# New Measures of Fiscal and Monetary Policy, 1958-1971

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In his controversial presidential address to the American Economic Association several years ago, Wassily Leontief [1971] urged professional economists to reallocate resources away from the more glamorous construction of mathematical models towards the more mundane task of data collection. While we believe that measurement without theory is no better than theory without measurement, we offer the present paper in the spirit of Leontief's plea.

The reader looking for new theoretical insights will be disappointed in this paper, for its primary task is the generation of new data. However, we would argue, the kind of data presented here cannot be directly observed but must carefully be constructed with the guidance of a model of the economy. Specifically, we are interested in measuring the effects that fiscal and monetary policies have had on macroeconomic performance. This, of course, requires an answer to the counterfactual question: what would have been the state of the economy in the absence of fiscal or monetary policy?

The present paper offers a general method for answering such questions, applicable to any model of any economy, and then applies this method to a specific model of the U.S. economy in order to generate quarterly time series on fiscal and monetary influence over the 1958-1971 period. Our aims are twofold. First, we hope other economists will be induced to adopt the method and generate new data based on other models. Second, we hope the series presented here will prove useful to others interested in U.S. fiscal and monetary policy.

The plan of the paper is as follows. The first section enumerates some uses to which measures like those presented here can conceivably be put, and discusses why the existing indicators of fiscal and monetary policy are inadequate for these purposes. The general method for constructing such data, and the specific details of our application, are examined in Section II. Sections III and IV present and analyze our measures of fiscal and monetary policy respectively. Attention is focused on how well they coincide with previous measures, and with one another; what story they tell about the conduct of stabilization policy; and what light they shed on the structure of the model used to generate them. Finally, in Section V we provide two examples of how our measures of policy may be used in empirical work. For the most part, this section is meant as an illustration of how our measures may be used in the formulation and estimation of "reaction functions" for the government and central bank--a subject we will examine in some detail in a subsequent paper.

## I. The Need for New Measures

Since the measures of fiscal and monetary policy presented here are rather unconventional, especially where monetary policy is concerned, some preliminary discussion of the purposes served by such measures, and why existing measures are not suitable for these purposes, is perhaps in order. At a sufficiently austere level, of course, all such indices are superfluous. Fiscal policy can be unambiguously described by a list of every change in government expenditures and in the tax laws, and monetary policy can be described analogously by a catalogue of all actions taken by the Federal Reserve System. The purist will point out, quite correctly, that any attempt to collapse these vectors into scalars is subject to insoluble index-number problems; while a specific summary measure may be good for some purposes, it will be inappropriate for others. In our view, however, there is sufficient commonality in the uses to which economists are likely to put such summary measures that one specific set of indicators may be satisfactory for most purposes. In particular, indices of fiscal and/or monetary policy are typically intended to show what effects the government or the Fed has had on some endogenous variable of interest, typically (but not always) real or nominal gross national product (GNP). Such information is desired for several reasons.

## Historical Analysis of Policy Actions

One important use to which aggregate measures of fiscal policy have been put is in historical appraisals of past policy actions. Brown's [1956] pioneering paper is a good illustration. While such studies are obviously useful in affixing blame for past errors, recrimination is surely not their only function. Policymaking is still in a sufficiently rudimentary state so that after each major policy episode, it is useful to consider with hindsight what the stabilization authorities did, why their policies did or did not work, and the reasons for the success or failure. In so doing, it is obviously not enough simply to look at the state of the economy; one must always compare this to the state the economy would have achieved in the absence of the policy under examination. Thus, it is necessary to know what impact fiscal and/or monetary policy had on the GNP, price level, or other variable of interest.

Policy Planning

Students of monetary policy in particular have often decried the lack of precision in categorizing the "ease" or "tightness" of policy.* Clearly, if the Federal Reserve Board tells its staff that it wants a "tight monetary policy," it has communicated very little of its true intent, and may not get the policy it wants. However, if it orders a $5 billion reduction in some prescribed measure of monetary influence, it can at least exercise effective control over monetary policy, though control over the economy is more elusive. In a word, if policy planning is to be more than a mere directional exercise (i.e., "expand" versus "contract"), numerical measures of the impacts of monetary and fiscal policy on macroeconomic targets are imperative.

"Reduced Form" Studies

There are also more strictly academic reasons for developing summary measures of policy. Friedman and Meiselman [1963] and, more recently, Andersen and Jordan [1968] have ignited a great deal of interest in the so-called "reduced form" approach to income determination and prediction. The attractive aspect of this approach is that is obviates the need to specify a detailed structural model of the economy, a task which has occupied many fine minds for many years with no observed tendency to converge. Instead, only a list of the exogenous variables in the (unspecified) model is required in order to estimate the reduced-form equation for the variable(s) of interest (say, GNP). Of course, one major gap in this reasoning is the mysterious way in which a complete list of exogenous variables is obtained in the absence of

*See, for example, Duesenberry [1969].

none of these have used the kind of summary measures of policy that we present here. Instead, these studies typically select a single monetary or fiscal variable, such as unborrowed reserves or government purchases and regress it on macro target variables. In a multi-instrument world, where "there is more than one way to skin a cat," this may be an inappropriate procedure. For example, it may be a rational countercyclical policy to cut government purchases when aggregate demand is deficient if, at the same time, taxes are cut by an even larger amount. Indeed, the former may be the political price necessary to achieve the latter.

Consider the following hypothetical scenario which we suggest may be descriptively accurate, and which makes the measures we present the most appropriate dependent variables in reaction functions. The government desires to stabilize GNP around its full-employment growth path, and has several instruments at its disposal: government purchases, transfers of various kinds, tax rates, and other tax provisions. To a good degree of approximation, whatever can be accomplished by variations in government purchases can also be accomplished, say, by changes in income tax rates. For stabilization purposes, then, it is a matter of indifference which instrument is used.

The government may behave as follows. At each point in time, it decides by how much fiscal policy ought to alter aggregate demand; this is the sort of decision a reaction function seeks to illuminate. Once this choice is made, however, the specific instrument or package of instruments to use becomes an essentially political choice, depending on such things as the makeup and mood of Congress, previous public pronouncements by the President, the prevailing ideology, and so on.

If this scenario approximates the way policy is actually made, it is a mistake for economists to seek to explain the behavior of government purchases and income tax rates separately, at least if explanatory variables are standard macro targets like the unemployment rate. A better procedure would be to construct, and explain the behavior of, some overall measure of fiscal policy, leaving the rest of the problem to the political scientists. We are exploring this approach to reaction functions in our current research and report a few preliminary results in Section V.

## Existing Measures of Fiscal Policy*

By now the shortcomings of the ordinary budget deficit as an indicator of fiscal policy are too well known to require elaboration. The most popular alternative is the full-employment surplus (FES), but its drawbacks are no less severe for being less well understood. First its usefulness is vitiated by the balanced-budget theorem, which shows that taxes and expenditures are not equally powerful instruments. Second, if the level of income corresponding to full employment rises each year, the FES grows automatically if the government takes no action; myopic concentration on the FES would incorrectly label this as fiscal contraction. Finally, the FES counts the tax receipts that <u>would</u> accrue <u>if</u> the economy were at full employment instead of actual tax receipts. It is easy to dream up conceivable changes in tax laws which involve a net revenue loss at low levels of resource utilization (and are thus expansionary), but <u>would</u> yield a net revenue gain at full employment.

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*This section draws very heavily on Blinder and Solow [1974]. Similar points have been made by Oakland [1969], Colwell and Lash [1973], and Hymans and Wernette [1970].

The first problem is easily solved by computing a weighted full-employment surplus, as was done approximately by Brown [1956] and precisely by Gramlich [1968]. But this does nothing about the latter two problems. These can be overcome by evaluating the net revenue gain from any changes in the tax code at current, rather than full employment, income levels. If one deducts from this the change in government purchases, one has the change in a standardized surplus of the kind computed by McCracken [1972], Hymans and Wernette [1970], and Corrigan [1970]. Of course, this measure fails to weight taxes and spending appropriately.

Finally, a better measure can be derived by applying both corrections simultaneously in the construction of a weighted standardized surplus. To our knowledge, only one such time series has been constructed: by Oakland [1969] for the period 1947-1966. However, Oakland arrives at his weights by introspection rather than by econometrics, a procedure we do not recommend.*

## Existing Measures of Monetary Policy

The controversy over how to measure monetary policy has lasted so long, and generated so much literature, that we hesitate to add our two cents.** However, it needs to be said that, at least for any of the four purposes outlined above, all of the measures suggested to date are at best incomplete.

The monetarists have made it quite clear why using some critical interest rate , such as the Treasury bill rate, is inappropriate. While it certainly is affected by monetary policy, it is also buffeted by a myriad of other forces.

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*He actually adopts the weights invented by Musgrave [1964].

**For a recent compendium of articles on the subject see Brunner [1969].

This makes it impossible to infer the behavior of the monetary authorities by looking at the course of interest rates. And this is true even if, as has been suggested, the Fed has pursued an interest rate target during some historical episodes. Some attempts have been made to construct a "full employment" interest rate (e.g., Starleaf and Stephenson [1969] and Hendershott [1971]). While a step in the right direction, this suffers from the difficulties alluded to in the discussion of the FES.

Similarly, the anti-monetarists have made it amply clear why using some monetary aggregate, such as $M_1$ or $M_2$ , is inappropriate. No one would question the fact that monetary policy actions have a great influence on the money stock; but so do other things. The stock of money may be "pushed up" by supply considerations or "pulled up" by demand considerations, and mere examination of the time series will never tell us how much of each actually occurred. And this objection would remain valid even were the Fed to adopt a constant-growth-rate policy as the monetarists have long urged.

We will not bore the reader by reciting analogous objections to using any other variable which is only partially controlled, such as net free reverves, to represent monetary policy. But what about variables which may plausibly be argued to be fully controlled, such as unborrowed reserves?* Here the point made earlier about fiscal policy applies again. The Fed has several weapons at its disposal. It can, to a good degree of approximation, achieve the same stabilization effects by open-market operations, changes in reserve ratios, discount policy, or some combination of these. Which instrument(s) it chooses to employ may be a fascinating question, but it is not directly

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*For a debate over whether this really is controlled by the Fed, see DeLeeuw and Kalchbrenner [1969] and Andersen and Jordan [1969].

relevant to stabilization policy.* What is needed is clearly an overall measure which combines open-market operations, reserve ratio changes and other policy actions in a satisfactory way, analogous to the weighted standardized surplus. Oddly enough, so far as we know, there is not a single attempt to do this in the literature.** We offer such a composite indicator in Section IV below.

## II. Conceptual Basis for the Measures

The conceptual basis for our measures of both fiscal and monetary policy can be elucidated most clearly by reference to a highly stylized world. We begin by deriving measures of policy which would command universal assent in such a milieu. Then we show how some harsh realities make the search for unanimity fruitless. Instead, the way one measures fiscal or monetary policy inevitably depends on his model of the economy. Every model generates (somewhat) different measures; in fact, even for a given model, there may be several "correct" measures.

To fix ideas, suppose for the moment that there is one accepted quarterly econometric model of the economy. Suppose further that this model contains no lags (so that the economy adjusts fully to any shock within a single quarter) and the price level is fixed. Finally, suppose that the government and central bank each have precisely two policy tools at their disposal: government purchases ($G$) and the income tax rate ($\tau$) for the government; the monetary base ($B$) and reserve ratio ($\rho$) for the central bank. A reasonable model

*This choice may, for example, have great bearing on bank profitability.

**Such a measure was called for by Duesenberry [1969], and some aspects of the theory of this have been considered in the work of Brunner and Meltzer in Brunner (ed). [1969].

which fits this bill of particulars is:

$$(1) \quad Y_t = C_t + I_t + G_t$$

$$(2) \quad C_t = C(Y_t - T_t, \alpha_t) \qquad 0 < C_Y < 1$$

$$(3) \quad T_t = T(Y_t, \tau_t) \qquad 0 < T_Y < 1 \ , \ T_\tau > 0$$

$$(4) \quad I_t = I(r_t, \beta_t) \qquad I_r < 0$$

$$(5) \quad M_t^d = L(r_t, Y_t, \gamma_t) \qquad L_r < 0 \ , \ L_Y > 0$$

$$(6) \quad M_t^s = h(r_t, \rho_t) B_t \qquad h_r > 0 \ , \ h_\rho < 0$$

$$(7) \quad M_t^d = M_t^s \ ,$$

where $t$ is time, $Y$ is income, $C$ is consumption, $I$ is investment, $T$ is tax receipts, $M^d$ and $M^s$ are respectively the demand for and supply of money, $\alpha$ , $\beta$ and $\gamma$ are (unspecified) exogenous variables affecting consumption, investment and demand-for-money respectively, and subscripts indicate partial differentiation.* This model can be reduced to two equations (the IS and LM curves) in the usual way, and the system totally differentiated and solved for $dY_t$ as a function of the policy instruments and exogenous variables. The result is:

$$(8) \quad dY_t = \{\mu_1 dG_t - \mu_2 T_\tau d\tau_t\} + \{\mu_3 dB_t - \mu_4 d\rho_t\} + \mu_5 d\alpha_t + $$
$$+ \mu_6 d\beta_t + \mu_7 d\gamma_t \ ,$$

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*For example, $L_r$ is the partial derivative of $L(\cdot)$ with respect to $r$ .

where

$$\mu_1 = \left[(1 - C_Y(1 - T_Y) + \frac{L_Y I_r}{L_r - Bh_r}\right]^{-1} > 0 \;;\; \mu_2 = C_Y\mu_1 > 0 \;;$$

$$\mu_3 = \frac{hI_r}{L_r - Bh_r}\mu_1 > 0 \;;\; \mu_4 = \frac{-Bh_\rho I_r}{L_r - Bh_r}\mu_1 > 0 \;;$$

$$\mu_5 = C_\alpha\mu_1 \;;\; \mu_6 = I_\beta\mu_1 \;;\; \mu_7 = -\frac{L_Y I_r}{L_r - Bh_r}\mu_1 \;.$$

With no ambiguity, the first bracketed term represents fiscal influence on GNP , the second bracketed term represents monetary influence, and the remaining terms encompass all other influences. We think few economists would disagree with this taxonomy.

Consider the first term more closely. It is simply the negative of the change in the weighted standardized surplus, multiplied by the government expenditure multiplier, $\mu_1$ . The second term is an analogous expression for total monetary policy. It takes the change in the base, multiplied by its multiplier, and deducts the change in the reserve ratio, also multiplied by its multiplier. It should be clear how both of these measures generalize to more complicated models with more than two instruments (so long as lags are absent). But, before such measures can be computed in practice, several troublesome aspects of the real world have to be dealt with.

To begin with, economists most assuredly do not agree on a single macro-econometric model. And it is clear that every model will give different $\mu$'s , and thus different indicators of fiscal and monetary influence. In this paper, we present a set of measures based on the FMP model. While we have little desire to defend this particular model against all competitors, we should at least explain our reasons for choosing it. First, in our opinion, the FMP project represents the most serious attempt to date to adhere to economic theory in specifying a macroeconometric model. Second, as it was designed with an eye on stabilization-policy analysis, it includes virtually every instrument of fiscal and monetary policy one would normally think of. Finally, it is readily available (and almost comprehensible) to outside investigators like ourselves. Having said this we wish to stress that we do not claim any theoretical superiority for our measures over analogous measures that might be constructed from other econometric models.

Unfortunately, picking "the" FMP model is not an unambiguous choice, for there are many versions of the model extant, depending on whether it comes from the Federal Reserve, MIT, or Penn, and in which year. Our work was based on the Fed's version of the model which was current in the fall of 1973.*

The FMP model is highly nonlinear, as most econometric models are these days, and this leads to a second problem. In a nonlinear model, the partial derivatives in expressions like (8) will vary through time as functions of "initial conditions," i.e., the values of all variables when the policy action is taken. In fact, the most important nonlinearity does not even appear in the illustrative fixed-price model: the fact that the degree of resource utilization (somehow defined) has considerable bearing on how any increase in aggregate demand is apportioned between increases in real output and increases in prices. In practice, this and other nonlinearities can lead to very substantial differences in multipliers. To cite just one example,

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*We wish to thank Dwight Jaffee for instructing us in the use of the requisite computer software. The model is quite similar to the one described in Hickman [1972], pp. 543-598.

the multiplier effect on real GNP (after eight quarters) of a $1 billion hike in real federal purchases ranges from 2.04 to 4.41 within our sample period. This variability renders futile any attempt to compute measures of fiscal or monetary influence based on constant multipliers.* The only correct procedure, tedious as it may be, is to compute different multipliers each quarter for every instrument. This involves simulating the model (once for each of the $N$ policy instruments) from each of the $T$ starting points in the sample period. These time-specific multipliers can then be used to compute measures of fiscal and monetary impact. Needless to say, if $N$ and $T$ are at all large, this represents a prodigious amount of computing. The high computational cost is the reason we have limited our study to a single model.

A third set of problems arises when lags are present, as they always are in econometric models. To illustrate, suppose we allow only one lag in our simple model; to wit, rewrite (4) :

$$(4') \quad I_t = I(r_{t-1}, \beta_t) \ .$$

Performing the same computations as before, the new expression for $dY_t$ is:

$$(9) \quad dY_t = \{m_1 dG_t - m_2 T_\tau d\tau_t\} + \{m_3 d\beta_{t-1} - m_4 d\rho_{t-1}\} + m_5 dY_{t-1} +$$

$$+ m_6 d\alpha_t + m_7 d\beta_t + m_8 d\gamma_{t-1}$$

where

$$m_1 = \frac{1}{1-C_y(1-T_y)} > 0 \ ; \ m_2 = C_Y m_1 > 0 \ ;$$

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*For example, Friedlaender [1973] assumes constant multipliers within each political administration in order to deduce welfare weights from her estimated reaction functions.

$$m_3 = \frac{hI_r}{L_r - Bh_r} m_1 > 0 \; ; \; m_4 = - \frac{Bh_\rho I_r}{L_r - Bh_r} m_1 > 0 \; ;$$

$$m_5 = - \frac{I_r L_Y}{L_r - Bh_r} m_1 < 0 \; ; \; m_6 = C_\alpha m_1$$

$$m_7 = I_\beta m_1 \; ; \; m_8 = - \frac{L_Y I_r}{L_r - Bh_r} m_1 \; .$$

Note the presence of $dy_{t-1}$ on the righthand side; this means we must contend with dynamic, rather than static, multipliers. For example, suppose G is increased permanently by one unit beginning in period zero. Then

$$dY_0 = m_1$$

$$dY_1 = m_1 + m_5 m_1 = m_1(1+m_5)$$

$$dY_2 = m_1 + m_5 m_1 (1+m_5) = m_1(1+m_5+m_5^2)$$

$$dY_3 = m_1 + m_1 m_5 (1+m_5+m_5^2) = m_1(1 + m_5 + m_5^2 + m_5^3)$$

and so on, in a never-ending chain. Every other instrument similarly has a first-quarter multiplier, a second-quarter multiplier, and so on. Clearly, before a measure of fiscal influence can be computed, a relevant time dimension must be chosen and, as was the case with selecting a model, there is no single correct answer. It seems safest to compute a variety of measures, based on different time horizons. So in Sections III and IV, we offer measures of fiscal and monetary influence based on one-quarter, four-quarter and eight-quarter weights. The choice of which measure to use clearly depends on the use to which it is to be put. For example, in specifying a dependent variable for a reaction function, the time dimension of the policy measure ought to be the presumed planning horizon of the policy maker.

Lags create still another problem. Suppose, for example, that the policy maker has a one year horizon. We could easily compute a measure, hereafter denoted by $F_Y^4(t)$ , defined as the influence of the fiscal actions of period $t$ on GNP in period $t+3$ . But this would not be the only way fiscal policy impinges on income in period $t+3$ . There are also the lagged effects of policies taken last quarter, two quarters ago, and so on. In the notation just introduced, the total impact on GNP in period $t+3$ of all fiscal policies executed through period $t$ would be:

$$F_Y^4(t) + F_Y^5(t-1) + F_Y^6(t-2) + F_Y^7(t-3) + \ldots$$

Strictly speaking, computing this infinite series requires an infinite number of multiplier runs to calculate the influence of fiscal policy $j$ periods in the past on GNP three periods in the future, for $j = 0,1,2,\ldots.$ As this exceeded both our computer budget and our patience, we adopted a shortcut interpolation procedure which required knowledge of only first-, fourth-, and eighth-quarter multipliers. By procedures explained in Appendix II, we computed the following series:

$K_Y^1(t)$ = impact on GNP in quarter $t$ of all fiscal policies executed prior to quarter $t$ , less those effects already felt by quarter $t$ ;

$K_Y^4(t)$ = same measure for four-quarter horizon (i.e. impact in quarter $t+3$)

$K_Y^8(t)$ = same measure for the eight-quarter horizon.

Subsequently we refer to these measures as the "overhang" of past fiscal policies.

The final step in defining a measure of fiscal or monetary influence is to settle on a list of instruments and targets to be considered. Both choices are constrained, perhaps sharply, by the model being used. As indicated above, one of the reasons for selecting the FMP model is its wide choice of policy instruments.

The model includes the following control variables that would normally be associated with (federal) fiscal policy:

(1) purchases of goods and services
(2) compensation of employees
(3) grants-in-aid
(4) corporation tax rate
(5) investment tax credit rate
(6) excise tax rate
(7) OASI tax rate
(8) unemployment insurance contribution rate
(9) personal income tax rate
(10) per-capita exemption in personal income tax
(11) earnings ceiling for social security tax
(12) OASI benefits
(13) supplemental unemployment benefits
(14) interest payments
(15) social insurance contributions, other than OASI and unemployment
(16) transfers to persons, other than unemployment compensation
(17) fraction of investment subject to accelerated depreciation
(18) depreciation service lives
(19) maximum unemployment benefits.

This lengthy list was pared down only slightly. First, items (17)-(19) were varied only trivially, or not at all, during our sample period; so we simply ignored them. Second, experiments with the model indicated that (as one would expect) each category of transfer payments (positive or negative) has the same multiplier; so items (12)-(16) were consolidated into a single variable called "net transfers." This leaves twelve fiscal policy tools with all dollar magnitudes expressed in 1958 dollars.

For monetary policy, the model offered a rather shorter menu of instruments:

(1) high-powered money (unborrowed reserves plus currency)
(2) the discount rate
(3) required reserve ratio against demand deposits
(4) required reserve ratio against time deposits
(5) Regulation Q ceiling on passbook savings accounts
(6) Regulation Q ceiling on large certificates of deposit.

Of these, only the last was ignored since it did not change during our period.

The model, of course, has a great many endogenous variables, so we had considerable latitude in selecting targets. Thus far we have only spoken of measures of fiscal and monetary influence on real GNP. But one might be interested in other target variables, so we also computed measures of fiscal and monetary influence on each of the following: the price level; the unemployment rate; the rate of interest (on Treasury bills); imports; and the money stock $(M_1)$ .*

III. Measures of Fiscal Policy, 1958-1971

Let the twelve fiscal policy instruments enumerated in the last section be denoted $I_j(t)$ . $j = 1,\ldots,12$ . Let the n-quarter multiplier for instrument $j$ be denoted $m_j^n(t)$ , $n = 1,4,8$ . Then our three measures of fiscal influence on real GNP are defined as follows:

$$F_Y^1(t) = \sum_{j=1}^{12} m_j^1(t)\Delta I_j(t) \qquad F_Y^4(t) = \sum_{j=1}^{12} m_j^4(t)\Delta I_j(t) .$$

*Imports were included in the list because the balance of payments is often mentioned as a macro policy target, and imports are the only endogenous component of the balance of payments in the versions of the FMP model available to us. $M_1$ was included to see whether the Fed might have pursued a money supply target during some part of our sample period. Time series for fiscal and monetary influence on these two targets are not presented herein; but are available upon request.

$$F_Y^8(t) = \sum_{j=1}^{12} m_j^8(t)\Delta I_j(t)$$

As explained in Appendix II, these series are used to construct three additional series representing the overhang of prior fiscal policies for a one-, four- and eight-quarter horizon, $K_Y^1(t)$ , $K_Y^4(t)$ and $K_Y^8(t)$ . All six of these time series are presented in Table 1. Finally, the total influence on real GNP of past and current fiscal policies over the four- and eight-period horizons, denoted $T_Y^4(t)$ and $T_Y^8(t)$ respectively, are obtained by summing the appropriate F and K series. $T_Y^4 = F_Y^4 + K_Y^4$ , $T_Y^8 = F_Y^8 + K_Y^8$ . These are given in the last two columns of Table 1.

We have, then, three indicators of the current thrust of fiscal policy, depending on the time dimension of the multipliers employed. A preliminary question is, how well do these measures correspond to one another? Casual perusal of the table suggests that $F_Y^8$ is very nearly a multiple of $F_Y^4$ , and that $F_Y^1$ is similar though not identical. Since a positive number signifies an expansionary policy while a negative number signifies a contractionary one, primary interest attaches to whether or not the sign patterns coincide. Sign discrepancies may arise becasue the economy responds with a different distributed lag to each fiscal instrument. Figure 1 provides a hypothetical illustration. The two lines represent the dynamic (cumulative) multipliers of two fiscal instruments. Suppose that instrument #1 is increased and instrument #2 is decreased, both by one unit, at $t=1$ . If these are the only policy changes, it is clear from the figure that $F_Y^1$ and $F_Y^4$ are positive while $F_Y^8$ is negative. And this is not just a quirk of the FMP model, but a property of the real world. It is simply true that some policy mixes are expansionary over

Table 1

Measures of Fiscal Influence on Real GNP[a] (in billions of 1958 dollars)

| Quarter | | $F_Y^1$ | $F_Y^4$ | $F_Y^8$ | $K_Y^1$ | $K_Y^4$ | $K_Y^8$ | $T_Y^4$ | $T_Y^8$ |
|---|---|---|---|---|---|---|---|---|---|
| 1958: | 1 | 0.72 | 1.51 | 1.88 | na | na | na | na | na |
| | 2 | 1.55 | 2.80 | 3.02 | na | na | na | na | na |
| | 3 | 0.54 | 0.99 | 1.00 | na | na | na | na | na |
| | 4 | 1.34 | 2.53 | 2.64 | na | na | na | na | na |
| 1959: | 1 | -2.25 | -4.58 | -5.28 | na | na | na | na | na |
| | 2 | -1.11 | -2.00 | -2.07 | na | na | na | na | na |
| | 3 | -0.84 | -1.41 | -1.39 | na | na | na | na | na |
| | 4 | -0.28 | -1.20 | -1.82 | -1.08 | -2.17 | -2.37 | -3.37 | -4.19 |
| 1960: | 1 | -1.41 | -3.96 | -6.16 | -0.88 | -2.35 | -2.81 | -6.31 | -8.97 |
| | 2 | 0.00 | -0.34 | -0.65 | -1.51 | -4.73 | -6.68 | -5.07 | -7.33 |
| | 3 | 0.88 | 1.99 | 2.41 | -1.43 | -4.33 | -5.82 | -2.34 | -3.41 |
| | 4 | -0.26 | -0.34 | -0.29 | -0.93 | -2.48 | -2.87 | -2.82 | -3.16 |
| 1961: | 1 | 0.52 | 0.93 | 0.97 | -0.49 | -2.13 | -1.97 | -1.20 | -1.00 |
| | 2 | 2.25 | 4.21 | 4.27 | -0.30 | -1.19 | -1.04 | 3.02 | 3.23 |
| | 3 | 2.07 | 3.68 | 3.62 | 0.09 | 1.21 | 1.28 | 4.89 | 4.90 |
| | 4 | 0.25 | -0.15 | -0.51 | 0.81 | 2.74 | 2.72 | 2.59 | 2.23 |
| 1962: | 1 | 2.74 | 4.29 | 3.39 | 1.10 | 1.44 | 1.16 | 5.73 | 4.55 |
| | 2 | 2.53 | 4.52 | 4.22 | 1.06 | 1.58 | 0.71 | 6.10 | 4.93 |
| | 3 | -0.43 | 1.81 | 5.57 | 1.06 | 2.10 | 1.34 | 3.91 | 6.91 |
| | 4 | 0.27 | 0.85 | 1.09 | 1.84 | 3.83 | 6.28 | 4.68 | 7.37 |
| 1963: | 1 | -0.33 | -1.96 | -3.80 | 1.29 | 3.27 | 5.26 | 1.31 | 1.46 |
| | 2 | -1.98 | -3.87 | -3.94 | -0.01 | 0.81 | 0.49 | -3.06 | -3.45 |
| | 3 | 0.74 | 1.33 | 1.21 | -0.43 | -0.54 | -1.46 | 0.79 | -0.25 |
| | 4 | -1.14 | -2.08 | -2.08 | -0.28 | 0.02 | -0.56 | -2.06 | -2.64 |
| 1964: | 1 | 1.91 | 7.57 | 10.58 | -0.28 | -1.15 | -1.22 | 6.42 | 9.36 |
| | 2 | 0.82 | 1.26 | 1.05 | 2.29 | 5.50 | 7.74 | 6.76 | 8.79 |
| | 3 | -1.77 | -3.53 | -3.43 | 1.27 | 4.32 | 5.68 | 0.79 | 2.25 |
| | 4 | -2.90 | -5.30 | -4.89 | 0.94 | 2.02 | 2.75 | -3.28 | -2.14 |

Table 1

(continued)

| Quarter | | $F_Y^1$ | $F_Y^4$ | $F_Y^8$ | $K_Y^1$ | $K_Y^4$ | $K_Y^8$ | $T_Y^4$ | $T_Y^8$ |
|---|---|---|---|---|---|---|---|---|---|
| 1965: | 1 | 4.15 | 10.81 | 12.58 | -0.53 | -0.49 | -0.18 | 10.32 | 12.40 |
| | 2 | -0.66 | -0.71 | -0.59 | 1.51 | 7.23 | 8.78 | 6.52 | 8.19 |
| | 3 | 1.81 | 3.27 | 3.80 | 2.13 | 6.26 | 7.33 | 9.53 | 11.13 |
| | 4 | 1.55 | 2.58 | 3.48 | 3.52 | 6.30 | 7.20 | 8.88 | 10.68 |
| 1966: | 1 | 1.85 | 0.98 | 4.26 | 1.33 | 4.64 | 5.60 | 5.62 | 9.86 |
| | 2 | 2.20 | 3.30 | 5.45 | 1.14 | 3.64 | 6.68 | 6.94 | 12.13 |
| | 3 | 4.46 | 8.07 | 14.41 | 1.13 | 5.32 | 8.80 | 13.39 | 23.21 |
| | 4 | 1.58 | 2.80 | 5.68 | 2.10 | 10.96 | 17.62 | 13.76 | 23.30 |
| 1967: | 1 | 4.40 | 8.19 | 14.96 | 3.18 | 13.75 | 19.63 | 21.94 | 34.59 |
| | 2 | 2.64 | 5.23 | 8.64 | 4.59 | 18.90 | 27.00 | 24.13 | 35.64 |
| | 3 | 0.74 | 1.32 | 1.98 | 5.71 | 21.76 | 28.42 | 23.08 | 30.40 |
| | 4 | 0.09 | 0.27 | 0.33 | 5.99 | 20.05 | 23.95 | 20.32 | 24.28 |
| 1968: | 1 | 1.25 | -3.99 | -10.56 | 5.66 | 16.98 | 18.21 | 12.99 | 7.65 |
| | 2 | 2.10 | 4.12 | 3.56 | 3.36 | 5.48 | 0.75 | 9.60 | 4.31 |
| | 3 | -3.80 | -10.48 | -9.21 | 2.42 | 2.54 | -1.15 | -7.94 | -10.36 |
| | 4 | -0.51 | -0.54 | -0.84 | -0.57 | -8.02 | -8.98 | -8.56 | -9.82 |
| 1969: | 1 | -2.20 | -4.41 | -5.18 | -2.17 | -9.01 | -8.74 | -13.42 | -13.92 |
| | 2 | -2.33 | -4.88 | -7.71 | -4.57 | -9.13 | -9.55 | -14.01 | -17.26 |
| | 3 | -1.71 | -3.64 | -5.83 | -3.05 | -7.77 | -10.36 | -11.41 | -16.19 |
| | 4 | -1.09 | -1.85 | -3.03 | -3.77 | -8.18 | -11.44 | -10.03 | -14.47 |
| 1970: | 1 | -1.66 | 1.19 | 6.21 | -1.84 | -6.92 | -9.61 | -5.73 | -3.40 |
| | 2 | -4.88 | -10.11 | -16.88 | -0.60 | -2.52 | 0.11 | -12.63 | -16.77 |
| | 3 | -0.66 | 0.45 | 1.09 | -2.57 | -8.42 | -11.29 | -7.97 | -10.20 |
| | 4 | -0.95 | -1.59 | na | -2.16 | -5.31 | -6.97 | -6.90 | na |
| 1971: | 1 | -2.84 | -5.94 | na | na | na | na | na | na |
| | 2 | -0.75 | -1.09 | na | na | na | na | na | na |
| | 3 | 2.01 | 9.11 | na | na | na | na | na | na |
| | 4 | 1.03 | na | na | na | na | na | na | na |

Table 1

(continued)

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Source: Simulations of FMP econometric model as explained in the text.

[a]The series $K_Y^1$ , $K_Y^4$ and $K_Y^8$ begin in 1959:4 because seven lagged values of $F_Y^4$ and $F_Y^8$ are required in their construction. $F_Y^4$ ends in 1971:3 and $F_Y^8$ ends in 1970:3 because our version of the model could be simulated only as far as 1972:2 .

na = not available

a one-quarter horizon but contractionary over an eight-quarter horizon.*

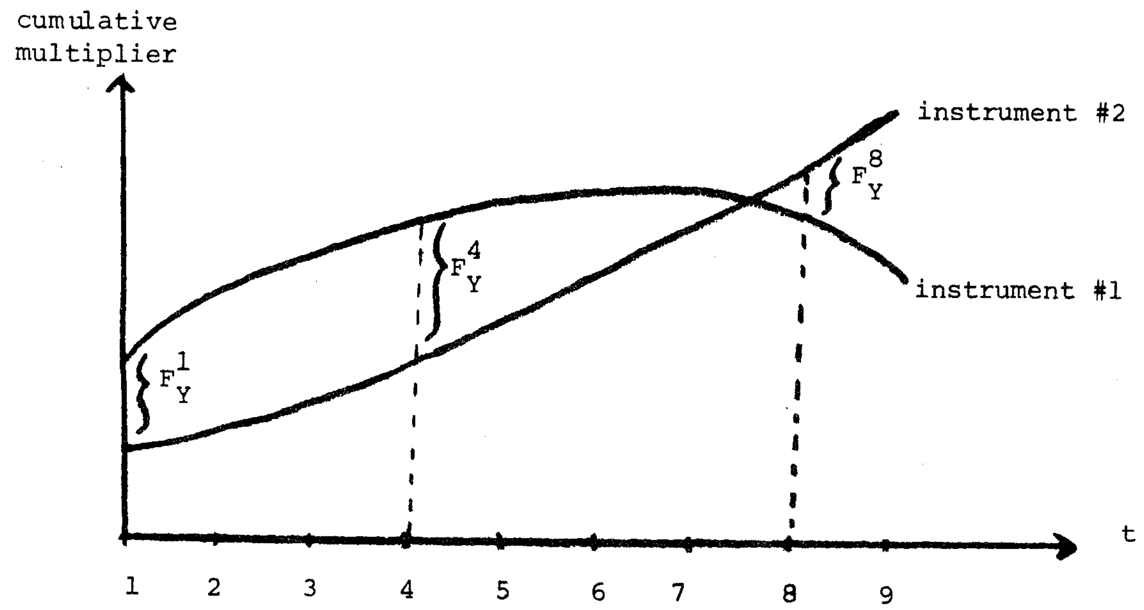


Figure 1

Five sign differences occur in the 55 quarters in which both $F_Y^1$ and $F_Y^4$ are available. But, since in two of these cases both measures are nearly zero, there are only three meaningful disagreements over the direction of fiscal policy. Comparison of the signs of $F_Y^1$ and $F_Y^8$ yields identical results, and $F_Y^4$ always has the same sign as $F_Y^8$.

A more quantitative appraisal of the similarities among the three time

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*There is another possible reason for sign discrepancies. Econometric models are high-order nonlinear difference equations which typically generate cycles when shocked. If these cycles have large enough amplitude, an instrument could have a positive multiplier over one horizon but a negative multiplier over another. While the FMP model does tend to produce cycles, our decision to cut off consideration after eight quarters effectively precluded this possibility.

series may be obtained by computing the simple correlations among them. The results, for the entire period and various subperiods (corresponding roughly to political administrations) are presented in Table 2. Clearly, the three indicators are closely related, but $F_Y^1$ and $F_Y^8$ are certainly not identical. For example, except for the Eisenhower years, $F_Y^1$ alone can explain only about 68% of the variance in $F_Y^8$. What this means is that, if we can rule out a one-quarter horizon as being unduly myopic, we need not really decide

Table 2

Simple Correlations Among Three Measures of Fiscal Influence on Real GNP

| Measures | 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $F_Y^1$ and $F_Y^4$ | 0.93 | 0.99 | 0.92 | 0.90 |
| $F_Y^1$ and $F_Y^8$ | 0.85 | 0.96 | 0.83 | 0.82 |
| $F_Y^4$ and $F_Y^8$ | 0.95 | 0.99 | 0.94 | 0.98 |

whether the government had a one-year or a two-year horizon; either measure will tell the same story. Since the time series is four quarters longer, and since we are a bit skeptical about simulating an econometric model too far into the future, we use $F_Y^4$ in most of our subsequent analysis.

## Comparison with Other Fiscal Indicators

The next natural question is how these new measures, and in particular $F_Y^4$, compare to some existing indicators of fiscal policy. Four such measures are readily available: the change in a full-employment deficit*, the change in a weighted full-employment deficit**, the change in an unweighted standardized deficit***, and the change in a weighted standardized surplus****. In comparing these with $F_Y^4$, the reader should recall the three problems with the full-employment deficit discussed in Section I. The weighted full-employment deficit corrects for one of these by applying multiplier weights. The unweighted standardized deficit corrects for the other two by computing only autonomous changes in tax revenues, evaluated at current income levels. The weighted standardized surplus makes all three corrections.

Conceptually, our measure is proportional to a weighted standardized surplus, with the negative of the multiplier for government spending as the factor of proportionality. However, the particular series computed by Oakland (a) fails to note that multipliers change each quarter, and hence uses the same weights throughout the period; (b) fabricates the weights rather than obtaining them from an econometric model; (c) is expressed in current dollars, whereas ours are measured in constant (1958) dollars. Further, there will always be minor timing differences between two fiscal-influence series even if

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*The negative of the first differences of the "high-employment surplus" as computed by the Federal Reserve Bank of St. Louis [1972], which is available over our entire sample period.

**Based on FRB-MIT model weights as computed by Gramlich [1968], Table 3, p. 126. The series is in constant 1958 dollars available from 1963-II to 1967-I.

***The negative of the unweighted initial surplus as computed by Corrigan [1970], Table I, p. 471. The series is in current dollars available from 1964-I to 1966-IV.

****The negative of the "change in weighted initial surplus" as computed by Oakland [1969], Table I, column 10. The series is in current dollars and is available from 1958-I to 1966-IV and is in current dollars. While Oakland never explicitly states whether his series is in nominal or real terms, from his discussion of its construction we surmise that it is nominal.

they are identical in all other respects. To cite just one example, the investigator has latitude in how to record a tax cut enacted in quarter t but made retroactive to quarter t-2. (We have let the proprietors of the FMP model make all such decisions for us.) In view of all these difficulties, it is not surprising that Oakland's series differs in sign from $F_Y^4$ in 10 of the 36 common quarters. A further indication of the degree of concordance is that the simple correlation over this period is 0.64.

Comparisons with Corrigan's unweighted standardized deficit are hazardous since he published only 12 observations. We were surprised that Corrigan's measure and $F_Y^4$ had the same sign in 11 cases; however, the correlation was only 0.44. Gramlich's weighted full-employment deficit (based on FRB-MIT model weights) exhibits a different sign from $F_Y^4$ in six of the 16 common quarters, and the simple correlation is only 0.45. Finally, sign discrepancies between the full-employment deficit and $F_Y^4$ occur in 11 of 55 quarters, while the correlation coefficient is 0.54.* We conclude that the differences between $F_Y^4$ are previous fiscal indicators are substantial.

## Fiscal Policy, 1958-1971

It is of interest to see what our new time series have to say about the conduct of fiscal policy. But, in doing so, it is not obvious which series should be used. The impact of current actions on real GNP over the next four quarters, $F_Y^4$, would appear to be a logical candidate, but objections can be raised. As shown by Figure 2A, there is a great deal of "noise" in this series.

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*There is considerable temporal variability in this statistic. For the three subperiods, 1958:1-1961:4, 1962:1-1968:4 and 1969:1-1971:3, the correlations are 0.86, 0.67 and 0.15 respectively.

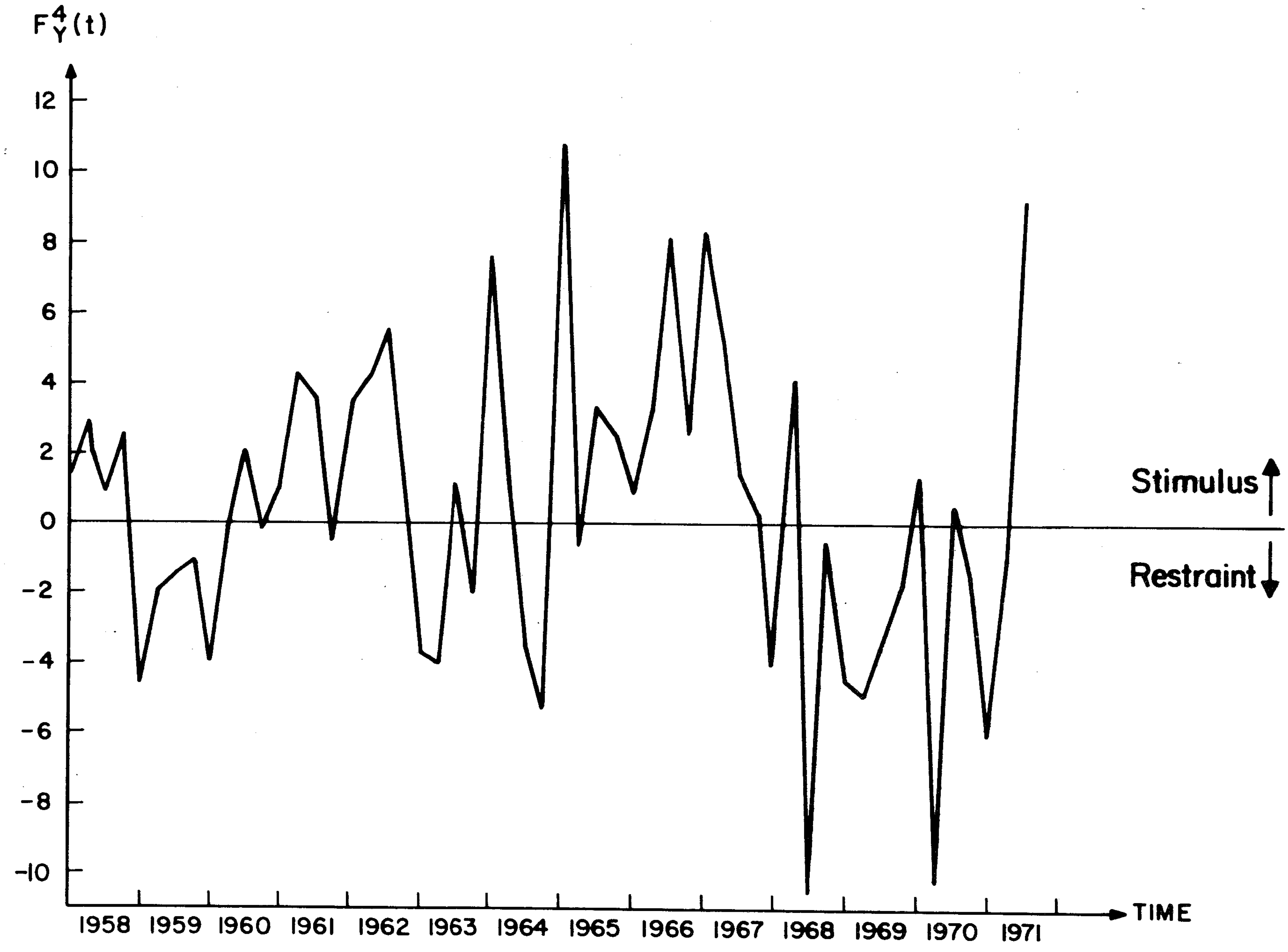


FIG. FISCAL IMPACT ON GNP

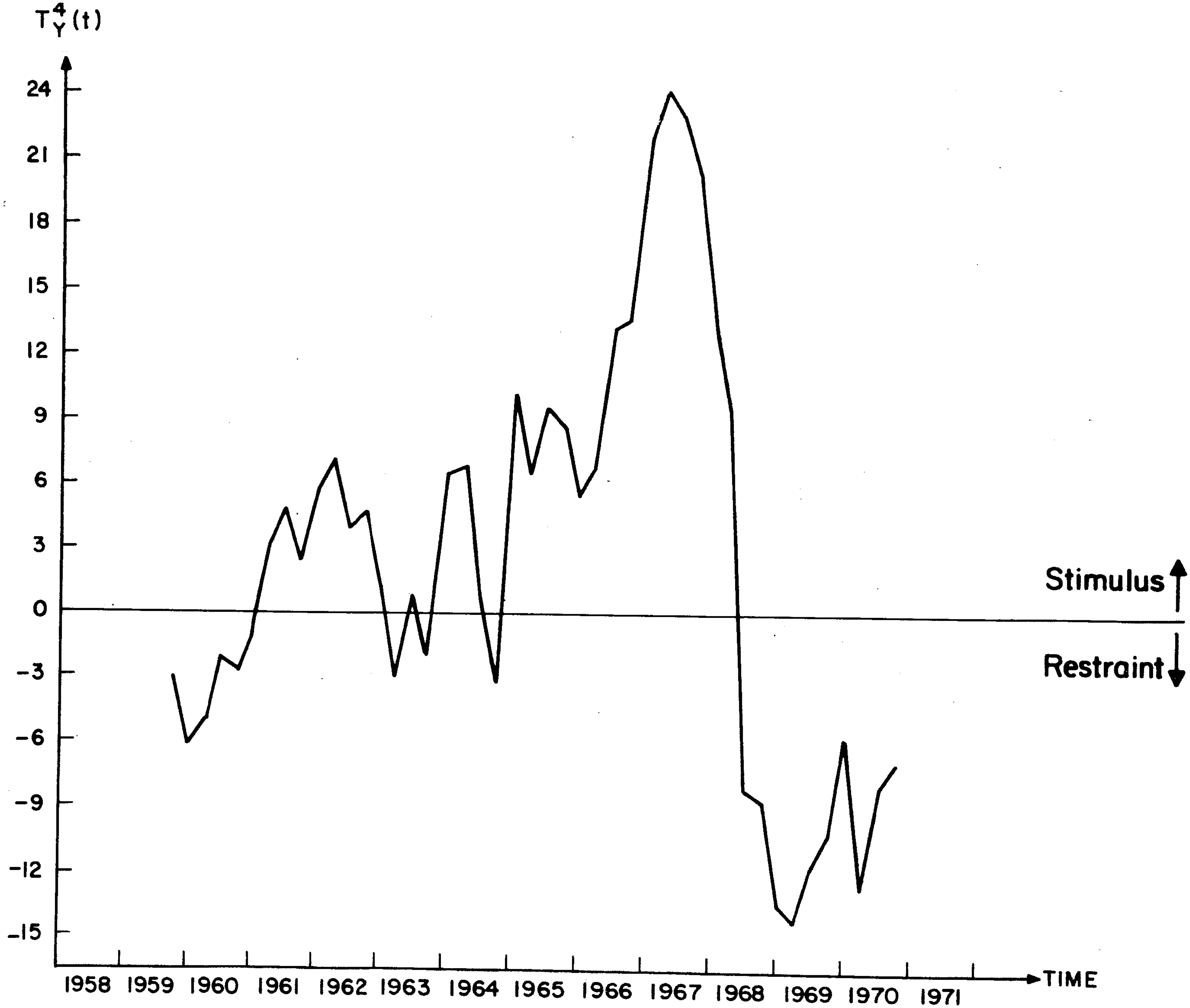


FIG. 2B CUMULATIVE FISCAL IMPACT ON GNP

Naive reading of the diagram would often show fiscal policy swinging wildly from expansion to contraction and back again within the span of a few quarters. What this reflects, of course, is the indivisibility of fiscal policy actions. For whatever reasons, the usual legislative practice is not, say, to cut taxes by 2.5% in each of four consecutive quarters, but to reduce them by 10% all at once. Often such a large tax cut is followed within a quarter or two by reductions in federal spending. The latter is clearly the policical price necessary to achieve the former, and not a sudden shift in the direction of fiscal policy.

If our real concern is with the total influence of fiscal actions on GNP--the difference between actual GNP and the GNP that would have prevailed with no changes in fiscal instruments--we should add together $F_Y^4(t)$ and $K_Y^4(t)$ to get $T_Y^4(t)$ . This series is plotted in Figure 2B. Of course, if one wishes to evaluate the performance of the authorities, it may be that even this is inappropriate. What we really want to know, in that case, is how well the authorities considered the overhang of their own past actions, $K_Y^4$ , as well as other relevant variables (including current and past monetary policy) in formulating current policy. Subtle questions such as these can only be answered by estimating the fiscal reaction function and appraising its stabilizing or destabilizing effect.

With these caveats in mind, what do Figures 2 tell us about the performance of fiscal policy? During 1958 the economy was in recession, and fiscal actions were appropriately expansive, though rather timid. As is well known, recovery from the 1957-58 recession was incomplete; the unemployment rate never fell below 5.5%. Yet, as the economy recovered in 1959, fiscal policy turned substantially restrictive--mostly by reducing purchases of goods, though there were also increases in excise taxes and unemployment insurance contributions. While the policies initiated in 1960 were roughly neutral in their effects, the overhang of past restrictive policies meant that government was a net drag on the economy throughout 1960 (a Presidential election year) and into the start of 1961.

The new Administration, which had made a political issue of the lack-luster fiscal performance of its predecessor, sharply reversed course in 1961-62. Our measure of total fiscal influence rose from -$2.8 in 1960:4 to +$7.4 by 1962:4. The relatively rapid increase in federal spending came to a rather abrupt halt at the start of 1963, and fiscal influence was either neutral or restrictive throughout the last year of the Kennedy Administration. The tax cut of 1964, of course, shows up as a sharp fiscal stimulus, but at least by our measures, it was more than neutralized by the expenditure cuts of the last half that year. Specifically, the fiscal policies promulgated through 1964:4 would have retarded the real GNP of 1965:3 by some $3.3 billion, if no further actions were taken. Of course, further stimulus was applied. 1965 saw a large cut in excise taxes and a small cut in income taxes in the first quarter, followed by a substantial increase in transfer payments in the third quarter, as unemployment fell from around 5% to around 4%.

What happened over the ensuing two years, and particularly from 1966:2 through 1967:3, is well known and shown very dramatically in Figure 2B. The combination of wartime spending and Great Society transfer programs boosted total fiscal influence from a moderate $5.6 billion stimulus in 1966:1 to a colossal $24.1 billion by 1967:2 (both in 1958 dollars). That is to say, the fiscal policies of 1965-67 were enough to make real GNP in early 1968 some $24 billion higher than it would otherwise have been.

A word about the FMP model's treatment of the 1968 tax surcharge is in order here. The corporate tax hike is treated as occuring in 1968:1 (it was enacted in 1968:3, but retroactive to 1968:1), while the personal tax increase is recorded when enacted (though it was retroactive to 1968:2). Thus two major restrictive policies appear in Figure 2A during 1968. (The stimulus in 1968:2 is largely due to a boost in transfer payments.) The model makes no allowance for the temporary nature of the surtax, that is, the tax multipliers used are the same as for a permanent tax hike. The model, then, tells us how much of a swing in aggregate demand would have occurred if the surcharge were fully effective. On this basis, total fiscal impact dropped precipitously from +$20.3 billion in 1967:4 to -$7.9 billion in 1968:3.

With some reductions in federal spending, and suspension of the investment tax credit, fiscal policy remained substantially restrictive throughout 1969, the first year of the Nixon Administration. While the surtax expired in stages during 1970, substantial expenditure cuts kept the fiscal brakes on as inflation continued. Then, as inflation ebbed (temporarily, as it turned out), the first substantial stimuli in years were applied during 1971: the investment tax credit was restored, excise taxes were reduced a bit, and personal income tax exemptions were raised. This may have contributed to the subsequent resurgence of inflation, though there were doubtless more powerful forces at work.

Fiscal Influence on Other Targets

To this point, we have focussed exclusively on measures of the impact of fiscal actions on real gross national product. But this is not the only target of macroeconomic policy. It is at least alleged that effort is sometimes expended in limiting the rate at which the price level rises; often the effect of fiscal policy on the unemployment rate will be of interest;for other purposes, such as the formulation of monetary policy, it may be important to know what fiscal actions will do to interest rates; and the reader can no doubt think of other examples.

We can use the same techniques to compute measures of fiscal influence on such variables as the price level, unemployment rate and interest rate, and, indeed, have done this. The series are presented in Appendix I. Our notational convention is that $F_X^n$ denoted the influence of fiscal actions on variable X over an n-quarter horizon, where n is equal to one, four, or eight, and X is the level of GNP deflator (P), the overall unemployment rate (U), or the rate of interest on Treasury bills (R).

Once again it is worth asking how well the three measures of fiscal influence on each target variable (for $n = 1,4,8$) correspond to one another. Tables 3, 4 and 5 contain the simple correlations for prices, unemployment, and the interest rate respectively. In the case of fiscal impact on the price level, it is clear from Table 3 that $F_P^1$ and $F_P^4$ are rather similar, but far from identical; the same can be said of $F_P^4$ and $F_P^8$. However, the relationship between $F_P^1$ and $F_P^8$ is surprisingly weak. In the FMP model at least, the initial impact of a given set of fiscal actions on the price level may not be indicative of the effect after eight quarters. The differences

Table 3

Simple Correlations Among Three Measures
of Fiscal Influence on the Price Level

| Measures | Period 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $F_P^1$ and $F_P^4$ | .82 | .82 | .76 | .91 |
| $F_P^1$ and $F_P^8$ | .56 | .39 | .51 | .52 |
| $F_P^4$ and $F_P^8$ | .91 | .82 | .92 | .79 |

Table 4

Simple Correlations Among Three Measures
of Fiscal Influence of the Unemployment Rate

| Measures | Period 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $F_U^1$ and $F_U^4$ | .84 | .82 | .85 | .52 |
| $F_U^1$ and $F_U^8$ | .80 | .76 | .81 | .47 |
| $F_U^4$ and $F_U^8$ | .97 | .99 | .95 | .99 |

Table 5

Simple Correlations Among Three Measures
of Fiscal Influence on the Interest Rate

| Measures | Period 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $F_R^1$ and $F_R^4$ | .86 | .98 | .90 | .95 |
| $F_R^1$ and $F_R^8$ | .72 | .98 | .76 | .91 |
| $F_R^4$ and $F_R^8$ | .71 | .99 | .75 | .99 |

are not usually qualitative (the signs differ in only seven of 51 cases), but quantitative. It would appear that this reflects the extreme nonlinearity in the equations determining the price level. Everything is approximately linear for the trivially small changes in prices found in the one-quarter series; but the eight-quarter series includes several very large changes, for which nonlinearities make their presence felt.

But a nonlinear Phillips curve is apparently not enough to account for the discrepancies, since Table 4 reveals that similar disparities do not appear among $F_U^1$, $F_U^4$ and $F_U^8$. With a single exception ( $F_U^1$ is rather different from the other two series in the last subperiod), the three measures of fiscal influence on the unemployment rate correspond reasonably well in every period.

Apparently the effect of fiscal policy on interest rates is the easiest quantity to define unambiguously. Except for the fact that $F_R^8$ is only moderately correlated with the other two during the Kennedy-Johnson years, all the intercorrelations are quite high.

One interesting use to which these measures of fiscal influence can be put is to shed some light on the tradeoffs implicit in the FMP model (and perhaps also in the U.S. economy, though the two are obviously not the same thing). This can be done by comparing, for the same time horizon, the impact of fiscal policy on any two target variables. Do policies that raise one always lower the other? How tight is the relationship. Tables 6, 7 and 8 contain information relevant to such questions.

Perhaps the most important tradeoff among policy goals is that between unemployment and inflation. One does not need a Phillips curve to argue that

Table 6

Simple Correlations between Fiscal Influence on Unemployment and on the Price Level

| Time Horizon (in quarters) | Period 1958:1-end[a] | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-end[a] |
|---|---|---|---|---|
| 1 | -.47 | +.05 | -.50 | -.65 |
| 4 | -.62 | -.38 | -.71 | -.36 |
| 8 | -.80 | -.74 | -.88 | -.87 |

[a]"end" is 1971:4 for one-quarter horizon, 1971:3 for four-quarter horizon; 1970:3 for eight-quarter horizon

Table 7

Simple Correlations between Fiscal Influence on Real GNP and the Price Level

| Time Horizon (in quarters) | Period 1958:1-end[a] | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-end[a] |
|---|---|---|---|---|
| 1 | +.52 | -.06 | +.46 | +.58 |
| 4 | +.68 | +.36 | +.77 | +.37 |
| 8 | +.88 | +.71 | +.92 | +.87 |

[a]same as above

Table 8

Simple Correlations between Fiscal Influence on Real GNP and on Interest Rates

| Time Horizon (in quarters) | Period 1958:1-end[a] | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-end[a] |
|---|---|---|---|---|
| 1 | .59 | .97 | .68 | .25 |
| 4 | .95 | .99 | .97 | .95 |
| 8 | .54 | .99 | .61 | .99 |

[a]same as above

fiscal policies which lower the unemployment rate will also tend to raise the price level. Is it possible, then for the government to use its portfolio of tools to pursue independent targets for unemployment and prices? Table 6 suggests that this may be possible in the short-run (one to four quarters), but not in the long run (eight quarters). According to the FMP model, the short-run impact of fiscal policy on the price level has typically not been highly correlated with the short-run impact on the unemployment rate. In fact, during the noninflationary 1958-61 period, there was hardly any relationship at all. The reason for this, it would appear, is that the lag in the response of the price level is rather longer than that for the unemployment rate. So expansionary fiscal policies can "buy" employment gains in the short tun without causing inflation. But, as the table shows, by the time two years have elapsed the inflationary price will have been paid. Thus, in a sense, the long-run tradeoff between $\Delta P$ and $\Delta U$ (which is not the same as the long run Phillips curve) is more reliable than the short run tradeoff.*

Table 7 tells virtually the same story about the tradeoff between higher real output and higher prices. The close correspondence between the reported correlations in Tables 6 and 7 suggests that the relationship between $\Delta Y$ and $\Delta U$ is very tight indeed. And the uniformly high correlations between $F_Y^n$ and $F_U^n$, for $n = 1, 4, 8$ (not reported here) verify that this is the case.

Finally, IS-LM reasoning suggests that the government may not have much

*Of course the simple correlations reported in Table 7 measure only linear dependence, and the functional relationship between $\Delta P$ and $\Delta U$ in the model may be nonlinear. However, for the small changes in policy, which typically occur, everything is approximately linear.

leeway to manipulate real income and interest rates in opposite directions. Consider the IS-LM model depicted in Figure 3. Since the FMP model is essentially a complex version of the IS-LM model with a price mechanism added, it is roughly true that fiscal policy moves the IS curve along a fixed LM curve as indicated in the diagram. Given monetary policy, this means that $\Delta Y$ and $\Delta R$ are constrained by the LM curve, which will be approximately linear in any local neighborhood. This suggests that $\Delta Y$ and $\Delta R$ should have a high positive correlation, and Table 8 reveals this to be the case. In the initial quarter, fiscal policy affects GNP significantly but, due to lags, has little impact on interest rates. Hence the relationship is not very tight (except for the Eisenhower years). However, by the time a year has elapsed, the LM constraint is clearly operative.* In a sense, the government must

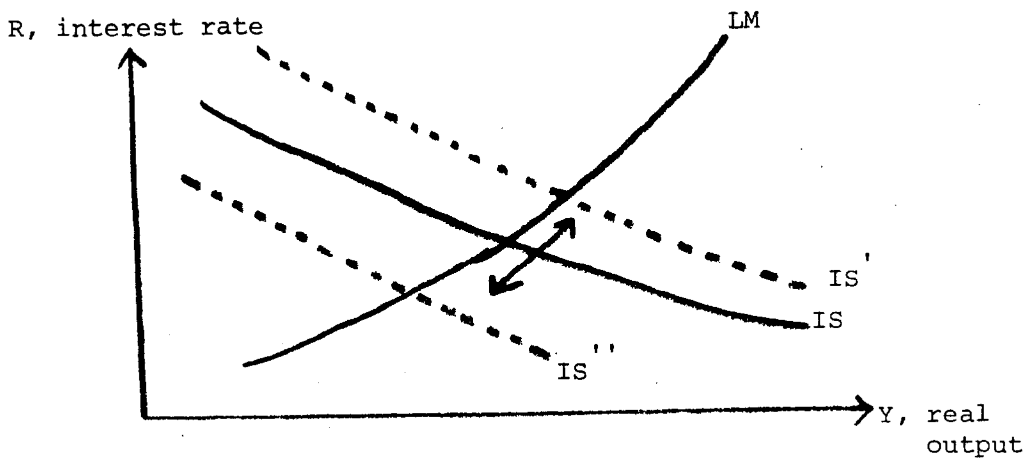


Figure 3

*The correlation of only 0.61 after two years for the Kennedy-Johnson period is a bit of a puzzle, though we suspect it is an artifact of the model. Inflationary expectations begin to affect interest rates abruptly in 1966.

choose between raising income and holding down interest rates; it does not have enough tools to do both. Of course, this raises the possibility--indeed, the necessity--of coordinating fiscal and monetary policies.

An important caveat to the preceding remarks about tradeoffs should be entered here, though we have no way of evaluating its significance. The correlations in Tables 6-8 are indicators, for each period, of the extent to which the policy mix actually employed by the government was capable of pursuing independent goals for the two target variables under consideration. But it is possible that policy packages which would have allowed much more leeway existed, but were never tried by the government.

## IV. Measures of Monetary Policy, 1958-1971.

The calculations behind our measures of monetary influence are precisely parallel to those for fiscal influence. Our notation here denotes the impact of current monetary policy on variable $X$, based on n-quarter multiplier weights by $M_X^n$, $n = 1, 4, 8$, $X = Y, R, P, U$; and uses the symbol $L_X^n$ for the corresponding overhang of past actions. The measures of monetary influence on real GNP ($S_Y^n$ is the sum of $M_Y^n + L_Y^n$) are presented in Table 9, and the rest are in Appendix I.

In inspecting these series, the reader should be cognizant of two idiosyncratic features. First there is a substantial seasonal pattern in high-powered money. We adjusted for this seasonality, and used the seasonally adjusted series as one of the five monetary instruments.* Second, high-powered money is measured in current dollars, while GNP is measured in constant dollars. Thus, for

*Seasonal adjustment was accomplished by the simple ratio to moving average technique.

Table 9

Measures of Monetary Influence on Real GNP
(billions of 1958 dollars)[a]

| Quarter | | $M_Y^1$ | $M_Y^4$ | $M_Y^8$ | $L_Y^1$ | $L_Y^4$ | $L_Y^8$ | $S_Y^4$ | $S_Y^8$ |
|---|---|---|---|---|---|---|---|---|---|
| 1958: | 1 | .64 | 2.59 | 8.17 | na | na | na | na | na |
| | 2 | .52 | 2.39 | 4.61 | na | na | na | na | na |
| | 3 | -.04 | -.44 | -1.51 | na | na | na | na | na |
| | 4 | -.24 | -1.46 | -3.27 | na | na | na | na | na |
| 1959: | 1 | -.06 | -.29 | -.34 | na | na | na | na | na |
| | 2 | -.32 | -2.26 | -5.36 | na | na | na | na | na |
| | 3 | -.17 | -1.32 | -3.33 | na | na | na | na | na |
| | 4 | -.28 | -2.09 | -5.22 | 0.13 | -4.71 | -7.79 | -6.80 | -13.01 |
| 1960: | 1 | .01 | .10 | .22 | -1.81 | -8.72 | -12.86 | -8.62 | -12.64 |
| | 2 | .26 | 1.75 | 3.43 | -2.47 | -8.87 | -10.84 | -7.12 | -7.41 |
| | 3 | .47 | 2.99 | 5.27 | -1.83 | -5.75 | -5.20 | -2.76 | 0.07 |
| | 4 | .14 | 1.04 | 1.96 | -0.71 | -1.16 | 1.42 | -0.12 | 3.38 |
| 1961: | 1 | .02 | .17 | .32 | -0.40 | 1.70 | 3.95 | 1.87 | 4.27 |
| | 2 | .08 | .64 | 1.25 | .35 | 3.50 | 4.65 | 4.14 | 5.90 |
| | 3 | .27 | 1.95 | 3.84 | .77 | 4.70 | 5.47 | 6.65 | 9.31 |
| | 4 | .17 | 1.15 | 2.66 | 2.05 | 6.51 | 8.27 | 7.66 | 10.93 |
| 1962: | 1 | .15 | 1.05 | 2.51 | 2.34 | 6.48 | 8.71 | 7.53 | 11.22 |
| | 2 | .19 | 1.77 | 4.28 | 2.18 | 6.41 | 8.73 | 8.18 | 13.01 |
| | 3 | .16 | 1.34 | 3.07 | 2.05 | 7.65 | 10.64 | 8.99 | 13.71 |
| | 4 | .37 | 2.86 | 7.67 | 2.26 | 8.59 | 11.51 | 11.45 | 19.18 |
| 1963: | 1 | .23 | 1.79 | 4.06 | 3.12 | 11.44 | 16.55 | 13.23 | 20.61 |
| | 2 | .25 | 2.18 | 5.50 | 3.59 | 12.73 | 17.27 | 14.91 | 22.77 |
| | 3 | .03 | .08 | .49 | 3.80 | 14.11 | 18.94 | 14.19 | 19.43 |
| | 4 | .34 | 3.20 | 7.70 | 3.81 | 13.07 | 15.61 | 16.27 | 23.31 |
| 1964: | 1 | .29 | 2.77 | 6.53 | 4.45 | 14.75 | 19.16 | 17.52 | 25.69 |
| | 2 | .35 | 3.21 | 7.01 | 4.83 | 15.78 | 20.95 | 18.99 | 28.01 |
| | 3 | .28 | 2.59 | 5.89 | 5.44 | 16.94 | 22.83 | 19.53 | 28.72 |
| | 4 | .14 | 1.52 | 3.71 | 5.18 | 17.66 | 23.00 | 19.18 | 26.71 |

Table 9

| Quarter | | $M^1_Y$ | $M^4_Y$ | $M^8_Y$ | $L^1_Y$ | $L^4_Y$ | $L^8_Y$ | $S^4_Y$ | $S^8_Y$ |
|---|---|---|---|---|---|---|---|---|---|
| 1965: | 1 | .08 | 1.12 | 2.48 | 5.19 | 17.14 | 21.39 | 18.26 | 23.87 |
| | 2 | .41 | 3.38 | 6.74 | 4.71 | 15.67 | 18.60 | 19.05 | 25.34 |
| | 3 | .35 | 2.70 | 6.10 | 5.65 | 16.47 | 20.22 | 19.17 | 26.32 |
| | 4 | .50 | 4.15 | 10.81 | 5.39 | 15.75 | 20.32 | 19.90 | 31.13 |
| 1966: | 1 | .07 | .69 | 2.61 | 5.66 | 17.70 | 25.24 | 18.39 | 27.85 |
| | 2 | .46 | 3.70 | 11.80 | 4.76 | 16.50 | 22.12 | 20.20 | 33.92 |
| | 3 | -.56 | -1.90 | -4.12 | 5.08 | 20.00 | 28.71 | 18.10 | 24.59 |
| | 4 | .45 | 3.49 | 11.80 | 4.53 | 17.19 | 20.07 | 20.68 | 31.87 |
| 1967: | 1 | 1.03 | 6.55 | 17.80 | 5.48 | 19.72 | 26.84 | 26.27 | 44.64 |
| | 2 | .72 | 5.45 | 18.09 | 7.43 | 26.11 | 38.12 | 31.56 | 56.21 |
| | 3 | .61 | 4.34 | 15.95 | 8.05 | 30.90 | 48.07 | 35.24 | 64.02 |
| | 4 | .31 | 2.71 | 14.03 | 8.68 | 37.52 | 55.36 | 40.23 | 69.39 |
| 1968: | 1 | -.00 | .30 | 4.86 | 9.98 | 42.95 | 60.41 | 43.25 | 65.27 |
| | 2 | -.06 | .15 | 7.32 | 9.63 | 43.31 | 55.30 | 43.46 | 62.62 |
| | 3 | .92 | 8.71 | 31.28 | 11.87 | 42.45 | 53.04 | 51.16 | 84.32 |
| | 4 | .29 | 3.27 | 11.31 | 14.43 | 49.82 | 71.54 | 53.09 | 82.85 |
| 1969: | 1 | .68 | 5.03 | 12.90 | 13.64 | 48.98 | 68.13 | 54.01 | 81.03 |
| | 2 | -1.48 | -6.89 | -13.68 | 13.74 | 51.13 | 66.70 | 44.24 | 53.02 |
| | 3 | -1.30 | -3.72 | -2.03 | 12.08 | 39.91 | 40.77 | 36.19 | 38.74 |
| | 4 | -.38 | 1.36 | 7.47 | 9.46 | 28.12 | 27.97 | 29.48 | 35.44 |
| 1970: | 1 | .73 | 4.45 | 12.23 | 9.42 | 22.62 | 26.35 | 27.07 | 38.58 |
| | 2 | .62 | 3.28 | 8.08 | 8.94 | 19.13 | 28.43 | 22.41 | 36.51 |
| | 3 | 1.00 | 5.74 | 15.26 | 5.41 | 17.94 | 26.95 | 23.68 | 42.21 |
| | 4 | 1.12 | 5.80 | na | 5.93 | 24.31 | 35.80 | 30.11 | na |
| 1971: | 1 | 1.43 | 8.80 | na | na | na | na | na | na |
| | 2 | .71 | 5.47 | na | na | na | na | na | na |
| | 3 | 1.70 | 9.38 | na | na | na | na | na | na |
| | 4 | -7.58 | na | na | na | na | na | na | na |

Table 9

[a]See notes to Table 1.

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example, during quarters in which unborrowed reserves is the only instrument employed by the Fed, $M_Y^n$ indicates the impact of the change in nominal reserves on real gross national product. This quirk affects only the interpretation of the measures. Whereas zero was a natural baseline from which to calibrate our fiscal measures, it cannot serve the same purpose for the monetary measures since presumably, even a "neutral" monetary policy would allow for growth in nominal high-powered money.

A simple and readily calculable definition of neutrality can be obtained by letting high-powered money grow at some fixed percentage rate per quarter (approximately equal to the trend rate of growth of potential GNP), while keeping the other monetary instruments fixed. In most reasonable models, such a policy would generate an expansion of the money stock just sufficient to finance non-inflationary growth with stable (real and nominal) interest rates.

Specifically, we focussed on a policy of steadily raising high-powered money at its observed trend rate over the 1958-1972 period (which was 1.07% per quarter), and holding the other instruments at their 1958:1 levels. We then computed, from the FMP model multipliers, the hypothetical monetary influence series ($M_Y^4$ and $L_Y^4$) which such a policy would have generated. These measures, denoted hereafter by $\bar{M}_Y^4$ and $\bar{L}_Y^4$, are used as our working definition of "neutral" policy. We interpret the deviation of actual policy from this baseline,

$M_Y^4 - \bar{M}_Y^4$ , as representing discretionary stabilization actions.

We have focussed attention thus far strictly on the four-quarter measures. This is because the choice of a time horizon is almost a matter of indifference in the case of measuring monetary policy. Largely, we believe, because movements in unborrowed reserves dominate all three indices, there are essentially no sign discrepancies among $M_Y^1$ , $M_Y^4$ , and $M_Y^8$ . (In the first two quarters of 1968, $M_Y^1$ has trivially small negative values, while the other two measures are positive.) The quantitative correspondence is also quite sharp, as Table 10 shows. For consistency with the fiscal measures, we shall concentrate on the four-quarter measures in what follows.

Table 10

Simple Correlations Among Three Measures of Monetary Influence on Real GNP

| Measures | 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $M_Y^1$ and $M_Y^4$ | 0.94 | 0.97 | 0.96 | 0.97 |
| $M_Y^1$ and $M_Y^8$ | 0.81 | 0.98 | 0.86 | 0.93 |
| $M_Y^4$ and $M_Y^8$ | 0.94 | 0.98 | 0.92 | 0.99 |

## Comparison with Other Monetary Indicators

As noted earlier, unlike the case of fiscal policy, there are no existing measures of monetary policy which are conceptually similar to ours. Nevertheless, a number of variables have been offered as indicators of monetary policy, and it is worth seeing how they compare with $M_Y^4$ . In particular, we shall consider the following (very incomplete) list of indicators:

(1) $\Delta B$ - the change in the adjusted monetary base:*

(2) $\Delta M_1$ - the change in currency plus demand deposits;

(3) $\Delta M_2$ - the change in the sum of $M_1$ plus time deposits at commercial banks;

(4) $\Delta R^*$ - the change in the "full-employment" interest rate;**

(5) $\Delta Q_T$ - the change in Tobin's "supply price of capital";***

(6) $\Delta Q_{EF}$ - the change in an alternative measure of the price of capital devised by Engle and Foley;****

The lefthand panel of Table 11 reports both the sign concordance and the simple correlation between $M_Y^4$ and each of these indicators. The three monetary aggregates, $\Delta B$ , $\Delta M_1$ , and $\Delta M_2$ , have the same sign as $M_Y^4$ in nearly 90% of the comparable quarters, and yield simple correlations in the 0.5 - 0.7 range, though part of this agreement is due to a common trend. The sign pattern of $\Delta R^*$ ($R^*$ , like $Q_T$ and $Q_{EF}$ , is virtually trendless) agrees much less well, but the correlation is about as high. (It is negative since monetary expansion reduces $R^*$.) The two "price of capital" measures, $\Delta Q_T$ and $\Delta Q_{EF}$ , have much less in common with $M_Y^4$ . Perhaps this is because the channels of monetary policy in the FMP model are rather different from those hypothesized by Tobin

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*The ordinary base is adjusted for changes in reserve requirements and changes in average requirements due to shifts in deposits where different requirements apply. The series was supplied to us by the Federal Reserve Bank of St. Louis.

**The series is an attempt to purge the ordinary interest rate of its cyclical effects except insofar as policymakers respond to the cycle. A chart of the data appears in Hendershott [1971], and he generously provided us with the numbers.

***Tobin [1974] approximates the theoretical concept by the ratio of market valuation to replacement cost of the corporate capital stock. We thank him for sending us his raw data.

****Both the theoretical basis and the (rather complicated) construction of this series are described in Engle and Foley [1972]. The measure is spiritually akin to Tobin's and was kindly provided to us by Rob Engle.

and by Engle and Foley.

The righthand side of Table 11 exhibits the same information for the deviation of our measure from its "neutral" baseline, $M_Y^4 - \bar{M}_Y^4$. For purposes of comparability, analogous trend adjustments were made to the three monetary aggregates;* the remaining indicators do not exhibit much trend. As one would expect, the deviations from trend show rather smaller correlations than the raw values in the case of the monetary aggregates. But a substantial degree of agreement remains, at least with $\Delta B$ and $\Delta M_2$. It is interesting that, of the three aggregates, the conventional money stock shows the least kinship to $M_Y^4$. By contrast, detrending $M_Y^4$ increases its correlation with the three remaining indicators. Though $\Delta Q_T$ and $\Delta Q_{EF}$ still bear little resemblance to $M_Y^4$, we find the correlation with $\Delta R^*$ quite remarkable. Apparently, Hendershott's shortcut procedure agrees with the FMP model very well.

Table 11

Relationship between $M_Y^4$ and $M_Y^4 - \bar{M}_Y^4$ and a Number of Monetary Indicators

| $M_Y^4$ | | | $M_Y^4 - \bar{M}_Y^4$ | | |
|---|---|---|---|---|---|
| Variable | No. of correct signs/ total sample | Simple Correlation | Variable | No. of correct signs/ total sample | Simple Correlation |
| $\Delta B$ | 46/55 | .67 | $\Delta B - \Delta\bar{B}$ | 37/55 | .55 |
| $\Delta M_1$ | 44/55 | .52 | $\Delta M_1 - \Delta\bar{M}_1$ | 34/55 | .35 |
| $\Delta M_2$ | 45/55 | .66 | $\Delta M_2 - \Delta\bar{M}_2$ | 34/55 | .58 |
| $\Delta R^*$ | 19/35 | -.62 | $\Delta R^*$ | 23/35 | -.76 |
| $\Delta Q_T$ | 35/55 | .16 | $\Delta Q_T$ | 27/55 | .29 |
| $\Delta Q_{EF}$ | 26/52 | .02 | $\Delta Q_{EF}$ | 24/52 | .07 |

*The "barred" variables in the table are defined as follows: $\Delta\bar{B}=.0107B_{t-1}$, $\Delta\bar{M}_1=.0097M_{1,t-1}$, $\Delta\bar{M}_2=.0157M_{2,t-1}$. The growth rates were selected to reproduce the historical growth of each variable over the sample period.

Monetary Policy, 1958-1971

Figures 4 depict the behavior of two measures of monetary influence on real GNP (based on the four-quarter horizon): the impact of current policy, $M_Y^4(t)$ , in Panel A; and the sum of current and lagged policy, $S_Y^4(t) = M_Y^4(t) + L_Y^4(t)$ , in Panel B . For comparison the "neutral" policy represented by $\bar{M}_Y^4$ and $\bar{S}_Y^4 = \bar{M}_Y^4 + \bar{L}_Y^4$ are also included in the graphs. As the wiggles in $\bar{M}_Y^4$ make clear, the "neutral" policy is somewhat of a misnomer. When multipliers vary from quarter to quarter, a constant growth policy for the base can not be expected to have identical effects on GNP.

What story do these series tell about the conduct of monetary policy? The period begins at the end of the 1957-58 recession, and monetary policy was appropriately expansive. It then turned substantially restrictive during the partial recovery of 1958-59; a policy stance which may or may not have been appropriate, depending on ones point of view. By our measures, monetary impact moved back sharply towards "neutrality" in 1960, and, with minor abberations, stayed roughly neutral from mid-1960 to mid-1964. The term "accomodating monetary policy" appears quite descriptive of this period.

Beginning in mid-1964, and continuing until late-1966, the Fed kept its foot moderately, but persistently, on the brake. This can be seen either from the behavior of $M_Y^4$ or from the fact that $S_Y^4(t)$ , which indicates the difference between actual output and the output that would have prevailed with no monetary stimulus whatever, is roughly level from 1964:2 until 1966:3 . Presumably, the earlier portion of this tight money period was due to the Fed's desire to "lean against" the effects of the tax cut. Thus we conclude that, contrary to what others have claimed, the Fed does not deserve much credit for

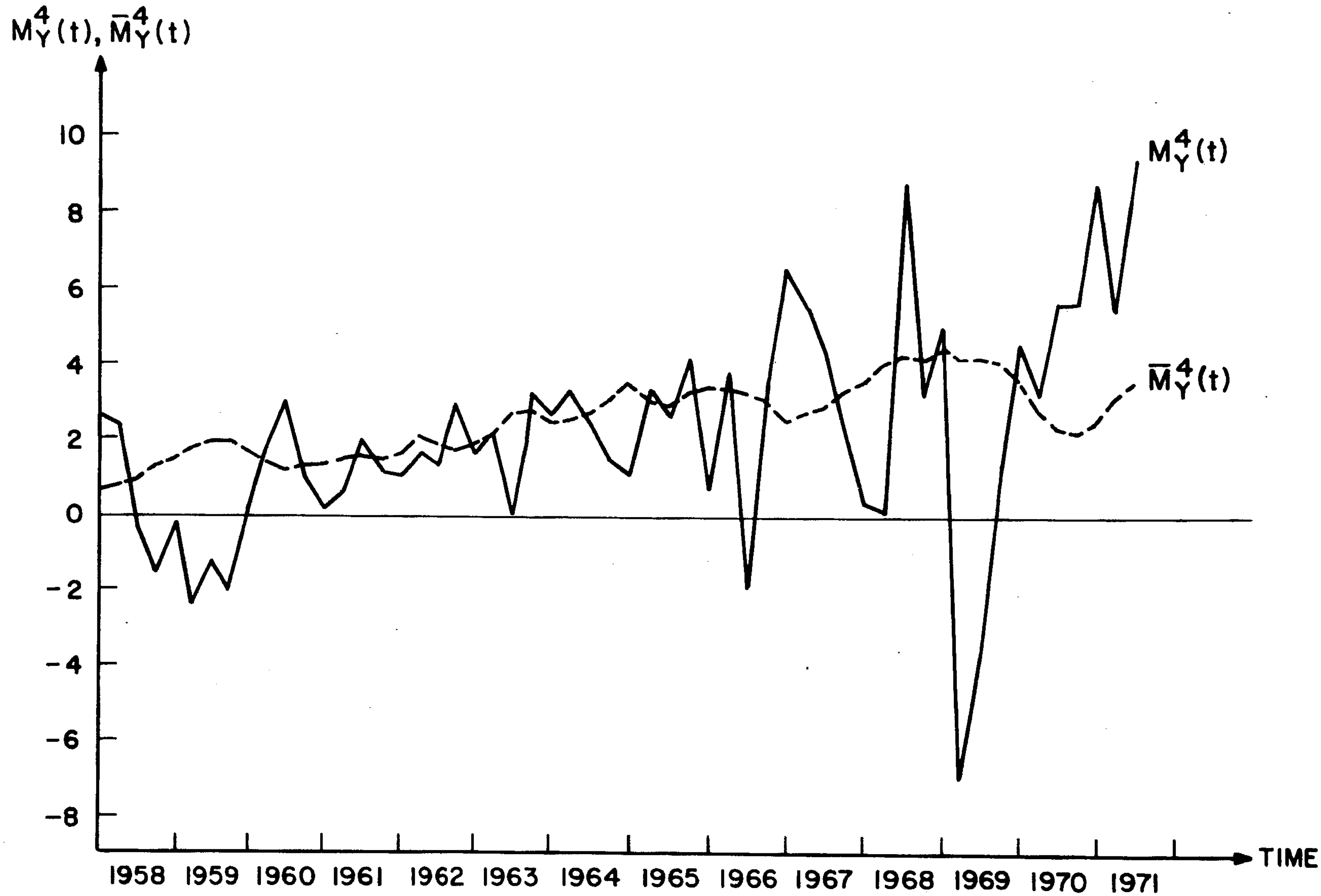

FIG. 4A MONETARY IMPACT ON GNP

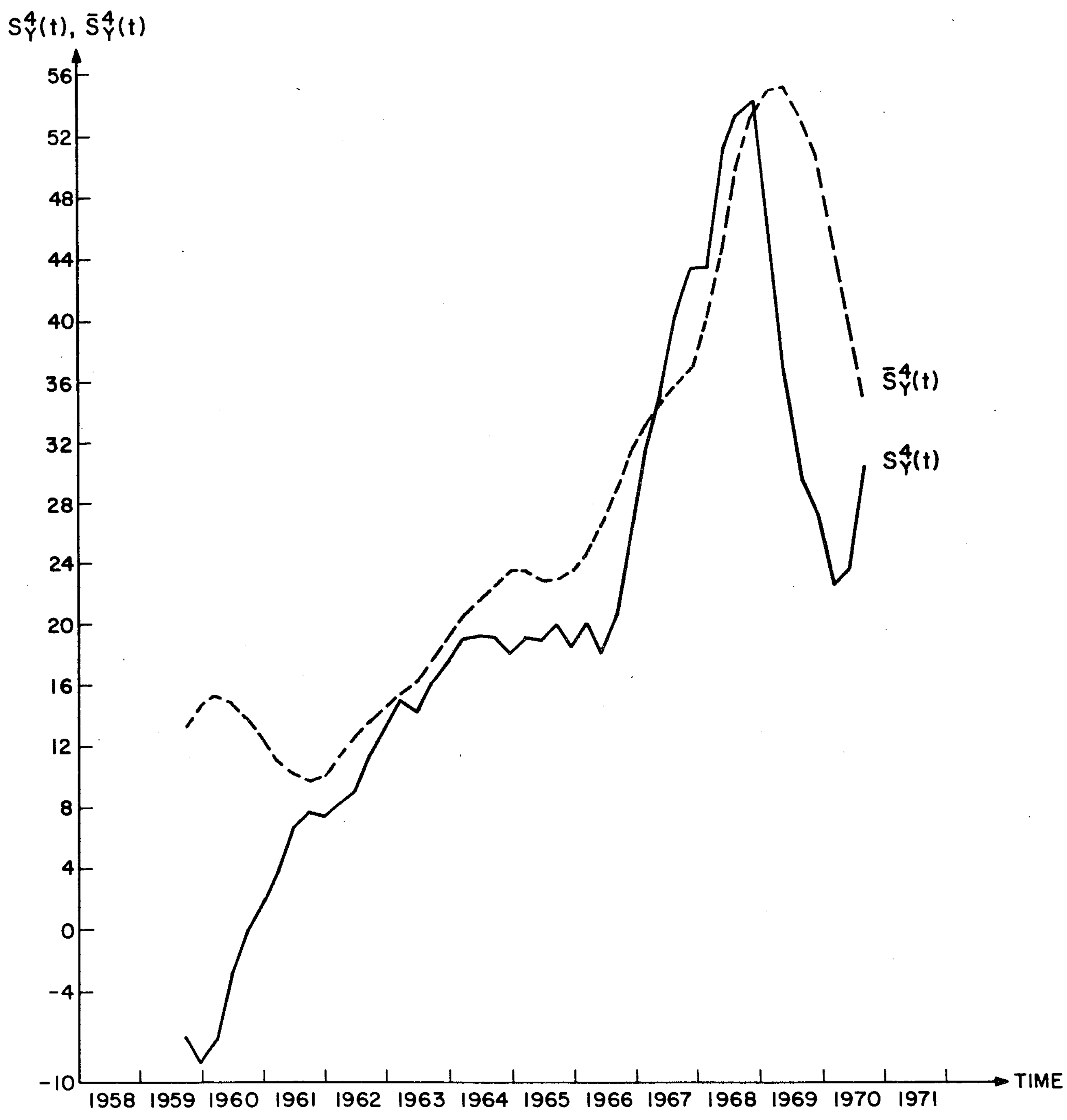


FIG. 4B CUMULATIVE MONETARY IMPACT ON GNP the strong expansion of 1964-65. Of course, the later portion of this tight money period was indubitably correct, though, in combination with the surging demand for money, it brought on the famous "credit crunch" of 1966 which is vividly indicated in Panel A by the trough in 1966-III .

One salient feature that is bound to strike readers of these diagrams is the marked increase in the variability of monetary policy in the 1966-71 period, as compared to 1958-65. The tight monetary policy of 1965-66 gave way to an expansive episode through 1967. This was followed by several quarters of restrictive policy, a sharp expansionary quarter in 1968-IV and an extraordinary restrictive policy in 1969. Our measure of total monetary influence rises by $33 billion from 1966:3 to 1968:3; or two-thirds of the growth in real output over 1966-68. Then from 1969:1 to 1969:4, this same index falls by $25.5 billion in only three quarters. This contractionary policy was itself reversed at the start of 1970, and monetary policy remained expansive through the end of period (1971:3).

In interpreting these data, the reader should be cautioned that some part of the "roller coaster" appearance of monetary policy since 1966 may be due to a feature of the model which may or may not be an accurate representation of the real world. Beginning in 1966, the FMP model has a mechanism whereby inflation leads to inflationary expectations which lower the real rate of interest, thereby inducing increased investment spending. The interaction of this with increases in stock-market values (and thus in consumption) can lead to substantial variations in money multipliers. For example, the four quarter multiplier for changes in high-powered money, was about 3 1/2 in the first half of 1967, 5 1/2 in the first half of 1969 and 2 1/2 in the last half of 1970. And multipliers for the other longer run effects (see Table 13). The choice of a time horizon matters a bit more if one is concerned with the price level (Table 12), but still the correlations are reasonably high.

Table 14, which lists the intercorrelations among $M_R^1$, $M_R^4$, and $M_R^8$, exhibits some puzzling numbers which merit some explanation. In the FMP model, due to long adjustment lags in the demand for money, expansionary central bank policies tend to quickly depress short-term interest rates well beyond their new equilibrium levels. Over somewhat longer horizons (like four or eight quarters), this "overshooting" is eliminated, and two other effects are felt: the upward pressures on nominal interest rates caused by the growth of both real income and prices. The latter effect is especially strong in the post-1966 period. Thus a "typical" response of the interest rate to monetary policy is a large immediate drop, followed by a gradual increase so that by the time eight quarters have elapsed nominal rates are approximately back to their original levels. This explains the low correlations in Table 14.

Tables 15 - 17 indicate, subject to the caveats mentioned previously, the ability of the Fed to pursue independent targets for two or more goals. Tables 15 and 16 show that it has even less latitude than the government to increase real output without causing inflation, and has essentially no such latitude in the long run. The remarks in the preceding paragraph about the behavior of interest rates help explain the correlations in Table 17. In the first quarter, monetary policy moves the LM curve along an approximately linear IS curve, causing an almost perfect negative correlation between $\Delta Y$ and $\Delta R$. This correlation is weaker after four quarters as interest rates reverse course, and may be zero or even positive after eight quarters due to the effects of inflation.

Table 12

Simple Correlations Among Three Measures of Monetary Influence on the Price Level

| Measure | Period 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $M_P^1$ and $M_P^4$ | 0.74 | 0.97 | 0.83 | 0.88 |
| $M_P^1$ and $M_P^8$ | 0.63 | 0.92 | 0.72 | 0.98 |
| $M_P^4$ and $M_P^8$ | 0.95 | 0.97 | 0.96 | 0.94 |

Table 13

Simple Correlations Among Three Measures of Monetary Influence on the Unemployment Rate

| Measure | Period 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $M_U^1$ and $M_U^4$ | 0.94 | 0.98 | 0.95 | 0.98 |
| $M_U^1$ and $M_U^8$ | 0.86 | 0.99 | 0.87 | 0.94 |
| $M_U^4$ and $M_U^8$ | 0.95 | 0.98 | 0.91 | 0.99 |

Table 14

Simple Correlations Among Three Measures of Monetary Influence on the Interest Rate

| Measure | Period 1958:1-1970:3 | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-1970:3 |
|---|---|---|---|---|
| $M_R^1$ and $M_R^4$ | 0.70 | 0.98 | 0.88 | 0.58 |
| $M_R^1$ and $M_R^8$ | 0.05 | 0.96 | -0.08 | 0.00 |
| $M_R^4$ and $M_R^8$ | -0.01 | 0.98 | -0.29 | 0.76 |

Table 15

Simple Correlations between Monetary Influence on Unemployment and on the Price Level

| Time Horizon (in quarters) | Period | | | |
|---|---|---|---|---|
| | 1958:1-end[a] | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-end[a] |
| 1 | -0.97 | -0.97 | -0.77 | -0.99 |
| 4 | -0.76 | -0.99 | -0.83 | -0.76 |
| 8 | -0.83 | -0.99 | -0.88 | -0.97 |

[a]"end" is 1971:4 for one-quarter horizon; 1971:3 for four-quarter; and 1970:3 for eight-quarter.

Table 16

Simple Correlations between Monetary Influence on Real GNP and the Price Level

| Time Horizon (in quarters) | Period | | | |
|---|---|---|---|---|
| | 1958:1-end[a] | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-end[a] |
| 1 | 0.96 | 0.97 | 0.82 | 0.97 |
| 4 | 0.65 | 0.97 | 0.91 | 0.71 |
| 8 | 0.87 | 0.99 | 0.89 | 0.94 |

[a]Same as above.

Table 17

Simple Correlations between Monetary Influence on Real GNP and the Interest Rate

| Time Horizon (in quarters) | Period | | | |
|---|---|---|---|---|
| | 1958:1-end[a] | 1958:1-1961:4 | 1962:1-1968:4 | 1969:1-end[a] |
| 1 | -0.99 | -0.99 | -0.99 | -0.99 |
| 4 | -0.81 | -0.98 | -0.95 | -0.67 |
| 8 | 0.31 | -0.91 | 0.50 | -0.13 |

[a]Same as above.

## V. Some Applications

In Section I we outlined four possible uses for measures of fiscal and monetary policy. Our original motivation in computing these measures was to use them as dependent variables in estimating "reaction functions" for the government and central bank. Our work on this subject is proceeding, and we will report on it in a subsequent paper. We conclude this paper by giving two examples, both related to reduced-form studies, of how these measures can be used. The first suggests a way in which these measures can be used to estimate a simple reaction function so as to resolve one seemingly contraductory set of results, where the second illustrates the estimation of a reduced-form equation based on our policy measures.

Blinder and Solow [1974] have argued, and we have proven in a very simple model (Goldfeld and Blinder [1972]) that *ceteris paribus* the better job the government does of stabilizing GNP, the worse it will look in "St. Louis equations" which regress changes in GNP on changes in fiscal and monetary policy variables (and, perhaps, other things). However, Silber [1971] has run separate St. Louis equations for the Eisenhower versus the Kennedy-Johnson administrations with seemingly contradictory results. Specifically, Silber finds that the Republican version looks very much like the original Andersen-Jordan results (i.e., the estimated fiscal coefficient was nearly zero), while the Democratic version exhibits a rather large fiscal multiplier. He attributes this to the notion that, "Discretionary fiscal policy was first used as a counter-cyclical weapon in the Kennedy Administration." (Silber [1971], p. 364). Of course, in our view, Silber's evidence implies just the opposite, i.e., that the Eisenhower Administration conducted the more stabilizing fiscal policy. Can these two views be reconciled?

Clearly, what is needed is a pair of empirical reaction functions to describe the stabilization policies of the two administrations.* As our formulation of the reaction function differs rather dramatically from previous formulations, it merits some preliminary explanation.

The conventional approach is to assume that the government (or, more frequently, the central bank) maximizes a quadratic welfare function subject to the constraints imposed by a linear model; this leads to a separate reaction function for each instrument. We have not followed this procedure for three reasons. First, probably the U.S. economy, and certainly the FMP model, is highly nonlinear. This makes linear feedback rules suboptimal, and it is well known that explicit solutions to optimal control problems can only rarely be obtained when there are nonlinear constraints. Second, and perhaps even more important, the government (or the Fed) may have far fewer "degrees of freedom" to pursue its desired ends than is indicated by counting instruments. The Tinbergen targets-instruments approach is not applicable in most macroeconomic contexts because the structure of the model may preclude fiscal policy from contributing

*Our choice of time periods must differ from Silber's because our fiscal policy measures begin only in 1958.

to more than one goal. For example, government spending and transfer payments clearly are not two instruments which can be used to achieve two targets. And, finally, we believe the rudimentary state of the art in reaction-function building should preclude closing the books so early on alternative approaches. To date, virtually everyone who ever thought of estimating a reaction function has adopted the Tinbergen-Theil framework. This alone is sufficient reason for us to try a different technique.

Our procedure is almost embarrassingly simple. Recall that $F_Y^4$ (alternatively, $F_Y^8$) indicates the contribution of this quarter's fiscal actions to real GNP three (seven) quarters in the future. In a static economy, it would be plausible government behavior to apportion $F_Y^4$ ($F_Y^8$) to the current gap between potential and actual GNP. However, in a growing economy, the government may also wish to make some contribution to the "normal" growth in aggregate demand. This leads us to the reaction function specifications:*

(10a) $$F_Y^4 = \hat{F}_Y^4 + \lambda_4(Q_t - Y_t) + u_t \qquad 0 \leqq \lambda_4 \leqq 1$$

(10b) $$F_Y^8 = \hat{F}_Y^8 + \lambda_8(Q_t - Y_t) + v_t \qquad 0 \leqq \lambda_8 \leqq 1$$

where $Q_t$ is potential GNP and $\hat{F}_Y^4$ ($\hat{F}_Y^8$) is the normal contribution of

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*It would perhaps seem more natural to enter the gap anticipated at the horizon instead of the current gap. Thus an additional assumption implicit in equations (10a) and (10b) is that the government assumes that, in the absence of fiscal policy, the gap at the horizon will be the same as the gap today. The results proved relatively insensitive to this last assumption.

fiscal actions to steady growth. To implement this we assume that $\hat{F}_Y^4$ $(\hat{F}_Y^8)$ is a linear function of the increase in potential GNP:

$$\hat{F}_Y^4 = \alpha_4 + \beta_4(Q_{t+3} - Q_t) \qquad \beta_4 \geq 0$$

$$\hat{F}_Y^8 = \alpha_8 + \beta_8(Q_{t+7} - Q_t) \qquad \beta_8 \geq 0 \; .$$

We would expect $\alpha_4 \approx \alpha_8 \approx 0$ , and further stipulate that:

$$Q_{t+3} = (1 + \gamma_4)Q_t \qquad \gamma_4 > 0$$

$$Q_{t+7} = (1 + \gamma_8)Q_t \; , \qquad \gamma_8 > 0$$

So that (10a) and (10b) become:

(11a) $$F_Y^4 = \alpha_4 + (\lambda_4 + \beta_4\gamma_4)Q_t - \lambda_4 Y_t + u_t$$

(11b) $$F_Y^8 = \alpha_8 + (\lambda_8 + \beta_8\gamma_8)Q_t - \lambda_8 Y_t + v_t \; .$$

Thus, this approach simply involves regressing $F_Y^4$ $(F_Y^8)$ on potential and actual GNP. The model suggests the following restrictions. First, if the reaction function is stabilizing, the coefficient of the former should be positive while the coefficient of the latter should be negative and <u>algebraically</u> <u>smaller</u>. Second, a plausible argument can be made that $\lambda_8 > \lambda_4$ , i.e. that more of the gap is filled over an eight-quarter horizon than over a four-quarter horizon. (No such relationship between $\beta_4$ and $\beta_8$ seems to follow.) Finally, we expect the constants to be approximately zero. Note that, if we fix $\gamma_4(\gamma_8)$ by extraneous information, all parameters are identified.

How do the empirical results square with these predictions? Our results for the 16 "Eisenhower" Quarters available to us* were as follows (estimation was by instrumental variables; t-ratios are in parentheses):

(12a) $$F_Y^4 = \underset{(.7)}{-8.86} + \underset{(3.5)}{.232Q_t} - \underset{(3.4)}{.230Y_t}$$

$$R^2 = .47,\ DW = 2.46,\ \sigma_e = 1.99$$

(12b) $$F_Y^8 = \underset{(.49)}{-7.23} + \underset{(3.5)}{.273Q_t} - \underset{(3.5)}{.278Y_t}$$

$$R^2 = .48,\ DW = 2.51,\ \sigma_e = 2.32$$

Equation (12a) meets all the *a priori* specifications, and has a reasonable $R^2$ considering that the dependent variable is a trendless and very "noisy" series (see Figure 2A). If an extraneous estimate of 4% is used as the growth rate of potential GNP, the implied parameter values are: $\lambda_4 = .23$, $\beta_4 = .02$, $\alpha_4 = -8.86$ . While the estimated $\beta_4$ is very small, the hypothesis that the coefficients of $Q$ and $Y$ sum to zero is easily rejected. Equation (12b) fits about as well, and verifies the supposition that $\lambda_8 > \lambda_4$ . However, the fact that $Y_t$ gets a larger coefficient than $Q_t$ indicates that the "normal" contribution of fiscal policy to growth is negative (the point estimate of $\beta_8$ is, in fact, -.02).

These two sets of results suggest that the assumption that the Eisenhower

*The period of estimation was 1958:1 - 1961:4 .

Administration was trying to stabilize GNP around potential GNP may not be a facile one. Instead, it may have tried to stabilize GNP around some fraction of $Q_t$. This cannot be tested directly since replacing $Q_t$ in (10a) and (10b) by $\theta\, Q_t$ leads to a regression of $F_Y^4$ ($F_Y^8$) on $Q_t$ and $Y_t$ with all the parameters (save the constant) unidentified. However, some light may be shed on this question by using an alternative measure of fiscal policy.

Recall that we also have measures of the fiscal-policy influence on the unemployment rate, $F_U^4$ and $F_U^8$. Suppose we focus on the unemployment rate instead, and ask whether the indicated target was greater than 4% unemployment. Specifically, we posit the reaction functions:

$$\text{(13a)} \quad F_U^4 = \hat{F}_U^4 + \lambda_4(U^* - U_t) + u_t \qquad 0 \leqq \lambda_4 \leqq 1$$

$$\text{(13b)} \quad F_U^8 = \hat{F}_U^8 + \lambda_8(U^* - U_t) + v_t \qquad 0 \leqq \lambda_8 \leqq 1 \, .$$

It seems reasonable to suppose that the "trend" contribution of fiscal policy to the unemployment rate should be zero, i.e., $\hat{F}_U^4 = \hat{F}_U^8 = 0$, so both the reaction coefficient ($\lambda$) and the target unemployment rate ($U^*$) are identified. The results are:

$$\text{(14a)} \quad F_U^4 = \underset{(3.4)}{.880} - \underset{(3.5)}{.152}U_t \qquad R^2 = .49,\ DW = 2.34,\ \sigma_e = .119$$

$$\text{(14b)} \quad F_U^8 = \underset{(3.4)}{1.189} - \underset{(3.5)}{.202}U_t \qquad R^2 = .48,\ DW = 2.46,\ \sigma_e = .162 \, .$$

While these equations fit the data about as well as equations (12a) and

(12b) , two important differences appear. First, the indicated degree of stabilization is rather smaller (again $\lambda_8 > \lambda_4$ as expected). But, more important, the implied target rate of unemployment is 5.8% in equation (14a) and 5.9% in equation (14b) .

In summary, then our finding for the Eisenhower administration is that there was a systematic, stabilizing fiscal program, but that the stabilization was accomplished around a low level of resource utilization.* This reconciles Silber's finding with the historical verdict that fiscal policy under Eisenhower was less than ideal.

What do we find for the Kennedy-Johnson Administration?** In the case of income stabilization, we find fairly sharp, though not very systematic, destabilizing actions. Specifically, the analogs of equations (12a) and (12b) are:

$$F_Y^4 = \underset{(2.2)}{58.59} - \underset{(2.1)}{.359Q_t} + \underset{(2.1)}{.271Y_t} \qquad R^2 = .17,\ DW = 2.35,\ \sigma_e = 4.34 \tag{15a}$$

$$F_Y^8 = \underset{(3.0)}{104.71} - \underset{(3.1)}{.674Q_t} + \underset{(3.1)}{.518Y_t} \qquad R^2 = .25,\ DW = 2.11,\ \sigma_e = 5.69\ . \tag{15b}$$

The implied parameter estimates are: $\lambda_4 = -.27$, $\lambda_8 = -.52$, $\beta_4 = -.70$ , $\beta_8 = -.49$ . Corresponding reaction functions with the unemployment rate

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*For a similar assessment of U.S. fiscal policy in the 1955-65 period, see Snyder [1970].

**For purposes of this study, we attribute the period 1962:1 - 1968:4 to the Kennedy-Johnson Administration.

as the target simply did not fit the data at all. In a word, the exemplary fiscal performance of 1962 and 1964 is dwarfed by the explosion in government spending in the full-employment context of 1966-67. On balance, the Kennedy-Johnson Administration did no stabilization of the unemployment rate and sharply destabilized the growth of real GNP. As we showed in our earlier paper (Goldfeld and Blinder [1972], esp. p. 608), multipliers in a St. Louis equation are biased upward when the authority is acting in a procyclical manner. We think this explains Silber's findings.

A second application to which the measures presented in this paper can be put is in the actual estimation of a reduced-form equation for GNP. Such equations typically have the form

$$\Delta Y_t = b + \sum_{i=0}^{n} W_i \Delta M_{t-i} + \sum_{i=0}^{m} W_i' \Delta F_{t-i} \qquad (16)$$

where $\Delta Y_t$ is the change in nominal GNP and $\Delta M_t$ and $\Delta F_t$ are some measures of monetary and fiscal influence, respectively. When estimating a model such as (16), a not uncommon finding is that the fiscal variable is generally statistically insignificant and often has the wrong sign as well. As indicated earlier, one common criticism of past empirical work based on (16) has been the measurement of the policy variables. Since we have constructed what we believe to be reasonable indicators of past policies, it seems natural to ask how these variables would fare in a reduced-form equation.

A question immediately arises as to which of our several fiscal or monetary measures should be used. A moment's thought should reveal that the appropriate variables are $T_y^1 = F_y^1 + K_y^1$ and $S_y^1 = M_y^1 + L_y^1$ . It will be recalled that $K_y^1(t)$ is defined as the effect of all fiscal policies taken in or before quarter t-1 on GNP in quarter t . If we add to this $F_y^1(t)$ , we get the total effect of all fiscal policies on GNP in quarter t . The situation is analogous for monetary policy so that we should have an estimating equation of the form

$$(17) \qquad \Delta Y_t = b_0 + b_1 S_y^1(t) + b_2 T_y^1(t) \ .$$

Furthermore, given the construction of $S_y^1$ and $T_y^1$ , we would expect that both $b_1$ and $b_2$ would be approximately unity.

There are two interesting differences between (16) and (17) which are worth noting. First, there are no lagged variables in (17) since past effects are already embodied in $S_y^1$ and $T_y^1$ . This would seem to be a step forward since Schmidt and Waud [1973] have shown that the estimates (and policy conclusions) obtained from (16) are sensitive to the length of lag one assumes (i.e., n and m ). Second, (16) assumes that the policy multipliers are constant over time while (17) , via the definition of $S_y^1$ and $T_y^1$ , allows for variable multipliers.

Equations (16) and (17) were both estimated over the period 1959:4 - 1970:4 . In (16) , the monetary measure was the adjusted monetary base* and the fiscal measure was the full employment deficit. The results are as follows (with t-statistics in parentheses):

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*Qualitatively similar results were obtained with either $M_1$ or $M_2$ as the monetary measure.

(16a)* $$\Delta Y_t = 3.83 + \sum_{i=0}^{4} W_i \Delta M_{t-i} + \sum_{i=0}^{4} W_i' \Delta F_{t-i}$$
(2.54)

$$\sum W_i = 12.09 \qquad \sum W_i' = .23$$
(5.68) (0.65)

$$R^2 = .53,\ DW = 1.58,\ \sigma_e = 4.20$$

(17a)** $$\Delta Y_t = 6.22 + .35T_y^1 + .88S_y^1$$
(5.70) (2.35) (5.60)

$$R^2 = .45,\ DW = 1.60,\ \sigma_e = 4.33$$

Not surprisingly, (16a) yields an insignificant, albeit correctly signed, coefficient for fiscal policy. In contrast, (17a) yields a statistically siginficant coefficient for $T_y^1$. However, while the magnitude of the monetary effect is close to unity, the coefficient of $T_y^1$ is biased below unity. This suggests that even using properly constructed policy variables is not sufficient to fully remedy the other defects of the reduced-form approach.***

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*(16a) was estimated by the Almon technique using a fourth degree polynomial and end point constraints at both ends. This choice and the lag length as well was taken from Andersen and Carlson [1970].

**(17a) was estimated by ordinary least squares. Since $T_y^1$ is based on expenditures in real terms, a price level adjustment was made to it before estimating .

***These would include the omission of other relevant explanatory variables as well as problems related to the first illustration in this section.

## VI. Concluding Remarks

This paper can be interpreted as presenting a few members of a rather large family of admissible indicators of the thrust of fiscal and monetary policy. The desiderata which must be met by any such member were sketched in Sections I and II. We showed how every choice of a model and of a time horizon implied a distinct set of measures, and offered several such measures, all based on the FMP model, but for different time horizons. As we stated at the outset, we hope other investigators will add new members to the family so that measures based on alternative models may be compared. We also invite students of fiscal and monetary policy to use the series published here in their own research. The examples given in Section V represent only a small sample of the questions which can be posed, and hopefully answered, by using such measures.

## Appendix I: Additional Time Series

This appendix reports our time series for fiscal (Table A1) and monetary (Table A2) influence on variables other than GNP. To review the notation, $F_X^n(t)\,(M_X^n(t))$ is the impact of fiscal (monetary) policy in period $t$ on $X(t+n-1)$, where $n$ may be 1, 4, or 8 and $X$ may be P, R, or U .

Table A1

Measures of Fiscal Influence on Selected Targets

| Quarter | $F_P^1$ | $F_P^4$ | $F_P^8$ | $F_U^1$ | $F_U^4$ | $F_U^8$ |
|---|---|---|---|---|---|---|
| 1958:1 | .001 | .018 | .051 | .029 | -.08 | -.12 |
| 2 | .005 | .062 | .157 | -.075 | -.20 | -.26 |
| 3 | .005 | .025 | .061 | -.035 | -.07 | -.09 |
| 4 | .011 | .050 | .118 | -.038 | -.16 | -.20 |
| 1959:1 | .011 | -.011 | -.134 | .139 | .33 | .43 |
| 2 | -.009 | -.041 | -.110 | .061 | .14 | .16 |
| 3 | -.014 | -.049 | -.101 | .032 | .09 | .10 |
| 4 | .003 | -.005 | -.048 | .029 | .08 | .14 |
| 1960:1 | .055 | .112 | .074 | .046 | .24 | .42 |
| 2 | .001 | .013 | .033 | -.073 | -.02 | .01 |
| 3 | .005 | .023 | .061 | .010 | -.09 | -.14 |
| 4 | -.002 | -.011 | -.032 | .038 | .03 | .03 |
| 1961:1 | .005 | .015 | .043 | -.017 | -.05 | -.06 |
| 2 | .019 | .067 | .218 | -.087 | -.24 | -.27 |
| 3 | .006 | .059 | .191 | -.111 | -.22 | -.24 |
| 4 | -.001 | .017 | .056 | -.116 | -.04 | -.01 |
| 1962:1 | .034 | .133 | .318 | -.139 | -.24 | -.22 |
| 2 | .013 | .088 | .265 | -.111 | -.24 | -.25 |
| 3 | .004 | .049 | .219 | .029 | -.08 | -.24 |
| 4 | .002 | .003 | .021 | .029 | -.03 | -.04 |

Table A1

| Quarter | $F_P^1$ | $F_P^4$ | $F_P^8$ | $F_U^1$ | $F_U^4$ | $F_U^8$ |
|---|---|---|---|---|---|---|
| 1963:1 | .066 | .153 | .149 | .031 | .11 | .19 |
| 2 | -.012 | -.061 | -.191 | .039 | .17 | .19 |
| 3 | .004 | .029 | .088 | -.035 | -.06 | -.06 |
| 4 | -.009 | -.049 | -.142 | .059 | .10 | .10 |
| 1964:1 | -.007 | .087 | .427 | -.065 | -.34 | -.49 |
| 2 | .007 | .025 | .076 | -.036 | -.06 | -.05 |
| 3 | -.019 | -.055 | -.171 | .042 | .14 | .14 |
| 4 | -.041 | -.102 | -.297 | .107 | .21 | .21 |
| 1965:1 | .019 | .193 | .689 | -.146 | -.43 | -.50 |
| 2 | -.008 | -.024 | -.060 | .030 | .03 | .03 |
| 3 | .018 | .083 | .287 | -.095 | -.13 | -.16 |
| 4 | .017 | .074 | .270 | -.086 | -.10 | -.14 |
| 1966:1 | .133 | .350 | .671 | -.106 | -.04 | -.15 |
| 2 | .026 | .143 | .527 | -.132 | -.13 | -.21 |
| 3 | .049 | .252 | 1.230 | -.205 | -.28 | -.51 |
| 4 | .017 | .108 | .564 | -.090 | -.10 | -.21 |
| 1967:1 | .082 | .335 | 1.368 | -.152 | -.26 | -.49 |
| 2 | .025 | .194 | .946 | -.097 | -.17 | -.29 |
| 3 | .008 | .077 | .303 | -.054 | -.05 | -.08 |
| 4 | .001 | .003 | .019 | .007 | -.01 | -.01 |
| 1968:1 | .012 | -.055 | -.473 | -.045 | .12 | .27 |
| 2 | .022 | .132 | .461 | -.075 | -.12 | -.11 |
| 3 | .044 | -.153 | -.854 | .106 | .32 | .30 |
| 4 | -.005 | -.043 | -.120 | .055 | .03 | .04 |
| 1969:1 | .031 | .052 | -.052 | .051 | .11 | .13 |
| 2 | -.029 | -.113 | -.325 | .043 | .11 | .18 |
| 3 | -.027 | -.085 | -.226 | .029 | .08 | .13 |
| 4 | -.015 | -.059 | -.151 | .056 | .05 | .08 |

Table A1

| Quarter | $F_P^1$ | $F_P^4$ | $F_P^8$ | $F_U^1$ | $F_U^4$ | $F_U^8$ |
|---|---|---|---|---|---|---|
| 1970:1 | -.069 | -.092 | -.053 | .076 | -.03 | -.12 |
| 2 | -.109 | -.228 | -.523 | .125 | .23 | .39 |
| 3 | -.082 | -.121 | -.125 | .045 | -.01 | -.02 |
| 4 | -.015 | -.035 | na | .051 | .05 | na |
| 1971:1 | .026 | .142 | na | .077 | .13 | na |
| 2 | -.013 | -.032 | na | .048 | .03 | na |
| 3 | .037 | .086 | na | .003 | -.18 | na |
| 4 | .063 | na | na | .017 | na | na |

Table A1

| Quarter | | $F_R^1$ | $F_R^4$ | $F_R^8$ |
|---|---|---|---|---|
| 1958: | 1 | .007 | .017 | .042 |
| | 2 | .010 | .042 | .089 |
| | 3 | .003 | .017 | .032 |
| | 4 | .008 | .040 | .064 |
| 1959: | 1 | -.019 | -.089 | -.140 |
| | 2 | -.008 | -.039 | -.061 |
| | 3 | -.003 | -.025 | -.039 |
| | 4 | .001 | -.023 | -.049 |
| 1960: | 1 | -.016 | -.060 | -.130 |
| | 2 | .001 | .004 | .001 |
| | 3 | .005 | .024 | .050 |
| | 4 | -.001 | -.008 | -.013 |
| 1961: | 1 | .002 | .011 | .021 |
| | 2 | .014 | .060 | .117 |
| | 3 | .013 | .056 | .100 |
| | 4 | .001 | .009 | .008 |
| 1962: | 1 | .012 | .064 | .112 |
| | 2 | .011 | .069 | .135 |
| | 3 | -.003 | .013 | .094 |
| | 4 | .001 | .008 | .021 |
| 1963: | 1 | -.011 | -.029 | -.081 |
| | 2 | -.011 | -.053 | -.115 |
| | 3 | .003 | .021 | .048 |
| | 4 | -.004 | -.034 | -.066 |
| 1964: | 1 | .043 | .180 | .398 |
| | 2 | .005 | .021 | .036 |
| | 3 | -.006 | -.049 | -.101 |
| | 4 | -.010 | -.085 | -.166 |

| Quarter | | $F_R^1$ | $F_R^4$ | $F_R^8$ |
|---|---|---|---|---|
| 1965: | 1 | .029 | .197 | .473 |
| | 2 | -.003 | -.012 | -.021 |
| | 3 | .005 | .057 | .121 |
| | 4 | .004 | .050 | .111 |
| 1966: | 1 | -.016 | .024 | .080 |
| | 2 | .005 | .072 | .181 |
| | 3 | .009 | .142 | .454 |
| | 4 | .005 | .054 | .179 |
| 1967: | 1 | .006 | .185 | .399 |
| | 2 | .011 | .092 | 2.559 |
| | 3 | .002 | .032 | .762 |
| | 4 | .000 | .002 | .023 |
| 1968: | 1 | -.008 | -.038 | -.823 |
| | 2 | .006 | .068 | .328 |
| | 3 | -.080 | -.304 | -3.561 |
| | 4 | -.001 | -.021 | -.041 |
| 1969: | 1 | .002 | -.035 | -.087 |
| | 2 | -.004 | -.071 | -.176 |
| | 3 | -.003 | -.051 | -.120 |
| | 4 | -.004 | -.039 | -.075 |
| 1970: | 1 | .017 | .041 | .133 |
| | 2 | -.018 | -.139 | -.330 |
| | 3 | .031 | .053 | .087 |
| | 4 | -.002 | -.028 | na |
| 1971: | 1 | -.022 | -.079 | na |
| | 2 | -.001 | -.021 | na |
| | 3 | -.003 | .094 | na |
| | 4 | -.013 | na | na |

Source: Computed from simulations of FMP econometric model as explained in the text.

[a] $F_X^n$ (n=1,4,8 ; X=P,U,R) denotes the influence of fiscal policy on variable X, based on n-quarter weights. P = price level (1958=100) , U = unemployment rate (in percentage points) , R = interest rate (in percentage points).

Table A2

Measures of Monetary Influence on Selected Targets[a]

| Quarter | | $M_P^1$ | $M_P^4$ | $M_P^8$ | $M_U^1$ | $M_U^4$ | $M_U^8$ | $M_R^1$ | $M_R^4$ | $M_R^8$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1958: | 1 | .0030 | .042 | .298 | -.029 | -.18 | -.59 | -1.45 | -.50 | -.29 |
| | 2 | .0034 | .038 | .143 | -.020 | -.16 | -.33 | -1.17 | -.50 | -.40 |
| | 3 | -.0004 | -.006 | -.031 | .001 | .03 | .09 | .07 | .10 | .08 |
| | 4 | -.0020 | -.020 | -.083 | .010 | .09 | .22 | .45 | .17 | .09 |
| 1959: | 1 | -.0005 | -.004 | -.009 | .003 | .02 | .02 | .11 | .005 | .002 |
| | 2 | -.0024 | -.027 | -.122 | .015 | .14 | .35 | .54 | .26 | .10 |
| | 3 | -.0009 | -.015 | -.071 | .007 | .08 | .21 | .30 | .17 | .05 |
| | 4 | -.0011 | -.022 | -.122 | .013 | .12 | .33 | .48 | .22 | .08 |
| 1960: | 1 | .0000 | .001 | .005 | -.001 | -.01 | -.01 | -.02 | -.01 | -.01 |
| | 2 | .0009 | .017 | .089 | -.011 | -.10 | -.21 | -.50 | -.25 | -.14 |
| | 3 | .0023 | .027 | .140 | -.018 | -.17 | -.32 | -.94 | -.46 | -.30 |
| | 4 | .0004 | .010 | .053 | -.005 | -.06 | -.12 | -.28 | -.16 | -.10 |
| 1961: | 1 | .0001 | .001 | .009 | -.001 | -.01 | -.02 | -.05 | -.02 | -.01 |
| | 2 | .0002 | .006 | .040 | -.003 | -.04 | -.07 | -.15 | -.09 | -.06 |
| | 3 | .0007 | .020 | .113 | -.010 | -.11 | -.21 | -.45 | -.26 | -.17 |
| | 4 | .0004 | .013 | .071 | -.006 | -.06 | -.14 | -.27 | -.17 | -.10 |
| 1962: | 1 | .0000 | .012 | .069 | -.005 | -.06 | -.13 | -.26 | -.14 | -.05 |
| | 2 | .0005 | .019 | .121 | -.007 | -.09 | -.21 | -.35 | -.21 | -.11 |
| | 3 | .0008 | .013 | .089 | -.005 | -.06 | -.15 | -.28 | -.15 | -.09 |
| | 4 | .0015 | .023 | .178 | -.014 | -.13 | -.36 | -.60 | -.20 | -.10 |
| 1963: | 1 | .0006 | .016 | .113 | -,008 | -.08 | -.19 | -.40 | -.23 | -.13 |
| | 2 | .0006 | .020 | .152 | -.009 | -.10 | -.25 | -.41 | -.26 | -.15 |
| | 3 | .0003 | .002 | .029 | -.001 | -.004 | -.02 | -.04 | -.03 | -.02 |
| | 4 | .0015 | .034 | .230 | -.012 | -.14 | -.33 | -.49 | -.28 | -.12 |
| 1964: | 1 | .0013 | .024 | .181 | -.010 | -.12 | -.27 | -.47 | -.26 | -.11 |
| | 2 | .0008 | .029 | .197 | -.012 | -.14 | -.29 | -.55 | -.36 | -.18 |
| | 3 | .0006 | .021 | .154 | -.009 | -.11 | -.23 | -.43 | -.28 | -.15 |
| | 4 | .0004 | .013 | .109 | -.004 | -.06 | -.14 | -.23 | -.15 | -.08 |
| 1965: | 1 | .0003 | .012 | .098 | -.003 | -.05 | -.09 | -.14 | -.10 | -.05 |
| | 2 | .0015 | .031 | .247 | -.013 | -.13 | -.25 | -.53 | -.32 | -.17 |
| | 3 | .0013 | .027 | .235 | -.012 | -.10 | -.22 | -.44 | -.29 | -.12 |
| | 4 | .0007 | .043 | .449 | -.016 | -.16 | -.37 | -.62 | -.41 | -.16 |

Table A2

| Quarter | | $M_P^1$ | $M_P^4$ | $M_P^8$ | $M_U^1$ | $M_U^4$ | $M_U^8$ | $M_R^1$ | $M_R^4$ | $M_R^8$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1966: | 1 | .0009 | .012 | .158 | -.003 | -.03 | -.09 | -.11 | -.09 | -.04 |
| | 2 | .0007 | .052 | .567 | -.015 | -.13 | -.39 | -.58 | -.36 | -.07 |
| | 3 | -.0020 | -.023 | -.028 | .018 | .06 | .12 | .73 | -.03 | -.09 |
| | 4 | .0010 | .057 | .794 | -.015 | -.12 | -.41 | -.61 | -.36 | -.08 |
| 1967: | 1 | .0031 | .108 | .997 | -.031 | -.22 | -.56 | -1.40 | -.67 | -.21 |
| | 2 | .0024 | .108 | 1.032 | -.021 | -.18 | -.56 | -1.02 | -.81 | .55 |
| | 3 | .0033 | .105 | .908 | -.018 | -.14 | -.49 | -.74 | -.50 | -.37 |
| | 4 | .0009 | .064 | .687 | -.009 | -.09 | -.42 | -.37 | -.33 | .48 |
| 1968: | 1 | .0011 | .010 | .238 | -.001 | -.01 | -.15 | .01 | -.11 | .53 |
| | 2 | .0007 | .004 | .234 | .003 | -.003 | -.21 | -.01 | -.06 | 1.05 |
| | 3 | .0049 | .119 | .938 | -.024 | -.26 | -.84 | -1.13 | -.86 | 1.35 |
| | 4 | .0030 | .041 | .291 | -.008 | -.09 | -.29 | -.46 | -.30 | -.13 |
| 1969: | 1 | .0042 | .048 | .304 | -.018 | -.14 | -.31 | -.79 | -.12 | .09 |
| | 2 | -.0084 | -.044 | -.253 | .037 | .17 | .31 | 1.81 | .06 | -.02 |
| | 3 | -.0049 | -.020 | .091 | .031 | .09 | .05 | 1.60 | -.29 | -.25 |
| | 4 | -.0015 | .006 | .099 | .008 | -.04 | -.17 | .49 | -.50 | -.21 |
| 1970: | 1 | .0019 | .009 | .172 | -.017 | -.11 | -.27 | -.97 | -.42 | -.02 |
| | 2 | .0010 | .001 | .106 | -.013 | -.07 | -.18 | -.81 | -.29 | -.09 |
| | 3 | .0021 | -.006 | .136 | -.018 | -.13 | -.28 | -1.49 | -.73 | -.36 |
| | 4 | .0033 | -.003 | na | -.018 | -.13 | na | -1.66 | -.79 | na |
| 1971: | 1 | .0057 | .009 | na | -.024 | -.19 | na | -2.01 | -1.11 | na |
| | 2 | .0030 | .015 | na | -.012 | -.12 | na | -.91 | -.55 | na |
| | 3 | .0053 | .013 | na | -.031 | -.20 | na | -1.79 | -.42 | na |

[a] See notes to Table A1.

Appendix II: Interpolation Procedure

The two time series on fiscal overhang, $K_Y^4$ and $K_Y^8$, were derived from the three time series on current fiscal policy, $F_Y^1$, $F_Y^4$ and $F_Y^8$, by making the following two assumptions:

(a) that, following a shock, the economy reaches its steady state after eight quarters (i.e., that ninth-quarter and subsequent multipliers are identical to eighth-quarter multipliers);*

(b) that the dynamic multiplier path is piecewise linear.

Figure A1 illustrates the two assumptions. The three large dots indicate

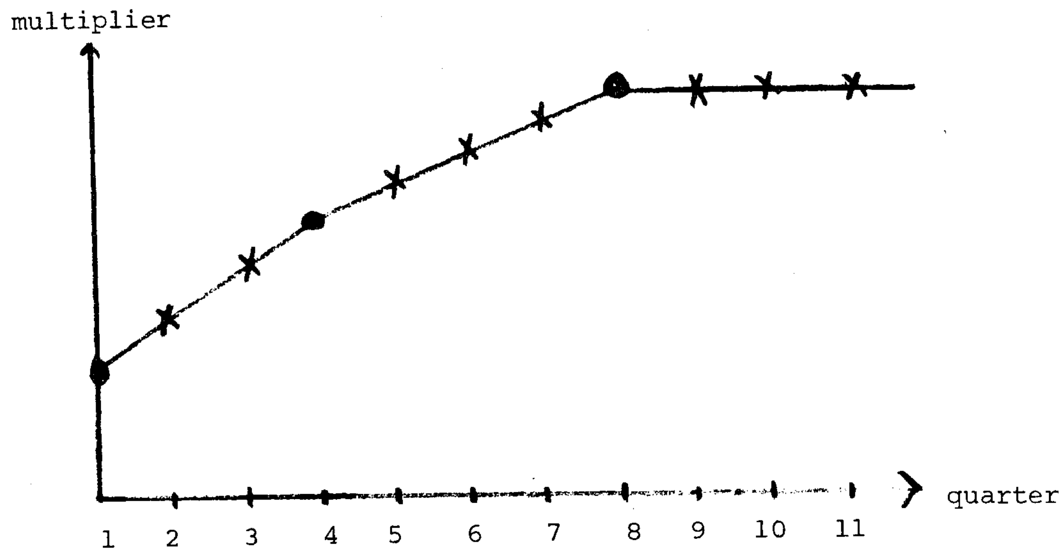


Figure A1

the multipliers actually computed from the FMP model. The x's show how unobserved multipliers were interpolated.

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*It should be noted that this is not a property of the FMP model.

The specific procedures can be explained best by an example. Suppose we wish to compute $K_Y^4(t)$ , which is defined (see text, p. 16) as:

$$\text{(A1)}\quad K_Y^4(t) = \{F_Y^5(t-1) - F_Y^1(t-1)\} + \{F_Y^6(t-2) - F_Y^2(t-2)\} +$$
$$+ \{F_Y^7(t-3) - F_Y^3(t-3)\} + \{F_Y^8(t-4) - F_Y^4(t-4)\} + \{F_Y^9(t-5) - F_Y^5(t-5)\} +$$
$$+ \{F_Y^{10}(t-6) - F_Y^6(t-6)\} + \{F_Y^{11}(t-7) - F_Y^7\ (t-7)\} + \{F_Y^{12}(t-8) - F_Y^8(t-8)\} + \ldots$$

Assumption (a) enables us to truncate this infinite series after seven terms since

$$\text{(A2)}\quad F_Y^8(t) = F_Y^9(t) = F_Y^{10}(t) = \ldots, \text{ for all } t .$$

Assumption (b) allows us to make the following substitutions in (A1) :

$$\text{(A3)}\begin{cases} F_Y^2(t-2) = \frac{2}{3}F_Y^1(t-2) + \frac{1}{3}F_Y^4(t-2) \\ F_Y^3(t-3) = \frac{1}{3}F_Y^1(t-3) + \frac{2}{3}F_Y^4(t-3) \\ F_Y^5(t-j) = \frac{3}{4}F_Y^4(t-j) + \frac{1}{4}F_Y^8(t-j) \ , \ j = 1,\ 5 \\ F_Y^6(t-j) = \frac{1}{2}F_Y^4(t-j) + \frac{1}{2}F_Y^8(t-j) \ , \ j = 2,\ 6 \\ F_Y^7(t-j) = \frac{1}{4}F_Y^4(t-j) + \frac{3}{4}F_Y^8(t-j) \ , \ j = 3,\ 7 . \end{cases}$$

Substituting (A3) into (A1) and using (A2) gives us a formula for $K_Y^4$ in terms of various lagged values of $F_Y^1$ , $F_Y^4$ and $F_Y^8$ . An analogous expression can be derived for $K_Y^8$ .

Simply replacing the letter "F" by the letter "M" everywhere yields the corresponding expressions for monetary overhang, $L_Y^4$ and $L_Y^8$ .

## REFERENCES

Leonall C. Andersen and Jerry L. Jordan, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," Federal Reserve Bank of St. Louis Review, 50(November 1968), pp. 11-24.

____________ and Keith M. Carlson, "A Monetarist Model for Economic Stabilization," Federal Reserve Bank of St. Louis Review, 52(April 1970), pp. 7-25.

Albert Ando and Franco Modigliani, "The Relative Stability of Monetary Velocity and the Investment Multiplier," American Economic Review, 55 (September 1965), pp. 693-728.

Alan S. Blinder and Robert M. Solow, "Analytical Foundations of Fiscal Policy," in Economics of Public Finance (Brookings Institution: 1974), pp. 3-115.

Karl Brunner (ed.), Targets and Indicators of Monetary Policy, (Chandler, 1969).

E. Cary Brown, "Fiscal Policy in the Thirties: A Reappraisal," American Economic Review 46(December 1956), pp. 857-879.

James W. Christian, "A Further Analysis of the Objectives of American Monetary Policy," Journal of Finance 23(June 1968), pp. 465-477.

Peter F. Colwell and Nicholas A. Lash, "Comparing Fiscal Indicators," Review of Economics and Statistics 55(August 1973), pp. 321-326.

E. Gerald Corrigan, "The Measurement and Importance of Fiscal Policy Changes," Federal Reserve Bank of New York Monthly Review 52(June 1970a), pp. 133-145.

____________, "Budgetary Measures of Fiscal Performance - Comment," Southern Economic Journal 36(April 1970), pp. 470-473.

Richard G. Davis, "How Much Does Money Matter? A Look at Some Recent Evidence," Federal Reserve Bank of New York Monthly Review 51(June 1969), pp. 119-131.

Frank DeLeeuw and John Kalchbrenner, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization - Comment," Federal Reserve Bank of St. Louis Review 61(April 1969), pp. 6-11.

Michael DePrano and Thomas Mayer, "Tests of the Relative Importance of Autonomous Expenditures and Money," American Economic Review 55(September 1965), pp. 729-752.

William G. Dewald and Harry G. Johnson, "An Objective Analysis of the Objectives of American Monetary Policy, 1952-61," in Deane Carson (ed.), Banking and Monetary Studies (Richard D. Irwin: 1963), pp. 171-189.

James S. Duesenberry, "Tactics and Targets of Monetary Policy," in Controlling Monetary Aggregates (Federal Reserve Bank of Boston: 1969), pp. 83-95.

Robert F. Engle and Duncan K. Foley, "A Supply Function of Aggregate Investment," M.I.T. Working Paper 89(August 1972).

Federal Reserve Bank of St. Louis, "Technical Notes for Estimates of the High-Employment Budget," unpublished paper (April 1972).

Ann F. Friedlaender, "Macro Policy Goals in the Postwar Period: A Study in Revealed Preference," Quarterly Journal of Economics 87(February 1973), pp. 25-43.

Milton Friedman and David Meiselman, "The Relative Stability of Monetary Velocity and the Investment Multiplier in the United States, 1897-1958," in Commission on Money and Credit, Stabilization Policies (Prentice Hall: 1963), pp. 165-268.

Richard T. Froyen, "A Test of the Endogeneity of Monetary Policy," Journal of Econometrics (forthcoming).

Stephen M. Goldfeld, Commercial Bank Behavior and Economic Activity (North Holland: 1966).

____________ and Alan S. Blinder, "Some Implications of Endogenous Stabilization Policy," Brookings Papers on Economic Activity 3 (1972:3), pp. 585-640.

Edward M. Gramlich, "Measures of the Aggregate Demand Impact of the Federal Budget," in Wilfred Lewis, Jr. (ed.) Budget Concepts for Economic Analysis (Brookings Institution: 1968), pp. 110-127.

____________, "The Usefulness of Monetary and Fiscal Policy as Discretionary Stabilization Tools," Journal of Money, Credit and Banking 3 (May 1971), pp. 506-532.

Thomas Havrilesky, "A Test of Monetary Policy Action," Journal of Political Economy 75(June 1967), pp. 299-304.

____________, Robert Sapp and Robert Schweitzer, "Tests of the Federal Reserve's Reaction to the State of the Economy," The Banker, forthcoming (Spring 1974)

Patric H. Hendershott, "The Full-Employment Interest Rate and the Neutralized Money Stock: Comment," Journal of Finance 26(March 1971), pp. 127-136.

Donald D. Hester, "Keynes and the Quantity Theory: A Comment on the Friedman-Meiselman CMC Paper," Review of Economics ans Statistics 46(November 1964), pp. 364-377.

Bert G. Hickman (ed.), Econometric Models of Cyclical Behavior, Vol. I (Columbia University Press for National Bureau of Economic Research: 1972)

Saul H. Hymans and J. Philip Wernette, "The Impact of the Federal Budget on Total Spending," Business Economics 5(September 1970), pp. 29-34.

Michael W. Keran and Christopher T. Babb, "An Explanation of Federal Reserve Actions (1933-68)," Federal Reserve Bank of St. Louis Review 51(July 1969), pp. 7-20.

Wassily Leontief, "Theoretical Assumptions and Nonobserved Facts," American Economic Review 61(March 1971), pp. 1-7.

Paul W. McCracken, "Moving Toward External and Internal Economic Balance," paper presented to Southwestern Economic Association, San Antonio, Texas, March 31, 1972.

Franco Modigliani, "Monetary Policy and Consumption," in Consumer Spending and Monetary Policy: The Linkages, Federal Reserve Bank of Boston (June 1971), pp. 9-85.

Richard A. Musgrave, "On Measuring Fiscal Performance," Review of Economics and Statistics 46(May 1964), pp. 213-220.

William H. Oakland,"Budgetary Measures of Fiscal Performance," Southern Economic Journal 35(April 1969), pp. 347-358.

Grant L. Reuber, "The Objectives of Canadian Monetary Policy, 1949-61: Empirical 'Trade-offs' and the Reaction Function of the Authorities," Journal of Political Economy 72(April 1964), pp. 109-132.

Peter Schmidt and Roger N. Waud, "The Almon Lag Technique and the Monetary Versus Fiscal Policy Debate," Journal of the American Statistical Association 68(March 1973), pp. 11-19.

William L. Silber, "The St. Louis Equation: 'Democratic'and 'Republican' Versions and Other Experiments," Review of Economics and Statistics 53(November 1971), pp. 362-367.

Wayne W. Snyder, "Measuring Economic Stabilization: 1955-65," American Economic Review 60(December 1970), pp. 924-933.

Dennis R. Starleaf and James A. Stephenson, "A Suggested Solution to the Monetary-Policy Indicator Problem: The Monetary Full Employment Interest Rate," Journal of Finance (September 1969), pp. 623-644.

James Tobin, "Monetary Policy in 1974 and Beyond," Brookings Papers on Economic Activity 5(1974;1), pp. 219-232.

George M. Von Furstenberg and James M. Boughton, "Stabilization Goals and the Appropriateness of Fiscal Policy During the Eisenhower and Kennedy-Johnson Administrations," Public Finance Quarterly 1(January 1973), pp. 5-28.

John H. Wood, "A Model of Federal Reserve Behavior," in George Horwich (ed.), Monetary Process and Policy: A Symposium (Richard D. Irwin: 1966), pp. 135-166.