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Central-Bank Policy and the Financing of Government Budget Deficits : A Cross-Country Comparison

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Internal Paper

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ABSTRACT

This paper provides a cross-country comparison of the role of government budget deficits in determining the course of macroeconomic activity. Government deficits have been accused of contributing to excessive money growth, inflation, high interest rates, the crowding out of private demand, etc. The purpose of this paper is to examine systematically and within a uniform econometric structure the effects of government budget deficits as well as the modes of financing these deficits on macroeconomic activity.

Section I provides an initial brief outline of the issues involved and the inadequacies found in the relevant literature.

Section II reviews the literature that has examined the role of government budget deficits as well as their financing in affecting macroeconomic activity.

Section III provides a comparative discussion of central bank's role in financing government deficits across the countries of our sample - Belgium, France, Germany, Italy, the Netherlands, the United Kingdom, Japan and the United States.

Section IV examines systematically how the objectives of central bank policy affect the financing of the government budget deficit. Reaction functions are estimated for each country depending upon the exchange rate regime and imposing the cross-equation parameter constraints implied by the government budget constraint.

Section V considers the effect of government budget deficits on macroeconomic activity through the vector autoregressive methodology. The findings and policy conclusions along with their comparison of those of the literature are brought together in Section VI.

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I. INTRODUCTION

In recent years, economists, in particular, and the public, in general, have carried on a debate concerning the role of government budget deficits in determining the course of macroeconomic activity. At one time or another, government deficits have been accused of contributing to excessive money growth, inflation, high interest rates, the crowding out of private demand, etc. The purpose of this paper is to examine systematically the effect of government budget deficits as well as the modes of financing these deficits on macro-economic activity.

This more systematic analysis involves two dimensions. First, the existing economic literature usually examines the experience of one country. A cross-country comparison of the issues involved within a uniform econometric structure should provide valuable information. For example, do differing policy objectives lead to differing modes of financing budget deficits or are the modes of financing budget deficits unrelated to the policy objectives of government? Second, most studies have neglected the information contained in the government budget constraint. That is, a study might estimate a reduced-form regression of base-money growth on certain variables, including the government budget deficit. The exact relationship between the budget deficit and changes in base money, government bonds held by the private sector, and international reserves is ignored. We propose to rectify these inadequacies by developing a cross-country study that incorporates the government budget constraint.

In Section II, we review some of the literature that has examined the role of government budget deficits as well as their financing in affecting macroeconomic activity. Much of the literature has considered the question of whether or not budget deficits are inflationary. Consequently, the review is heavily slanted in that direction. Nevertheless, our analysis considers the deficit-inflation question as only one of a number of interrelated macroeconomic questions.

Section III provides a comparative discussion of the central bank's role in financing government deficits across the countries in our

sample. We have included six countries from the European Community - Belgium, France, Germany, Italy, the Netherlands and the United Kingdom - Japan and the United States. The government financing constraint is given by

$$G - T \equiv dB + dB_{CB} \qquad (1)$$

where G-T is the government budget deficit, dB is the change in government debt held by the private sector, and dB_{CB} is the change in the central bank's holding of (net) claims on government. Consequently, we shall compare the countries in our sample as to how they differ in financing government deficits through changes in B and B_{CB}.

Section IV examines systematically how the objectives of central bank policy affect the financing of the government budget deficit. We shall assume that the central bank is faced with a government budget deficit and that the modes of financing the deficit reflect central bank policy. First, the central bank's choice as to dB_{CB} determines dB. Second, dB_{CB} is equal to dH minus dR where dH is the change in base money and dR is the change in central bank holdings of (net) foreign assets. We shall view the budget financing decision (i.e., dH, dB, and dR) as eminating from central bank reaction functions. For each country, we shall estimate two or three reaction functions, depending upon the exchange rate regime, and impose the cross-equation parameter constraints implied by the government budget constraint.

Section V considers the effect of government budget deficits on macroeconomic activity (i.e., wage and price inflation, interest rates, etc.). The approach is the vector autoregressive methodology suggested by Sims (1980). Thus, our analysis is not based on any a priori structural model.

Finally, Section VI contains the summary and conclusions.

II. BUDGET DEFICITS AND ECONOMIC ACTIVITY: A REVIEW

In examining the existing literature, it is obvious that considerable controversy exists concerning the effect of government budget deficits on economic activity. The controversy centers upon whether budget deficits affect economic activity through their mere existence or whether it is the methods of financing deficits that ultimately determine their effect on economic activity.

Neo-Keynesian analysis suggests that deficit spending is expansionary independent of the financing mode. With significant slack in the economy, government budget deficits stimulate aggregate demand and, hence, employment and output for both money and bond financing; while at or near full employment, deficits are inflationary. The debate focuses on which method of financing is more expansionary. Short-run IS-LM analysis suggests that money-financed deficits are more expansionary. Long-run IS-LM analysis with the government budget constraint suggests that bond-financed deficits are more expansionary[1].
Monetarist analysis generally argues that bond-financed deficits have a neutral effect on real economic activity. That is, increases in public demand "crowd out" private demand leaving little, if any, increase in total demand[2]. On the other hand, money-financed deficits are inflationary because inflation is primarily a monetary phenomenon. Whether the increase in the money stock occurs directly - the treasury sells bonds to the central bank - or indirectly - the central bank buys government bonds from, while the treasury sells bondy to - the private sector is irrelevant; the net result is an increasing money stock and price level.

The crowding out effect as a result of bond-financed deficits has several explanations. First, bond sales drive up interest rates which reduce private demand. This interest-rate-induced crowding out is obtained in any bare-bones IS-LM model. Second, a more sophisticated and, thus, controversial explanation is that the private sector considers

bonds and tax-financed government expenditure equivalently. Bond-financed expenditure implies future taxes. Under certain assumptions, the discounted value of these future taxes equals the value of the bonds issued to finance the expenditure. Thus, we have the equivalence, in a present value sense, of bond- and tax-financed government expenditure (See Barro (1974))[3].

The area receiving the most attention in recent years is whether or not government budget deficits are inflationary. As mentioned above, Neo-Keynesians argue that deficits are inflationary only if the economy is operating at or near full employment. Monetarists, on the other hand, argue that deficits are inflationary when and if the deficits are monetized. Monetization would occur under a policy regime where the monetary authorities are targeting interest rates. In such a policy regime, the monetary authorities are pressured to monetize deficits to defend the interest rate targets; the resulting inflation is the "price" they pay.

Buchanan and Wagner (1977) take the monetarist argument one step further. They suggest that in the United States, direct and indirect political pressure will force the hand of the monetary authorities. They will be required to monetize the deficit (i.e., stabilize interest rates); independent policy action is not an option.

The link between the budget deficit and its monetization for both monetarists and Buchanan and Wagner is the interest rate. Whether or not the interest-rate linkage is operative, however, depends upon whether and to what extent the current generation of voters foresee the future tax liabilities associated with bond-financed deficits. If these future tax liabilities are fully anticipated, then bond financing is equivalent to tax financing. Therefore, bond-financed deficits will not put pressure on money and capital markets causing interest rates to rise;[4]

the link between the budget deficit and its monetization is broken.[5]

To a monetarist, controlling inflation requires controlling the rate of money growth; interest rates must be allowed to adjust in response to market forces. Recently, Sargent and Wallace (1981) have challenged the ability of the monetary authorities to control inflation in the long run. Their premise is that the private sector's demand for government bonds places an effective constraint on the degree of independence between monetary and fiscal policy. The question is who, monetary or fiscal authorities, dominates policy making. For example, if the fiscal authorities dominate and are expanding the stock of government bonds more rapidly than the central bank is adding government bonds to its portfolio, then the supply of bonds to the private sector is expanding more rapidly than base money. This portfolio shift cannot continue indefinitely. Either the interest rate will become too high and/or the demand for government bonds will become perfectly inelastic. When this occurs, then the monetary authorities must accommodate fiscal policy. In the reverse case, fiscal policy must accommodate monetary policy when the monetary authorities dominate policy making. Here, the monetary authorities do control the rate of inflation in the long run.

This cursory discussion suggests that there is substantial disagreement among economists about the effect of government deficits on economic activity. We now turn to examine some of the empirical evidence on the role of government deficits in the economy. In some cases, the role of government deficits is peripheral to the central themes of the papers. Nevertheless, these papers were included because they do speak to the issues under discussion in this paper.

A series of papers examining the inflation problem was published as Volume 8 of the Carnegie-Rochester Conference Series on Public Policy (1978). The authors of the papers (i.e. Korteweg, Fourcans, Fratianni,

Dutton, Neumann, Jonson and Taylor, and Korteweg and Meltzer) generally examined the relative importance of the most proximate determinants of inflation in various countries. The underlying analytical structure of the empirical analyses was based on dynamic aggregate demand and aggregate supply curves whose interaction provides a solution for the inflation rate as well as the rate of output growth. Persistent movements in the price level are caused by both policy and foreign impulses. Policy impulses are either fiscal or monetary in origin. Monetary impulses occur because of open market operations, fiscal actions that affect base money, and a foreign impulse working through the balance of payments (i.e., the balance-of-payments effect on base money). Fiscal impulses are a result of tax and expenditure policy. Two additional non-monetary foreign impulses are employed - the foreign inflation rate and the foreign growth of real output. All of these impulses are then used to explain movements in the domestic inflation and output growth rates. These estimating equations would be viewed ordinarily as reduced form regressions. From the global perspective, however, the equations are not complete reduced forms. That is, for any country, the non-monetary foreign impulses are ultimately driven by foreign policy impulses. Consequently, pushed to the limit, one could estimate domestic inflation and output growth rates as functions of policy impulses - both domestic and foreign.

In their introduction, Brunner and Meltzer (1978) carefully delineated the role of the government budget constraint in linking together the various impulses. That is, the domestic monetary impulse, the monetary impulse through the balance of payments, and the fiscal impulse (if measured by the government deficit) are related to each other through the government budget constraint. Although the authors occasionally noted this interdependence (e.g., Fourcans (1978, p. 98)), they did not utilize this information in performing or interpreting their empirical work. One commentator (i.e., Schwartz (1978) p. 195)) was concerned about this interdependence between impulses.

The results, although covering a number of countries, exhibited some consistency. The monetary impulse was generally the major factor explaining inflation and output growth rates. The fiscal impulse was usually a minor factor.

Gordon (1977) investigated empirically alternative hypotheses of inflation - international monetarist versus cost push - for eight industrial countries. The theoretical framework built upon Gordon's (1975) demand and supply analysis of inflation. The demand for monetary accommodation (and thus inflation) emanates from the beneficiaries of inflation; the stimuli of this demand are domestic demand shifts, domestic cost push, and foreign demand and supply shocks. The supply of inflation depends upon the central bank's degree of monetary accommodation of the demand pressures; this accommodation is subject to the central bank's reaction function (i.e., what is the central bank's attitude toward accommodation?) and the central bank's degree of independence from government. If the central bank is not independent in formulating policy, then the degree of accommodation will be determined by the government and its "voter maximizing" behaviour. If the central bank is independent, then its reaction to accommodation pressures will be determined by its monetary reaction function subject, however, to the conflicts between the ultimate economic goals.

Gordon tested for the importance of demand factors - shifts in domestic demand, wage push, import prices, international reserves, and domestic unemployment - as sources of monetary accommodation and determinants of domestic money-stock behaviour. The full-employment budget deficit was introduced as a domestic demand shock. Money, wage, and price equations were run for the eight countries - both independently and pooled. Gordon concluded that, "The basic message of the results is that ... the international monetarists fare better than the wage-push group ... The wage-push hypothesis appears to be alive and well as an explanation of wage

rates, but not as a theory of inflation or of monetary growth." (1977, pp. 431-3). The fiscal deficit variable was included in the money equation but was significant at the five-percent level with the correct sign only for Japan.

Dornbusch and Fischer (1981) examined the linkage between government deficits, money growth, and inflation for a sample of seven, mostly-industrialized countries. They developed a theoretical aggregate demand and aggregate supply model of the macro economy to motivate their econometric analysis. First, they estimated money growth equations that depended upon budget deficits, wage inflation, the unemployment rate, and changes in foreign assets. They found a significant positive relationship between budget deficits and money growth in only three countries (i.e., Guatemala, Israel, and Norway). Moreover, in five countries, wage inflation was positive and significant in the money growth equation. This, they argued, confirmed that monetary policy has accommodated wage pressure. Second, they estimated price and wage inflation equations. Price inflation was regressed onto money growth, import price and wage inflation, and a variable representing changes in fiscal policy. Money growth was not significant in any country while the fiscal variable was significant in three countries (i.e., Finland, Ireland, and Israel). They concluded that: ... wage inflation is an important determinant of money growth." (1981, p. 340) and that "... they (their results) do not confirm the accepted wisdom that budget deficits are the dominate source of money growth." (1981, p. 341).

Willett and Laney (1978) examined two issues - the inflation-unemployment relationship and demand-pull versus cost-push inflation - in Italy and the United Kingdom. They considered the effect of import price inflation, wage inflation, international reserve flows, and budget deficits on money growth. The evidence suggested that both wage inflation and budget deficits have been major causes of money growth in both countries. Import price inflation was significant in both countries

while international reserve flows were significant only in Italy. They concluded that, "While we are quite sympathetic to monetarists critiques on many aspects of the 'wage-push view' of inflation we have argued that there is another aspect of the wage push view, the influence of wage increase on monetary expansion, which cannot be rejected from the evidence we have considered." (1978, p. 331). We note that in the last conclusion, Willett and Laney agree with Dornbusch and Fischer but disagree with Gordon. These three papers, however, consider different countries with different models over different time periods.

Parkin (1975) and Akhtar and Wilford (1978) also have considered the linkage between budget deficits and money growth and thus inflation in the United Kingdom. Parkin's analysis supported the existence of a positive relationship between government deficits and money growth.

Akhtar and Wilford reached a similar conclusion when they examined the effect of budget deficits on money growth. Their model related the money stock to base money through a banking multiplier; base money was broken into foreign and domestic components. Changes in the latter represented the monetized portion of the government deficit. The change in the domestic component of base money was dependent upon the government deficit, the minimum lending rate (a proxy for the authorities ability to raise funds through the sale of government securities), and the market interest rate. Finally, they analyzed and tested the effect of the public-sector borrowing requirement in M3. Their results ".. supports the view that the public sector deficit has been an important influence on the money stock in the United Kingdom ... While ... its size is rather modest." (1978, p. 12). They also supported the view that monetary policy is accommodating and passive to fiscal policy.

Akhtar and Wilford's results were criticized by Cobham (1980) as failing to provide a theoretical explanation of why monetary policy was accommodating budget deficits passively. After altering the data in

several ways, Cobham found evidence that monetary policy was passive in the 1960s but not in the 1970s.

McMillin and Beard (1980) (M-B), using a structural model, examined the short run effect of fiscal actions on the money stock in the United States. Their model incorporated endogenous taxes, wealth, and inflationary expectations with unborrowed reserves as the monetary policy variable. The model was tested both with and without a Federal Reserve (FED) policy reaction function. In the former case, the FED's behaviour was assumed to be exogenous and thus the effect of fiscal actions on the money stock was solely due to the private-sector's reactions. In the latter case, the effect of fiscal actions on the money stock depended upon both the FED's and the private sector's reactions. Their results supported the hypothesis that the money stock is endogenous and that monetary policy accommodates fiscal policy.

M-B's conclusion that monetary policy accommodates fiscal policy is consistent with the arguments presented by Buchanan and Wagner (1977) (B-W). The Journal of Monetary Economics (1978) published a symposium examining the issues raised by B-W. The empirical evidence presented in this symposium failed to support B-W's propositions concerning the size of real government spending and the connection between budget deficits and inflation.

Barro (1978) argued that B-W's assertion of a shift in policy to the Keynesian "new debt doctrine" was based on an inappropriate reading of the data. B-W used nominal debt; Barro employed real debt. Examining the ratio of government debt to GNP in the United States, Barro observed that this ratio has declined, on average, over the post-WWII period. He also found no statistical support for B-W's proposition that there exists a link between money growth and government deficits. He concluded that "... the principle link from the federal budget to money creation in recent U.S. experience involves departures of federal spending from normal ..." (1978, p. 578). The budget deficit per se was not an important determinant of money growth.

Niskanen (1978) examined empirically the relationship between budget deficits and the size of government spending and inflation in the United States. He tested a demand for government services equation and found evidence of a significant relationship between budget deficits and increases in government spending. He considered, however, the results "suggestive but not conclusive" and he called for more research "... to test for the effect of political conditions on federal spending ..." (1978, p. 597). In order to examine the relationship between budget deficits and inflation, Niskanen developed a "crude theory" of the money supply. First, he estimated a reaction function of the monetary authorities allowing for a policy shift in 1966-67. He found no support for the proposition that government deficits pressure the FED to increase the money stock. Second, based on the money supply function, Niskanen derived a price equation which incorporated the combined effects of government deficits and money growth. He estimated both a short- and long-run version of the model and found that deficits were not significant. While lagged money growth was significant in explaining price movements, he concluded that "... federal deficits do not have any significant effects on the inflation rate operating either through or independent of the rate of money growth " (1978 , p. 601).

Several papers have appeared commenting on the articles published in the B-W symposium. Hamburger and Zwich (1981) (H-Z) adopted essentially Barro's model and reexamined the relationship between budget deficits and money growth over two sample periods - 1954 to 1976 and 1961 to 1974. The first period's results supported Barro's conclusions, money-stock growth related to government expenditure and lagged unemployment rather than budget deficits. The second period's results, which was termed the "Keynesian period", suggested that budget deficits rather than government spending affected money growth. They concluded that "... monetary policy is strongly influenced by the Federal Government's fiscal policy actions, measured either by expenditures or budget deficits." (1981, p. 149).

In a comment on H-Z, McMillin and Beard (1982) (M-B) reexamined the fiscal-monetary growth linkage employing revised national income accounts data. They did not find any strong evidence of a positive budget deficit-money growth relationship in the post-1961 period. In a reply, H-Z (1982) argued that M-B's (1982) findings differed from H-Z (1981) not because they employed revised national income accounts data but because of their "... mis-specification of the timing of deficits and money growth." (1982, p. 283). More specifically, H-Z (1982) argued that M-B (1982) regressed current rates of money growth on future deficits. H-Z (1982) reestimated their equations using the revised national income accounts data; they found a strong positive link between budget deficits and money growth. In fact, the link was strengthened when data through 1981 was added.

So far, the discussion has focused on the role of budget deficits in affecting macroeconomic activity - e.g., a deficit is monetized by the monetary authorities due to various pressures which leads to inflation. The basic question addressed in most of the empirical work was whether or not budget deficits are inflationary. Inflation, however, may have feedback effects on the budget deficit and money growth. That is, there may exist two-way causality between government budget deficits and macroeconomic activity (e.g., inflation).

Several scenarios have been offered as to the effect of inflation on budget deficits. The simplest argument states that if government expenditure to GNP is held constant, then as inflation drives taxpayers into higher marginal tax brackets, the deficit will be reduced; this is the "fiscal-dividend" ("fiscal-drag") argument. An alternative view asserts that as prices rise, the amount of government expenditure rises more rapidly than tax revenue. Even if the government allows tax revenue to increase at the same rate as expenditure, there will be an increase in both the real and nominal budget deficit due to the lag in tax collection.[6] Finally, Barro (1979) has argued that if the government

holds the ratios of government expenditure and tax revenue to GNP constant, higher expected inflation will lead to higher budget deficits.

Several papers have appeared on this question of reverse causation. First, Dutton (1979) and Aghevli and Khan (1977, 1978) among others have examined the "self-perpetuating hypothesis" of inflation and its feedback effect on budget deficits. Dutton (1971) developed a system of four simultaneous equations explaining the rates of change of the money stock, the price level and base money and the level of the budget deficit. The money stock is endogenous and related to the budget deficit which, in turn, depends upon the rate of inflation. Using Argentinian data, he concluded that the inflation process is self-perpetuating. Aghevli and Khan (1977) developed a dynamic model of the inflationary process in a continuous-time framework that incorporated the self-perpetuating effect between deficit financing and inflation. The model consisted of four first-order differential equations for the growth rates of the price level, real government spending, nominal tax revenue, and the money stock. Using Indonesian data, they found a one-to-one link between government budget deficits and inflation. They, concluded that, "... the authorities should aim to keep the goal of price stability by increasing the speed of adjustment in their tax collection which would brake the vicious cycle of the self-perpetuating inflation". (1977, p. 402). Aghevli and Khan (1978) extended their analysis by modifying the model and examining four developing countries. They found no significant lags of adjustment for government spending but significant lags for tax revenue; the tax revenue lags became larger the greater the inflation rate was.

Second, Dwyer (1982) and Ahking and Miller (1982) have examined the existence of two-way causality between government budget deficits and other macroeconomic variables (e.g., money growth). Dwyer (1982) employed the Sim's (1980) vector autoregressive method for the United States. He found that budget deficits were the result of inflation and "... play no role in determining inflation or other important macro-economic variables." (1982, p. 327). Ahking and Miller (1982) examined

the relationship between budget deficits, money growth, and inflation in the United States employing Granger causality tests as developed by Granger (1969, 1980) and Ashley, Granger and Schmalensee (1980). Their results did not support the existence of a budget deficit money growth link but did suggest a feedback relationship between budget deficits and inflation.

III. CENTRAL BANK FINANCING OF GOVERNMENT BUDGET DEFICITS

Before embarking upon the econometric analysis, we shall examine historically the degree of central bank financing of government budget deficits. We computed the average annual budget deficit over five year periods (where possible) and the percent of the deficit financed by central bank holdings of (net) claims on government.[7] Table 1 reports the results of this calculation.

Several general observations can be made. First, deficits appear to be different beasts when the 1960s are compared with the 1970s. Deficits are larger in 1966-70 than in 1961-65 for six of the eight countries. Italy and the United Kingdom are the exceptions. Deficits are larger in 1976-80 than in 1971-75 in all countries. Moreover, there does appear to be a general acceleration in the size of the government budget deficit. For example, Belgium's deficit in 1966-70 is approximately one-and-a-half fold increase in the deficit from 1966-70 to 1971-75 and approximately a two-and-three-quarter fold increase from 1971-75 to 1976-79.

Second, along with the growing size of the government deficit, there is a tendency for the central bank to finance a smaller and smaller share of the deficit. In the 1976-80 period, central banks financed between 4.6 and 13.6 percent of government deficits - the United Kingdom is the exception with a minus 2.6 percent financing. The range of financing percentages has narrowed considerably in an absolute sense. In the 1961-65 period, the financing percentages varied from minus 74.2 to 164.4 percent. The Netherlands is the outlier in our sample. In the first three subperiods, the central bank in the Netherlands reduced, on average, its holdings of net claims on government. That is, the private sector, both domestic and foreign, financed the deficit and the central bank's reduction in net claims on government. It should be noted that Belgium, Germany, and the United Kingdom each had one subperiod where the central bank reduced its holding of (net) claims on government. In addition, a reduction in (net) claims on government does not imply necessarily that base money fell. Base money also adjusts to changes in (net) foreign assets held by the central bank.[8]

IV. FINANCING GOVERNMENT BUDGET DEFICITS: CENTRAL BANK REACTION FUNCTIONS

This section systematically examines how the objectives of central bank policy affect the financing of the government budget deficit. We begin with two assumptions: (i) The government deficit is determined by fiscal policy and (ii) The central bank determines how the deficit is financed. That is, we assume that the levels of dH and dR, and thus dB, chosen to finance the budget deficit are a result of central bank policy decisions. We shall investigate this process by estimating central bank reaction functions for the choice variables. Moreover, we shall impose the cross-equation constraints implied by the government budget constraint.

It is well-known that the parameter estimates from reaction functions do not provide information about the actual policymakers' preferences. The parameter estimates combine information on policymakers' preferences along with the reduced-form parameters of the macro-economy. The process can be visualized as a constrained optimization; the reaction functions emerge from the maximization of the policymakers' preferences (i.e., objective function) subject to the reduced-form equations that describe the economy (or, at least, policymakers' perception of the reduced-form equations). Although methodologies have been developed to identify the separate influences, this is beyond the intent of this paper.[9] We are not deriving inferences about policymakers' preferences. Rather, the parameter estimates of our reaction functions tell us the response of policy instruments to changes in policy targets.

General discussions of the objectives of policy usually consider four categories: (i) full employment of resources, (ii) price stability, (iii) real economic growth, and (iv) external balance. The external balance objective depends upon the exchange-rate regime. If the world economy is operating under a fixed exchange-rate regime, then external balance translates into balance-of-payments stability. If, on the other hand, the world economy is operating under a flexible exchange-rate

regime, then external balance translates into exchange rate stability. Since our sample encompasses both a fixed and a flexible exchange-rate regime (i.e., 1961I to 1982I), the reaction-function specifications differ between the two regimes (i.e., pre- and post-March 1973).

The two sets of reaction functions are given as follows:

Fixed Exchange-Rate Period

$$dH/\bar{Y}_{-1} = a_0+a_1 d\ln y+a_2 \{(y-\bar{y})/\bar{y}\} +a_3 \{d\ln P-d\ln P_w\} +a_4(dR/\bar{Y}_{-1})+a_5 \{(G-T)/\bar{Y}_{-1}\} +e_a \quad (2)$$

$$dB/\bar{Y}_{-1} = b_0+b_1 d\ln y+b_2 \{(y-\bar{y})/\bar{y}\} +b_3 \{d\ln P-d\ln P_w\} +b_4(dR/\bar{Y}_{-1})+b_5 \{(G-T)/\bar{Y}_{-1}\} +e_b \quad (3)$$

where $a_i+b_i = 0$; $i = 0, 1, 2, 3$ and $a_i+b_i = 1$; $i = 4, 5$.

Flexible Exchange-Rate Period

$$dH/\bar{Y}_{-1} = \alpha_0+\alpha_1 d\ln y+\alpha_2 \{(y-\bar{y})/\bar{y}\} +\alpha_3 d\ln P + \alpha_4 d\ln E_w+\alpha_5 \{(G-T)/\bar{Y}_{-1}\} +\varepsilon_\alpha \quad (4)$$

$$dB/\bar{Y}_{-1} = \beta_0+\beta_1 d\ln y+\beta_2 \{(y-\bar{y})/\bar{y}\} +\beta_3 d\ln P + \beta_4 d\ln E_w+\beta_5 \{(G-T)/\bar{Y}_{-1}\} +\varepsilon_\beta \quad (5)$$

$$-dR/\bar{Y}_{-1} = \gamma_0+\gamma_1 d\ln y+\gamma_2 \{(y-\bar{y})/\bar{y}\} +\gamma_3 d\ln P + \gamma_4 d\ln E_w+\gamma_5 \{(G-T)/\bar{Y}_{-1}\} +\varepsilon_\gamma \quad (6)$$

where $\alpha_i+\beta_i+\gamma_i = 0$; $i = 0, 1, 2, 3, 4$ and $\alpha_5+\beta_5+\gamma_5 = 1$.

The variables employed in these two sets of equations are given as follows:

dB ≡ change in private-sector holdings of government securities

dR ≡ change in central-bank holdings of (net) foreign assets,

dH–dR ≡ change in central-bank holdings of (net) claims on government,

$\bar{Y}$ ≡ trend value of nominal income,[10]

y ≡ real income,

$\bar{y}$ ≡ trend value of real income,

$(y-\bar{y})/\bar{y}$ ≡ fractional deviation of real income from its trend value (i.e., measure of resource employment level),

$dlny$ ≡ rate of growth of real income,

$dlnP$ ≡ domestic inflation rate,

$dlnP_w$ ≡ world inflation rate faced by country,[11]

$G-T$ ≡ nominal government budget deficit, and

$dlnE_w$ ≡ rate of change of effective exchange rate faced by country.[12]

See the appendix for details on data sources and definitions.

The government budget constraint imposes the parameter restrictions given for the two sets of reaction functions. During the fixed exchange-rate regime, the change in (net) foreign assets (i.e., dR) becomes a policy objective. Consequently, it appears on the right-hand side of the reaction functions. The exchange rate is fixed and is therefore not a policy objective. Moreover, in the long run, the domestic inflation rate is linked to the world inflation rate through Purchasing Power Parity. Thus, we have included the difference between domestic and world inflation rates as the policy objective.

During the flexible exchange-rate regime, the change in (net) foreign assets ceases to be a policy objective. It is replaced by the rate of change of the effective exchange rate faced by the country. Consequently, dR appears in a third reaction function. Moreover, flexible exchange rates unhinge the domestic inflation rate from the world inflation rate. Therefore, we have the domestic inflation rate as a policy objective instead of the difference between domestic and world inflation rates.

The policy decisions that determine the modes of financing the government deficit occur prior to the attainment of complete information on the policy objectives. For example, information on the growth rate

of real income is realized with a lag. Consequently, the interpretation of the right-side variables with the exceptions of the government deficit and the change in (net) foreign assets is that they are policymakers' forecasts.

The process of forecast formation for a variable X can be represented as follows:

$$X_t^F = E(X_t | I_t) \tag{7}$$

where X_t^F is the forecasted value at time t, I_t is the information set used to forecast X_t, and E is the expectations operator. Thus, X_t^F is the expected value of X_t conditional upon the information set available at time t.

Different approaches have been adopted in the reaction function literature to proxy these forecasted values. First, some authors have assumed an autoregressive structure on the variable X_t.[13] That is,

$$X_t = \delta_0 + \delta_1 X_{t-1} + \delta_2 X_{t-2} + \ldots \mu_t \tag{8}$$

where δs are the parameters in the autoregressive scheme and μ_t is the random error. Given knowledge on the δs, X_{t-1}, X_{t-2}, etc., then the autoregressive structure is employed to forecast X_t. The basic criticism of this approach is that it employs too little information. For example, if one is forecasting inflation, then information on money growth or unemployment might add to the accuracy of the forecast. Of course, we desire to model policymakers' behaviour. Even if we could improve our forecasts by adding additional information, it would be appropriate to utilize these forecasts only if they reflect the actual forecasting behaviour of the policymakers. That is, our forecasting procedure should be as efficient (inefficient) as the procedure actually employed by the policymakers.

Second, others adopt a perfect foresight assumption; the actual values are taken as policymakers forecasts (i.e., X_t^F is proxied by X_t).[14] The basic criticism of this approach is that policymakers are endowed with too much ability. If the control variables are fixed for the entire period, then this assumption is unrealistic. That is, how can the policymakers know the values of the policy objectives at the beginning of the period when the control variables are set? If, on the other hand, the control variables are adjusted within the period as information on the policy objectives becomes available, then the perfect foresight assumption begins to make some sense. We are employing quarterly data. Within a quarter, the control variables do have some flexibility; policymakers can and do adjust the direction of policy within a quarter. Thus, it seems inappropriate to reject the perfect-foresight assumption without further consideration.

Third, Abrams, Froyen, and Waud (1980) have adopted a middle road between the autoregressive and perfect-foresight assumptions; they employ "consistent" forecasts in the reaction function. The procedure for producing consistent forecasts is outlined in McCallum (1976). A consistent forecast of X is based on past values of X as well as past values of other variables that also influence X.

Although the third approach of consistent forecasts is preferable on many grounds we have chosen the autoregressive and perfect-foresight assumptions in this paper. An advantage of our choice is that it provides us with two benchmarks along the information axis. That is, one approach is criticized because it assumes too much information is used (i.e., perfect foresight) while the other is criticized because too little information is used (i.e., autoregressive).

Empirical results

The results of estimating the reaction functions under the two forecast assumptions are presented in Tables 2 through 6. Tables 2 and 3 are the estimates of the reaction functions for $dH/\bar{Y}_{-1}$ and $dB/\bar{Y}_{-1}$,

respectively, during the first exchange-rate period. The sample period for all countries except the United Kingdom is 1961I to 1970IV; for the United Kingdom, data problems restrict the sample to 1964I to 1970IV. Tables 4, 5 and 6 are the estimates of the reaction functions for $dH/\bar{Y}_{-1}$, $dB/\bar{Y}_{-1}$, and $(-dR/\bar{Y}_{-1})$, respectively, during the flexible exchange-rate period. Here, the sample periods are 1973II to 1979IV for Belgium and the Netherlands, 1973II to 1980II for Japan, 1973II to 1982I for France, Italy, and the United Kingdom, and 1973II to 1982II for Germany and the United States. In all cases, data availability determined the end point of the various samples.

All equations were estimated using ordinary least squares.[15] Since the independent variables are identical across equations in both the fixed and flexible exchange-rate systems, the government budget constraint is automatically imposed upon the parameter estimates. The first set of estimates for each country corresponds to the perfect-foresight (PF) assumption. The second set corresponds to the autoregressive-forecast (AF) assumption. The PF assumption entailed the use of actual values for the right-side, independent variables. The AF assumption required the construction of forecasts from equation (8) for all the right-side variables except $dR/\bar{Y}_{-1}$ and $(G-T)/\bar{Y}_{-1}$ over the appropriate sample period.[16] Since we employed quarterly data, we used four lagged values in all the autoregressive equations. These equations were employed to construct the predicted values of the right-side variables in the AF results.

Several results stand out. There was a marked change in the effect of government deficits on base-money growth between the fixed and flexible exchange-rate periods.[17] During fixed exchange rates, most countries exhibited a significant, positive effect of deficits on base-money growth. Only for the United States was the coefficient of deficits not significantly different from zero. Belgium, the Netherlands, and the United Kingdom had coefficients that were small and positive, but these coefficients were significantly different from zero. Moreover, Japan's coefficient was not significantly different from one while Germany's coefficient was significantly greater than one. During flexible

exchange rates, only Germany, Italy, the Netherlands, and the United Kingdom had coefficients of the deficit that were positive and significant. In addition, all of these coefficients were significantly less than one.

An increase in international reserves leads to an increase in base money unless the central bank sterilizes the reserve flow.[18] During fixed exchange rates, the coefficient of changes in international reserves in the base-money regression (i.e., a_4) gives some indication of the degree of sterilization. The results suggested that only the Netherlands, the United Kingdom, and the United States conducted significant amounts of sterilization based on the magnitude of a_4. After conducting tests to see if a_4 differed significantly from one at the ten-percent level, only Belgium, the Netherlands and the United Kingdom had coefficients significantly different from one. Thus, in most countries, international reserve changes were allowed to affect domestic base money. This adjustment in base money is a necessary prerequisite to the operation of a fixed exchange-rate system. On the other hand during flexible exchange rates, the rate of change in the exchange rate faced by a country replaced changes in international reserves as the policy objective. That is, international reserve changes appeared as a third reaction function. Given the method of measuring exchange rates (see footnote 12), a depreciation in the exchange rate meant an increase in E_w. If central banks intended to resist exchange-rate movements, then a depreciating exchange rate should cause the central bank to intervene and buy domestic currency and sell foreign exchange (i.e., R decreases). Thus, γ_4 is positive. In Table 5, the coefficient of $d\ln E_w$ (i.e., γ_4) was positive in every instance. Moreover, France, Germany, Italy, Japan, and the United Kingdom had coefficients that were significantly positive. This suggests that these countries were attempting to smooth exchange rate adjustments.

During fixed exchange rates, five of the eight countries had coefficients of the difference between domestic and world inflation rates significantly

different from zero in the base-money regressions. France and Germany had negative coefficients. This sign is consistent with countercyclical monetary policy; that is, an increase in domestic relative to world inflation causes a reduction in base-money growth. Italy, the United Kingdom, and the United States had significant, positive coefficients. This sign is consistent with a procyclical monetary policy. During flexible exchange rates, four countries had coefficients of domestic inflation significantly different from zero in the base-money regressions. Germany and the United Kingdom had significantly negative coefficients while Italy and Japan had significantly positive coefficients. The former results are consistent with a countercyclical policy while the latter are consistent with a procyclical policy. In sum, Germany had a pattern of reaction function responses which is consistent with a countercyclical policy during both fixed and flexible exchange rates. On the other hand, Italy's pattern is consistent with a procyclical policy.

During fixed exchange rates, only two countries had coefficients of deviations of real income from trend in the base-money regressions that were significantly different from zero. France and Italy both had positive coefficients; that is, a rise in real income above trend caused a rise in base-money growth. This pattern is consistent with a procyclical monetary policy response. During flexible exchange rates, Italy and the United Kingdom had significant, positive coefficients associated with deviations of real income from trend. Again, this finding is consistent with procyclical policy. In sum, once again Italy's pattern of reaction function responses is consistent with a procyclical policy under fixed and flexible exchange rates.

During fixed exchange rates, only two countries had coefficients of real output growth in the base-money regressions that were significantly different from zero. Japan's coefficient was positive while the United

Kingdom's coefficient was negative. A negative coefficient, which implies that a rise in real output growth causes a fall in base-money growth, is consistent with a countercyclical monetary policy. During flexible exchange rates, three countries had coefficients of real output growth in the base-money regressions that were significantly different from zero. Belgium and France had negative coefficients, consistent with a countercyclical policy, while Japan had a positive coefficient. In sum, Japan had a pattern of reaction function responses which is consistent with a procyclical policy under fixed and flexible exchange rates.

During fixed exchange rates, five countries had constant terms that were significantly different from zero in the base-money regressions. Germany, Italy, and Japan had negative constant terms while the United Kingdom and the United States had positive constant terms. The constant term implies that there is a positive or negative base-money growth tendency in the central bank's reaction function not explainable by the variables included in the regressions. During flexible exchange rates, only Japan had a constant term significantly different from zero. Again, it was negative.

Finally, the base-money regressions during the fixed exchange-rate period had a higher explanatory power, as measured by F-statistics, than during the flexible exchange-rate period. Consequently, the central bank's deficit financing decision appears to have been more responsive to policy objectives during fixed exchange rates.

V. GOVERNMENT BUDGET DEFICITS AND ECONOMIC ACTIVITY

In this section, we examine the government budget deficit's role in affecting macroeconomic activity. That is, what are the linkages, if any, between the government deficit and macroeconomic variables such as the interest rate, the inflation rate, the unemployment rate, etc .. Some authors have attributed a major causal role to government deficits in the macro economy. For example, high inflation rates, high interest rates, etc. have been blamed upon high budget deficits. This view has been popular in the United States for several years.[19]

Nearly all the empirical analysis of government deficits has been based on structural models.[20] Thus, the tests of the government deficit's effect on economic activity are conditional on the structural specifications being correct. If the structure is misspecified, then conclusions about the effect of deficits on economic activity are open to question. We, therefore, are not employing structural macroeconomic model as a basis for our empirical analysis. We adopt the vector autoregressive methodology as suggested by Sims (1980).[21] This procedure involves the estimation of relatively unconstrained relationships among the variables of interest.

The general form of the vector autoregression is as follows:

$$Z_t = \phi_o + \sum_{i=1}^{n} \phi_i Z_{t-i} + \varepsilon_t \qquad (9)$$

where Z_t is a one-by-m vector of variables, ϕ_o is a one-by-m vector of constants, ϕ_i is a m-by-m matrix of coefficients at lag i, n is the number of lags in the autoregression, and ε_t is a one-by-m vector of error terms. The variables included in Z_t are dlny, $(y-\bar{y})/\bar{y}$, dlnP, $dlnP_W$, i, i_W, dlnW, and $(G-T)/\bar{Y}_{-1}$. We define i to be the domestic interest rate, i_W to be the world interest rate faced by this country,[22] and dlnW to be the rate of change in the nominal wage rate. This vector

autoregression examines the effect of government deficits on economic activity, if any, as well as the effect of economic activity on government deficits, if any.

Empirical Results

Vector autoregression requires a large sample in order to estimate the model. We have eight variables in the vector autoregression and have chosen to include four lags of each variable.[23] Each equation involves the estimation of 36 parameters including the constant term and three seasonal dummy variables. Consequently, we combined the fixed and flexible exchange-rate periods in the estimation. The sample periods are as follows: Belgium and the Netherlands (1961I to 1979IV), Japan (1961I to 1980II), France and Italy (1961I to 1982I), the United Kingdom (1964I to 1982I), and Germany and the United States (1961I to 1982II).

Since the same right-side variables are included in all the vector autoregressions, we estimated using ordinary least squares (See Zellner (1962)). Although seasonally unadjusted data are preferable in the vector autoregression framework, data constraints caused us to employ seasonally adjusted data for dlny and $(y-\bar{y})/\bar{y}$ for all countries and for dlnW in Japan only. Seasonal dummy variables were included in all equations to remove seasonal factors. Table 7 presents the results that examine whether or not government budget deficits help explain movements in the variables listed across the top of the Table (e.g., do deficits help explain movements in dlny?). The procedure took each of the variables listed across the top of Table 7 and regressed them, using ordinary least squares, on four lagged values of all the variables with and then without the deficit. An F-test was performed comparing the regressions with and without the four lagged values of the government budget deficit. The numbers reported in Table 7 are F-statistics. A significant F implies that government deficits contributed to explaining the variable at the head of the column where the F is reported. Table 8 presents results that examine whether or not the variables across the top of the

Table help explain movements in government deficits. Here, the procedure was to regress, using ordinary least squares, the government budget deficit on four lagged values of all the variables and then to rerun the regressions but to exclude, one at a time, the four lagged values of the variable listed across the top of Table 8. The numbers reported in Table 8 are also F-statistics. A significant F implies that four lagged values of the variable at the head of the column contribute to explaining movements in the government deficit. Finally, the plus and minus signs in Table 7 indicate whether the sum of the four coefficients on the four lagged deficits is positive or negative. The plus and minus signs in Table 8 indicate whether the sum of the coefficients of the four lagged values of the variable at the head of the column is positive or negative.

First, let us examine the results contained in Table 7. Two countries, Belgium and the United Kingdom, had deficits helping to explain the domestic interest rate. Larger deficits led to a higher domestic interest rate. One country, Japan, had deficits helping to explain domestic inflation; the effect was positive. Italy had deficits positively affecting both real output growth and deviations of real output from trend. All of these results are consistent with popular views about the effects of government budget deficits on economic activity. That is, deficits stimulate output, cause inflation, and raise interest rates. Germany, on the other hand, had deficits negatively affecting wage inflation. Of interest, however, is that if we combine the two real output effects, none of these four effects occured in any one country simultaneously. Moreover, for France, the Netherlands, and the United States, government deficits were not helpful in explaining any of the domestic economic variables.

Unexpected findings also occured. In Italy and Japan, government deficits helped explain the world (i.e. the United States) interest rate. The effect was positive in both instances; higher deficits led to a higher world interest rate. Also, two countries had deficits helping to explain

the world inflation rate. The United Kingdom had higher deficits leading to higher world inflation while France had the opposite effect.

Second, let us examine the results contained in Table 8. Increases in domestic inflation led to decreases in deficits in Germany and Italy. This finding is consistent with the "fiscal dividend" argument of a progressive tax system. It also is consistent with a countercyclical deficit policy. Also, increases in the world inflation rate led to increases in deficits in Belgium, Germany and Japan. A possible, if highly speculative, rationalization of this result is as follows. If the world inflation rate of a country rises, this is a signal to domestic policy authorities that the world economy is expanding and this allows the domestic authorities to embark upon an expansionary policy domestically and increase the government deficit.

Germany had an increasing domestic interest rate leading to a rising deficit. This result is consistent with the view that deficits must rise as interest rates rise because one of the components of government expenses is the interest cost of financing the outstanding government debt. But, at the same time, a positive link between interest rates and deficits might be indicating a countercyclical deficit policy. That is, the contractionary effect of rising interest rates is countered with a rising government deficit. Moreover, in Germany, a rising world (i.e., United States) interest rate led to a declining government deficit. This result is consistent with domestic authorities tightening the domestic policy screws in response to rising interest rates in the rest of the world. In fact, one might be surprised that the world interest rate had such little significant effect on domestic budget deficits.

Domestic wage inflation provided us with conflicting results. Two countries had wage inflation affecting budget deficits significantly. France had a positive overall effect; Germany had a negative overall effect. A positive overall effect is consistent with a procyclical

deficit policy; that is, an increase in wage inflation leading to an increase in budget deficits.

The effects of real variables also provided conflicting evidence. Two countries had significant effects of real output growth on deficits. France had a positive relationship while Germany had a negative one. Once again, France's relationship is consistent with a procyclical deficit policy. France, however, also had a significant relationship, which was negative, between deviations of real output from trend and government deficits. A negative effect is consistent with a countercyclical deficit policy.

Finally, in only one instance did we uncover a two-way relationship. That is, government deficits affected an economic variable (Table 7) and the same economic variable affected government deficits (Table 8). The two-way relationship occured in Germany for domestic wage inflation. Moreover, the two effects reinforce each other. That is, a rise in the deficit led to a fall in wage inflation and a fall in wage inflation led to a rising deficit.

VI. SUMMARY AND CONCLUSIONS

This paper has examined in a systematic way the central bank's financing of the government budget deficit as well as the effect of government budget deficits on economic activity and vice versa across a sample of eight industrialized countries. It is difficult to summarize all the information contained in the regression analysis. Nevertheless, Tables 9, 10 and 11 attempt to organize the results in an orderly fashion.

Table 9 summarizes the findings concerning the central-bank reaction function estimates during the fixed exchange-rate period. Here, as in Tables 10 and 11, all of the conclusions are of the following form: The coefficient estimates of dlny for the United Kingdom are consistent with a countercyclical base-money policy. We are not infering directly that monetary (or deficit) policy is procyclical or countercyclical. Rather, the results are consistent with such interpretations. A much more detailed analysis is required before one can draw conclusions about policy maker preferences (See footnote 9).

Most of the significant coefficients in the first three columns of Table 9 are associated with the difference between domestic and world inflation rates. The coefficients in France and Germany are consistent with a countercyclical base-money policy while in Italy, the United Kingdom and the United States the coefficients are consistent with a procyclical policy. Regarding the central bank's role in sterilizing international reserve flows, France, Germany, Italy and Japan exhibit a pattern consistent with no sterilization; all other countries exhibit a pattern of partial sterilization. Finally, the central banks had varying degrees of accommodating the deficit through base-money growth. Germany and Japan had coefficients consistent with complete accommodation while the United State's coefficient was consistent with no accommodation.

Table 10 summarizes the findings concerning central-bank reaction function regressions during the flexible exchange-rate period. Once again, the

domestic inflation rate had the most significant effects among the first three columns. Germany and the United Kingdom had coefficients that were consistent with a countercyclical policy while Italy and Japan had coefficients consistent with a procyclical policy. Belgium, the Netherlands, and the United States had coefficients of $d\ln E_W$ consistent with a policy of no intervention in the foreign exchange markets. All the other countries had coefficients consistent with intervention aimed at stabilizing exchange rates. Finally, Germany, Italy, the Netherlands, and the United Kingdom exhibited a pattern consistent with partial accommodation of the government budget deficit through base-money growth. The other countries exhibited a pattern of no accommodation.

Comparing the results from the fixed and flexible exchange-rate periods, the following consistent patterns emerge. First, there was a higher degree of accommodation of budget deficits by base-money growth during fixed exchange rates. Second, the four countries - France, Germany, Italy and Japan - that exhibited a pattern of no sterilization of reserve flows during fixed exchange rates presented a pattern of stabilizing intervention during flexible exchange rates. Third, the German reaction functions were consistent with a countercyclical policy response to changes in domestic inflation over both periods. Fourth, the Italian reaction functions were consistent with a procyclical policy response to changes in domestic inflation and deviations in real output from trend over both periods. Finally, the Japanese reaction functions were consistent with a procyclical policy response to changes in real output growth over both periods.

Table 11 summarizes the findings concerning the effect of economic activity on the governmental budget deficit. That is, we are again interpreting results as being consistent with a countercyclical or procyclical deficit policy. Two items are immediately obvious. First, the results for Germany form a consistent pattern across four of the five

variables examined in the Table; budget deficits are responding to economic variables in a way that is consistent with a countercyclical policy response. It is also worth noting that this pattern for Germany also occured in the reaction function results summarized in Tables 9 and 10. There, however, the possible countercyclical policy link was between base-money growth and domestic inflation. Second, for most countries (i.e., Belgium, Japan, the Netherlands, the United Kingdom and the United States), we do not find a significant link from domestic economic variables to budget deficits.[24]

In Section II, we reviewed a number of articles that were directly or indirectly related to this paper. It is, therefore, incumbent upon us to examine how our results compare with the existing literature. By far, the most work has been done examining whether or not government budget deficits lead to base-money or money growth in the United States. We find no evidence supporting the assertion that deficits lead to base-money growth either during fixed or flexible exchange rates in the United States. Thus, our findings concur with Barro (1978), Niskanen (1978), Dwyer (1982), McMillin and Beard (1982), and Ahking and Miller (1982) but run counter to Hamburger and Zwich (1981, 1982) and McMillin and Beard (1980).[25] Gordon (1977) examined eight industrial countries and concluded that the government deficit was significant in the money equation with the correct sign only for Japan.[26] We, on the other hand, find that during fixed exchange rates, the government deficit helped explain base-money growth significantly in every country except the United States. When we examined the flexible exchange-rate period, Belgium and Japan joined the United States in not having deficits help explain base-money growth. Dornbusch and Fischer (1981) examined the link between budget deficits and money growth in seven, mostly industrialized, countries. They found a positive link between budget deficits and money growth in three countries (i.e., Guatemala, Israel, and Norway) but no link in the other four (i.e., Finland, Ireland, South Africa, and Sri Lanka). Willett and Laney (1978) found that budget

deficits led to money growth in Italy and the United Kingdom; this is consistent with our results. With respect to the United Kingdom, Akhtar and Wilford (1979) found that budget deficits led to money growth although the size of the effect was small. This finding matches closely our results for the United Kingdom.[27]

Dornbusch and Fischer (1981) found that all of the countries in their sample except Finland had changes in net foreign assets significantly and positively affecting money growth. This is a pattern that we also found for all countries except the United States during fixed exchange rates. Willett and Laney (1978) found a significant, positive effect of changes in foreign assets on changes in money in Italy while the United Kingdom did not have a significant effect. We had significant effects for both Italy and the United Kingdom. Akhtar and Wilford (1979), however, found a positive and significant link between changes in international reserves and changes in money in the United Kingdom.

Finally, Dutton (1971) and Aghevli and Khan (1977, 1978) proposed the "self-perpetuating hypothesis" of inflation. Their analysis examined developing countries but was built on work associated with hyperinflation. Within our sample, we find no support for this hypothesis. We do not find any feedback effects between inflation and government deficits. We do find a positive link from deficits to inflation in Japan and a negative link from inflation to deficits in Germany and Italy.

Two items stand out as future directions for research. First, we did not experiment in any way with the objectives of central bank policy. Obvious candidates for consideration are interest rates and wage inflation. One might argue that these objectives are subsumed in the objectives considered in this paper. That is, the central bank's use of interest rate or wage inflation objectives might only be a means to an end - the end being the objectives of real output growth, etc.. Nevertheless, it might be instructive to include an interest rate and wage inflation in the reaction functions. Second, in the vector

autoregression analysis, we only employed the government budget deficit and not the financing modes. Thus, one might repeat the vector autoregression techniques with that portion of the deficit financed by the central bank as an additional variable. That is, one would include both the government deficit and the central bank financing of the deficit in the vector autoregression.

APPENDIX

Data Definitions and Sources:

The following data were taken from the individual country pages of the International Monetary Fund's International Financial Statistics 1973 Supplement for 1961-1969 and the December issues for 1970-1982.

1. Government Deficit or Surplus, Line 80.

2. Central Bank Holdings of (Net) Claims on Government:
   - Belgium, France, Italy, and United Kingdom, Line 12a.
   - Germany, Japan, Netherlands and United States, Line 12a-Line 16d.

3. Central Bank Holdings of (Net) Foreign Assets:
   - Belgium, Japan, and Netherlands, Line 11.
   - France, Germany, Italy, United Kingdom and United States, Line 11-Line 16c.

4. Exchange Rates:
   - Australia, Ireland, and United Kingdom, Line rh.
   - Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, and Switzerland, Line rf.

As sources for the following data, we used the OECD/Main Economic Indicators Historical Statistics 1960-1979, the 1980 and 1981 December issues, and the November issue of 1982 of the Main Economic Indicators.

1. Consumer Price Index (1975=100)

2. Wages (1975=100):
   - Belgium, France, Germany, Italy and the United States: Hourly Rates (Earnings) in Manufacturing.
   - Japan: Monthly Earnings in Manufacturing (Adjusted).
   - Netherlands: Hourly Rates in Industry (males) for 1960-1969 and, Hourly Rates in Manufacturing for 1970-1979 from OECD/Historical Statistics Main Economic Indicators 1955-1971 and 1960-1979 respectively.

3. Interest Rates:
   - France: Bond Yields (issues guaranteed by the government).
   - Belgium, Germany, Italy, United Kingdom and the Netherlands: Yield of Government Bonds.
   - Japan: Treasury Bill Rate (60 days).
   - United States: a) Yield of Government Bonds, and
     b) Treasury Bill Rate (3 months).

4. Income:
   - Germany, Japan, and United States: Gross National Product at current prices (Adjusted)

- Italy and United Kingdom: Gross Domestic Product at current market prices (Adjusted).
- Belgium, France, and Netherlands: Industrial Production (Adjusted) (1975=100).

5. Implicit Price Deflator:

- Germany, Japan and United States: The Gross National Product Implicit Price Deflator (1975=100).
- Italy and United Kingdom: The Gross Domestic Product Implicit Price Deflator (1975=100).

FOOTNOTES:

1. See Blinder and Solow (1973). Also, see Infante and Stein's (1976) critical review and Blinder and Solow's (1976) reply.

2. For a description of the various avenues through which crowding out can occur, see Carlson and Spencer (1975).

3. For an alternative view of bond-financed government expenditure, see Buchanan (1976).

4. As noted above, Buchanan rejects the notion that bond- and tax-financed deficits are equivalent.

5. For a more thorough review of these and related issues, see Stevens (1979).

6. For a more thorough review of the linkages between tax revenue and inflation, see Nowotny (1980).

7. See the appendix for details on data sources and definitions.

8. In the empirical sections, we define changes in base money to equal changes in (net) claims on government plus changes in (net) foreign assets held by the central bank.

9. Building upon the work of Tinbergen (1952) and Theil (1964, 1965, 1968), Friedlander (1973) employed the reduced-form equations from the FRB-MIT-Penn econometric model to deduce the implied preferences of policymakers during the Eisenhower and Kennedy administrations. The preferences were assumed to be based upon deviations of actual from "desired" policy targets (i.e. a quadratic loss function). This methodology raises the problem of identifying the desired policy targets. In a recent paper, Cargill and Meyer (1981) have extended this methodology by developing a procedure whereby policymakers' preferences are uncovered without prior knowledge of desired policy

targets. Moreover, by solving sequentially over the sample period, they obtained time-varying estimates of the policymakers' preferences. Although knowledge of policymakers' preferences is of interest, the magnitude of such an undertaking across the countries in our sample is enormous. Thus, we have opted for the simpler reaction-function approach.

10. Trend values are calculated as follows. Let x be the variable in question. We first regress the natural logarithm of x as a linear function of time. The trend value of x (i.e., $\bar{x}$) is then computed based on the coefficient estimates from this regression.

11. The world inflation rate faced by a country is a trade weighted index. The weights and the methodology in their construction is given in Robinson, Webb and Townsend (1979). Eighteen countries are included in the weighting scheme. Moreover, the weights compensate not only for direct trade competition between countries but also for indirect trade competition in third countries.

12. The world exchange rate faced by a country is also a trade-weighted index. The same weights used to construct the world inflation rate are used to construct the world exchange rate. See footnote 11 for more details. Also, it should be noted that the world exchange rate as constructed in the empirical work is domestic currency per unit of foreign exchange. For example, the world exchange rate facing the Netherlands is measured as Guilders per basket of the seventeen countries currencies. Consequently, a depreciating exchange rate means an increasing E_W.

13. See, for example, Froyen (1974) and Havrilesky, Sapp, and Schwietzer (1975).

14. See, for example, Dewald and Johnson (1967), Friedlander (1973) and Havrilesky (1967).

15. The Time Series Processor (TSP) 2.8B was utilized in all the econometric analysis.

16. Ideally, we would have preferred to use prior data to estimate the autoregressive structure. Data problems prevented us from this approach. Thus, we must assume that the autoregressive structure has not undergone a structural shift.

17. We have defined base money to equal (net) claims on government plus (net) foreign assets held by the central bank. All other factors have been excluded.

18. We have defined international reserves to equal (net) foreign assets held by the central bank.

19. The review of the literature has documented some of this concern about government budget deficits and economic activity. See Section II for details.

20. Exceptions are Dwyer (1982) and Ahking and Miller (1982).

21. For another description of the vector autoregressive technique, see Sargent (1979).

22. We are using the United States interest rate as a proxy for the world interest rate faced by each country. Of course, this implies that in the United States regression, a world interest rate variable will not appear.

23. Both Sims (1980) and Dwyer (1982) employ four lagged values of each variable.

24. This statement would change if we changed the significance level of the F-tests to twenty percent. Several F-statistics just failed to be significant at the ten-percent level.

25. Note that M-B came to differing conclusions regarding this question in 1982 as compared to 1980. They offer no explanation of this inconsistency.

26. The countries included were Canada, France, Germany, Italy, Japan, Sweden, the United Kingdom and the United States.

27. Also, for the United Kingdom, Cobham (1980) found that monetary policy was accommodating during the 1960s but not during the 1970s. We find possible accommodating policy in both the 1960s and the 1970s.

Table 1: Average Annual Government Budget Deficits and Central Bank Financing Percentages

Country	1961-65	1966-70	1971-75	1976-80
Belgium				
Deficit	15.64	25.24	63.44	173.77
Central Bank(%)	58.2	3.2	-1.3	4.9
France				
Deficit	4.03	6.01	5.07	9.40
Central Bank(%)	51.7	4.3	35.7	4.6
Germany				
Deficit	1.42	2.73	10.41	26.56
Central Bank(%)	133.4	-11.7	4.2	7.4
Italy				
Deficit	816	615	1993	8794
Central Bank(%)	75.3	40.4	51.9	15.3
Japan				
Deficit	206	638	2462	10,249
Central Bank(%)	67.8	64.8	35.5	8.3
Netherlands				
Deficit	.10	1.87	1.63	9.78
Central Bank(%)	-74.2	-1.6	-48.6	9.7
United Kingdom				
Deficit	940	124	3285	8242
Central Bank(%)	78.5	235.8	14.7	-2.6
United States				
Deficit	5.43	5.68	27.24	49.69
Central Bank(%)	164.4	74.6	21.5	13.6

Note: In all countries except the U.K., the deficit is measured in billions of domestic currency units (e.g., in Belgium, the deficit is in billions of Francs). The U.K. deficit is in millions of pounds. Also, for Belgium and the Netherlands, the most recent period is 1976-79. And for the U.K., the first period is 1964-65.

Table 2: Estimates of Equation (2)

Country	a_0	a_1	a_2	a_3	a_4	a_5	F	D-W
Belgium(PF)	-.0001	.0022	-.0003	.0054	.7976*	.1449*	17.72	2.72
(33)	(-.64)	(.88)	(-.20)	(.40)	(9.17)	(1.95)		
Belgium(AF)	.00002	-.0064	-.0012	-.0026	.8048*	.1570*	20.24	2.44
(30)	(.14)	(-.61)	(-.72)	(-.08)	(8.97)	(2.13)		
France(PF)	-.0001	-.0004	.0008	-.0183**	1.0612*	.4539*	12.46	3.26
(33)	(-1.06)	(-.28)	(.45)	(-1.52)	(7.51)	(2.55)		
France(AF)	-.0001	.0001	.0042**	-.0562*	1.1595*	.5504*	23.53	3.09
(30)	(-.86)	(.05)	(1.65)	(-3.28)	(10.19)	(4.06)		
Germany(PF)	-.0013*	.0105	.0190	-.0698	.8948*	1.4334*	46.86	2.21
(33)	(-1.87)	(.37)	(1.08)	(-.62)	(12.58)	(6.83)		
Germany(AF)	-.0021*	-.0155	.0261	-.3442**	.8813*	1.5007*	45.02	2.32
(30)	(-1.73)	(-.23)	(1.19)	(-1.55)	(10.66)	(7.51)		
Italy(PF)	-.0022*	-.0358	.0837*	.3511*	1.1587*	.6235*	27.24	2.37
(33)	(-1.76)	(-.66)	(2.84)	(3.18)	(8.57)	(6.68)		
Italy(AF)	-.0070*	.1849	.1241*	.6853*	1.1679*	.7971*	32.14	2.24
(30)	(-2.76)	(.95)	(3.94)	(3.87)	(9.41)	(7.97)		
Japan(PF)	-.0020*	.0180	.0018	.0161	1.2283*	1.0288*	175.96	2.27
(33)	(-2.16)	(.56)	(.30)	(.41)	(4.72)	(25.10)		
Japan(AF)	-.0048*	.1429**	-.0006	-.0701	1.4801*	1.0092*	171.43	2.17
(30)	(-1.92)	(1.63)	(-.10)	(-.47)	(4.82)	(24.48)		
Netherlands(PF)	.00001	-.0004	.00001	.0012	.3523*	.2443*	2.68	2.89
(33)	(.63)	(-.62)	(.07)	(1.28)	(2.01)	(2.66)		
Netherlands(AF)	.00002	-.0010	-.00003	.0023	.3937*	.2570*	2.52	3.02
(30)	(.84)	(-.88)	(-.14)	(.97)	(2.27)	(3.10)		
United Kingdom(PF)	.0017*	-.0751**	.0264	.2654*	.1145*	.2079*	13.21	2.26
(21)	(2.39)	(-1.71)	(.75)	(3.51)	(2.02)	(6.47)		
United Kingdom(AF)	.0020*	-.1462*	.0514	.5125*	.1640*	.1936*	10.87	1.85
(18)	(2.47)	(-1.90)	(.90)	(2.40)	(2.66)	(5.38)		
United States(PF)	.0014*	-.0060	-.0060	.0634**	.5746*	.0041	1.73	2.19
(33)	(4.46)	(-.25)	(-.97)	(1.69)	(1.99)	(.17)		
United States(AF)	.0008**	.0733	-.0037	.1280*	.4744**	.0038	1.79	2.02
(30)	(1.55)	(1.25)	(-.50)	(1.98)	(1.39)	(.15)		

Table 2 continued

Note: All regressions were performed on the Time Series Processor (TSP) 2.8B. All equations are estimated using ordinary least squares. Numbers under coefficients in parentheses are t-statistics. Numbers under countries in parentheses are degree of freedom. PF means the perfect-foresight assumption while AF means the autoregressive-forecast assumption. All tests are two-tailed.

* Means the coefficient is significantly different from zero at the ten-percent level.

** at the twenty-percent level.

Table 3: Estimates of Equation (3)

Country	b_0	b_1	b_2	b_3	b_4	b_5	F	D-W
Belgium(PF)	.0001	-.0022	.0003	-.0054	.2024*	.8551*	33.75	2.72
(33)	(.64)	(-.88)	(.20)	(-.40)	(2.33)	(11.51)		
Belgium(AF)	-.00002	.0064	.0012	.0026	.1952*	.8430*	35.73	2.44
(30)	(-.14)	(.61)	(.72)	(.08)	(2.18)	(11.46)		
France(PF)	.0001	.0004	-.0008	.0183**	-.0612	.5461*	7.48	3.26
(33)	(1.06)	(.28)	(-.45)	(1.52)	(-.43)	(3.06)		
France(AF)	.0001	-.0001	-.0042**	.0562*	-.1594	.4496*	11.71	3.09
(30)	(.86)	(-.05)	(-1.65)	(3.28)	(-1.40)	(3.32)		
Germany(PF)	.0013*	-.0105	-.0190	.0698	.1052**	-.4334*	2.21	2.21
(33)	(1.87)	(-.37)	(-1.08)	(.62)	(1.48)	(-2.07)		
Germany(AF)	.0021*	.0155	-.0261	.3442**	.1187**	-.5007*	2.33	2.32
(30)	(1.73)	(.23)	(-1.19)	(1.55)	(1.44)	(-2.51)		
Italy(PF)	.0022*	.0358	-.0837*	-.3511*	-.1587	.3765*	5.36	2.37
(33)	(1.76)	(.66)	(-2.84)	(-3.18)	(-1.17)	(4.03)		
Italy(AF)	.0070*	-.1849	-.1241*	-.6853*	-.1679**	.2029*	6.62	2.24
(30)	(2.76)	(-.95)	(-3.94)	(-3.87)	(-1.35)	(2.03)		
Japan(PF)	.0020*	-.0180	-.0018	-.0161	-.2283	-.0288	0.66	2.27
(33)	(2.16)	(-.56)	(-.30)	(-.41)	(-.88)	(-.70)		
Japan(AF)	.0048*	-.1429**	.0006	.0701	-.4801**	-.0092	1.11	2.17
(30)	(1.92)	(-1.63)	(.10)	(.47)	(-1.56)	(-.22)		
Netherlands(PF)	-.00001	.0004	-.00001	-.0012	.6476*	.7557*	14.48	2.89
(33)	(-.63)	(.62)	(-.07)	(-1.28)	(3.69)	(8.21)		
Netherlands(AF)	-.00002	.0010	.00003	-.0023	.6063*	.7430*	17.49	3.02
(30)	(-.84)	(.88)	(.14)	(-.97)	(3.49)	(8.96)		
United Kingdom(PF)	-.0017*	.0751**	-.0264	-.2654*	.8855*	.7921*	125.62	2.26
(21)	(-2.39)	(1.71)	(-.75)	(-3.51)	(15.63)	(24.67)		
United Kingdom(AF)	-.0020*	.1462*	-.0514	-.5125*	.8360*	.8064*	107.60	1.85
(18)	(-2.47)	(1.90)	(-.90)	(-2.40)	(13.57)	(22.42)		
United States(PF)	-.0014*	.0060	.0060	-.0634**	.4254**	.9959*	370.27	2.19
(33)	(-4.46)	(.25)	(.97)	(-1.69)	(1.47)	(42.53)		
United States(AF)	-.0008**	-.0733	.0037	-.1280*	.5256**	.9962*	330.22	2.02
(30)	(-1.55)	(-1.25)	(.50)	(-1.98)	(1.54)	(40.47)		

Note: See Table 2

Table 4. Estimates of Equation (4)

Country	α_0	α_1	α_2	α_3	α_4	α_5	F	D-W
Belgium(PF)	.0005	-.0144*	.0015	-.0145	-.0062	.0308	1.67	1.74
(21)	(1.19)	(-2.66)	(.55)	(-.74)	(-.68)	(.51)		
Belgium(AF)	.0003	-.0102	.0024	-.0070	-.0037	.0476	0.43	2.03
(21)	(.65)	(-.98)	(.79)	(-.30)	(-.16)	(.72)		
France(PF)	.0007	-.0142*	-.0016	-.0120	-.0106**	-.2364**	1.94	2.35
(30)	(1.08)	(-1.78)	(-.66)	(-.46)	(-1.56)	(-1.37)		
France(AF)	-.0002	-.0350*	-.0018	.0275	-.0108	-.1927	1.92	2.34
(30)	(-.16)	(-2.14)	(-.68)	(.53)	(-.88)	(-1.10)		
Germany(PF)	-.0008	-.0323	-.0046	-.2146**	-.0917*	.6037*	3.55	2.51
(31)	(-.28)	(-.39)	(-.19)	(-1.58)	(-2.96)	(2.04)		
Germany(AF)	.0006	.3918	-.0058	-.4329*	-.1385**	.4512**	2.99	2.86
(31)	(.16)	(1.27)	(-.23)	(-2.32)	(-1.36)	(1.48)		
Italy(PF)	-.0116	-.0355	.1908*	.2652**	.0350	.4659*	1.53	1.60
(30)	(-1.03)	(-.24)	(1.80)	(1.37)	(.42)	(1.87)		
Italy(AF)	.0060	-.3612	.1429	-.0763	.0706	.4233**	0.60	1.76
(30)	(.21)	(-.79)	(1.05)	(-.12)	(.32)	(1.48)		
Japan(PF)	-.0090**	.1243**	-.0398	.2721*	-.0165	.1876	1.09	2.58
(23)	(-1.54)	(1.47)	(-1.12)	(1.76)	(-.33)	(.88)		
Japan(AF)	.0025	.2354	.0058	-.1422	.0070	.1056	0.33	2.83
(23)	(.25)	(.99)	(.13)	(-.39)	(.05)	(.47)		
Netherlands(PF)	-.0001	-.0002	-.0003	.0038	.0008	.2183**	1.65	2.91
(21)	(-1.10)	(-.17)	(-.97)	(1.19)	(.47)	(1.41)		
Netherlands(AF)	-.00003	.0015	-.0001	.0009	.0002	.2909*	1.22	2.92
(21)	(-.35)	(.53)	(-.45)	(.19)	(.06)	(1.94)		
United Kingdom(PF)	.0014	.0099	.0424*	-.0980*	.0020	.2588*	4.36	2.35
(30)	(.81)	(.20)	(1.86)	(-2.17)	(.10)	(3.85)		
United Kingdom(AF)	.0014	-.1030	.0166	-.1299	.1277**	.2771*	4.11	2.31
(30)	(.32)	(-.61)	(.53)	(-1.07)	(1.61)	(4.12)		
United States(PF)	-.00003	.0080	-.0019	.0479	.0155**	-.0216	0.93	1.77
(31)	(-.03)	(.30)	(-.14)	(.98)	(1.62)	(-.48)		
United States(AF)	.0008	.0373	.0073	.0082	.0079	-.0293	0.41	1.82
(31)	(.43)	(.38)	(.47)	(.11)	(.27)	(-.66)		

Note: See Table 2.

Table 5: Estimates of Equation (5)

Country	β_0	β_1	β_2	β_3	β_4	β_5	F	D-W
Belgium(PF)	.0001	.00001	-.0003	-.0047	-.0025	.9172*	85.36	2.63
(21)	(.43)	(.001)	(-.16)	(-.31)	(.34)	(19.38)		
Belgium(AF)	.0001	-.0047	-.0007	-.0026	-.0133	.9145*	88.34	2.59
(21)	(.23)	(-.67)	(-.33)	(-.17)	(-.84)	(20.18)		
France(PF)	-.0002	.0016	-.0005	.0082	-.0004	.8517*	55.66	2.90
(30)	(-.89)	(.64)	(-.63)	(1.03)	(-.18)	(16.10)		
France(AF)	.0001	.0027	-.0003	-.0056	.0066*	.8563*	63.73	2.87
(30)	(.29)	(.57)	(-.43)	(-.37)	(1.85)	(16.94)		
Germany(PF)	.0028	.0731	-.0207	.1111	.0285	.0708	0.72	3.16
(31)	(1.02)	(.88)	(-.84)	(.80)	(.90)	(.24)		
Germany(AF)	-.0012	.2953	-.0272	.3246*	.0307	.1540	1.18	3.24
(31)	(-.36)	(1.00)	(-1.11)	(1.82)	(.32)	(.53)		
Italy(PF)	.0068	-.0205	-.1452**	-.0073	-.1294*	.6296*	8.74	1.49
(30)	(.74)	(-.17)	(-1.67)	(-.05)	(-1.90)	(3.09)		
Italy(AF)	-.0029	-.0140	-.1844**	.3862	-.3807*	.6196*	7.52	1.29
(30)	(-.12)	(-.04)	(-1.69)	(.77)	(-2.15)	(2.71)		
Japan(PF)	.0072	-.0888	.0211	.2397**	-.0019	.7891*	5.14	2.75
(23)	(1.24)	(-1.06)	(.60)	(-1.57)	(-.04)	(3.74)		
Japan(AF)	-.0098	-.1475	-.0406	.3461	-.0733	.8771*	4.37	2.83
(23)	(-1.01)	(-.65)	(-.92)	(.99)	(-.60)	(4.06)		
Netherlands(PF)	.0001*	.0001	-.00003	-.0023**	-.0005	.3412*	4.86	2.09
(21)	(2.93)	(.22)	(-.16)	(-1.45)	(-.62)	(4.29)		
Netherlands(AF)	.00002	-.0011	-.0002**	.0010	-.0037*	.3222*	6.06	2.32
(21)	(.46)	(-.81)	(-1.41)	(.47)	(-2.11)	(4.64)		
United Kingdom(PF)	.0023	.0068	-.0243	.0648	-.0488**	.6366*	7.32	2.18
(30)	(.74)	(.08)	(-.62)	(.83)	(-1.41)	(5.46)		
United Kingdom(AF)	.0058	.1571	-.0027	.0361	-.2520*	.5653*	7.91	1.94
(30)	(.81)	(.55)	(-.05)	(.18)	(-1.89)	(5.01)		
United States(PF)	-.0002	-.0045	.0013	-.0345	-.0179*	1.0481*	125.52	1.75
(31)	(-.16)	(-.16)	(.09)	(-.64)	(-1.70)	(21.47)		
United States(AF)	-.0007	-.0603	-.0061	-.0050	-.0140	1.0509*	116.99	1.75
(31)	(-.33)	(-.56)	(-.36)	(-.06)	(-.43)	(21.62)		

Note: See Table 2.

Table 6: Estimates of Equation (6)

Country	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5	F	D-W
Belgium(PF)	-.0006**	.0144*	-.0012	.0193	.0087	.0519	1.55	1.67
(21)	(-1.42)	(2.46)	(-.40)	(.91)	(.88)	(.80)		
Belgium(AF)	-.0004	.0419**	-.0017	.0096	.0171	.0379	0.62	1.78
(21)	(-.77)	(1.38)	(-.54)	(.40)	(.70)	(.55)		
France(PF)	-.0006	.0126*	.0021	.0038	.0109*	.3847*	2.81	2.36
(30)	(-.89)	(1.73)	(.93)	(.16)	(1.77)	(2.44)		
France(AF)	.0001	.0323*	.0021	-.0220	.0042	.3365*	2.09	2.22
(30)	(.08)	(2.07)	(.85)	(-.44)	(.36)	(2.01)		
Germany(PF)	-.0020	-.0408	.0253	.1034	.0632*	.3255	1.72	2.32
(31)	(-.81)	(-.54)	(1.13)	(.82)	(2.20)	(1.19)		
Germany(AF)	.0006	-.6872*	.0330**	.1083	.1078	.3948**	2.35	2.34
(31)	(.21)	(-2.57)	(1.48)	(.67)	(1.22)	(1.50)		
Italy(PF)	.0048	.0561	-.0456	-.2579**	.0944	-.0955	0.58	1.30
(30)	(.43)	(.37)	(-.43)	(-1.32)	(1.13)	(-.38)		
Italy(AF)	-.0031	.3751	.0415	-.3098	.3101**	-.0429	0.85	1.21
(30)	(-.12)	(.89)	(.33)	(-.54)	(1.52)	(-.16)		
Japan(PF)	.0018	-.0355	.0187*	-.0324	.0183	.0233	1.13	1.76
(23)	(.93)	(-1.27)	(1.58)	(-.63)	(1.12)	(.33)		
Japan(AF)	.0072*	-.0879**	.0348*	-.2038*	.0663*	.0173	3.13	2.03
(23)	(2.71)	(-1.39)	(2.86)	(-2.11)	(1.96)	(.29)		
Netherlands(PF)	.00003	.0001	.0004	-.0014	-.0002	.4405*	1.67	2.76
(21)	(-.38)	(.05)	(1.02)	(-.44)	(-.14)	(2.75)		
Netherlands(AF)	.00001	-.0004	.0003	-.0019	.0035	.3869*	1.85	2.70
(21)	(.14)	(-.16)	(1.13)	(-.41)	(.93)	(2.64)		
United Kingdom(PF)	-.0037*	-.0168	-.0181	.0332	.0468*	.1047	1.76	1.62
(30)	(-1.74)	(-.29)	(-.66)	(.61)	(1.94)	(1.29)		
United Kingdom(AF)	-.0072**	-.0541	-.0138	.0939	.1243	.1577*	1.18	1.42
(30)	(-1.35)	(-.26)	(-.36)	(.62)	(1.26)	(1.89)		
United States(PF)	.0003	-.0034	.0005	-.0134	.0023	-.0265*	1.22	1.61
(31)	(.71)	(-.45)	(.14)	(-.95)	(.85)	(-2.07)		
United States(AF)	-.0001	.0230	-.0012	-.0031	.0061	-.0217*	1.00	1.56
(31)	(-.24)	(.83)	(-.28)	(-.16)	(.74)	(-1.74)		

Note: See Table 2

Table 7: Effect of Government Budget Deficits on Economic Activity

Country	dlny	$(y-\bar{y})/\bar{y}$	dlnP	$dlnP_W$	dlnW	i	i_W
Belgium	0.36	0.33	0.66	2.08	1.63	3.37*	1.49
(4,36)	(+)	(-)	(-)	(+)	(+)	(+)	(+)
France	0.86	0.95	0.34	2.82*	1.31	0.36	0.39
(4,45)	(+)	(+)	(+)	(-)	(+)	(-)	(-)
Germany	1.20	1.14	0.90	1.36	3.05*	1.98	1.47
(4,46)	(-)	(+)	(+)	(+)	(-)	(-)	(-)
Italy	2.51**	2.50**	1.95	1.15	0.88	1.56	5.66*
(4,45)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Japan	0.21	0.18	3.46*	1.63	1.88	0.88	2.15**
(4,38)	(-)	(-)	(+)	(-)	(-)	(+)	(+)
Netherlands	0.30	0.17	0.82	0.33	1.93	0.72	1.56
(4,36)	(+)	(+)	(-)	(-)	(-)	(+)	(+)
United Kingdom	0.15	0.19	1.58	2.31**	1.99	2.65**	1.95
(4,33)	(+)	(+)	(-)	(+)	(-)	(+)	(+)
United States	1.65	1.23	0.67	1.01	1.97	0.61	
(4,50)	(+)	(+)	(-)	(-)	(+)	(+)	

Note: Numbers are F-statistics. Degrees of freedom are listed in parentheses under each country. The plus and minus signs indicate whether the sum of the coefficients on the four lagged deficits were positive or negative, respectively.

*means the F-statistic is significant at the five-percent level.

**at the ten-percent level.

Table 8: Effect of Economic Activity on Government Budget Deficits

Country	dlny	$(y-\bar{y})/\bar{y}$	dlnP	$dlnP_W$	dlnW	i	i_W
Belgium	0.91	1.58	0.20	2.12**	0.68	0.19	0.84
(4,36)	(+)	(-)	(-)	(+)	(-)	(-)	(+)
France	3.79*	5.96*	0.63	0.50	3.78*	0.90	1.51
(4,45)	(+)	(-)	(-)	(-)	(+)	(+)	(-)
Germany	3.01*	1.60	2.74*	5.63*	4.68*	2.57**	7.75*
(4,46)	(-)	(+)	(-)	(+)	(-)	(+)	(-)
Italy	0.98	0.92	3.48*	1.48	0.93	1.55	0.76
(4,45)	(-)	(-)	(-)	(+)	(+)	(+)	(-)
Japan	1.86	1.71	0.79	6.37*	1.11	2.06	0.98
(4,38)	(+)	(-)	(-)	(+)	(-)	(-)	(-)
Netherlands	0.14	1.00	2.00	0.63	1.71	0.90	0.50
(4,36)	(-)	(-)	(+)	(+)	(-)	(+)	(-)
United Kingdom	2.10	1.46	1.39	1.31	1.88	1.98	1.44
(4,33)	(+)	(+)	(-)	(+)	(+)	(-)	(+)
United States	0.90	0.63	1.61	0.38	0.91	0.63	
(4,50)	(+)	(-)	(+)	(+)	(+)	(-)	

Note: Numbers are F-statistics. Degrees of freedom are listed in parentheses under each country. The plus and minus signs indicate whether the sum of the coefficients of the four lagged values of the column variable were positive or negative, respectively.

*means the F-statistic is significant at the five-percent level.

**at the ten-percent level.

Table 9: Possible Policy Implications of Reaction Function Regressions: Fixed Exchange Rates

Country	dlny	$(y-\bar{y})/\bar{y}$	$dlnP-dlnP_W$	$dR/\bar{Y}_{-1}$	$(G-T)/\bar{Y}_{-1}$
Belgium	-	-	-	PS	PA
France	-	PC	CC	NS	PA
Germany	-	-	CC	NS	CA
Italy	-	PC	PC	NS	PA
Japan	PC	-	-	NS	CA
Netherlands	-	-	-	PS	PA
United Kingdom	CC	-	PC	PS	PA
United States	-	-	PC	-	NA

Note: In the first three columns, PC means procyclical and CC means countercyclical. In column four, NS means no sterilization and PA means partial sterilization. In column five, CA means complete accomodation, PA means partial accomodation, and NA means no accomodation.

Table 10: Possible Policy Implications of Reaction Function Regressions: Flexible Exchange Rates

Country	dlny	$(y-\bar{y})/\bar{y}$	dlnP	$dlnE_W$	$(G-T)/\bar{Y}_{-1}$
Belgium	CC	-	-	NI	NA
France	CC	-	-	SI	NA
Germany	-	-	CC	SI	PA
Italy	-	PC	PC	SI	PA
Japan	PC	-	PC	SI	NA
Netherlands	-	-	-	NI	PA
United Kingdom	-	PC	CC	SI	PA
United States	-	-	-	NI	NA

Note: See Table 9. In column four, NI means no intervention and SI means stabilizing intervention.

Table 11: Possible Policy Implications of Vector Autoregressions

Country	dlny	$(y-\bar{y})/\bar{y}$	dlnP	dlnW	i
Belgium	-	-	-	-	-
France	PC	CC	-	PC	-
Germany	CC	-	CC	CC	CC
Italy	-	-	CC	-	-
Japan	-	-	-	-	-
Netherlands	-	-	-	-	-
United Kingdom	-	-	-	-	-
United States	-	-	-	-	-

Note: In all columns, PC means procyclical and CC means countercyclical.

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