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This paper contains preliminary findings from research work still in progress and should not be quoted without prior approval of the author.

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DOMESTIC MONETARY INSTITUTIONS AND FISCAL DEFICITS

by

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I. Introduction

This paper investigates the relationship between the behavior of a country's central government budget deficit and the legal arrangements governing the establishment and operation of its central bank. That there is a good deal of variability in the laws under which central banks are established and operated is well known, and there is more than folklore to suggest that the inflationary performance of a country is not independent of its central bank laws. In two earlier papers[1] Robin Bade and I studied the features of central bank laws in 12 countries and examined the relationship between those laws and a country's inflation performance. Our conclusion was that countries with an "independent" central bank experience significantly lower inflation than countries whose central banks are under the direct control of the government. No claim was made as to the "causal" relationship between central bank laws and inflation. It is possible, and perhaps likely, that some deeper, as yet ill-understood, "national characteristics" are the source of both low inflation performance and central bank independence. The discovery itself, however, is of significance. It suggests one mechanism whereby people wishing to live in a low inflation environment may order their affairs so as to achieve that outcome.

This paper draws on those earlier studies and investigates the way in which central bank laws influence the behavior of the central government budget deficit. The specific questions addressed are: Do countries with independent central banks not only experience lower inflation, on the average, than other countries but also lower government deficits? Or, instead, do such

countries simply have inflation and deficit experience that are decoupled from each other with deficits behaving in a manner that is not significantly different from other countries but with money growth and inflation held in check by the independent central bank? In other words, does an independent central bank make it possible for a country to enjoy low inflation even in the face of a large and continuing deficit or does an independent central bank enable a country to enjoy low inflation by keeping the fiscal authority under control and ensuring a moderate and well-behaved deficit?

The importance of, and interest in, these questions is perhaps obvious. Their importance has been enhanced, however, in the face of ongoing and large deficits in most major industrial countries in the past few years. Although some economists are unconcerned about the state of central government deficits the consensus view is that, although immediate massive tax increases or spending cuts would not be appropriate, some long-run measures are needed in order to ensure that deficits are gradually brought under control. Most suggested remedies either focus on constitutional amendments directly limiting the permissible action of legislators or involve explicit recommendations as to which parts of the budget should be cut, which new taxes should be introduced, or which existing taxes should be increased. No attention seems to have been paid to the possibility of bringing indirect pressure to bear on the central government process through the authority and independence of the central bank. This seems to be a natural, alternative mechanism for achieving long-term deficit control and one worthy of careful exploration.

The importance of the connection between the deficit and monetary policy was highlighted recently in a provocative paper by Thomas Sargent and Neil Wallace.[2] A superficial reading of that paper would suggest that there is

little hope for the successful use of the central bank as a source of discipline on the fiscal authority for what Sargent and Wallace show is that in the face of an ongoing deficit even the purusit of tight monetary policies may lead not to a fall in inflation, but perversely to a rise in its rate. The apparent implication of this result is that if an independent central bank ruthlessly pursued tight monetary policies, not only would the deficit not be brought under control but inflation would also accelerate.

Reading that paper more carefully, it is clear that this conclusion is not inevitable. Sargent and Wallace's proposition--described as "unpleasant monetarist arithmetic"--is that <u>if</u> the real deficit, net of debt interest, is unresponsive to inflation, monetary policy, or monetary institutions, and if the monetary authority pursues a low and fixed money supply growth target, then inflation may respond perversely. If institutional arrangements can be devised that deliver firm monetary policy and low inflation and if the deficit process can be made responsive to these monetary arrangements, then the implication of the Sargent and Wallace analysis are that the deficit itself will eventually be brought under control via monetary restraint. An effective and independent central bank could be seen, therefore, not only as the deliverer of low inflation but also as the effective constitutional constraint on the legislative spending and taxing processes.

This paper explores these issues. First, in the next section I set out the "unpleasant arithmetic" and show the essence of the Sargent and Wallace proposition. I also show that if the monetary authority is the dominant one then the fiscal authority must fall in line with the actions of the monetary authority and the deficit must eventually be brought under control. Then, in

Section III, I examine some of the ways--some mechanical and some "behavioral"--in which inflation and the deficit might be connected. I conclude that the notion that the real deficit is exogenous is not compelling. I then, in Section IV examine the behavior of the deficit in twelve countries--the same twelve countries whose central bank laws were studied in the papers cited above--and study the relationship between the deficit, and the central banking arrangements.

I conclude that there are surprisingly strong links between central banks laws and deficits. Those countries whose central banks are "independent" have a lower long-run average deficit than most other countries. Furthermore, the long-run variability--and unpredictability--of their deficits is smaller than the average. Interesting though these results are, they need to be qualified. They are based on a very small sample of countries (twelve) and the relatively small time series (1955-1983). Also there are two anomalous findings. One country with a government controlled central bank--France--looks more like the countries that have an independent central bank in its deficit behavior than any of the others studied here. I do not attempt to uncover the source of that anomaly. A deeper investigation which resolves that anomalous result might lead to important modifications of my overall conclusion. A second country--the United States--has a deficit process that is similar to those of the countries whose central banks are more independent than the Federal Reserve. Thus the relationship between central bank independence and the deficit is not a precise one.

With this summary preview of the key findings let us now turn to a more detailed investigation of the relationship between monetary policy and deficits.

II. Sargent and Wallace's "Unpleasant Arithmetic"

Sargent and Wallace's "Unpleasant Arithmetic" is important for present purposes for two reasons. First, it provides a coherent analysis of situations in which a country's inflation performance is independent of its monetary policy and is driven, instead, by the behavior of the deficit. Secondly, the analysis serves as a useful vehicle for showing that if the monetary authority is independent and dominant, and if it ruthlessly pursues a low target inflation rate then eventually, the fiscal authority will be constrained by the monetary authority to bring the deficit under control.

The starting point for the analysis is simply a definition of the fiscal authority's budget constraint. This is shown in equation (1):

$$d_t = \frac{H'_t - H'_{t-1}}{P_t} + b_t - b_{t-1}(1+r) \quad t=1,2,\ldots . \tag{1}$$

where d is real deficit; H is nominal base money; P is the price level; b is real bonds (par); r is real rate of interest; and t is time.

Equation (1) states that the deficit, defined as the real deficit net of debt service charges, must be financed by creating money (the first term) and by issuing bonds over and above the value of bonds being retired and interest payments made (the second and third terms). Equation (1) is written for the case where all bonds are one-period instruments. Although this is a special case it does not constitute a relevant loss of generality. Also a constant real rate of interest is assumed in equation (1).

Sargent and Wallace assume that the population is growing at a constant rate so that:

$$N_t = (1+n)N_{t-1} \qquad (2)$$

where N is population; and n is growth rate of population.

Using equations (1) and (2) gives the difference equation that drives the per capita real par value of government debt namely:

$$\frac{b_t}{N_t} = \left(\frac{1+r}{1+n}\right)\left\{\frac{b_{t-1}}{N_{t-1}} + \frac{d_t}{N_t} - \frac{(H'_t - H'_{t-1})}{N_t P_t}\right\} \qquad (3)$$

The real rate of interest, r, is assumed to exceed the population growth rate. That is:

$$r > n \qquad (4)$$

It will be a convenient, in what follows, to set n=0 and to normalize $N_t=1$.

The demand for high powered money function is specified in a manner similar to Cagan's[3] formulation namely:

$$\frac{H'_t}{P_t} = \gamma_1 - \gamma_2\left(\frac{E_t P_{t+1}}{P_t}\right), \qquad \gamma_1 > \gamma_2 > 0 \qquad (5)$$

where E_t is an expectation conditional on information available at t.

Policy is specified in the following way. First the deficit, d, follows an exogenous stochastic process. Next, the money stock follows a constant growth rule from period t=1 to t=T. For t=T+1,...,∞, the money stock behaves in such a way that equation (3) above holds with the per capita stock of

government debt either converging to or, more simply, being maintained at, a constant. This monetary policy may be stated as follows: First,

$$H'_t = (1+\theta)H'_{t-1}, \quad \text{for } t=1,\ldots,T \tag{6}$$

and for $t > T$, equation (3) drives the money stock with the stock of bonds held constant.

Finally, expectations concerning the future price level are rational.

Some insights can be obtained into the nature of the solution of this model by examining the behavior of the price level. From equation (5) it is evident that we could obtain an equation expressing the price level as depending on the current stock of money and the expected future price level. With rational expectations it is evident that the expected future price level must depend on the expected stock of money in existence at the relevant future date and expectations of the price level one period further into the future. Repeated application of that line of reasoning suggests that the current price level must depend on the current and all expected future values of the money stock. Using the conventional method of undetermined coefficients, and ruling out unstable roots and speculative bubbles on the grounds that they are inconsistent with "market fundamentals", gives rise to an expression for the price level of the form:

$$P_t = \sum_{i=0}^{\infty} \left(\frac{\gamma_2}{\gamma_1}\right)^i E_t H'_{t+1} \tag{7}$$

What this equation tells us is that the current value of the price level depends on the current value of the money stock, H'_t with coefficient $1/\gamma_1$ and on all expected future values of the per capita money stock with coefficients that decline geometrically with the lead coefficient being (γ_2/γ_1^2). An implication of this equation is that, if the money supply growth rate was slowed down for low values of t (tight monetary policy in the present) the response would not necessarily be a slowing in the inflation rate. To slow down the inflation rate, it is necessary to slow the rate at which the entire infinite weighted sum of expected future per capita money stocks is changing. If, in pursuing slow money growth in the present, a rational expectation is set up of more rapid money growth in the future, then the inflation rate might not slow down in the present. This is the essence of the unpleasant arithmetic. Sargent and Wallace provide numerical examples in which the unpleasant result occurs.

To see this result more clearly consider the system of three equations that define the paths of bonds, money, and the price level for a given deficit process and for a given monetary policy (θ,T). Those equations are:

$$b_t = (1+r)\left[b_{t-1} + d_t - \frac{H'_t - H'_{t-1}}{P_t}\right] \quad \forall_t > 0 \tag{8}$$

$$\left.\begin{aligned} H'_t &= (1+\theta)H'_{t-1} && \text{for } t=1,\ldots,T && \text{(a)} \\ H'_t &= H'_{t-1} + P_t\left(d_t + \frac{r}{1+r} b_T\right) && \text{for } t > T && \text{(b)} \end{aligned}\right\} \tag{9}$$

with the price level defined by (7) and where b_T is the value of the real

stock of bonds at the point in time at which the disinflationary monetary policy is replaced by a policy that accommodates the deficit and stabilizes the bond stock.

Although the explicit solution to this system of equations is not very revealing (Sargent and Wallace resort to numerical methods and fairly heavy analysis in an appendix) the message is transparently clear from an inspection of those three equations. It is clear from equation (8) that the slower the growth rate of H (the lower the value of θ) and the longer the time for which slow money growth is pursued (the higher the value of T), the larger will be the value of the stock of bonds at the point in time at which the tight monetary policy is replaced by a policy of accommodating the ongoing deficit. The role of the stock of bonds outstanding at the point in time at which policy is switched is apparent from equation (9b). Clearly the larger the stock of bonds outstanding, the larger is the real debt service that has to be maintained in perpetuity. When that real debt service is added to the deficit and multiplied by the price level (second term in equation (9b)) we obtain an expression for the absolute growth of the nominal stock of high powered money. It is worth remarking that the high powered money stock will, in this situation, follow a process with a unit root.

Inspecting equations (7) through (9) does not, of course, constitute a proof that tight money now inevitably means more inflation now. It is evident from equation (7) that tight money now gets a bigger weight than loose money later. The term $\frac{\gamma_2^i}{\gamma_1^{(i+1)}}$ is the one to focus on. Current and near future

money stocks have a bigger influence on the price level than distant future values of the money stock. What Sargent and Wallace's numerical exercises show is that it is indeed possible, nevertheless, to run a tight policy now and generate such a large rise in the future money stock that the inflation rate in fact does rise now.

It is worth noting that even if the perverse result--tight money now implying higher inflation now---does not arise the above model still predicts that the linkage between tight money now and inflation now is substantially loosened by virtue of the fact that the future behavior of the money stock has to come into line with the behavior of the deficit and, therefore, whatever reductions in money growth are engineered in the present those "gains" will have to be offset by higher money growth in the future. Thus even if tight money now lowers the inflation rate now it will not lower it one-for-one with the slowdown in the growth rate of the money stock. It is also worth emphasizing that this reverses the standard result. That result, using the Cagan demand for money function such as equation (5) is that, when the growth rate of the money stock is slowed down (speeded up) the inflation rate slows down (accelerates) by even more that the slowdown (acceleration) in the money supply growth rate. This "overshooting" occurs because of the effects of the change in the inflation rate on the demand for money which reinforces the effect on inflation of the change in the growth rate of the supply of money. In rational expectations models this "overshooting" occurs as a spike at the instant that the growth rate of the money stock is changed.

The conclusion of the "unpleasant arithmetic" then is that if the deficit is an exogenous process that proceeds independently of inflation and

of monetary policy, the pursuit of tight, monetarist type, policies will have a limited effect on the rate of inflation and, in certain cases, can have a perverse effect. Thus, although a monetary phenomenon, inflation and the money stock are the result of the deficit process. Inflation and monetary policy are fiscal phenomena. It is clear that this conclusion rests heavily on the assumption that the deficit is an exogenous process. I now want to turn to an examination of that assumption.

III. Links Between the Deficit, Inflation and Monetary Policy

Does it make sense to assume that the deficit is an exogenous process that proceeds independently of inflation and of monetary policy? In part, the answer to that question is not independent of the way in which the deficit is defined. In an earlier paper[4] I examined a variety of alternative measures of the deficit and concluded that for the purpose of conducting macroeconomic analysis the definition that makes sense is precisely the one that Sargent and Wallace propose, namely the real deficit excluding debt payments. (I qualified that in my earlier paper by suggesting that the effects on the deficit of the business cycle should also be allowed for.) Working with that definition of the deficit, does it make sense to assume independence between the deficit process and the behavior of nominal magnitudes such as the price level and the money supply?

In approaching this question I find it useful to distinguish between what might be called mechanical links between the deficit and the price level and what, for want of a better term, I will call "behavioral" links. By mechanical links I mean the links between the deficit and the price level with unchanged settings of policy instruments. By "behavioral" links I mean those links that arise as a result of actions taken by those who set policy

instruments. Those actions will, of course, include possible responses to the evolution of the price level.

It is useful to begin by studying how the deficit behaves for given settings of policy instruments. First, in all jurisdictions, the tax collection instruments are defined, for the most part, in nominal terms. Tax brackets are specified in terms of nominal income; allowable deductions from taxable income specified in nominal units; tax rates on capital income apply to nominal interest rates and pretty well the entire corporate tax code is based on accounting conventions that emphasize nominal rather than real profits. Transfer programs (negative taxes) are based on similar nominal codes. The implication of all this is that, for given tax instrument settings total <u>real</u> tax collections are an increasing function of the <u>level</u> of prices.

In contrast government spending programs are typically legislated in real terms. Governments choose a set of real activities to pursue and, typically, in writing contracts, accept escalator clauses for price level movements. It is probably a reasonable approximation, therefore, to assert that government expenditures on goods and services are set in real terms.

Recognizing that the deficit is the difference between government spending and real taxes leads us to specify the deficit as

$$d_t = g_t - \tau(P_t) \qquad \tau' > 0 \tag{10}$$

Evidently if we were to substitute equation (10) for the deficit in the system of equations set out in the previous section of the paper and treat g as an exogenous stochastic process we would obtain very different conclusions from those reached above. Any ongoing inflation would eventually remove the

deficit. If the inflation persisted the deficit would decline at least until all taxpayers and transfer recipients were in the highest tax brackets defined by the legislation in place.

A deficit process set up by fixing taxes and keeping them fixed independently of the price level--equation (10)--does not look like a political equilibrium. Two types of political response would likely be triggered by an ongoing inflation in the face of a tax code specified in nominal terms. First, with rising revenues, there would be political pressure to raise expenditure. Second, as individuals were moved up to higher and higher effective marginal and average tax rates there would be political pressure to redefine the nominal values of the tax brackets, allowances, and transfer programs. If the political process is itself free from money illusion, though recognizing some unevenness due to costs of enacting legislation, the tax collection schedules would be persistently modified in order to exactly offset the effects of rising real revenues coming from "bracket creep".

Attractive though this line of reasoning is, it does not inevitably drive us to the conclusion that the real deficit will be a exogenous process. Further, and more importantly for present purposes, it does not force onto us the conclusion that the deficit process will be independent of the monetary policy institutions that a country has established. Let us examine why this might be so.

Although the price <u>level</u> is a nominal phenomenon having no real consequences, the rate of inflation is not. Inflation is a tax and, as such, is a method of redistributing resources among economic groups. Political activities are, among other things, about redistributing resources. How much

redistribution the political process undertakes and by which instruments will, in general, depend on the marginal costs and marginal benefits attaching to these activities and these marginal costs and benefits will not be independent of the institutional arrangements and the incentive structures that are in place within those institutions. Extreme examples that make this point vividly clear abound. The scale and nature of the redistributions that occur under well armed despots is transparently different from that which arises in an open democracy. Presumably the separation of the powers of the legislature and executive from those of the judiciary is viewed as producing different distributions both of real resources and rights than would occur in a unified system of government. The same line of reasoning suggests that an independent central bank established under a set of incentives that insulate its policies from the desires of the government will also produce a different outcome from a situation in which monetary policy is made at the daily behest of the government. In this latter case the cost of using inflation as a redistributive instrument is vastly increased as compared with the case in which the government can inflate by fiat.

This line of reasoning suggests that the linkages between monetary policy and the deficit might, in an important way, depend upon the relationships between the central bank and government. Where the central bank is a subdivision of the Ministry of Finance it seems likely that the government will set its deficit and monetary instruments with a view to achieving its real allocation and distribution objectives. In such a case there would be no tension between monetary and fiscal policy. The issues surrounding the unpleasant arithmetic presumably would not arise--at least not

as a practical matter for the government. In such cases whether one wants to talk about inflation being a monetary or a fiscal phenomenon is not very interesting. Fundamentally inflation is a political phenomenon. Its rate is determined by the political process and the deficit and the monetary policy generated by that process will be consistent with each other and will produce the political equilibrium rate of inflation.

In cases where an independent central bank has been established with incentive arrangements that ensure the pursuit of a monetary policy that does not necessarily reflect the wishes of the government of the day, but that reflects some deeper ideas of financial integrity and efficiency, tension arises between monetary and fiscal policy. It will always pay the government to attempt to move the central bank to a position that accommodates the government's own unconstrained (by monetary policy) allocation and distribution objectives. Equally, assuming the appropriate incentives are in place, it will pay the central bank to seek to resist these pressures. The outcome will be an equilibrium that balances these tensions and a range of outcomes is possible. With very strong government and weak incentives for the central bank the solution will be similar to the case in which the central bank is a sub-department of state. At the other extreme, where the incentives are such as to provide the central bank with considerable insulation from government pressure, the outcome will be one in which the central bank dominates. In this latter case inflation will indeed be a monetary phenomenon. It will be determined by the monetary policies pursued by the central bank and the deficit will ultimately have to fall into line with the constraints that the central bank imposes. This does not mean that the deficit will never become a (perhaps prolonged) concern. It does mean,

nevertheless, that so long as the ultimate credibility of the central bank is preserved the "unpleasant arithmetic" case never arises. No matter how unruly the deficit becomes--even for relatively prolonged period--so long as the central bank's authority is beyond question, rational agents will know that at some stage in the future, it is the deficit and not the monetary policy that will yield.

Which of these various cases are relevant seems to be an open question. I shall attempt, in the next section, to provide some tentative answers by examining a wide range of experience both with regard to central bank laws and deficit behavior.

IV. Central Bank Laws, Inflation and Deficits

It will be convenient to begin by giving a brief account of the variety of central banks types established in Bade and Parkin (1985). Table 1 provides a summary overview and also provides the identities of the twelve countries that feature in this study. The table also, with its notes, is self-contained. Some brief elaboration, however, on the varieties of central bank types will perhaps be helpful. The degree of financial independence between central bank and central government ranges all the way from complete budgetary control (Japan) through to total financial independence (United Kingdom). The dimensions of financial independence cover budgetary approval, determination of board members' salaries, and allocation of residual profits from central banking operations.

Policy independence covers three characteristics: Government representation on the banks' policy board, government authority to appoint members of the banks' policy board, and finally, the government's powers with regard to the direction of the banks' policy. The least independent policy type (Australia) has a government representation on the banks' policy board,

Table 1

Central Bank Types

Policy Type	Financial Type 1	2	3	4
1		Austraiia		
2		France Sweden	Belgium Canada Italy Netherlands	United Kingdom
3	Japan	United States		
4			Germany Switzerland	

Note: Financial Types:
1 Government approves budget, determines Board Members' salaries and profit allocation.
2 Bank determines budget allocation (and reports to government); government determines Board Members' salaries and profit allocation.
3 Bank determines budget and Board Members' salaries; profit allocation determined by statute.
4 Bank determines budget, Board Members' salaries and profit allocation.

Policy Types:
1 Government is final policy authority, has official on bank Board, and appoints all Board Members.
2 Like 1, but no government official on bank Board.
3 Bank is final policy authority but all Board appointments made by government.
4 Bank is final policy authority and some Board appointments made independently of government.

Source: Bade and Parkin, 1985.

has all the policy board members appointed by the government and has the government as the ultimate authority responsible for directing monetary policy. The largest policy group (Belgium, Canada, France, Italy, Netherlands, Sweden, United Kingdom) is like Australia but does not have a government representative directly on the bank policy board. Policy Types 3 and 4 (Germany, Japan, Switzerland and the United States) have independence from government in the formation and implementation of monetary policy. There are two groups within this category of independence, however, concerning appointments to the board. In the case of Japan and the United States the government controls all appointements. In the case of Germany and Switzerland a significant number of board members are appointed independently of government by the central bank or, in some cases, by state (non-federal) authorities.

In studying the relationship between central bank types and inflation performance it was discovered that just one of the central bank categories stands out as delivering significantly different--and lower--inflation than the others. This is policy type 4--central banks that are independent in the two senses that the bank is the final monetary policy authority and has power to make some of the Board appointments--Germany and Switzerland. Differences in financial types are in no significant way associated with differences in inflation performances and variations over the first three policy types are also associated with no significant differences in inflation behavior. Indeed a very simple model describes rather well the times series and cross-section behavior of inflation in all twelve of the countries studied. Inflation in any given year is 2/3 of its rate in the previous year plus a random variable,

the mean and variance of which depends upon the country in question. The mean is of the order of 1½ percent for Germany and Switzerland (policy type 4) and of the order of 3¼ percent for the other ten countries.

Are central bank types associated in any way with the behavior of deficits? That is the question to which attention is now turned. In addressing this question it is first necessary to be clear and specific as to the particular definitions of the variables that will be employed.

The fiscal authorities' budget identity, equation (1), can be rearranged in a variety of ways. One fairly natural thing to do is to first of all multiply through the identity by the price level to give:

$$P_t d_t = H'_t - H'_{t-1} + P_t b_t - P_{t-1} b_{t-1} \frac{P_t}{P_{t-1}} (1+r) \qquad (11)$$

Noticing that

$$P_{t-1} b_{t-1} \frac{P_t}{P_{t-1}} (1+r) = P_{t-1} b_{t-1} (1 + R_t) \qquad (12)$$

where R_t is the nominal rate of interest, enables us to write the identity, equivalently, as

$$P_t d_t + R_t P_{t-1} b_{t-1} \equiv D'_t = H'_t - H'_{t-1} + B'_t - B'_{t-1} \qquad (13)$$

where $B' = Pb$.

What equation (13) says is that the conventionally measured deficit--in current nominal units--is equal to the absolute change in the nominal money stock plus the absolute change in the nominal stock of bonds. This measure of the deficit is readily available for all countries and on a comparable basis.

If we divide the above equation by the level of nominal national income and also multiply and divide the absolute changes in money and bonds by the current stock of those two variables, we obtain:

$$\frac{D'_t}{Y_t} = \left(\frac{H'_t}{Y_t}\right)\left(\frac{H'_t - H'_{t-1}}{H'_t}\right) + \frac{B'_t}{Y_t}\left(\frac{B'_t - B'_{t-1}}{B'_t}\right) \qquad (14)$$

where Y is nominal GNP. This may be written more compactly as

$$D_t = h\Delta H_t + k\Delta B_t \qquad (15)$$

where D is the nominal deficit expressed as a percentage of nominal GNP, ΔH is the percentage growth rate of base money, and ΔB is the percentage growth rate of bonds; $h = H/Y$ and $k = B/Y$.

The budget identity, written as equation (15) above, now needs to be supplemented with some behavioral propositions concerning the deficit. The most convenient and potentially useful way to proceed here is to specify a simple and parsimonious time-series model of the evolution of the deficit and money growth. Specifically, the following model is proposed:

$$D_t = \alpha_0 + \alpha_1 D_{t-1} + \alpha_2 \Delta H_{t-1} + \alpha_3 C_t + u_t \qquad (16)$$

$$\Delta H_t = \beta_0 + \beta_1 D_{t-1} + \beta_2 \Delta H_{t-1} + \beta_3 C_t + v_t \qquad (17)$$

where, in addition to the variables that have been defined above, C is a measure of the current cyclical state of the economy and is equal to the deviations of <u>real</u> GNP from trend and u and v are zero-mean identically and independently distributed random disturbances.

There are a variety of ways in which central bank independence could manifest itself in the parameters of the processes described by equations (16) and (17). An independent central bank, for example, might be one that has a negative β_1 and a positive β_2. This would induce negative autocorrelation

into the deficit process keeping the deficit returning to some target level. A further possibility for an independent central bank is to set β_3 either equal to zero or some negative magnitude designed to achieve countercyclical monetary policy. A further possibility is that a country with an independent central bank will be one with a small value of α_1 indicating that the deficit may not persist at levels that are far away from its long-run target.

Although these are all possible ways in which independence of the central bank might influence the deficit process, they are not matters of ultimate concern. What matters ultimately is not the details of the process but its outcome. If central bank independence produces a well-behaved deficit it must mean that it produces a deficit that has a small mean and also a small variance. Although there are alternative concepts available to characterize means and variances of stochastic processes, the asymptotic concepts seem to be the relevant ones here. They tell us the properties of the process on the average in the steady state. The values of those steady states are determined by the parameters of the entire system and are

$$\hat{D} = \frac{1}{\Delta^*}[(1-\beta_2)\alpha_0 + \alpha_2\beta_0] \tag{18}$$

$$\hat{\Delta H} = \frac{1}{\Delta^*}[\beta_1\alpha_0 + (1-\alpha_1)\beta_0] \tag{19}$$

where

$$\Delta^* = (1-\alpha_1)(1-\beta_2) - \alpha_2\beta_1.$$

The variances associated with these steady-state values arise from the stochastic processes u and v as well as the cyclical features of the economy.

If independent central banks are associated with the properties of the deficit process just described, then government-dominated central banks will

be ones that have the contrary features. That is, β_1 will likely be positive, indicating a central bank that accommodates the deficit. The coefficient β_3 may well be positive, indicating a central bank that accommodates the "needs of trade" and α_1 may be quite large and indeed approach unity. A high value of α_1 would imply a great deal of inertia in the deficit--in the limit a random walk--and, in the limiting case, an undefined asymptotic mean and variance.

Again, the key feature of a government-dominated central bank will be the long-run behavior of the deficit. If central bank independence is of any importance those countries with government-dominated central banks will tend to be ones with high values for the asymptotic mean and variance of the deficit process.

Before turning to an examination of the detailed findings, some preliminary remarks are required concerning the data employed. In the interests of achieving the nearest thing available to comparability across countries I used as the main data source International Financial Statistics. The money supply was defined as "reserve money" and the deficit as a public sector accounts definition inclusive of debt service payments. The basic variables with which I worked are the deficit expressed as a percentage of Gross National Product and the annual percent growth rate of reserve money--the definitions of D and ΔH derived in equation (15) above.[5]

For some purposes it would be desirable to work with a definition of the deficit that excludes debt service payments. This definition would correspond to the variable, d', used in the analysis in Section II. There are two reasons for not using that definition in the empirical investigation undertaken. First obtaining the relevant data with sufficient accuracy and

cross-section comparability would be no mean feat. Secondly, for the specific purpose in hand, the more comprehensive definition of the deficit does provide interesting and relevant information. We are going to be interested in studying the interaction between the deficit process and the money supply growth process and further in studying the linkages, if any, between the identified processes and the central bank types set out in Table 1. If there are any connections between central bank types and deficit behavior those connections will not be obscured by using the broader definition of the deficit. None of this is to say that it would not be interesting to undertake a careful study with the narrower definition if those data could be reliably compiled.

Let us now turn to the details of the empirical investigation undertaken. First, the model specified in equations (16) and (17) was estimated using annual data, 1955-1983, for the twelve countries whose central bank types are recorded in Table 1. The results of the estimation are set out in Tables 2, 3, 4 and 5. Tables 2 and 3 report the results of the estimation of the equations exactly as specified in equations (16) and (17). (Table 2 reports the estimation of equation (16) and Table 3 that of equation (17).) As is apparent, several of the coefficients in the two processes are not significantly different from zero. (The figures in square brackets below each coefficient are t-statistics.) Hypotheses on α_i and β_i were tested and where the null hypothesis of a zero value for one or more of those coefficients could not be rejected at better than the 10 percent level, a zero value for the relevant coefficient was imposed. The results of this restricted estimation are set out in Tables 4 and 5. The computed value of F,

TABLE 2

Unrestricted Deficit Processes

Country	Coefficients				Residuals		D of F
	α_0	α_1	α_2	α_3	σ_u^2	Q	
Australia	-1.12 [2.89]	0.74 [4.45]	0.08 [2.23]	-0.02 [0.32]	2.11	6.76	23
Belgium	-0.49 [0.72]	1.10 [9.59]	0.12 [1.20]	-0.04 [0.57]	1.69	7.22	25
Canada	-0.63 [0.81]	0.48 [2.03]	-0.09 [0.71]	0.16 [1.56]	1.85	4.51	23
France	-0.42 [1.26]	0.47 [3.37]	-0.02 [1.10]	0.09 [2.28]	0.76	5.32	22
Germany	-1.46 [4.60]	0.11 [0.67]	0.04 [1.73]	0.06 [2.96]	0.51	10.58	23
Italy	-1.59 [1.84]	1.00 [10.24]	0.07 [1.48]	0.04 [0.64]	4.00	9.66	23
Japan	-1.14 [1.40]	0.79 [6.16]	0.04 [0.86]	-0.01 [0.24]	1.72	6.87	23
Netherlands	-0.75 [1.69]	0.93 [7.66]	0.05 [0.69]	0.07 [1.74]	1.03	2.85	23
Sweden	-0.11 [0.27]	0.98 [7.29]	-0.03 [0.88]	0.03 [0.43]	1.93	5.64	22
Switzerland	-0.03 [0.16]	0.40 [2.07]	-0.02 [0.70]	0.00 [0.07]	0.51	22.27	23
United Kingdom	-0.63 [1.33]	0.77 [5.23]	-0.00 [0.06]	-0.02 [0.27]	2.39	15.16	23
United States	-0.01 [0.02]	0.29 [1.69]	-0.26 [2.83]	0.29 [4.39]	0.96	12.49	23

Notes: [ ] denotes t-statistic
Q is Box-Pierce Q as distributed χ^2 with 13 degrees of freedom.

TABLE 3

Unrestricted Reserve Money Processes

Country	Coefficients				Residuals		D of F
	β_0	β_1	β_2	β_3	σ_v^2	Q	
Australia	7.82 [3.23]	-0.46 [0.45]	-0.30 [1.36]	0.47 [1.33]	81.52	5.15	23
Belgium	2.70 [1.80]	-0.03 [0.11]	0.40 [1.88]	0.19 [1.20]	8.05	7.28	21
Canada	6.85 [3.83]	-0.44 [0.81]	-0.03 [0.08]	0.65 [2.65]	9.97	5.64	23
France	8.21 [2.39]	0.16 [0.11]	-0.05 [0.20]	-0.06 [0.16]	81.03	11.29	22
Germany	6.32 [2.20]	0.75 [0.51]	0.25 [1.21]	0.07 [0.32]	41.72	18.20	23
Italy	14.96 [3.92]	-0.37 [0.85]	-0.20 [0.95]	-0.09 [0.33]	77.79	2.83	23
Japan	13.47 [3.78]	0.90 [1.60]	0.09 [0.45]	0.24 [2.24]	32.92	8.72	23
Netherlands	6.87 [4.62]	-0.22 [0.57]	-0.12 [0.54]	-0.00 [0.00]	11.69	5.19	23
Sweden	8.46 [3.57]	-0.72 [1.00]	-0.35 [1.67]	0.60 [1.48]	62.82	7.13	23
Switzerland	8.45 [4.47]	4.48 [2.34]	-0.39 [1.61]	0.39 [1.97]	49.34	10.03	23
United Kingdom	6.08 [3.41]	-1.10 [2.00]	-0.31 [1.51]	1.16 [3.23]	33.29	6.72	23
United States	2.08 [2.32]	-0.23 [0.59]	0.53 [2.61]	0.16 [1.11]	4.75	13.16	23

Notes: [ ] denotes t-statistic
Q is Box-Pierce Q as distributed χ^2 with 13 degrees of freedom.

TABLE 4

Restricted Deficit Processes

Country	Coefficients				Significance of Restrictions		Residuals		D of F	Asymptotic Properties	
	α_0	α_1	α_2	α_3	F	Sig. Level	σ_u^2	Q		μ^*	σ^{2*}
Australia	-1.11 [2.93]	0.75 [4.61	0.08 [2.25]	R	0.10	0.75	2.03	6.64	24	-2.34	5.69
Belgium	-0.00 [0.01]	1.09 [13.22]	R	R	0.73	0.49	1.65	7.40	23	u	u
Canada	-0.90 [2.16]	0.70 [4.40]	R	R	2.04	0.15	2.00	3.63	25	-3.02	3.96
France	-.066 [2.68]	0.42 [3.17]	R	0.09 [2.46]	1.22	0.28	0.76	3.41	23	-1.15	1.34
Germany	-1.30 [8.95]	R	R	0.09 [4.19]	2.08	0.15	0.56	7.76	25	-1.30	1.02
Italy	-0.69 [1.03]	0.98 [11.48]	R	R	1.34	0.28	4.11	11.08	25	-29.90	90.04
Japan	-0.50 [1.49]	0.84 [7.60]	R	R	0.38	0.69	1.64	6.92	25	-3.14	5.63
Netherlands	-0.52 [1.78]	0.90 [7.98]	R	0.08 [2.01]	0.47	0.50	1.01	3.38	24	-5.26	6.44
Sweden	-0.24 [0.75]	1.04 [10.76]	R	R	0.40	0.68	1.84	5.49	24	u	u
Switzerland	-0.13 [0.95]	0.37 [2.04]	R	R	0.39	0.68	0.49	22.63	25	-0.21	0.57
United Kingdom	-0.66 [1.65]	0.77 [5.92]	R	R	0.06	0.94	2.21	14.20	25	-2.90	5.44
United States	-0.01 [0.02]	0.29 [1.69]	-0.26 [2.83]	0.29 [4.39]			0.96	12.49	23	-1.93	1.68

Notes: [ ] denotes t-statistic
Q is Box-Pierce Q as distributed χ^2 with 13 degrees of freedom
u denotes that the asymptotic distribution is undefined.

TABLE 5

Restricted Reserve Money Processes

Country	Coefficients				Significance of Restrictions		Residuals		D of F	Asymptotic Properties	
	β_0	β_1	β_2	β_3	F	Sig. level	σ_v^2	Q		μ^*	σ^{2*}
Australia	6.75 [3.87]	R	R	R	1.05	0.39	82.04	---	26	6.75	82.04
Belgium	1.97 [1.98]	R	0.58 [3.45]	R	1.11	0.35	8.13	4.79	23	4.73	12.35
Canada	7.52 [12.59]	R	R	0.59 [5.17]	0.60	0.56	9.65	4.39	25	7.52	19.30
France	7.62 [4.59]	R	R	R	0.02	0.99	71.50	---	25	7.62	71.50
Germany	7.46 [5.98]	R	R	R	1.07	0.38	42.07	---	26	7.46	42.07
Italy	14.41 [8.72]	R	R	R	0.55	0.65	73.78	---	26	14.41	73.78
Japan	12.88 [11.23]	R	R	0.31 [3.29]	1.98	0.16	35.50	7.62	25	12.88	50.84
Netherlands	6.55 [10.46]	R	R	R	0.19	0.90	10.60	---	26	6.55	10.60
Sweden	7.56 [4.88]	R	R	R	1.26	0.31	64.73	---	26	7.56	64.73
Switzerland	8.45 [4.47]	4.48 [2.34]	-0.39 [1.61]	0.39 [1.97]	---	---	49.34	10.03	23	5.42	84.54
United Kingdom	6.08 [3.41]	-1.10 [2.00]	-0.31 [1.51]	1.16 [3.23]	---	---	33.29	6.72	23	7.09	63.83
United States	1.67 [2.14]	R	0.68 [4.92]	R	0.62	0.55	4.61	13.32	25	5.25	8.62

Notes: [ ] denotes t-statistic
Q is Box-Pierce Q as distributed χ^2 with 13 degrees of freedom
u denotes that the asymptotic distribution is undefined

together with the significance level for the restrictions, are also shown in those tables.

In discussing these results it will be convenient to begin with the money growth process--the coefficients β_i. Only in the case of one country--Switzerland--is the previous year's deficit a significant positive influence on the current year's money supply growth rate. Even in that case the significance attaching to the coefficient is weak. It is true that it is a large coefficient (4 1/2). It also has a t-statistic greater than two. If, however, the other two variables--the lagged money supply growth rate and the cycle are excluded from the equation, the coefficient β_1 drops in value and becomes insignificant at the 5 percent level. Nevertheless, it has to be recorded that the Swiss money supply growth process has this unique feature and a feature which would be expected to be associated not with an independent central bank such as that of Switzerland but with one that is heavily dominated by the government and encouraged to accommodate past deficits.

Only one other country has a non-zero coefficient in its money supply growth process on the lagged deficit--the United Kingdom. Here the effect is negative and just on the margin of significance. In no other case is there any remotely significant connection between the previous year's deficit and the current year's money supply growth rate.

Only four of the twelve countries have money supply growth processes that are significantly autoregressive--Belgium, Switzerland, the United Kingdom and the United States. Also, only four countries have money supply growth processes that respond to the cyclical state of the economy--Canada, Japan, Switzerland and the United Kingdom.

Eight of the twelve countries' money supply growth processes, within the class of models considered, can be best characterized as constant growth rates with noise.

The variations in mean money supply growth rates (asymptotic mean) range all the way from below 5 percent (Belgium) to 14 percent (Italy) and the variances range from 8.6 percent (United States) to more than 80 percent (Australia and Switzerland).

There are no obvious relationships that stand out between the properties of the money supply growth processes described in Table 5 and the central bank policy type classification set out in Table 1. For example, the most independent central banks--Germany and Switzerland--have rather high variances of money growth, higher than average means, and, in the case of Switzerland, the strongest positive feedback from the deficit to money growth. One of the least independent central banks--U.K--is the only one that has negative feedback from the deficit to money growth but it has a high average money growth rate (large mean) and an enormous variance. Detailed inspection of the other countries reveals a similar lack of any clear matching between central bank type and the base money growth process.

Let us turn next to the deficit processes. These are shown in Table 4. The first thing that stands out concerning the deficits is the universal finding of autocorrelation in the deficit process--significant values of (α_1). There is variation, however, in the strength of this autocorrelation. Four countries--Belgium, Italy, the Netherlands and Sweden--display a clear unit root. Japan also has a high coefficient (.84). Three other countries have high autoregressive coefficients in the neighborhood of 3/4--Australia, Canada and the United Kingdom. Only four countries have low values for the autoregressive coefficient. They are France, Germany, Switzerland and the

United States. In the case of Germany the autoregressive coefficient is not significantly different from zero.

Next consider the coefficient α_2--the influence of the money supply growth rate on the deficit. Only in the case of two countries--Australia and the United States--is this effect significant and in each case weakly so.

Only four countries display a deficit that responds to the cyclical state of the economy. A positive α_3 indicates that the deficit becomes larger when output is below trend. This occurs most significantly in the United States and Germany, though the strength of the effect is small in all cases except the United States.

The intercept in the deficit equations is always negative though not always significantly so. The variability of the noise processes driving the deficits, although differing across countries, are much more closely clustered than was the case for the variance of the money supply growth processes. Here the range is from approximately 1/2 (for Germany and Switzerland) to 4 (for Italy).

It is instructive to return to the estimated coefficients on the lagged deficit (α_1). In view of the well-known problems concerning estimation and inference in the presence of unit roots[6] we need to be cautious about all cases in which estimated coefficients on lag-dependent variables is close to unity. This takes in all countries with the exceptions of France, Germany, Switzerland and the United States. It is of some interest to note that two of these countries have central banks in the most "independent" policy category. All the other countries have a strong degree of autocorrelation and possibly all of them have unit roots. It is virtually certain that unit roots are present in the cases of Belgium, Italy, the Netherlands and Sweden.

These observations invite a further investigation of the longer-term behavior of deficits by calculating and inspecting the asymptotic means and variances of the deficit processes. The results of these calculations are set out in the final two columns of Table 5. The results are extremely revealing. The lowest steady-state deficits are in Switzerland, France and Germany (in that order). The asymptotic variances, however, are least in Switzerland and Germany. Further, the difference between Switzerland and Germany and all the other countries in this latter regard is quite considerable. Closest to Switzerland and Germany are five countries whose steady-state deficits are in the range 2-3% of GNP but that have large asymptotic variances--Australia, Canada, Japan, the United Kingdom and the United States. There are then four countries that do not have a well-defined steady state. In the case of Belgium and Sweden no steady state could be calculated because the estimated coefficient on the lagged dependent variable in the deficit equation exceeds unity. In the case of Italy it was possible to calculate the steady state but it is on the edge of being undefined as indicated by its asymptotic mean of 30 and variance of almost 90.

It seems quite remarkable that the steady-state behavior of the deficit matches as closely as it does the central bank types of Table 1. Very little uncertainty surrounds the deficit processes (and the way that they interact with the money growth processes) in Germany and Switzerland. They also are countries which have steady-state deficits of trivial magnitudes and that are not significantly different from balanced budgets. France and the United States are slightly anomalous. France has a lower steady-state deficit than Germany but the asymptotic variance attaching to that it is larger. The

United States has a larger asymptotic mean and variance to its deficit process than these other three countries but not by much. In all other cases there is a considerable range of uncertainty concerning the long-run behavior of the deficit, with asymptotic variances ranging from around 5 (for Australia, Canada, Japan and the United Kingdom) all the way to being undefined in the case of the unit root countries.

Although I have not provided formal statistical tests of the significance of the differences in steady-state deficits and their variability on the one hand and central bank types on the other, the particular patterns that have been revealed here are striking and at least interesting.

V. Conclusions

This paper has studied the relationship between central bank laws and the performance of the central government's deficit. It has shown that, although there is great diversity and variety in both central bank types and deficit and money supply growth processes a strong and striking pattern emerges. The two countries that have the most independent of central banks--Germany and Switzerland--are not only countries whose inflation rates are significantly lower than the average, but they are also countries whose deficit processes have the least uncertainty surrounding them and which have steady states that are very close to zero. It is tempting to conclude that by choosing the appropriate central banking institutions a country might achieve not only low and predictable inflation but fiscal discipline as well.

FOOTNOTES

[1] Michael Parkin and Robin Bade (1978) and Bade and Parkin (1985).

[2] Thomas J. Sargent and Neil Wallace (1984).

[3] Phillip Cagan (1956)

[4] Parkin (1983)

[5] See "Data Note" at the end of this paper.

[6] See, especially David A. Dickey and Wayne A. Fuller (1981).

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Data Note

All the data employed in this study (with one exception to be detailed below) are from International Financial Statistics Year Book 1984. The specific series used are Reserve Money (line 14), Deficit (line 80), Gross National Product (line 99a) and Real Gross National Product (line 99b). The data runs and sources for each country are the following:

	line 14	line 80	line 99a/b	IFS pp.
Australia	1955-83	1955-83	1955-83	148-151
Belgium	1955-83	1955-83	1955-83	172-175
Canada	1955-83	1955-83	1955-83	206-209
France	1955-83	1955-82	1955-82	274-277
Germany	1955-83	1955-83	1955-83	286-289
Italy	1955-83	1955-83	1955-83	350-353
Japan	1955-83	1955-79	1955-83	362-365
Netherlands	1955-83	1955-83	1955-83	434-437
Sweden	1955-83	1955-82	1955-83	549-553
Switzerland	1955-83	1955-83	1955-83	554-557
United Kingdom	1955-83	1955-83	1955-83	588-591
United States	1955-83	1955-83	1955-83	592-597

As indicated in the above, data for Japan's deficit are not available in IFS after 1979. To obtain a longer run of deficit data for that country I proceeded as follows. First, for 1970-1982, I obtained the National Accounts measure of the deficit (DN) from OECD National Accounts 1970-1982, Vol. II, p. 64. I obtained the same measure for 1983 (the so-called "revised" but not

"final" version) from OECD Economic Surveys, Japan, July 1984, p. 76. Second, for 1970-1979, I regressed the IFS public sector accounts measure of the deficit (DP) on DN which gave

$$DP_t = -215.1 + 0.956DN_t \quad (t\text{-statistics in } [\ ],\ R^2 = .897).$$
$$\qquad\quad [0.26] \quad [8.33]$$

I then used these estimated coefficients to "predict" the DP measure of the deficit for 1980-1983. The resulting deficit figures are:

	National Accounts Measure	My estimate of Public Sector Accounts Measure
	¥ Billion	¥ Billion
1980	-12,618	-12,289
1981	-14,243	-13,844
1982	-14,208	-13,810
1983	-13,323	-12,964

ANNUAL DATA ON MONEY BASE GROWTH

AUSTRALIA

1956- 1	1.078501	8.835136	-6.595797	7.248328
1960- 1	1.399377	-5.832236	9.143971	2.602852
1964- 1	13.239725	-6.236378	-1.657627	7.584613
1968- 1	9.010530	9.192110	-.555043	16.987585
1972- 1	18.106842	21.979417	-13.614091	26.317715
1976- 1	11.517370	5.054417	-.360530	8.486292
1980- 1	9.357758	10.455883	8.481000	12.030428

BELGIUM

1956- 1	3.129446	2.176838	3.968440	.165426
1960- 1	3.890280	6.090514	5.032050	8.647781
1964- 1	6.012567	5.555325	2.863884	1.735280
1968- 1	2.141174	.162822	2.886358	6.920360
1972- 1	13.156289	11.739982	4.166487	6.407886
1976- 1	6.378393	8.463608	7.140771	3.133344
1980- 1	1.093782	1.735972	.026072	3.483959

CANADA

1956- 1	4.098934	1.593659	9.423162	.000000
1960- 1	3.186110	6.082956	3.859000	4.924072
1964- 1	5.264373	9.245711	7.503519	5.622089
1968- 1	7.881539	5.129329	5.448819	14.107860
1972- 1	14.518201	14.905746	13.184492	14.381666
1976- 1	8.894749	11.484729	11.186436	8.264864
1980- 1	9.582109	2.244763	3.811022	1.379332

FRANCE

1956- 1	9.531018	5.884050	5.556985	2.666825
1960- 1	10.008346	13.353139	11.778304	12.188982
1964- 1	6.351341	5.971923	4.255961	8.004271
1968- 1	6.213178	.000000	3.550669	11.000090
1972- 1	27.193372	6.899287	12.516314	-24.294618
1976- 1	7.232066	8.183002	11.460338	6.771817
1980- 1	13.872621	4.557751	16.819585	4.898939

GERMANY

1956- 1	8.786136	14.341232	10.008346	9.097178
1960- 1	16.318760	3.352269	5.088112	7.055823
1964- 1	10.827597	6.549331	6.146632	-2.927038
1968- 1	6.701071	3.099610	19.658205	14.014663
1972- 1	23.436243	7.142399	-1.139613	2.825047
1976- 1	9.724972	7.621191	12.323264	5.046479
1980- 1	-3.743753	-1.648389	5.195097	5.437860

ITALY

1956-	1	7.494749	5.655217	42.153558	2.700720
1960-	1	3.268870	13.436539	15.996926	16.122967
1964-	1	7.805773	11.199327	9.218147	11.628281
1968-	1	7.702800	12.325517	11.726611	15.738213
1972-	1	9.523716	19.419038	12.371884	36.676784
1976-	1	19.083427	16.029081	22.905126	13.978345
1980-	1	11.505881	12.694150	13.893260	14.313677

JAPAN

1956-	1	15.783845	6.760131	6.868701	17.982022
1960-	1	17.438916	25.523028	8.317204	18.792980
1964-	1	12.265353	8.933168	12.442362	16.934403
1968-	1	17.286406	17.927707	15.342443	13.580923
1972-	1	25.469138	29.486695	14.970121	3.968666
1976-	1	8.246837	8.030970	13.851011	7.200324
1980-	1	6.203853	2.622340	6.030509	5.256281

NETHERLANDS

1956-	1	1.892801	.208117	11.013082	1.111123
1960-	1	8.131686	2.845380	7.775525	3.598589
1964-	1	10.609662	8.987702	6.673043	3.121770
1968-	1	1.956584	7.064203	5.369762	4.734063
1972-	1	8.761561	4.625571	7.557964	12.104568
1976-	1	8.668559	8.691181	7.590576	7.573826
1980-	1	7.913732	1.724181	7.331401	11.220755

SWEDEN

1956-	1	1.801851	2.405890	3.885493	3.003229
1960-	1	4.625102	4.690515	6.521215	6.949779
1964-	1	5.722385	4.459684	5.887089	6.597931
1968-	1	6.365785	6.811143	3.318799	11.352771
1972-	1	9.291667	9.153481	29.957911	-.659198
1976-	1	10.138437	9.567230	12.858617	31.709250
1980-	1	-10.117012	11.086101	6.468202	2.087403

SWITZERLAND

1956-	1	3.244931	4.982350	10.377968	.328048
1960-	1	9.173094	13.576992	10.318424	7.332335
1964-	1	7.171026	4.315306	2.629199	4.153060
1968-	1	14.605135	6.499749	11.942050	16.973541
1972-	1	7.618345	3.717153	3.329870	2.294616
1976-	1	7.452962	3.541948	16.017766	-8.073476
1980-	1	1.353615	-4.328783	-14.422221	21.700480

UNITED KINGDOM

1956-	1	4.311012	5.340078	1.980263	4.223276
1960-	1	3.690456	3.559095	1.733146	3.378700
1964-	1	7.671492	9.949721	5.947699	4.365263
1968-	1	3.941397	1.913934	10.985278	-5.229950
1972-	1	19.270741	27.421542	3.851920	10.859415
1976-	1	18.312833	5.109166	9.496181	9.309042
1980-	1	-3.062286	3.852804	4.239556	6.501011

UNITED STATES

1956-	1	1.188133	.196657	-.393701	.197044
1960-	1	-1.587335	2.566775	2.882044	3.535252
1964-	1	4.992124	5.085842	6.402186	5.724454
1968-	1	6.380619	4.301739	6.618191	8.947140
1972-	1	3.757348	7.720203	5.849621	6.418334
1976-	1	5.444109	9.462182	10.933120	6.376662
1980-	1	5.812320	3.636764	6.021126	5.418327

ANNUAL DATA ON DEFICITS AS A PERCENTAGE OF GNP

AUSTRALIA

1955- 1	1.433087	1.284047	2.121212	2.144725
1959- 1	-.032573	-1.640954	-.223620	-2.318653
1963- 1	-2.454169	-2.247312	-1.333997	-1.981308
1967- 1	-2.830835	-2.544887	-1.071179	-.441410
1971- 1	-1.437075	-.630081	-2.170758	-1.125246
1975- 1	-6.297866	-5.382440	-2.944957	-3.525263
1979- 1	-2.987219	-1.904489	-.945058	-.637638
1983- 1	-4.499261			

BELGIUM

1958- 1	-3.973129	-4.320298	-3.811189	-2.854785
1962- 1	-1.898148	-3.347701	-1.928021	-2.591284
1966- 1	-1.864035	-2.354145	-3.260038	-2.439655
1970- 1	-1.842105	-2.393768	-4.029096	-2.851563
1974- 1	-2.819781	-4.699054	-5.034039	-5.875746
1978- 1	-5.969954	-6.508912	-8.633362	-13.125345
1982- 1	-13.909813	-13.785542		

CANADA

1955- 1	.420610	1.528384	-.596837	-3.594020
1959- 1	-1.085482	-.651721	-2.522068	-2.003261
1963- 1	-.500217	-.338107	-.036127	-1.148310
1967- 1	-1.972594	-1.129632	.275655	-1.155462
1971- 1	-2.022234	-1.653521	-1.375850	-1.104860
1975- 1	-3.798234	-2.585218	-4.324659	-4.508850
1979- 1	-3.935220	-3.436067	-2.825459	-6.376893
1983- 1	-6.990146			

FRANCE

1955- 1	-3.844367	-5.248301	-4.887324	-2.819779
1959- 1	-2.336310	-1.390285	-1.346036	-1.673537
1963- 1	-2.011269	-.348940	.036938	-.383374
1967- 1	-1.111697	-1.533236	-.479705	.467658
1971- 1	-.393118	.641559	.656105	.335879
1975- 1	-2.953578	-.750460	-.759413	-.796205
1979- 1	-.102803	-.013656	-1.046303	-2.358134

GERMANY

1955-	1	.837927	.603491	-2.306636	-.243278
1959-	1	-1.655551	-.626856	-1.025951	-.407880
1963-	1	-.798220	-.262154	-.458215	-.473943
1967-	1	-1.669030	-.783358	.247533	-.081409
1971-	1	-.179569	-.470303	-.292773	-1.025875
1975-	1	-3.308709	-2.685663	-1.859065	-1.985271
1979-	1	-1.872716	-1.935788	-2.582756	-2.262806
1983-	1	-1.854844			

ITALY

1955-	1	-3.747508	-2.012932	-1.532176	-2.594726
1959-	1	-2.550589	-1.641810	-1.380244	-1.996626
1963-	1	-2.380595	-2.242226	-3.940096	-4.300444
1967-	1	-2.624840	-3.974969	-3.005202	-5.103997
1971-	1	-6.916959	-7.842955	-8.888963	-8.106788
1975-	1	-13.172482	-9.371856	-11.833093	-15.418970
1979-	1	-11.106433	-10.947573	-13.330995	-15.523628
1983-	1	-16.650772			

JAPAN

1955-	1	-1.635351	.020566	.604529	.225675
1959-	1	-.471917	.348680	.318971	-.278276
1963-	1	-.808989	-1.089362	-1.576997	-2.180217
1967-	1	-1.623822	-1.333890	-.981973	-.436221
1971-	1	-.224783	-1.578326	-1.623073	-1.342573
1975-	1	-4.768925	-1.985576	-6.195218	-6.605561
1979-	1	-5.377032	-5.210909	-5.493690	-5.215958
1983-	1	-4.720270			

NETHERLANDS

1955-	1	-.376611	.306502	.562536	-1.957865
1959-	1	.031521	.704325	-.162874	-.981250
1963-	1	-.220054	-1.306116	-1.629230	-2.254467
1967-	1	-2.594991	-2.390487	-2.255074	-1.145960
1971-	1	-1.269609	-.062402	.275663	-.565319
1975-	1	-3.063899	-3.627630	-2.930195	-3.119733
1979-	1	-4.142902	-4.550788	-5.775392	-7.336115
1983-	1	-8.071410			

SWEDEN

1955-	1	-2.278083	-1.679610	-2.317713	-2.403846
1959-	1	-1.205364	-1.701716	.750445	.703235
1963-	1	-.087816	-.186787	.017886	1.429276
1967-	1	.764572	1.607258	.578871	-1.800546
1971-	1	-1.309013	-1.210073	-1.410927	-3.106993
1975-	1	-2.503399	-.343451	-1.640809	-4.974822
1979-	1	-7.205449	-8.257849	-9.147565	-9.671069

SWITZERLAND

1955-	1	-.326165	.830000	.691824	-.308869
1959-	1	.436782	1.984334	1.013953	.366876
1963-	1	.040153	.220690	-.392283	-.189552
1967-	1	-.371706	.041344	-.460714	.314164
1971-	1	-.815962	-.044813	-1.059480	-.603413
1975-	1	-1.221300	-.935462	-.849901	-.040635
1979-	1	-1.423729	-.042865	-.766581	.438443
1983-	1	-.687589			

UNITED KINGDOM

1955-	1	-2.302530	-.243089	-.765443	-.343053
1959-	1	-.636215	-1.183500	-.794224	.271758
1963-	1	-.542636	-1.176994	-1.629895	-1.387448
1967-	1	-2.820701	-1.661761	1.914219	1.352080
1971-	1	-1.107671	-2.442855	-3.030100	-4.188235
1975-	1	-7.694915	-5.337848	-3.006004	-4.955731
1979-	1	-5.327777	-4.718815	-4.111019	-2.831957
1983-	1	-4.777745			

UNITED STATES

1955-	1	-.675000	1.059995	.265766	-1.609962
1959-	1	-1.610986	.049358	-.661456	-1.279646
1963-	1	-.797721	-.928336	-.231515	-.501323
1967-	1	-1.088044	-1.738035	.576271	-1.146368
1971-	1	-2.301411	-1.464710	-.599367	-.758611
1975-	1	-4.867028	-3.294529	-2.661210	-2.041684
1979-	1	-1.154355	-2.611240	-2.455203	-4.258952
1983-	1	-5.761619			

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