation rates, have been used against both inflation and recession. A slogan which accompanied the formulation of this law was: "as much market as possible, as much planning as necessary". The intention was for this law to affect macroeconomic relations only, whereas the market mechanism was to be the sole means of affecting microeconomic relationships. From the beginning there was criticism that such a distribution of responsibilities between government and market was not feasible, and perhaps even contradictory. Moreover, the philosophy on which the law was based was strongly attacked. The underlying philosophy of the law postulated that market systems have inherent tendencies to increase cyclical disturbances to such an extent that the system itself may be endangered — a hypothesis which remains unsupported.

(4) *Market Intervention:* An additional distinguishing feature of the reaction phase of government was that certain sectors (the market for rental property, and portions of the markets for land and energy) were taken out of the free market and subjected to governmental price and/or quantity controls. Such a move was generally motivated by above average price increases in those particular sectors.

Reappraisal of Market System Phase

While the second phase was characterized by increasing government expenditures, a third phase which appears to be emerging is characterized by increased anxiety about government activity. Some feel that government involvement in the economy has advanced so far as to seriously endanger economic freedom in particular and the market system in general. Those concerned with this development demand reductions of both governmental controls and intervention and also call for a reappraisal of the merits of the market system. Such demands have become more pronounced in recent years as a result of intense public discussion and of new political initiatives involving governmental guidance of private investment decisions and the requirement to have workers participate in the corporate decisionmaking process (known as "democratization of employer decisions"). In general, those opposed to the growth of government base their arguments primarily on the following:

(1) Deductions for taxes and social security amounting to approximately 40 percent of GNP lead to both a diminished willingness to work and to a general welfare mentality. Since more and more private sector functions are assumed by the public sector, the functioning of the market system is jeopardized. Bureaucratic administration of profits and losses is increasingly substituted for profit and loss decisions made in the market.

(2) The Keynesian doctrine, which advocates smoothing of the business cycle through fiscal actions, is not supported by the German experience. On the contrary, the opposite thesis has to be entertained, namely that the use of policy instruments (implementation of the Stabilization and Growth Law) worked in such a way as to increase cyclical disturbances.

In fact, a number of undesirable results materialized after implementation of the new law in 1967. Even though the law was designed to affect macroeconomic processes only, microeconomic effects resulted in practice. Restrictive policy actions, for example, led to discrimination against small and medium sized firms. The reason for this was that because of a lack of diversification such firms were affected more by a cutback of government orders than large corporations. On the other hand, during periods of expansionary fiscal policy large corporations were able, because of skilled management, to react to changes in tax and depreciation rates much faster than small and medium sized firms.

Once such selective micro effects had manifested themselves, specific governmental programs were required to correct the effects of previous fiscal actions. In other words, fiscal policy assumed an *ad hoc* character, based on the principle of trial and error. There were also the more general problems associated with fine tuning, and the lagged response of the economy to policy actions which increased both the uncertainty of private sector decisions and the size of the public sector.

(3) Finally, price controls over the markets for land and rental property generated sharp criticism. Since all sectors of the economy are interdependent, government control of prices in one sector will necessarily affect other sectors also. Once begun, governmental intervention, like an oil spill on water, tends to spread

to more and more markets, but first to the most closely related sectors. With respect to the markets for land and rental property, the most closely related sectors, (and, hence, likely candidates for the imposition of controls), would be the construction industry and capital markets. Germany is now once again at a point where she is trying to decide what degree of government involvement will give desired results without impinging on the benefits derived from the free market.

IN SEARCH OF AN OPTIMAL MIX BETWEEN PRIVATE AND PUBLIC SECTOR

In an economy where private and public sectors coexist, the question arises whether there is an optimal combination between the two. This question may be analyzed by considering a governmental action regarding the assumption of new responsibilities (for example, environmental conservation). The life cycle of such a decision may be characterized as follows:

The starting point is *why* should government assume this responsibility? A common answer might be: because desires for this service exist. This answer immediately provokes several other questions: *how* is it possible to determine whether this service is desired? Would the private sector be less efficient at providing these services? Or, are we concerned about goods and services which the private sector won't provide — either not at all, or in insufficient quantities (too high a cost)? Is the decision perhaps based on political considerations?

Assuming the government, after considering its constitutionality, decides to accept the new responsibility, the next step would be to inquire into the *consequences* of this decision. Responsibility for this service necessitates expenditures (for salaries, goods, and perhaps transfer payments). These expenditures, in turn, have consequences for the development and the structure of the markets for goods, services and factors of production (allocation of resources).

Finally, it is necessary to decide on the method of *financing* the new expenditures (user charges, contributions, taxes or credit). Which is preferred, depends on legal, political and economic considerations.

The fundamental question in this connection concerns the "appropriate" (optimal) proportions of private and public goods in a (principally) market oriented economy. Answering this question requires a theoretical basis, a general theory of optimal state activity, that is, *a theory of public responsibilities.*

Analytical Approach

An exact criterion for determining the optimal quantities of both public and private goods supplied would be a social welfare function. Such a function should contain all privately and publicly produced goods and services (as well as their distribution among individuals) as arguments. If it were possible to find a yardstick with which to measure the supply of public goods objectively, and if a social welfare function were available, it would be possible to determine the optimal supply of public goods for any available quantity of resources. Research on the construction of an empirical welfare function has been going on for more than 100 years, and so far has been, and will probably remain, unsuccessful.

This approach is based on principles of price and utility theory, which conclude that the last unit of money spent will result in the same utility in all its uses.[4] In other words, if the additional utility of a dollar spent on public goods exceeds that of private goods, then this dollar should be channeled to the public sector in order to maximize social welfare. Although plausible, this approach does have serious drawbacks.

Since interpersonal and intertemporal utility comparisons can not be used as objective yardsticks, the evaluation of the supply of public goods can only be made on the basis of subjective preferences.[5] Different groups of society — in the extreme each individual — will, therefore, consider a different combination of total supply as optimal. In addition, there is the complication that the output of public goods is either imperfectly, or not at all, measurable (see screened insert). An empirical social welfare function is therefore difficult, if not impossible, to come by; it is an abstract theoretical concept. The failure to develop an empirical social welfare function was described by one of the leading welfare theoreticians, K. E. Boulding, as follows: "I believe this attempt has been a failure, though a reasonably glorious one. . . ."[6] Thus, the absence of objective guidelines with which to evaluate state responsibilities has led in recent years to increasing anxiety over state activities.

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[4]For a lucid evaluation of this approach, see Francis M. Bator, "Simple Analytics of Welfare Maximization," *The American Economic Review* (March 1957), pp. 22-59.

[5]See E. J. Mishan, *Welfare Economics* (New York: Random House, 1964).

[6]Kenneth E. Boulding, "Economics As A Moral Science," *The American Economic Review* (March 1969), p. 5.

Measurement of State Activity

Today there is fear that the Federal Republic is moving relentlessly in the direction of a "welfare state," *à la* Scandinavian examples. However, the degree of state activity upon which such judgments are based is usually expressed by economic variables, and can lead, depending on the choice of the particular variable, to different conclusions. According to the accompanying chart with data for 1974, there are at least three different variables which can serve as proxies for the degree of state activity (relative to GNP):

— The *broadly defined* indicator of state activity ($G^* = 43.6$ percent; for the U.S. $G^* = 33$ percent).

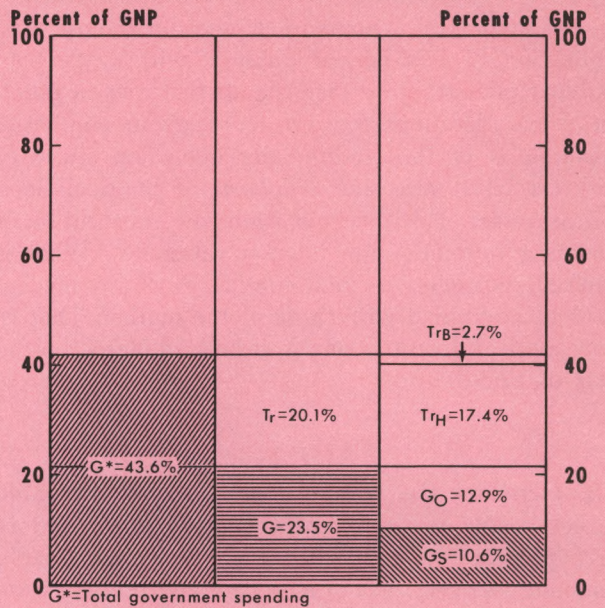
— The *less broadly defined* indicator (excluding transfer payments) ($G = G^* - Tr = 23.5$ percent; for the U.S. $G = 21.4$ percent in 1973).

— The *narrowly defined* indicator ($Gs = G^* - Tr - Go = 10.6$ percent; for the U.S. $Gs = 11.5$ percent in 1973).

Criticism concerning state activity is usually based on the broadly defined indicator ($G^* = 43.6\%$ of GNP). This indicator may be misleading, because double counting occurs. (It is appropriate to use the broadly defined indicator only if it is desired to express that amount of national income, including monetary transfers, that flow through government accounts; or — partly — as an indicator of income redistribution). If one is interested in the amount of resources which are directly absorbed by Government, expenditures on goods and services, the less broadly defined indicator ($G = 23.5$ percent), would be appropriate. With respect to the comparative contributions of the public and private sectors on total value added, the even more narrowly defined indicator ($Gs = 10.6$ percent) is the appropriate measure.

Moreover, regardless of how the output of the public sector (that is, the supply of public goods) is measured, criticism arises. This occurs because an increasing Government proportion of GNP does not necessarily result in a noticeable increase in Government output. In addition, Government activity, regardless of how it is measured, is an imperfect indicator with respect to the actual supply of public goods, for a number of reasons. Price stability, internal and external security, and equal opportunity are also public goods, but are not captured quantitatively in this measure. In addition, this measure does not reflect positive (and negative) *externalities* resulting from Government activity. So far as Government activity is included, it is only at *producer cost*, rather than at market prices. Therefore, it is incorrect to associate a constantly increasing Government share of GNP with a *real* increase in the supply of public goods. Even if it were possible to determine the specific rate of inflation of government expenditures, the measurement of public output would still be a problem. Therefore, it is not possible to determine either a sufficient measure of productivity, or a reliable decomposition of quantity and price components in the public sector.

Alternative Measures of Government Spending in the Federal Republic of Germany, 1974[1]



G*=Total government spending
Tr=Transfer payments
G=Government expenditures on goods and services
Tr_B=Transfer payments to domestic business
Tr_H=Transfer payments to domestic households and to foreign countries (1.1% of GNP)
G_O=Government expenditures other than for wages, salaries and transfers
G_S=Government expenditures for wages and salaries

[1] Includes Federal, state, local, and social security expenditures.

Source: Statistical Bureau of the Federal Republic of Germany National Income Accounts (preliminary report), April 1975.

Normative Approach

When applied to the political process, the analytical approach to public expenditures, based on price and utility theoretical considerations, is transformed into a normative approach. That is, politicians fix norms and make decisions about priorities. Since the constitution does not specify an objective decisionmaking apparatus and since such an apparatus does not even exist, politicians resort to such guiding principles as some vague notion of increasing public welfare. This is not to say that political decisions are reached without any economic rationale. Rather, economic prin-

ciples may exist in the background, as a vague guideline, when attempting to achieve the largest possible (social) benefit per unit of money.

The essence of this argument, then, is the following: a continuing and intensive development of a theory of public responsibilities (and expenditures) is necessary — especially a *nonmarket decision theory*. The application of cost-benefit analysis with respect to (public) infrastructure investments is a case in point. These considerations require a change in emphasis: *de-emphasis* of the traditionally one-sided study of market relationships and *emphasis* of political decision processes. This does not mean the substitution of "planning rationale" for "market rationale". What is required, however, is that political decision mechanisms be combined with those of the market. That is, even political decisions ought to be formulated on the basis of prices.

SUMMARY AND CONCLUSIONS

In Germany the adoption of a socially oriented market economy after World War II proceeded in three phases. The first phase, which featured rapid economic recovery, left numerous social problems unsolved. The following reaction phase led to increased government involvement in the economy, as witnessed by progressively increasing government expenditures and numerous restrictions on economic freedom. The present (third) phase of economic development constitutes, to some degree, a counter reaction — criticism and anxiety concerning increasing state activity, and reassessment of the efficiency of a market economy. In evaluating the role of government such cycles can be noticed in other countries as well. Developments in the United States, in this regard, show many parallels with the German case. It is too early to tell, however, whether elements of a planned or a market economy will dominate the future economic system in Germany. Independent of specific historic and legal arrangements in individual countries, the determination of an *optimal* relationship between the private and the public sector constitutes an unsolved problem for all industrial countries of the west.

The magnitude of government expenditures, as contained in the National Income Accounts, do not permit unambiguous assertions with respect to the measurement of government activity. Neither are they a reliable indicator with which to evaluate the supply of public goods as to its optimality. Although, in theory, a social welfare function provides exact criteria for the determination of optimal government activity, it has not been possible to represent the empirically observable counterpart of such a function. Even the construction of social indicators as substitutes for an empirical welfare function is not possible without appealing to value judgments. Thus, as long as it is not possible to develop a comprehensive and empirically meaningful theory of public responsibilities, politicians must necessarily rely on normative, and therefore many times arbitrary, decisions.

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