AUTONOMOUS EXPENDITURES VERSUS MONEY SUPPLY: AN APPLICATION OF DYNAMIC MULTIPLIERS

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I Introduction

THE purpose of this paper is to test empirically two propositions which have been closely, although not exclusively, associated with Milton Friedman in recent years. The first is the hypothesis that changes in monetary or fiscal policy variables are frequently ineffective in stabilizing some target variable because they are poorly timed.[1] The second hypothesis, which was presented by Friedman and Meiselman (1963), is that the money supply is a more important determinant of aggregate demand than autonomous expenditures.[2] We test these hypotheses by considering the effects of changes in fiscal and monetary variables upon the movements in gross national product within the framework of a small, short-run econometric model of the United States economy. In our model both money supply and government expenditure are regarded as autonomous manipulative policy instruments. A special feature of the study is a quarter-by-quarter investigation of the effects of changes in each of the two policy variables upon the movement of GNP. The period of investigation dates from the end of the Korean War (1954-I) to the beginning of serious military involvement in Vietnam (1963-IV).

The plan of the paper is as follows: In section II we specify and estimate the structural equations of the model. Section III is concerned with a dynamic analysis of the system. Here we derive our estimates of the dynamic multipliers and examine the system for stability. In section IV we utilize the preceding results to determine the relative importance of each of the two policy variables during the sample period. Simplified criteria are suggested and applied for evaluating the actual operation and relative effectiveness of the two types of policy. The final section contains a summary of the main results and some concluding remarks.

II The Model

The quarterly national income and product data used in the model are seasonally adjusted and measured in 1958 prices, the monetary variables having been deflated by the implicit price index for consumption expenditures.[3] The notation is as follows:

- Y . . . gross national product ($ bill.)
- C . . . consumption expenditures ($ bill.)
- I^d . . . producer's outlays on durable plant and equipment ($ bill.)
- I^r . . . residential construction ($ bill.)
- I^i . . . investment in inventories ($ bill.)
- G . . . government purchases of goods and services plus net foreign investment ($ bill.)
- S . . . final sales of goods and services ($ bill.)
- t . . . time in quarters (first quarter of 1954 = 0)
- r . . . yield on all corporate bonds (%)
- M . . . money supply, i.e., demand deposits plus currency outside banks ($ bill.)
- R . . . time deposits in commercial banks ($ bill.)
- L . . . money supply plus time deposits in commercial banks ($ bill.).

The variables are dated by subscripts; in the case of stock variables the subscript refers to the first day of the quarter. The variables G, L, M, R and t are considered to be exoge-

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[1] See Friedman (1948), Fox, Sengupta, and Thorbecke (1966), and Phillips (1954, 1957), who focus attention upon fiscal policy. Mayer (1958), Kareken and Solow (1963), Teigen (1964), Tucker (1966), and Smith (1967) make the same point with respect to monetary policy.

[2] We have somewhat slighted the FM position in the empirical part of our paper since we do not specify a real balance effect in the investment demand equations but include an interest rate and use a Keynesian money market equation.

[3] The data have been obtained from the *Survey of Current Business* and are available on request from the authors.

nous.[4] The structural disturbances are assumed to be normally distributed with zero means, constant variances, and zero coefficients of autocorrelation.

The coefficients of the model were estimated by the three-stage least squares method, except for the adaptive expectations coefficient in the consumption function which was estimated by nonlinear two-stage least squares. The results, along with the estimated standard errors and the coefficients of determination, are shown below.[5]

$$\hat{C}_t = \underset{(0.7803)}{-1.7951} + \underset{(0.0131)}{0.1731}\, Y_t + \underset{(0.0277)}{0.0421}\,(L_t - \underset{(0.0665)}{0.7275}\, L_{t-1}) + \underset{(0.0665)}{0.7275}\, C_{t-1} \qquad \bar{R}^2 = 0.9968$$

$$\hat{I}_t^d = \underset{(1.0759)}{2.5624} - \underset{(0.1891)}{0.4411}\, r_t + \underset{(0.0501)}{0.1381}\,(S_{t-1} - S_{t-2}) + \underset{(0.0110)}{0.0237}\, t + \underset{(0.0700)}{0.8917}\, I^d_{t-1} \qquad \bar{R}^2 = 0.8961$$

$$\hat{I}_t^r = \underset{(0.5779)}{3.6083} - \underset{(0.1133)}{0.5127}\, r_t + \underset{(0.0335)}{0.1267}\,(S_{t-1} - S_{t-2}) + \underset{(0.0059)}{0.0218}\, t + \underset{(0.0668)}{0.6483}\, I^r_{t-1} \qquad \bar{R}^2 = 0.8394$$

$$\hat{I}_t^i = \underset{(1.3610)}{3.0782} - \underset{(0.4089)}{0.8934}\, r_t + \underset{(0.1301)}{0.3713}\,(S_{t-1} - S_{t-2}) + \underset{(0.0208)}{0.0450}\, t + \underset{(0.1181)}{0.3178}\, I^i_{t-1} \qquad \bar{R}^2 = 0.5341$$

$$\hat{r}_t = \underset{(1.8706)}{13.8928} + \underset{(0.0042)}{0.0261}\, Y_t - \underset{(0.0335)}{0.1501}\, M_t + \underset{(0.0338)}{0.0588}\, M_{t-1} \qquad \bar{R}^2 = 0.8538$$

$$Y_t = C_t + I_t^d + I_t^r + I_t^i + G_t$$

$$S_t = Y_t - I_t^i$$

$$L_t = M_t + R_t.$$

The consumption function is of the form suggested by Zellner, Huang, and Chau (1965). The authors assume that consumption is a linear function of permanent income (Y_t^p), a gap between the actual and the desired level of liquid assets ($L_t - L^*_{t+1}$), and a stochastic disturbance (ϵ_t). Permanent income is determined by the usual adaptive expectation mechanism, and the desired level of liquid assets is proportional to permanent income. In terms of measurable variables, the relationship becomes

$$C_t = (1-b)C_{t-1} + aL_t - a(1-b)L_{t-1} + (k-a\eta)bY_t + \epsilon_t - (1-b)\epsilon_{t-1} \qquad (1)$$

where b is the adaptive expectations coefficient, η is the ratio of desired liquid assets to permanent income, and k and a represent the respective coefficients of Y_t^p and $(L_t - L^*_{t+1})$ in the original formulation of the consumption function. In estimating equation (1) we allowed for a non-zero constant term and assumed that ϵ_t follows a first-order autoregressive scheme with the coefficient of autoregression equal to $(1-b)$.[6]

All three investment equations are based on the proposition that the desired level of investment is linearly dependent on the cost of capital (r_t), the immediately preceding change in sales ($S_{t-1} - S_{t-2}$), time trend (t), and a stochastic disturbance. The cost of capital is represented by the rate of interest, which also serves as the transmitter of the changes in money supply to the investment demand equations. The acceleration term involves final sales rather than GNP on the grounds that a large part of inventory changes may be un-

[4] Regarding monetary and fiscal variables deflated by a consumer price index as being exogenous is a simplification imposed to avoid dealing with the problem of price and wage determination. Since during the period under investigation the price level was relatively stable this simplificaton, shared by many previous studies, is unlikely to have serious consequences in our case.

[5] The calculated values of the Durbin-Watson d-statistic are not presented since they are biased when the explanatory variables include the lagged value of the dependent variable. However, Durbin (1957, pp. 370) suggests that in this case the test "may be expected to hold approximately." In our model all five values of the d-statistic indicated no presence of positive autocorrelation at 1 per cent level of significance.

[6] In order to keep our model as simple as practicable, we used GNP as the measure of income in the consumption function. While from the theoretical point of view it would be more satisfactory to use personal disposable income (PDI), the resulting distortion is likely to be quite small since the ratio of PDI to GNP was very stable during the period under observation.

intended. The trend variable is included to take account of autonomous changes in investment. Further, we assume that only a fixed fraction of the desired adjustment of investment is accomplished within any particular period and make use of the standard partial adjustment formulation. This leads to the specification

$$I_t = a_0\gamma + a_1\gamma r_t + a_2\gamma\,(S_{t-1} - S_{t-2}) + a_3\gamma t + (1-\gamma)I_{t-1} + \gamma\epsilon_{1t} + \epsilon_{2t} \quad (2)$$

where a_0, a_1, a_2, a_3 and ϵ_{1t} are the coefficients and the disturbance of the desired investment equation, γ is the partial adjustment coefficient, and ϵ_{2t} is the disturbance of the partial adjustment equation.

The money demand equation represents a fairly standard formulation as discussed in Chow (1966), Howrey (1968), and Tucker (1966), and involves the proposition that households and firms are unable to adjust their actual money holdings to the desired level. Inasmuch as M_t is postulated to be exogenous, we specify r_t to be the "dependent variable" in the equation as suggested by Chow (1966, pp. 10–11). We also use the conventional definition of money as a medium of exchange and hence include only currency outside banks and demand deposits. This seems to be the most appropriate monetary policy variable since, as argued by Laidler (1969), the authorities may be able to control the quantity of demand deposits but not the quantities of other financial intermediary liabilities. However, time deposits are included in our definition of the liquid asset variable in the consumption function.

On the basis of the traditional criteria, the results of estimation appear quite satisfactory. All of the coefficients have the expected signs, the values of $\bar{R}^2$ are reasonably high, and the ratios of the estimated coefficients to their respective standard errors are greater than two in all but two cases. However, to check the results still further we subjected the estimated model to two additional tests, a prediction test and a specification error test. The details and the results of the tests are set out below.

The forecasting ability of our model was tested by predicting the values of the endogenous variables for eight quarters following our sample period, using the equations of the derived reduced form of the model.[7] The predicted values were then compared with the actual values of the variables. In order to test the significance of the differences, we estimated the standard deviations of the prediction errors by following the elaborate procedure developed by Goldberger, Nagar, and Odeh (1961). The result is that in 40 out of 48 cases the actual values of the endogenous variables lie no further than two standard deviations from the predicted values, and that in 46 cases the actual values lie within three standard deviations. Only in predicting consumption expenditure for the first two quarters of 1964 are our predictions more widely off the mark. This result is likely due to the effect of the income tax rate cut which was introduced at the beginning of that year. On the whole, it seems that we may reasonably conclude that the observations for the two years following the sample period constitute no serious contradiction of our model.

In addition to the prediction test, we have also subjected our model to a series of specification error tests as described by Ramsey (1969). These tests, which are applicable to the reduced-form equations of the model, have been designed to uncover errors resulting from omission of relevant explanatory variables, mis-specification of the functional form, simultaneous equation bias (e.g., that caused by an incorrect classification of an endogenous variable as exogenous), and heteroscedasticity. The tests include

(i) regression specification error test (RESET), for which the test statistic has an F-distribution;
(ii) rank specification error test (RASET), which leads to a t-distribution;
(iii) Bartlett's M-test (BAMSET), which involves a chi-square distribution; and
(iv) Kolmogorov specification error test (KOMSET), which leads to a nonstandard distribution with calculated values.

All of the tests have been developed for large samples but appear to perform satisfactorily in small samples as well.[8] The results for the first three tests are presented in table 1. They indicate that the null hypothesis (of no specification error) can be accepted by all three

[7] The predictions were based on the actual values of the predetermined variables.

[8] See Ramsey and Gilbert (1969) for evidence.

tests at the 1 per cent level for every equation, and at the 5 per cent level for every equation except for the last one. The results of the KOMSET test led to acceptance of the null hypothesis for all equations at the 5 per cent level. The reduced-form equations of the model thus pass the specification error tests quite well.

TABLE 1. — SPECIFICATION ERROR TESTS OF THE MODEL

Reduced Form Equation	Value of		
	F-statistic	t-statistic	Bartlett's M-statistic
C_t	0.301	0.704	0.719
I_t^a	0.754	0.748	1.864
I_t^r	1.764	0.410	1.644
I_t^i	1.802	0.324	0.848
Y_t	0.555	1.283	1.169
r_t	7.936	0.384	0.559
Critical Value (per cent)			
5	5.76	1.701	5.991
1	13.93	2.467	9.210

III Dynamic Analysis of the Model

If we use the estimated structural equations and express current endogenous variables in terms of the exogenous and lagged endogenous variables, we obtain a set of derived reduced-form equations. The coefficients of these equations, which measure the immediate effects of predetermined variables on the current values of the endogenous variables, are called "impact multipliers." In our case the derived reduced-form equation for GNP is

$$\begin{aligned} Y_t = & -20.8070 + \underset{(0.1024)}{0.3168\, M_t} - \underset{(0.0755)}{0.1242\, M_{t-1}} \\ & + \underset{(0.0308)}{0.0481\, L_t} - \underset{(0.0224)}{0.0350\, L_{t-1}} \\ & + \underset{(0.0286)}{1.1427\, G_t} + \underset{(0.0489)}{0.1035\, t} + \underset{(0.0356)}{0.8313\, C_{t-1}} \\ & + \underset{(0.1796)}{0.7270\, (S_{t-1} - S_{t-2})} + \underset{(0.0853)}{1.0190\, I^d_{t-1}} \\ & + \underset{(0.0802)}{0.7409\, I^r_{t-1}} + \underset{(0.1350)}{0.3631\, I^i_{t-1}} + v_{1t}. \end{aligned} \quad (3)$$

According to our estimates, the impact effect of a 1 billion dollar increase in government expenditures is to increase GNP by 1.1427 billion dollars, while the impact effect of a 1 billion dollar increase in money supply yields a 0.3649 billion dollar increase.

The reduced-form solution presents a clear picture of the immediate responses of GNP to changes in the predetermined variables and enables us to estimate the effects of the exogenous variables *given* the immediate past history of all endogenous variables. An econometrician who is only interested in forecasting does not have to go any further since his concern is with the future. For an analysis of the past, however, the impact multipliers alone are not very illuminating. If our knowledge were confined to the reduced-form equations, we would undoubtedly find that the main influence on the current values of GNP is its own immediate history, and the question of estimating the relative importance of cumulative fiscal, monetary and other exogenous variables would remain unresolved. The relevant solution for this problem is obviously one which would determine the time path of GNP in response to exogenous forces alone. Such a solution involves the determination of current GNP in terms of its own lagged values and of current and lagged values of the exogenous variables. The resulting equation, called the "fundamental dynamic equation," is

$$\begin{aligned} Y_t = & \ 3.0716\, Y_{t-1} - 3.6561\, Y_{t-2} + 2.0850\, Y_{t-3} \\ & - 0.5585\, Y_{t-4} + 0.0535\, Y_{t-5} + 1.1427\, G_t \\ & - 2.5300\, G_{t-1} + 1.3779\, G_{t-2} + 0.5853\, G_{t-3} \\ & - 0.7463\, G_{t-4} + 0.1784\, G_{t-5} + 0.3168\, M_t \\ & - 0.7499\, M_{t-1} + 0.6253\, M_{t-2} - 0.2000\, M_{t-3} \\ & + 0.0082\, M_{t-4} + 0.0046\, M_{t-5} + 0.0481\, L_t \\ & - 0.1065\, L_{t-1} + 0.0580\, L_{t-2} + 0.0246\, L_{t-3} \\ & - 0.0314\, L_{t-4} + 0.0075\, L_{t-5} + 0.1034\, t \\ & - 0.2050\, (t-1) + 0.1267\, (t-2) \\ & - 0.0192\, (t-3) - 0.0032\, (t-4) \\ & - 0.5113 + \text{error}. \end{aligned} \quad (4)$$

The fundamental dynamic equation enables us to determine whether the system is or is not dynamically stable, and it provides the basis for evaluating the relative importance of individual exogenous variables. The question of dynamic stability can be settled by reference to the so-called "auxiliary equation" which is obtained from the fundamental dynamic equation by transferring all terms involving Y to the left-hand side and putting the right-hand side equal to zero. The characteristic roots of the auxiliary equation are

$$\lambda_1 = 0.2081,$$
$$\lambda_{2,3} = 0.8475 \pm 0.0809i,$$
$$\lambda_{4,5} = 0.5843 \pm 0.1156i$$

The largest modulus of the conjugate complex roots is 0.8513 with estimated standard error of 0.2275.[9] This indicates that the estimated time path of Y, apart from the influence of exogenous variables and of initial conditions, is one of damped oscillations. The system is thus estimated to be inherently stable, although the hypothesis of instability cannot be rejected on the basis of our observations.

The influence of exogenous variables on the time path of Y can be determined by eliminating all the lagged values of Y from the fundamental dynamic equation. This can be done by successive substitution, beginning with the first period in which Y is function only of current values of the exogenous variables and of given initial conditions, and leads to an expression of the form

$$Y_t = a_{0t} + b_0 G_t + b_1 G_{t-1} + \dots + b_t G_0 + c_0 M_t + c_1 M_{t-1} + \dots + c_t M_0 + \dots$$
$$\text{where } t = 0, 1, 2, \dots \qquad (5)$$

In a stable system the term a_{0t}, which includes the effects of initial conditions, will converge to a fixed level. The coefficients attached to the exogenous variables in equation (5), called "dynamic multipliers," indicate the current and the delayed effects of each exogenous variable on the time path of Y. The sum total of all dynamic multipliers attached to a specific exogenous variable gives, for a large t, the value of the long-run multiplier for that variable.

The estimates of the dynamic multipliers for our model are presented in table 2. The main features of the results are the following:

(i) As anticipated, all dynamic multipliers exhibit a damped oscillatory movement and tend to converge to zero as the length of the time lag increases.

(ii) A positive change in government expenditure or in liquid assets is stimulating for the first four quarters and then becomes mildly depressing.

(iii) The effect of changes in the money supply operating through the interest rate on investment demand appears to be very much stronger than that operating through liquid assets on consumption.

(iv) The estimates of the long-run multipliers and of their standard errors are as follows:

Government expenditure	1.8406	(0.4099)
Money supply (combined effect)	1.2270	(1.0066)
Trend	0.6363	(2.2431)

[9] The standard error was estimated by expressing the modulus as a linear approximation of the structural coefficients.

TABLE 2. — DYNAMIC MULTIPLIERS FOR THE TIME PATH OF GNP

Lag k	Multipliers of G_{t-k}	M_{t-k}	L_{t-k}	$t-k$
0	1.14271	0.31683	0.04811	0.10341
1	0.98001	0.22330	0.04126	0.11262
2	0.21029	0.15287	0.00885	0.09459
3	0.03086	0.11372	0.00130	0.07525
4	−0.01519	0.08722	−0.00064	0.05920
5	−0.02878	0.06775	−0.00121	0.04660
6	−0.03352	0.05291	−0.00141	0.03679
7	−0.03539	0.04135	−0.00149	0.02908
8	−0.03604	0.03210	−0.11052	0.02298
9	−0.03592	0.02487	−0.00151	0.01808
10	−0.03520	0.01896	−0.00148	0.01412
11	−0.00396	0.01410	−0.00143	0.01091
12	−0.03227	0.01036	−0.00136	0.00830
13	−0.03024	0.00729	−0.00127	0.00619
14	−0.02795	0.00486	−0.00118	0.00448
15	−0.02552	0.00295	−0.00107	0.00312
16	−0.02303	0.00148	−0.00097	0.00204
17	−0.02056	0.00037	−0.00086	0.00120
18	−0.01816	−0.00044	−0.00076	0.00055
19	−0.01589	−0.00102	−0.00067	0.00006
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.

IV Effects of Fiscal and Monetary Policies

The results of the preceding section, though interesting, do not settle the question as to whether fiscal or monetary factors were more influential in bringing about changes in the level of GNP during the sample period. The reason for this is that the actual effect of each of the exogenous variables depends not only upon the magnitudes of the dynamic multipliers but also on the amount of change displayed by the respective exogenous variables. In order to examine the effects of current and past changes in exogenous variables on current changes in GNP, we restate equation (5) in terms of first differences. The contributions of individual exogenous variables to changes in GNP in period t can then be represented as follows:

Variable	*Current Effect*	*Cumulative Effect*
G	$b_0(G_t - G_{t-1})$	$\sum_{i=0}^{t-1} b_i(G_{t-i} - G_{t-i-1})$

$$M \qquad c_0(M_t - M_{t-1}) \qquad \sum_{i=0}^{t-1} c_i(M_{t-i} - M_{t-i-1})$$

etc. The calculations for the monetary and fiscal variables are presented in table 3.

TABLE 3. — EFFECTS OF MONETARY AND FISCAL VARIABLES: 1954 THROUGH 1963 (BILLIONS OF DOLLARS)

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in Y		Current Effects		Cumulative Effects	
Quarter	Actual	Estimated [a]	M and L	G	M and L	G
1954 2	−0.2	−2.585	−0.212	−0.914	−0.324	−2.430
3	1.3	2.441	0.721	−0.457	0.496	−1.614
4	2.1	1.919	0.520	−0.343	0.892	−1.013
1955 1	3.1	2.085	0.306	0.114	0.862	−0.333
2	1.9	1.638	0.272	−1.143	0.804	−1.133
3	1.6	2.521	0.170	0.571	0.713	−0.385
4	1.1	1.176	−0.047	−0.228	0.428	0.084
1956 1	0.7	1.825	−0.492	0.114	−0.198	0.032
2	0.5	−0.682	−0.214	0.686	−0.373	0.816
3	0.3	0.461	−0.711	−0.343	−0.948	0.328
4	1.5	0.336	−0.358	0.800	−1.025	0.706
1957 1	0.7	2.945	−0.227	1.143	−0.917	1.856
2	0.0	−0.209	−0.371	0.000	−1.025	1.180
3	0.5	−1.484	−0.322	−0.343	−1.067	−0.055
4	−1.7	0.559	−0.380	−0.228	−1.165	−0.448
1958 1	−2.7	−1.602	−0.711	0.000	−1.565	−0.243
2	0.5	−1.985	0.405	0.457	−0.745	0.400
3	2.8	2.160	0.436	0.343	−0.063	0.717
4	2.7	2.601	0.403	0.114	0.265	0.481
1959 1	1.8	0.890	0.369	−1.143	0.432	−0.981
2	2.8	2.243	0.343	0.000	0.575	−0.970
3	−1.2	2.457	0.291	0.343	0.627	0.103
4	1.3	−0.935	−0.421	0.114	−0.018	0.337
1960 1	2.5	−0.518	−0.866	0.343	−0.912	0.474
2	−0.2	2.977	−0.608	0.570	−1.224	0.879
3	−0.6	0.713	−0.234	0.457	−1.043	0.997
4	−0.8	−1.098	0.060	0.571	−0.619	1.059
1961 1	−0.3	0.625	−0.103	0.571	−0.538	1.137
2	2.5	−0.249	0.568	0.114	0.139	0.688
3	2.2	2.729	0.344	0.571	0.405	0.743
4	2.6	2.536	0.276	0.343	0.466	0.808
1962 1	1.9	2.733	0.420	0.343	0.668	0.668
2	2.1	2.374	0.455	1.143	0.845	1.428
3	1.4	0.993	0.188	−0.114	0.435	0.840
4	1.2	1.219	0.147	0.114	0.342	0.127
1963 1	0.7	1.422	0.426	0.457	0.635	0.447
2	0.9	0.712	0.382	0.000	0.806	0.274
3	2.2	1.536	0.626	0.343	1.108	0.284
4	1.6	2.669	0.314	0.343	1.014	0.503

[a] Fitted values from the derived reduced-form equation.

Concerning the question of relative importance of fiscal and monetary policy, the relevant entries in table 3 are those in column (5), which represent the combined effects of the monetary variables, and those in column (6), which indicate the effect of autonomous expenditures. A comparison of these columns shows that there is not much basis for claiming that either monetary factors or autonomous expenditures played a considerably more significant role during this period. In terms of absolute magnitudes, autonomous expenditures appear to have had a greater effect in 19 cases while monetary effects were stronger in 20 cases. Thus, the Friedman-Meiselman hypothesis does not receive a strong support from our investigation.

A choice between the two policy variables from the viewpoint of stabilization objectives can be made by arbitrarily establishing some simple evaluation criterion. Suppose we decide that a quarterly increase in real gross national product of 1.5 billion dollars is desirable and that any increase below that amount is deflationary, while any larger increase places an undesirable upward pressure on the economy. In this case we can claim that, say, a monetary policy is inflationary if the money supply is increased when GNP could be expected to grow by 1.5 billion dollars or more, even if the money supply remained unchanged. Similarly, a monetary policy can be claimed to be deflationary if the money supply is decreased when the expected growth of GNP with no change in the money supply is less than or equal to 1.5 billion dollars. That is, a monetary policy is called inflationary if

$$(\hat{Y}_t - \hat{Y}_{t-1}) - c^*_0(M^*_t - M^*_{t-1}) \geqq 1.5 \text{ and } c^*_0(M^*_t - M^*_{t-1}) > 0$$

and it is called deflationary if

$$(\hat{Y}_t - \hat{Y}_{t-1}) - c^*_0(M^*_t - M^*_{t-1}) \leqq 1.5 \text{ and } c^*_0(M^*_t - M^*_{t-1}) < 0$$

where $M^* = M + L$ and c^*_0 is the corresponding impact multiplier. The same rule can also be adopted for judging the destabilizing effects of fiscal policies.[10] The relevant information is provided in table 3, columns (2), (3) and (4). The results indicate that changes in autonomous expenditures affected the target variable in the wrong direction in 18 of the 39 cases, while monetary changes were of the

[10] The policy effects are evaluated against expected changes in GNP (estimated from the derived reduced form) to abstract from the uncontrollable disturbances which could frustrate well conceived policy measures.

wrong sign in 25 cases. Thus, we are led to conclude that the effects of the changes in the two variables were often destabilizing, and that the record of the monetary variable is even poorer than that of the expenditures variable. While the actual number of times in which the variables were "of the wrong sign" is, of course, dependent on the choice of the criterion of evaluation, the above conclusions turned out to be invariant for a relatively wide range of hypothetical objectives.

The apparent lack of success of fiscal and monetary policy as stabilizing instruments during the period from 1954 through 1963 might lead us to a speculation that a policy of random changes (within some reasonable range) or of a constant modest change in the policy variables might well have been as successful as the policy changes which actually took place. In order to test this, we carried out two simulations of the time path of GNP in response to such measures. In the first simulation we let autonomous expenditures and money supply fluctuate at random within the limits actually observed for the period; the remaining exogenous variables were given their actual values. The second simulation differed from the first in that autonomous expenditures were being increased and money supply decreased from their initial values by 0.1 billion dollars per quarter, in accordance with the trends actually observed. The results are presented in table 4. Using the same criterion as above, we find that for the 39 quarters under examination random changes in autonomous expenditures affected the target variable in the wrong direction in 14 cases, while random monetary changes had the wrong sign in 13 cases. As noted above, under actual changes in the two policy variables there were 18 wrong signs for autonomous expenditures and 25 for money supply. With respect to the policy of a constant change in the two variables, we find 17 wrong signs for autonomous expenditures and 18 for money supply.[11] However, to make the comparison of the effects of alternative policy measures more comprehensive, we should

TABLE 4. — SIMULATED CHANGES IN GNP UNDER RANDOM AND CONSTANT CHANGES IN POLICY VARIABLES (BILLIONS OF DOLLARS)

		(1)	(2)	(3)	(4)	(5)	(6)
		Random Policy			Constant Change Policy		
		Change in Estimated Y	Current Effects		Change in Estimated Y	Current Effects	
Quarter			M and L	G		M and L	G
1954	2	−0.092	5.225	−2.057	−1.104	0.512	0.114
	3	2.143	−1.505	1.028	2.819	0.064	0.114
	4	3.753	−0.721	2.742	2.228	0.045	0.114
1955	1	4.607	−4.365	6.742	2.025	−0.022	0.114
	2	−2.704	5.965	−9.827	2.728	0.016	0.114
	3	1.180	−4.866	3.657	2.043	−0.012	0.114
	4	11.271	5.902	5.713	1.572	0.026	0.114
1956	1	−6.160	−3.776	−5.028	0.959	−0.017	0.114
	2	−3.630	−0.871	−1.485	−0.906	−0.032	0.114
	3	−0.355	3.158	−3.314	1.113	−0.017	0.114
	4	2.801	−1.416	4.114	0.296	0.007	0.114
1957	1	1.819	−2.818	2.057	2.414	−0.007	0.114
	2	−0.440	3.790	−3.428	0.455	0.031	0.114
	3	−0.114	−2.949	2.971	−0.424	0.007	0.114
	4	−4.297	0.058	−5.485	1.675	0.021	0.114
1958	1	7.495	−1.003	10.056	−0.578	−0.017	0.114
	2	0.803	3.798	−0.457	−1.800	0.112	0.114
	3	−3.494	−4.308	−2.400	1.975	0.108	0.114
	4	5.976	6.315	−1.257	2.531	0.002	0.114
1959	1	2.960	−4.448	4.114	1.969	0.040	0.114
	2	−0.229	−1.810	−0.914	2.243	0.022	0.114
	3	−5.903	0.000	−7.313	2.047	−0.036	0.114
	4	6.167	2.024	6.339	−0.545	−0.056	0.114
1960	1	−4.072	4.389	−7.999	0.159	−0.027	0.114
	2	0.627	−3.965	0.457	3.338	−0.060	0.114
	3	5.832	1.444	4.457	0.874	0.021	0.114
	4	0.901	−1.947	3.771	−1.336	0.060	0.114
1961	1	0.850	−0.906	1.143	0.486	0.080	0.114
	2	−8.499	−0.162	−7.542	−0.616	0.093	0.114
	3	11.920	6.767	4.914	2.302	0.089	0.114
	4	−6.761	−6.366	−4.342	1.837	0.093	0.114
1962	1	9.782	4.398	5.028	1.944	0.055	0.114
	2	−3.652	−2.328	−2.971	0.697	0.190	0.114
	3	2.776	−0.483	2.514	1.016	0.064	0.114
	4	−5.451	1.789	−7.656	0.868	0.074	0.114
1963	1	2.561	0.353	2.514	0.475	0.170	0.114
	2	0.067	−3.267	2.971	0.215	0.127	0.114
	3	0.160	3.473	−2.514	0.448	0.079	0.114
	4	−3.844	−2.167	−3.542	1.769	0.132	0.114

take into account not only the direction of the effects but also their magnitude. For this purpose we may use as a measure the standard deviation of the change in $\hat{Y}_t$ under the three alternative policies. The results are:

Actual policy	1.507
Random change policy	4.818
Constant change policy	1.270

It would then appear that, from the stabiliza-

[11] Current effects of the monetary variables shown in column (5) of table 4 are not constant because of the effects of the time deposits (R) which were allowed to take on their actual values.

tion point of view, a policy of constant change compares favorably with the actually adopted policy, whether we consider the direction or the extent of the effects. A policy of random changes, while more frequently of the right direction than the other two policies, leads to considerably greater dispersion of the target variable.

V Summary and Concluding Remarks

In this paper we have attempted to investigate the effect upon aggregate demand of those variables which can be, at least in part, manipulated by economic policy makers. To this end we constructed and estimated a small quarterly econometric model of the United States economy for the ten-year period from 1954 through 1963. For each of the exogenous variables of the system, we calculated a set of dynamic multipliers in order to estimate the changes in aggregate demand arising from current and previous changes in these variables during the sample period. The multipliers were then applied to the actual movement in money supply and autonomous expenditures during the sample period so that we could assess the relative importance of these variables and their effectiveness as factors of stabilization. Concerning the importance of money supply and autonomous expenditures as determinants of aggregate demand, we found that neither appeared to be predominant during the period under investigation. With respect to short-run stabilization policy, the performance of neither tool can be viewed with any great amount of enthusiasm. The effects of changes in both money supply and autonomous expenditures were often destabilizing, the record of monetary policy being even poorer than that of autonomous expenditures.

At the end, we should emphasize that the conclusions reached in this study are necessarily tentative, as would be the case for any other econometric model. However, we can claim that the use of a small simultaneous equation model represents an improvement over some of the single equation tests of the Friedman-Meiselman hypothesis previously employed, although, of course, our results are more historically confined. We also believe that our model captures some of the basic features of the United States economy during the period under investigation without suffering from the complexities and difficulties of understanding encountered with some of the recent large-scale and highly disaggregated models.

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