Technical Report No. 60 / Rapport technique n° 60

Fiscal Policy and External Balance in the G-7 Countries

by
Stephen S. Poloz

Bank of Canada Banque du Canada

June 1992

FISCAL POLICY AND EXTERNAL BALANCE IN THE G-7 COUNTRIES

by Stephen S. Poloz

ACKNOWLEDGMENTS

I would like to thank Robert Amano, Pierre Duguay, Robert Kollman, Robert Lafrance, Tiff Macklem, Mark McClellan, John Murray, Larry Schembri, and seminar participants at the International Monetary Fund for helpful comments on an earlier draft.

CONTENTS

ABSTRACT i

RÉSUMÉ ii

1 INTRODUCTION 1

2 THE STYLIZED FACTS 3

3 THEORETICAL CONSIDERATIONS 9

4 EMPIRICAL EVIDENCE 16

5 TESTING THE TDH FOR THE G-7 COUNTRIES 22

Evidence from Unrestricted VARs, 1972Q2-1990Q3 22

Evidence from Restricted VARs, 1972-1990Q3 35

Relative Fiscal Shocks 42

Sample Sensitivity 50

CONCLUSION 54

REFERENCES 55

Abstract

This paper assesses evidence, from the G-7 countries, of a link between a country's fiscal policy and its external balance, often referred to as the "twin deficits" phenomenon. It begins by reviewing the stylized facts, and then examines the theoretical case for such a link. A survey of the existing empirical literature reveals a rather mixed message: some authors find statistical evidence of a link, while others do not, and those who do find one report a wide range of estimates of the proportion by which the current account balance reacts to changes in the fiscal stance.

This paper focusses on two issues. First, it hypothesizes that important cross-country linkages may not have been incorporated in previous tests recorded in the literature. This is suggested because the standard theory behind the twin deficits link implies movements in the home country's exchange rate and external balance, and therefore by definition involves more than one country. In this regard, the paper investigates whether fiscal shocks should be modelled in a manner that takes account of fiscal stances in other countries when testing the strength of the twin deficits link. Second, the paper seeks to establish whether the data for the 1980s are substantially different from those for the 1970s, and whether studies focussing mainly on the former would give a fair impression of the strength of the link between the two balances.

These and a number of secondary issues are investigated in the context of six-variable vector autoregressions for each of the seven major industrial economies (United States, Japan, western Germany, France, Italy, the United Kingdom and Canada) over the 1972-90 period. It is found that the evidence in favour of the twin deficits link varies considerably across the seven countries. Also, while the evidence of such a link over the entire sample period is far from compelling, it is generally stronger when the 1980s data are examined in isolation. Although there is evidence of cross-country interdependencies that might influence single-country studies of the twin deficits link, tests based on relative measures of fiscal impulse yield mixed results. The paper concludes with some caveats put forward in the form of suggestions for further research.

Résumé

La présente étude vise à évaluer, sur la base de résultats recueillis pour les sept grands pays industriels, la validité de l'hypothèse selon laquelle il existe un lien entre la politique budgétaire d'un pays et sa balance des paiements, lien qui est communément appelé phénomène des «déficits jumeaux». L'auteur passe d'abord en revue les faits stylisés se rattachant au phénomène, puis analyse le fondement théorique de l'hypothèse. L'examen des travaux empiriques existants ne permet ni de confirmer ni de démentir celle-ci : certains économistes obtiennent des résultats la corroborant, tandis que d'autres non; en outre, les premiers font état d'estimations très variées de la sensibilité de la balance courante aux variations budgétaires.

L'étude se focalise sur deux questions essentielles. En premier lieu, l'auteur émet l'hypothèse que d'importants liens entre les pays n'ont peut-être pas été pris en compte dans les tests précédents relatifs au phénomène. Cette hypothèse repose sur l'idée que la théorie établit habituellement le lien entre les deux déficits par l'intermédiaire de variations des taux de change et des balances extérieures et donc implique par définition deux ou plusieurs pays. Dans cette optique, l'étude cherche à établir si, dans les tests visant à déterminer l'étroitesse du lien entre le déficit budgétaire et le déficit extérieur, les variations du solde budgétaire doivent être formalisées de façon à prendre en compte l'orientation de la politique budgétaire survenue dans d'autres pays. En second lieu, l'étude vise à vérifier 1° si les données des années 80 diffèrent sensiblement de celles de la décennie précédente et 2° si des travaux portant surtout sur les données des années 80 permettraient d'apprécier à sa juste valeur la force du lien existant entre le solde budgétaire et le solde de la balance des paiements.

Ces différentes questions ainsi qu'un certain nombre de questions secondaires sont analysées à l'aide de modèles autorégressifs vectoriels dotés de six variables et spécifiés pour chacun des sept grands pays industriels (États-Unis, Japon, Allemagne occidentale, France, Italie, Royaume-Uni et Canada) pour la période 1972-1990. Les résultats obtenus

à l'appui de l'hypothèse des «déficits jumeaux» varient beaucoup entre les sept pays étudiés. De plus, même si ces résultats sont loin d'être concluants sur l'ensemble de la période d'observation, ils sont en général plus solides lorsque l'estimation ne porte que sur les données des années 80. Bien qu'il semble y avoir entre les pays des liens qui pourraient influencer les études du phénomène des «déficits jumeaux» pour un seul pays, les tests axés sur des mesures relatives des chocs budgétaires donnent des résultats contradictoires. Dans sa conclusion, l'auteur sert quelques avertissements sous la forme de suggestions ayant trait à des recherches ultérieures.

1 INTRODUCTION

The purpose of this paper is to examine the so-called "twin deficits hypothesis" (TDH) for the economies of the seven major industrial countries (G-7): United States, Japan, western Germany, France, Italy, the United Kingdom and Canada. ("Western Germany" is referred to as simply "Germany" henceforth in the text.) The TDH underlies the interpretations of many observers of developments in the United States during the 1980s: according to the TDH, the current account deficit that the United States experienced during the latter half of the decade was to a substantial degree the product of the rise in fiscal deficits that accompanied the tax reforms of the first half. The tax reforms led to an increase in government borrowing, which put upward pressure on U.S. interest rates, which, in turn, led to an appreciation of the dollar and a deterioration in the trade balance.

An extreme interpretation of the TDH would see a one-for-one response of the current account balance to an exogenous change in the fiscal balance. The opposing view, that the current account balance is independent of the fiscal balance, is often associated with the Ricardian equivalence hypothesis (REH), although it will become evident that the TDH and the REH are not mutually exclusive. According to some models that incorporate the REH, economic agents fully discount changes in fiscal policy and adjust their savings so as to compensate exactly for the implied future change in taxes that must occur in response, even if after their lifetime. In such a world there may be no link between a country's fiscal deficit and its current account deficit, and no need for them to be resolved in tandem.

Weighing the extreme assumptions needed for Ricardian equivalence against the, also extreme, alternative assumption that agents ignore entirely the implications of the government's budget constraint has led many to think that actual behaviour probably lies somewhere between the two views. According to such an intermediate view, one would expect that economic agents would exemplify Ricardian equivalence *to a degree*, and therefore would provide evidence of a link between fiscal and external

balances that is less than one-for-one. The extent to which the two balances are related, according to this interpretation, is inherently an empirical issue. Unfortunately, while the empirical literature provides some justification for this intermediate view, the results are sufficiently mixed to warrant some reconsideration. Moreover, as we shall see later, there are some aspects to the existing literature that deserve closer scrutiny.

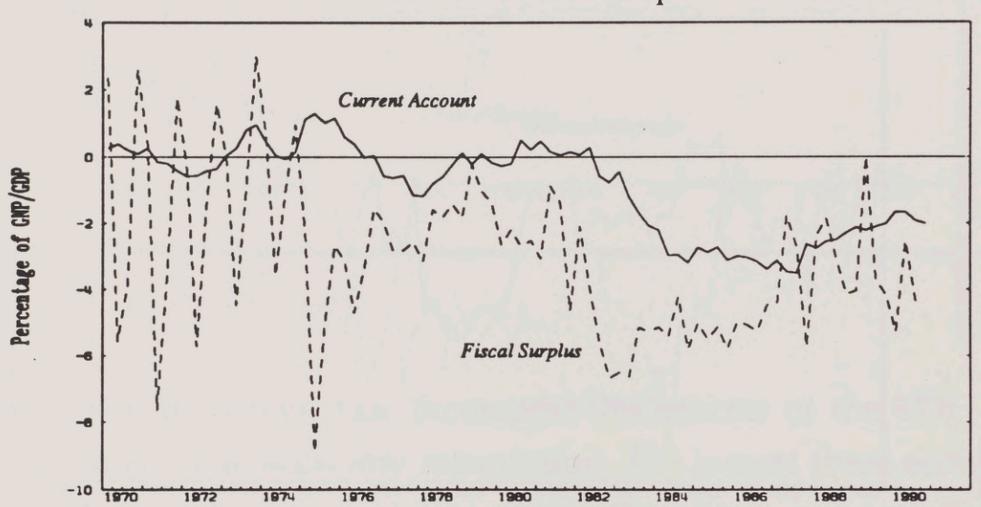
The plan of the paper is as follows: Section 2 reviews the stylized facts on the link between fiscal deficits and current account deficits, focussing on the largest world economies. Section 3 surveys recent theoretical developments in the area, while Section 4 assesses the empirical literature on Ricardian equivalence and the TDH. Section 5 provides new empirical evidence, based on vector autoregressive models for each of the G-7 countries, and addresses some issues raised by the existing literature. Section 6 offers some concluding remarks.

2 THE STYLIZED FACTS

It is useful to begin our review with the United States, which during the early 1980s undertook what now appears to be a bona fide laboratory experiment to test the TDH. A series of tax reforms was introduced which resulted in a very large fiscal deficit. Figure 2.1 compares the U.S. current account with the central government fiscal deficit over the past two decades.[1] From the figure it is clear that the U.S. data would, on the surface, support the TDH. The positive correlation stems not only from the episode in the early 1980s, but also from earlier incidents, such as the rise in both balances during 1972 and 1973, and the subsequent decline. From the figure it is also evident that the relationship between the two deficits is less than one-for-one.

Figure 2.1

Current Account Balance and Fiscal Surplus - United States



Simple bivariate correlation statistics support this visual impression. The contemporaneous correlation between the two variables shown in Figure 2.1 is 0.351, calculated over the entire 1970Q1-1990Q3 sample period. The peak correlation between the various leads and lags of the two variables is

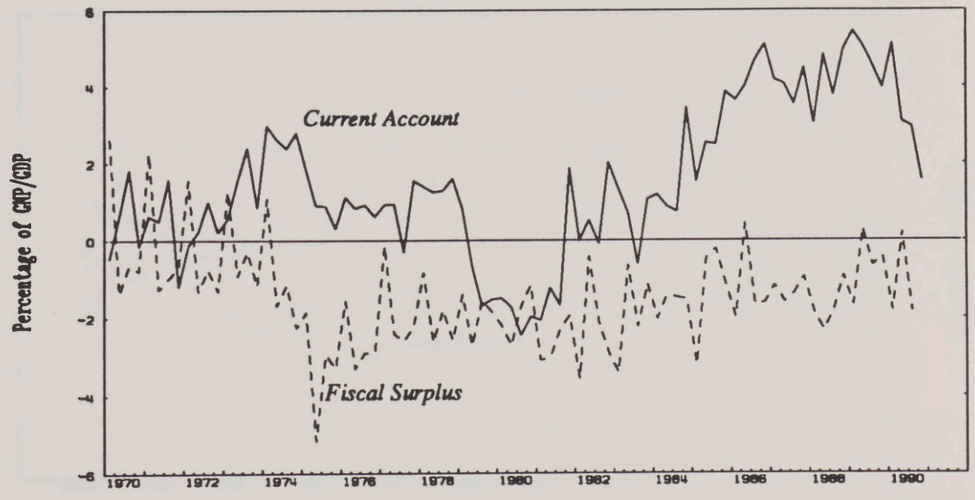
1. The distinction between the *central* government balance and the *general* balance, which would incorporate lower levels of government, can be important for some countries. In this paper, however, we have restricted attention to the central government balance.

0.594, which occurs between the current account and a 7-quarter lag of the fiscal surplus. This lag between the movements in the fiscal surplus and the later movements in the current account is also evident from Figure 2.1.

Turning now to Germany, we see in Figure 2.2 that support for the TDH is unlikely based on that country's data. The only evident exception is the 1974 rise in the government fiscal deficit, which was followed later by some decline in the current account surplus. Through the 1980s the fiscal deficit tended to decline, while the current account showed strong improvement, but the correlation is nothing like that observed for the United States. Indeed, the contemporaneous correlation between the two variables is 0.167 over the entire 20-year sample period, and the peak in the correlogram is only 0.256 and occurs at a 2-quarter lag.

Figure 2.2

Current Account Balance and Fiscal Surplus - Germany

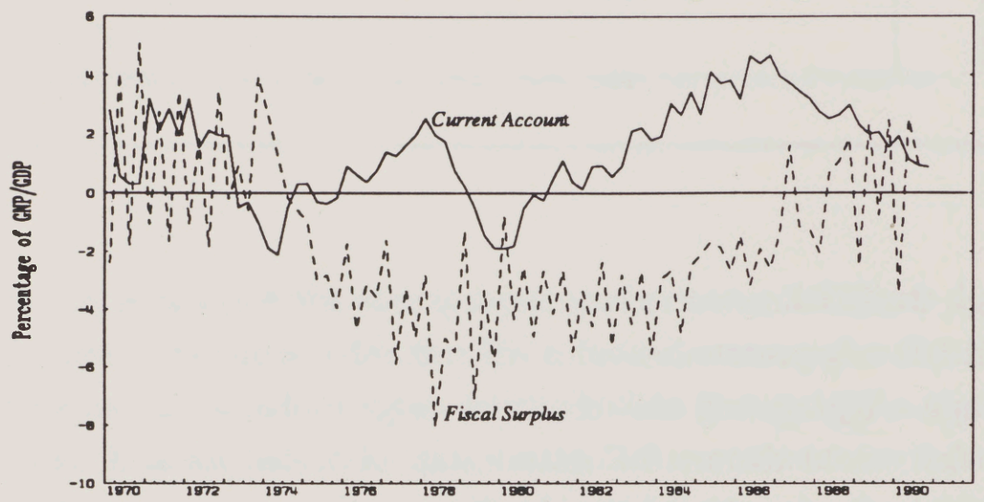


The case of Japan is similar to that of Germany. Figure 2.3 shows that, while the central government fiscal deterioration after the first oil shock preceded some worsening in the current account, the steady rise in the current account surplus between 1980 and 1987 was basically unrelated to the fiscal situation. Towards the end of the 1980s, of course, Japan's fiscal surplus improved substantially; however, if anything, the improvement

would appear to have been associated with the subsequent *decline* in Japan's external surplus. Examination of the correlogram between the two variables confirms this jumbled impression. The contemporaneous correlation between the two variables is only 0.030, and the peak positive correlation is found between the current account and a 12-quarter *lead* of the fiscal deficit. Lags of the fiscal deficit bear a negative correlation with the current account.

Figure 2.3

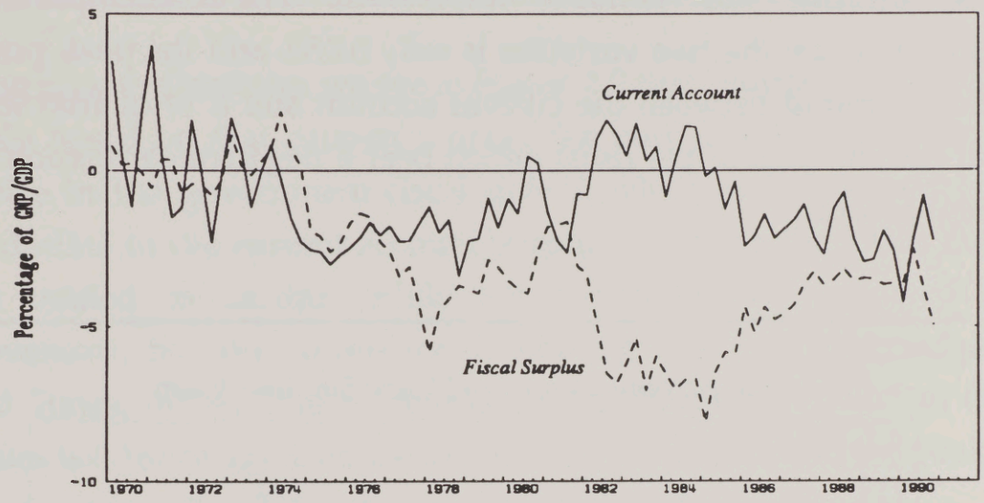
Current Account Balance and Fiscal Surplus - Japan



Later on it will be shown that theoretical discussions of the TDH often invoke the small open-economy assumption. The largest three economies might therefore not be representative. Figure 2.4 examines the relationship for Canada, since it is the smallest of the G-7 and comes closest to the theoretical assumptions of a small open economy. As is clear from the figure, the correspondence between the two variables has not been very great over the past 20 years in Canada. Indeed, during the 1980s the correlation tended to be negative. Examination of the correlogram between the two variables suggests that no systematic relationship exists when the entire sample is taken as a whole.

Figure 2.4

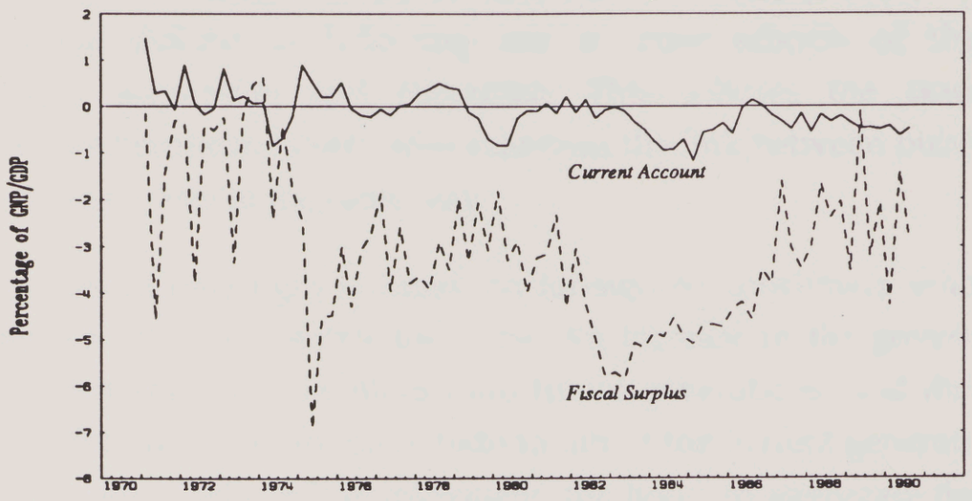
Current Account Balance and Fiscal Surplus - Canada



Although the TDH seems to hold loosely only for the largest economy in the world, it may seem more valid when the G-7 countries are considered *as a group*. Aggregating the countries might internalize cross-country shocks that could distort the relationship between the two deficits. In Figure 2.5 I examine the relationship between the aggregate G-7 current account and the aggregate fiscal position of the same countries. The data were constructed by converting all the data on current accounts, fiscal positions and national income into U.S. dollars and then summing to obtain a G-7 version. Interestingly, the figure does suggest a positive association between the two variables, albeit much less than one-for-one. The contemporaneous correlation over the entire sample period is 0.224; however, the correlation between the aggregate current account and the 6-quarter lag of the aggregate fiscal surplus is 0.434. To a large extent, of course, these results reflect the U.S. results discussed above.

Figure 2.5

Current Account Balance and Fiscal Surplus - Aggregate G-7



Overall, my review of the stylized facts, admittedly informal, does not provide extensive support for the TDH. Indeed, among the data for the countries examined, only the data for the United States show a significant association. To some extent the data for the G-7 as a whole also indicate an association. However, while the simple correlations in these data are suggestive, simple bivariate analysis is always risky, and especially so for two variables such as the government surplus and a country's current account, which are influenced by so many other variables that are not accounted for in the analysis.

Furthermore, it may be the case that the G-7 data are dominated by U.S. fiscal shocks, in which case the external positions of countries like Japan and Germany would have had to adjust to movements in the U.S. current account, regardless of the underlying fiscal situation in those countries.

Also, a number of measurement issues affect the interpretation of these correlations; in particular, cyclically adjusted fiscal positions and, possibly, a parallel concept for external imbalances should perhaps be considered.

Finally, supporters of the REH might interpret the U.S. data as simply an indication that private savings would have fallen even further during the

1980s had government saving not declined. More formal empirical evidence will be examined after a brief review of the theoretical literature.

3 THEORETICAL CONSIDERATIONS

It is convenient to categorize the various views of the link between fiscal and external deficits as following one of three schools of thought: neoclassical, Keynesian and Ricardian. This follows the taxonomy suggested by Bernheim (1989), who examines the link between public and private savings rates in the same way.

The neoclassical paradigm is based on far-sighted consumers who plan consumption over their entire life cycle. An increase in the government budget deficit shifts tax liabilities onto future generations, and therefore raises the lifetime consumption of individuals of the current generation. In a closed economy with full employment, the boost to aggregate demand produces higher interest rates and crowds out investment. In contrast, in an open economy the widened budget deficit has some degree of impact on the exchange rate and therefore on net exports, and, in a small open economy that takes world interest rates as given, all the adjustment is borne by net exports.

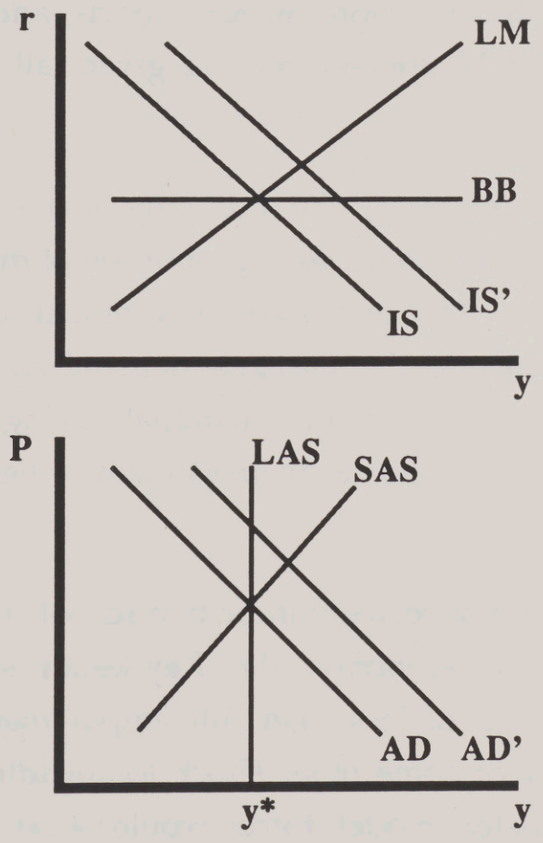
Under Keynesian assumptions, the economy starts in a position of underemployment, and includes a large proportion of myopic or liquidity-constrained consumers. The increased government deficit leads to a proportionately large increase in aggregate demand and national income; because of the latter effect, aggregate national saving may or may not decline, so crowding out via domestic investment or net exports need not occur.

The fundamental difference between these two schools is their view on the self-equilibration of the economy: the Keynesian school begins the experiment in a position of less than full employment that, barring a change in fiscal policy or some other shock to spending, would persist, whereas in the neoclassical model, forces would be at work to move the economy back to its full employment position, regardless of the stance of the fiscal authorities.

The nature of the twin deficits linkage is illustrated in Figure 3.1, which provides a geometric interpretation of the neoclassical model. This takes a

Mundell-Fleming small open-economy extension of the Keynesian IS-LM model (top panel) and combines it with an aggregate demand - aggregate supply characterization in price-output space (lower panel). The latter distinguishes between short-run aggregate supply (SAS), which is defined for a particular expectation of the price level, and long-run aggregate supply (LAS), which is defined simply by the full employment rate of output. The framework can notionally accommodate rational or adaptive expectations, or, alternatively, rational expectations with either sticky or flexible prices.

Figure 3.1
A Fiscal Shock in the Neoclassical Model of a Small Open Economy



Starting from a point where output is at its natural level, y*, a rise in the government deficit would involve a rightward shift in the IS curve, to IS',

and in the aggregate demand curve to AD'. I assume that the monetary authorities act to keep the LM curve unchanged throughout the experiment. With the intersection of the IS and LM curves above the BB curve, upward pressure on interest rates would develop, which in turn would lead to a currency appreciation. Because the economy would be at full employment, some upward pressure on domestic prices would also occur, as indicated by the intersection of AD', which corresponds to IS', and the SAS, or short-run aggregate supply curve. The latter corresponds to expectations of prices equal to the initial equilibrium. These two effects, taken together, would produce a real appreciation which would shift the IS curve, and hence the AD curve, back to their initial positions. The end result would simply be both an appreciation of the nominal and, given unchanged prices, real exchange rate, and a current account deficit. The latter would be of the same magnitude as the fiscal deficit, and would indicate that private domestic economic activity had been completely crowded out by the fiscal shock.

The nominal equilibrium associated with this shock can be altered by the rule adopted by the monetary authorities. For example, preventing the nominal appreciation of the currency would have meant shifting the LM curve outwards to the intersection of IS' and BB; this would have led to a further outward shift of AD and would have put even greater pressure on prices. With the nominal exchange rate held fixed, prices would have risen until the necessary real appreciation had taken place. The IS curve would therefore end up at its initial starting point, as in the previous example. However, the upward ratcheting of the price level would have caused an upward revision to price expectations, and the SAS curve would now intersect the LAS curve at this new, higher price level. Therefore, the final position would see both a higher domestic price level which, with an unchanged nominal exchange rate, would imply a real appreciation, and a current account deficit. In real terms the equilibrium would be identical to that described under a money stock rule or, for that matter, to whatever nominal rule the monetary authorities saw fit to pursue.

Clearly, the TDH is an implication of the above framework. How important is the full employment assumption to this conclusion? If the

economy were in a position of underemployment, as the Keynesian paradigm would assume, one could imagine filling the "deflationary gap" with government spending without otherwise affecting the equilibrium, including the external position. Indeed, to the extent that a deterioration in the fiscal balance is the consequence of a downturn in the economy, and therefore reflects a cyclical rather than a structural phenomenon, an increased fiscal *deficit* may be associated with a current account *improvement*. However, if one accepts a self-equilibrating view of the economy, as is implicit in the model set out in Figure 3.1, then the analysis of an *exogenous* change in the deficit would be identical, regardless of the starting point of the economy.

To illustrate this point, suppose there was excess supply in the economy; AD and SAS would intersect to the left of LAS, resulting in downward pressure on prices. Price expectations would then tend to be revised downward, and SAS would shift down the AD curve until the intersection again fell on LAS and y*. This mechanism would be active regardless of any additional shocks that were superimposed on the model; therefore, the TDH would emerge once the economy had self-equilibrated, and would be detectable in the data once cyclical factors were accounted for.

In contrast, were no self-equilibration forces at work, as in the Keynesian paradigm, the twin deficits correlation would be observed only if the fiscal experiment were undertaken from a position of full employment, or if the fiscal shock were sufficiently large to push the economy beyond full employment.

These points may be made in much more elegant models. Frenkel and Razin (1987) is perhaps the definitive source, where the effects of fiscal policy in an open economy are analyzed in a comprehensive taxonomy of models of increasing realism. While a rich menu of qualifications is provided to the above exercise by introducing distinctions between traded and non-traded goods, and between single-generation economies and overlapping generation economies, and by analyzing the dynamic effects of permanent and transitory fiscal shocks, the basic thrust of the conclusions with regard to the TDH remains the same.

At the centre of the TDH is the assumption that an exogenous change in the fiscal deficit will shift the IS curve. It is this assumption that is called into question by those of the Ricardian school (see, in particular, Barro, 1989).

According to this view, consumers are very far-sighted, taking what is essentially a *dynastic* view of their consumption problem. Each generation is linked to the next by altruistically motivated resource transfers, so that shifting a tax burden from the present generation to the next causes the present generation to save more so as to leave a greater legacy to cover that tax liability. The upshot is that an attempt by the fiscal authorities to shift the IS curve may fail, for consumers may simply augment their saving in response to any increase in the fiscal deficit. Since no curves shift, there is no crowding out of private investment or net exports, and the twin deficits hypothesis will fail to hold.

The Ricardian equivalence hypothesis (REH) has been attacked on a number of theoretical grounds. In particular, contrary to the assumptions of the model, people do not live forever, private capital markets are imperfect, future taxes and incomes are uncertain, taxes are not lump-sum, and economies are not in a perpetual state of full employment. In general, failure of any one or more of these assumptions leads to failure of the REH, and as a consequence would restore the TDH *to some degree*.

For example, throughout their analysis Frenkel and Razin (1987) maintain the assumption that private agents have finite lives, whereas the government has an infinite horizon, a difference which leads to a difference between the time rate of discount between the two sectors. This means that the time path of taxes matters to private wealth, and therefore private consumption. By extending the private horizon to infinity in their model, Frenkel and Razin restore the REH as a special case.

While Barro himself has acknowledged that the assumptions underlying the REH are extreme, he nevertheless defends this paradigm as containing important insights into the "first-order effects" of fiscal policy (Barro, 1989, p. 48), likening the hypothesis to the Modigliani-Miller theorem which,

although literally incorrect, ruled out a number of previously held beliefs as to why the structure of corporate finance might matter. Furthermore, Barro has noted that the objections that can be raised against the Ricardian view do not, in and of themselves, provide support to any other view, including the TDH.

An important issue in this regard pertains to the permanency of fiscal shocks (see Ahmed, 1986, 1987; Enders and Lee, 1990). In a model in which the REH holds by construction, a fiscal shock that is regarded as permanent will be fully discounted back to the present, savings will react, and the shock will have no real effect. However, the reaction to a *temporary* increase in government spending will be quite different: since agents can spread the necessary rise in savings over their entire horizon, they reduce consumption spending in every period into the future by something *less* than the increase in the government deficit that took place in the first period.

Thus, aggregate demand rises (temporarily) so that even though the REH holds by construction, temporary changes in the government deficit may be associated with corresponding movements in the external balance. The implication is that empirical evidence of a link between fiscal and external balances does not necessarily imply rejection of the REH.

Interestingly, this also suggests an intuitive reconciliation of the U.S. stylized facts of the 1980s with the REH: that the major fiscal shock that took place in the early 1980s was so large, and the U.S. economy is such an important actor in the world economy, that the shock was perceived as *unsustainable* by U.S. consumers, and therefore *temporary*. Agents may not have discounted fully the shift in the early part of the period, assuming it would end before long and they could take the remainder of their lifetimes (and those of their descendants) to pay for the temporary excesses; aggregate demand rose and so did the current account deficit.

The above discussion suggests that it may be very difficult to test the TDH empirically. First, one would need a model that could distinguish shocks from dynamics in the data, because the observed correlation between the

external balance and the fiscal balance depends on the nature of the original shock. Second, the framework would have to be multicountry in dimension, since shocks in one country could have offsetting implications for the external position of another country, which could be undergoing the sort of fiscal shock in question. Third, testing the TDH may require discriminating between different *perceptions* of the permanency of government spending shocks.

4 EMPIRICAL EVIDENCE

Given the above observations, it should not be surprising to find that the empirical evidence on the TDH and the REH is mixed. What one draws from a survey of this evidence depends on one's priors; but an objective reading would seem to suggest that there is a degree of validity to both views, or at least to two theories that would have empirical implications similar to the TDH and the REH. In short, it seems that consumers typically are Ricardian to some degree, and that a link exists between fiscal and external deficits, although the relationship is less than one-for-one.

A comprehensive survey of this extensive literature would serve little practical purpose here, so what follows is a selective series of highlights, rather than a blow-by-blow account of the debate. The purpose is to give the reader a flavour of the state of the debate. Interested readers may find a more thorough review in Barro (1989).

A prolific researcher in this area has been Paul Evans (1985, 1986, 1987a, 1987b, 1988). Through estimation of a variety of reduced-form equations, vector autoregressions (VARs) and models of consumption, Evans has demonstrated that no empirical link exists between fiscal deficits and domestic interest rates, exchange rates or external balances for any of the major economies. According to Evans, this places the burden of proof on those who would reject the REH. Unfortunately, Evans' studies have utilized data ending in the mid-1980s, and therefore may be affected by updating. Also concluding in favour of Ricardian equivalence, using the event-rich data for Israel, are Liederman and Razin (1988).

In contrast, Feldstein (1982) rejects the REH on several counts for the United States, while Johnson (1986) concludes that fiscal policy is an important determinant of the current account in Canada. Ahmed (1987) examines the U.K. data over two centuries and finds evidence of a link between government spending and the external balances, particularly for *temporary* fiscal shocks. Ebrill and Evans (1988) estimate consumption functions for the United States, which include tax and transfer payment variables as well as measures of the outstanding stock of government debt,

and also reject the REH. Indeed, their parameter estimates suggest that the degree of Ricardian equivalence should be considered to be approximately zero.

Evidence in favour of the TDH is also put forward by Roubini (1988). Roubini estimates reduced-form equations for the current account of 18 countries in an effort to address the well-known puzzle of Feldstein: that domestic savings-investment correlations are too high, given high international capital mobility. Roubini points out that in assessing the correlation between domestic savings and investment, one must take account of the fiscal balance, since in the absence of Ricardian equivalence, the fiscal balance affects private saving independently of the path of domestic investment. His estimations therefore bear directly on the issues discussed here; he finds that for 11 of 18 countries the current account is significantly influenced by both the fiscal deficit and the level of domestic investment.

Knight and Masson (1988) investigate the TDH and REH for the United States, Germany and Japan using an empirical version of a model developed in Frenkel and Razin (1987). In their model, government bonds are treated as if some fraction of their outstanding stock is regarded as net wealth by the private sector. Estimation of the model over the 1961-83 period reveals that, although full Ricardian equivalence does not hold, a substantial fraction - perhaps as much as one-half - of any increase in public sector saving is likely to be offset by induced declines in private saving at unchanged real interest rates. The values ranged from 0.25 for the United States to 0.60 for Germany. For later purposes the authors constrained the proportion to be the same for all three countries, a constraint that was found to be acceptable to the data; in this estimation the value was 0.43.

Andersen (1990) pushes Roubini's (1988) analysis a step further, arguing that the position of the economy relative to its level of potential is an important determinant of the strength of the twin deficits linkage. (Roubini made the point in his paper, but ignored it in his empirical work on the grounds that output followed a random walk.) Andersen also uses a longer

sample period (1960-89) and makes use of error-correction models to capture the dynamics of the current account. Although the results vary somewhat across the 16 countries studied, he finds that on average an increase in the government deficit by 1 per cent of GNP increases the external deficit by 0.4-0.6 per cent of GNP, depending on the methodology used.

Andersen's results accord well with those of Helliwell (1990), who presents the simulation results of fiscal shocks from a variety of multicountry structural models. He finds that, on average, an increase in the fiscal deficit will be accompanied by an increase in the external deficit that is approximately half as large. Thus, from this branch of the literature a consensus seems to be emerging that the degree of Ricardian equivalence is neither zero nor unity, but rather lies somewhere between the two, and that the TDH correspondingly has some empirical support.

The partial nature of some of these tests may be rectified to some extent by estimating VARs. For example, the paper by Enders and Lee (1990), cited earlier, estimates a VAR for the United States over the period 1947-87, including consumption expenditure, federal government purchases, the outstanding stock of government debt, the trade balance, the IMF MERM effective exchange rate and the real rate of interest. The variance decomposition shows that government spending explains 16 per cent of the variance of the trade balance and close to 9 per cent of consumption; similarly, the level of outstanding government debt explains 13 per cent of the variance of the trade balance and close to 6 per cent of that of consumption. Impulse response analysis reveals that a shock to government spending is associated with a trade deficit; although the exact magnitude is difficult to isolate from the complex dynamics, the average response over the first 16 quarters is close to one-for-one. These and other results appear to contradict the predictions of the REH. Nevertheless, the theoretical restrictions implied by REH are acceptable to the data when imposed on the VAR. This suggests that the VAR may not explain the data very well, making such theoretical restrictions difficult to reject. In any case, the central point of their paper is that apparently non-Ricardian data

realizations are possible even in a model in which the REH has been imposed.

In a similar vein, Abell (1990) estimates a VAR for the United States over the period 1979-85, including the money stock, the federal government budget deficit, the triple-A bond yield, the trade-weighted exchange rate, the trade balance, real disposable income and the consumer price index. In interpreting his results Abell makes use of the concept of *indirect Granger causality,* which essentially lends to the VAR a structural interpretation. Thus, although Abell's results show that budget deficits do not *directly* Granger-cause trade deficits, budget deficits *indirectly* cause trade deficits by first affecting the AAA bond rate; the AAA bond rate, in turn, is found to Granger-cause the effective exchange rate; the latter, in turn, is found to Granger-cause the trade balance. The strength of this indirect linkage is summarized in the share of the total variance of the trade balance that may be explained by the budget deficit, using a standard variance decomposition. Alternatively, one can simulate the VAR and allow the estimated dynamics of the system to produce the ultimate effect on the current account.

Further evidence in favour of the TDH for the United States is presented by Rosensweig and Tallman (1991), who estimate a four-variable VAR including the fiscal balance, the trade balance, the real rate of interest and the real exchange rate, over the period 1961-89. Based on Bayesian Monte Carlo methods, they conclude that the levels data are stationary, and therefore specify their VAR in levels rather than first differences. They find that some 30 per cent of the variance of the external balance is explained by the fiscal variable; when the model is respecified in first differences this proportion is cut to 15 per cent, but nevertheless remains large compared with previous work based on the VAR methodology. Regardless of the outcome of the active debate on testing for unit roots, therefore, the U.S. data seem supportive of the TDH.

A qualification is added to a number of previous studies by Dewald and Ulan (1990), who suggest that existing tests of the TDH may have been biased by measurement problems in the data. They attempt to correct the

U.S. budget balance and current account data for inflation accounting problems and for market value fluctuations. Thus, they measure the real budget deficit as the increase in the real net debt position of the federal government, and measure the real current account balance as the change in the real U.S. net external wealth position. When the two variables are reconstructed in this way, they find that there is no statistical support for the TDH, even in the aftermath of the early-1980s fiscal shock. It is difficult to assess the extent to which this conclusion is influenced by the assumptions that Dewald and Ulan have to make in order to complete the exercise in the absence of the appropriate data.

As noted at the beginning of this section, the impression that one gets from reading this literature is that both the TDH and the REH hold up under examination, to a degree. In practical terms, this means that the TDH is operative but perhaps only loosely so; not only is it at most less than one-for-one, but there may be circumstances in which the correlation between the two deficits will be nonexistent, or even perverse, depending on the nature of the underlying shock.

In terms of the various studies that have been reviewed, several empirical questions arise.

First, the very essence of the TDH is that it involves more than one country. Thus, a fiscal shock in one country can only influence that country's trade balance if it also influences the trade balance of at least one other country. While various authors have tested the TDH or the REH for more than one country, they generally have chosen not to recognize these cross-country interdependencies in their tests. Not taking account of fiscal shocks in a trading partner country when testing the TDH for the home country may risk a biased test, for finding evidence favouring the TDH in one requires that the trade balance of the other move independently of its domestic determinants, including fiscal shocks. It would seem worthwhile to investigate the importance of this issue for established results.

Second, it would be of interest to know whether empirical support for the TDH is different for the 1980s than for the 1970s.

A third objective would be to examine more closely the notion of *indirect* Granger causality, as discussed by Abell (1990). Although it may be asking too much of a VAR, an examination of the estimated intermediate linkages between fiscal deficits and trade deficits may, in some cases, be helpful in explaining the lack of direct evidence of such a link.

5 TESTING THE TDH FOR THE G-7 COUNTRIES

Evidence from Unrestricted VARs, 1972Q2-1990Q3

In this section we use a framework similar to that of Enders and Lee (1990) and Abell (1990) to re-examine the TDH for the G-7 countries. VARs are estimated for each of the G-7 countries and the statistical significance of budget deficits in determining current account deficits is assessed. Then the residual variances for each VAR system are analyzed for cross-country correlations that may have been neglected by previous researchers. I also investigate the inference of Abell (1990) that indirect causality links budget deficits and current account deficits in the U.S. data.

The VARs include output (y); prices (p); a short-term money market interest rate (r); the IMF trade-weighted (MERM) nominal exchange rate (s), for which a rise indicates an appreciation; the current account balance (c); and the fiscal balance (d) - six variables in total.[2] The variables enter the model in first differences of logarithms in the case of output, prices and the exchange rate; first differences for the interest rate; and first differences of the ratio to nominal spending in the case of the current account and the fiscal balance.[3] Each equation contains a constant and, to take account of any residual seasonality, four lags of each variable. The data are available on a consistent basis across all seven countries, taking account of lags, from 1972Q2 to 1990Q3, providing 49 degrees of freedom for each regression. Most of the data were obtained from the OECD Historical Statistics data base; however, the fiscal balances (with the

---

2. I might also have included a money supply variable in the VAR; however, doing so for all seven countries would have necessitated a substantial shortening of the sample period, given the available data. Since the focus of the study is on real correlations, I hope that this omission will not greatly influence the results.

3. The decision to use differenced data does not reflect an insensitivity to the issues surrounding unit root tests and their implications. Rather, it reflects a conscious hedge against the outcome of this debate: if it turns out that differencing is inappropriate, then we will have biased our tests towards non-rejection of the null hypothesis that there is no link between fiscal and external balances. This implies that, should we find evidence of such a link, such evidence probably would be even stronger if the decision to difference proved to be inappropriate. See Rosensweig and Tallman (1991) for a thorough discussion of this issue.

exception of Japan's) and MERM exchange rates were taken from the International Financial Statistics data base of the IMF. The Japanese fiscal balance was obtained from the national authorities. All series except the interest rates and exchange rates are seasonally adjusted either in the original source or by the author using FAME 6.2 software. The VAR results are generated using SunOS-RATS 1.0.

The VAR estimation results are voluminous and are not provided here. However, Table 5.1 provides test statistics of the statistical significance of each block of variables in each equation. The null hypothesis that the four lags of one variable in a particular equation are jointly insignificant is tested using an F-ratio, and Table 5.1 reports the corresponding p-values; a very low value in Table 5.1 indicates that the hypothesis may be rejected with a great deal of confidence, whereas a high value indicates that the hypothesis cannot be rejected with much confidence. A p-value below 0.05 would indicate rejection of the null at the 95 per cent level of confidence, for example.

In the present context such tests are known to have relatively low power.[4] This is the case because the model necessarily includes more variables than would be the case were one selectively including them on the basis of statistical significance. Thus, one might regard a level of confidence of 75 to 80 per cent as relatively strong in this situation. Nevertheless, the presentation of Table 5.1 will allow all readers to make their own inferences at whatever level of significance they wish.

The results reveal a statistically important influence running from fiscal balances to current account balances for the United Kingdom and France only, with p-values of 0.03 and 0.09 respectively. A moderately encouraging result is also found for Italy (0.27). For the United States the p-value is 0.44, which is consistent with Abell's (1990) finding of no *direct* causality between the twin deficits for the United States; the principal

4. One means of raising the power of tests undertaken in the context of a VAR is to eliminate selectively from the equations variables that are not significant, as is done by Abell (1990). However, the low power of the tests also extends to the decisions on whether to exclude or include a variable, making the risk of introducing bias during this procedure relatively high. The effects of such restrictions on the results are examined later in detail.

Table 5.1

Summary of Unrestricted VAR Results, 1972Q2-1990Q3 (p-values)

1. United States

Equation	y	p	r	s	c	d
y	0.11	0.90	0.00	0.50	0.85	0.78
p	0.77	0.00	0.19	0.49	0.71	0.42
r	0.10	0.13	0.00	0.84	0.19	0.20
s	0.85	0.27	0.56	0.47	0.87	0.74
c	0.76	0.02	0.23	0.93	0.57	0.44
d	0.02	0.19	0.63	0.39	0.51	0.00

2. Japan

Equation	y	p	r	s	c	d
y	0.79	0.98	0.78	0.76	0.87	0.52
p	0.10	0.00	0.62	0.26	0.03	0.02
r	0.40	0.61	0.34	0.32	0.13	0.88
s	0.41	0.96	0.12	0.02	0.04	0.21
c	0.00	0.15	0.41	0.17	0.00	0.35
d	0.23	0.02	0.20	0.41	0.16	0.00

3. Germany

Equation	y	p	r	s	c	d
y	0.06	0.02	0.01	0.12	0.13	0.05
p	0.22	0.00	0.09	0.89	0.90	0.84
r	0.02	0.91	0.09	0.34	0.53	0.28
s	0.05	0.03	0.28	0.45	0.02	0.13
c	0.60	0.98	0.74	0.26	0.02	0.71
d	0.03	0.30	0.76	0.96	0.18	0.00

4. France

Equation	y	p	r	s	c	d
y	0.29	0.27	0.71	0.11	0.27	0.89
p	0.75	0.00	0.12	0.82	0.53	0.08
r	0.76	0.83	0.06	0.16	0.82	0.60
s	0.98	0.14	0.57	0.02	0.45	0.99
c	0.58	0.68	0.40	0.25	0.06	0.09
d	0.01	0.66	0.15	0.09	0.67	0.00

5. United Kingdom

Equation	y	p	r	s	c	d
y	0.21	0.21	0.28	0.13	0.37	0.53
p	0.29	0.00	0.30	0.60	0.06	0.62
r	0.27	0.19	0.14	0.44	0.33	0.06
s	0.63	0.15	0.25	0.88	0.70	0.61
c	0.41	0.26	0.43	0.77	0.10	0.03
d	0.34	0.39	0.66	0.51	0.24	0.00

6. Italy

Equation	y	p	r	s	c	d
y	0.11	0.31	0.09	0.20	0.01	0.31
p	0.06	0.00	0.00	0.64	0.07	0.39
r	0.16	0.55	0.09	0.44	0.22	0.85
s	0.14	0.55	0.09	0.24	0.01	0.71
c	0.03	0.53	0.81	0.06	0.00	0.27
d	0.42	0.19	0.30	0.66	0.15	0.00

7. Canada

Equation	y	p	r	s	c	d
y	0.02	0.57	0.17	0.68	0.23	0.13
p	0.26	0.00	0.56	0.05	0.44	0.78
r	0.06	0.05	0.09	0.84	0.07	0.60
s	0.31	0.98	0.03	0.01	0.82	0.54
c	0.74	0.89	0.27	0.85	0.00	0.43
d	0.03	0.01	0.32	0.98	0.51	0.24

Table 5.2
Cross-Country VAR Residual Correlations

Output

	U.S.	Jpn.	Ger.	Fra.	U.K.	Ity.	Can.
U.S.	1.00						
Jpn.	0.06	1.00					
Ger.	0.03	0.14	1.00				
Fra.	0.33	0.26	0.41	1.00			
U.K.	0.02	0.27	0.17	0.10	1.00		
Ity.	0.00	0.20	0.37	0.28	-0.09	1.00	
Can.	0.29	0.16	-0.06	0.08	0.14	-0.02	1.00

Prices

	U.S.	Jpn.	Ger.	Fra.	U.K.	Ity.	Can.
U.S.	1.00						
Jpn.	0.07	1.00					
Ger.	0.06	0.13	1.00				
Fra.	-0.02	0.13	0.17	1.00			
U.K.	0.03	-0.12	0.27	0.28	1.00		
Ity.	0.17	-0.10	0.02	0.17	0.20	1.00	
Can.	0.22	0.07	-0.31	-0.20	-0.16	0.23	1.00

Interest Rates

	U.S.	Jpn.	Ger.	Fra.	U.K.	Ity.	Can.
U.S.	1.00						
Jpn.	-0.07	1.00					
Ger.	0.24	0.06	1.00				
Fra.	0.24	0.14	0.22	1.00			
U.K.	0.12	0.06	-0.19	-0.08	1.00		
Ity.	0.11	-0.26	-0.22	0.07	0.17	1.00	
Can.	0.41	-0.09	0.13	0.10	0.10	0.07	1.00

Exchange Rates

	U.S.	Jpn.	Ger.	Fra.	U.K.	Ity.	Can.
U.S.	1.00						
Jpn.	-0.54	1.00					
Ger.	-0.42	0.08	1.00				
Fra.	-0.39	0.05	0.31	1.00			
U.K.	-0.02	0.03	-0.01	-0.01	1.00		
Ity.	-0.09	0.18	0.00	0.08	0.01	1.00	
Can.	0.53	-0.26	0.30	-0.46	0.07	-0.13	1.00

Current Account Balances

	U.S.	Jpn.	Ger.	Fra.	U.K.	Ity.	Can.
U.S.	1.00						
Jpn.	-0.12	1.00					
Ger.	-0.05	0.15	1.00				
Fra.	-0.02	0.19	0.09	1.00			
U.K.	0.00	-0.02	-0.14	0.06	1.00		
Ity.	0.07	-0.04	-0.12	0.14	0.27	1.00	
Can.	-0.15	0.04	0.04	-0.10	0.01	-0.12	1.00

Fiscal Balances

	U.S.	Jpn.	Ger.	Fra.	U.K.	Ity.	Can.
U.S.	1.00						
Jpn.	0.36	1.00					
Ger.	0.12	-0.03	1.00				
Fra.	-0.09	0.14	0.11	1.00			
U.K.	0.13	0.08	0.03	0.17	1.00		
Ity.	-0.10	-0.01	-0.09	-0.13	0.03	1.00	
Can.	0.01	-0.05	0.10	0.11	0.05	0.14	1.00

determinant of the U.S. current account appears to be the domestic price level. Prices, along with domestic output, are also important determinants of the Japanese current account. For the remaining countries, not much about the current account equations is noteworthy. Interestingly, the current account is a key determinant of the fiscal balance for Japan, Germany, Italy and, to a lesser extent, the United Kingdom.

The possibility of indirect causality running from fiscal deficits to current account deficits would require evidence of links between fiscal deficits and interest rates, then between interest rates and exchange rates, and finally between exchange rates and the current account. The first connection is evident only for the United Kingdom and the United States; the second for the United Kingdom, Japan, Italy and Canada; and the third is evident for Japan, Germany, France and Italy. Thus, no single country seems to demonstrate all of the components necessary to support Abell's (1990) interpretation.

Next, to investigate in a preliminary way the extent to which tests of the TDH might be influenced by the failure to recognize cross-country interdependencies, the residuals of each of the VARs were examined for cross-country correlations. For this purpose I calculated a correlation matrix between the residuals of the seven output equations, the seven price equations, and so on, comparing the corresponding variables across countries. These results are presented in Table 5.2. Given a sample size of 74, these statistics would be statistically significant at the indicated levels of confidence, if they exceeded the following (approximate) values: 95% - 0.23; 90% - 0.20; 80% - 0.15.

For the purposes of this paper, the panel dealing with current account balances is the most interesting, although the importance of cross-country interdependence may extend to other equations as well (see Kuszczak and Murray, 1987). While the correlations are generally quite small, that between the United Kingdom and Italy is significantly positive at the 0.95 level. A number of others would be regarded as significant at the 0.80 level, and therefore are potentially economically significant. Among the latter are positive correlations between Japan and Germany, Japan and France, and

France and Italy, and negative correlations between the United States and Canada, and Germany and the United Kingdom. Although these correlations do not suggest a major problem of omitted variables in studies that examine the TDH on a single-country basis, they do provide sufficient basis for further study; this issue is examined in greater depth below. Not surprisingly, strong correlations are found in the exchange rate panel. Most of the correlations with the United States are negative, the one linking Canada and the United States being the lone exception; the European bloc has relatively low correlations, except for the one between Germany and France. Not surprisingly, these correlations are all positive. Some of the correlations between output residuals are quite high, particularly those within the European bloc. The highest correlation in the interest rate panel is the one between Canada and the United States.

Table 5.3 gives the decomposition of the forecast variance of the current account for each of the G-7 countries at an 8-quarter simulation horizon. The estimated VAR is used to calculate the percentage of the total variation in the current account during a recursive sequence of overlapping 8-quarter horizons that can be explained by innovations in each of the explanatory variables. Such a calculation requires that one choose a causal ordering of the variables in the system. For this purpose two different orderings were considered. The first (y, p, r, s, c, d) is essentially arbitrary, except that it places the fiscal balance last, and therefore will tend to attribute less variance to that variable than would other orderings. The second (d, r, s, c, y, p) follows Abell (1990) and better reflects the causal sequence implied by theoretical descriptions of the twin deficits linkage. Table 5.3 provides both sets of results.

As is evident from the table, a relatively small proportion of the forecast variance of the seven current account variables is explained by movements in the fiscal balance in each country, for either ordering. Interestingly, it is only in the cases of the United States and Japan that the second ordering provides a stronger result; for the remaining countries there are, in fact, some large reductions in the explanatory power of the fiscal balance when moving to the second ordering. The reason for this result may be found by inspecting the variance decompositions of the fiscal balance variables

themselves. In most cases these calculations indicate that only a small proportion of the fiscal variable is explained by its own history, which implies that these variables are themselves highly endogenous to the system. The preferred ordering of the system is therefore unclear. At this stage, then, it appears that the results for the United States, Japan, France and Canada are relatively robust to the ordering assumption, whereas those for the other three countries are not. With this caveat in mind, the remainder of the analysis of these systems will focus on results based on the ordering (y, p, r, s, c, d).

With regard to the indirect causality hypothesis of Abell (1990), on the basis of the decomposition of variance for interest rates (not shown), 5.5 per cent of the forecast variance of U.S. interest rates is explained by the U.S. fiscal deficit, which is considerably less than the 25 per cent reported by Abell. Abell's calculations may have been sharpened by his exclusion from the VAR of a number of insignificant variables, a possibility which is explored in the next subsection. The reasonableness of Abell's hypothesis may also be investigated by examining directly the dynamic impulse response functions of the system. First, instead of examining the three components of the indirect causality hypothesis independently, I calculate the dynamic simulation of each system in response to the fiscal shock. This allows any indirect linkages to emerge according to the dynamics that have been estimated from the data. The results are given in Figures 5.1-7, which show the effect on the *level* of the current account of a permanent fiscal shock equal to 1 per cent of GDP.[5]

Beginning with the United States, Figure 5.1 shows that the current account deteriorates on impact in response to the fiscal consolidation, although the response is extremely small numerically. While soon thereafter the current account improves, in the long run the effect of the shock is only to bring the

---

5. That is, the impulses followed by the *first difference* of the current account have been cumulated for presentation in the charts. Notice also that the shock in question is a unit positive innovation in the error term of the fiscal balance equation. Because the latter is expressed in first differences, the shock is permanent only in the sense that it is not offset by another innovation in a future period; however, given the endogeneity of the fiscal balance in the system, in general the shock cannot be expected to produce a permanent 1 per cent rise in the *simulated* fiscal balance.

Table 5.3
Decomposition of Variance of Current Account Variables
(8-quarter horizon, 1972Q2 - 1990Q3)

(a) Ordering: y, p, r, s, c, d

Country	*Percentage Explained By:*					
	y	*p*	*r*	*s*	*c*	*d*
United States	9.8	11.0	18.2	5.3	53.1	2.6
Japan	17.4	6.8	5.0	7.5	60.2	1.4
Germany	9.3	6.4	1.6	25.7	55.1	1.8
France	4.6	7.2	4.0	13.6	67.0	3.4
United Kingdom	7.6	6.3	14.6	6.9	55.0	9.6
Italy	8.0	5.0	22.3	5.4	52.2	7.1
Canada	3.2	4.0	4.7	4.5	76.9	6.7

(b) Ordering: d, r, s, c, y, p

Country	*Percentage Explained By:*					
	d	*r*	*s*	*c*	*y*	*p*
United States	2.8	2.5	27.5	66.5	0.0	0.8
Japan	2.9	8.2	51.4	37.2	0.1	0.3
Germany	0.6	5.2	91.5	2.6	0.0	0.0
France	2.3	1.8	90.9	4.7	0.1	0.2
United Kingdom	0.1	0.1	83.5	15.7	0.1	0.5
Italy	0.1	20.7	78.3	0.7	0.1	0.1
Canada	6.5	3.7	87.6	2.1	0.1	0.0

current account back to balance. Thus, there is no evidence of the expected link between the two balances contained in the VAR for the United States.

I perform the same experiment for Japan in Figure 5.2. The response of the Japanese current account balance to a permanent fiscal consolidation is also found to be opposite to what is expected. Moreover, in the Japanese case there is a permanent deterioration in the current account balance of about one-tenth the size of the fiscal shock.

Figure 5.1

Current Account Response to Permanent Fiscal Innovation - United States

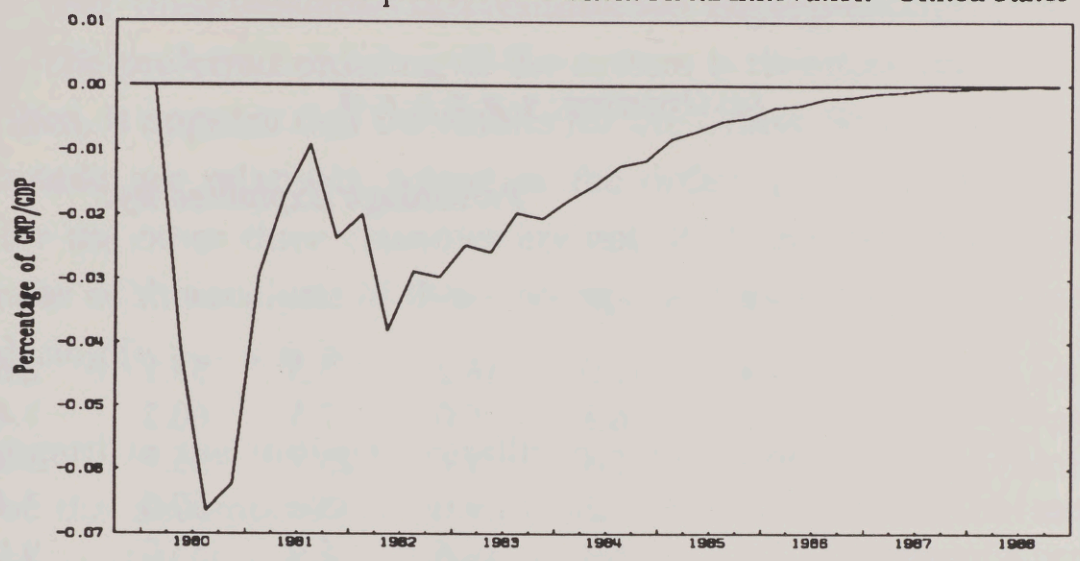
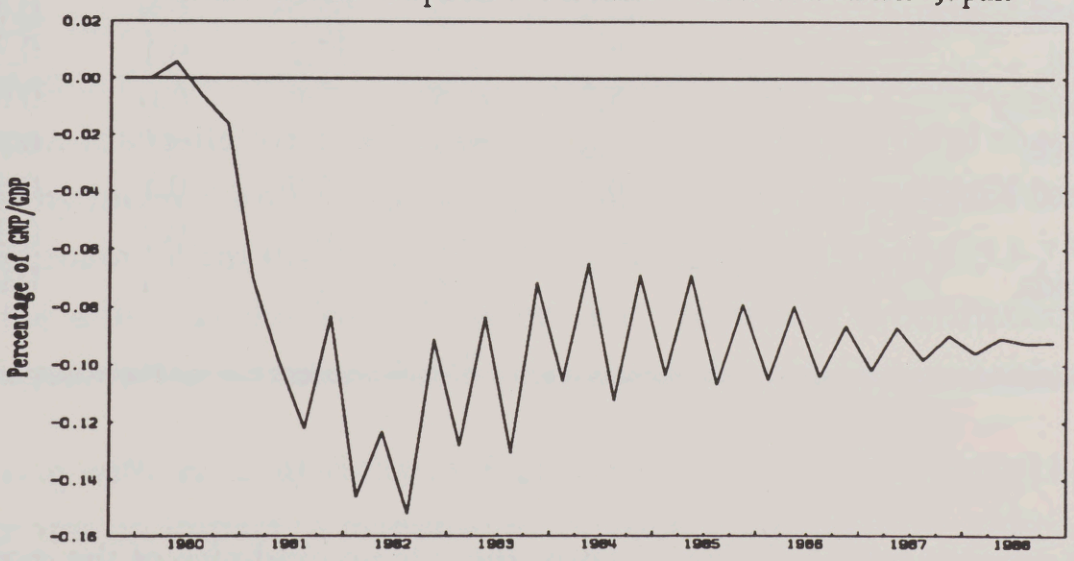


Figure 5.2

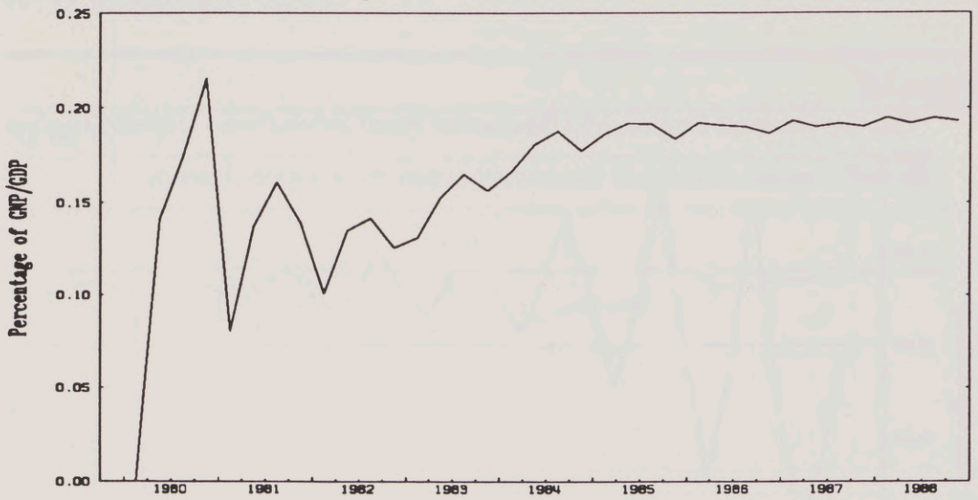
Current Account Response to Permanent Fiscal Innovation - Japan



The results for Germany in Figure 5.3 come much closer to expectations. There is an immediate positive response of the current account to the fiscal consolidation and, after some retrenchment, the improvement builds to about one-fifth of the magnitude of the fiscal shock.

Figure 5.3

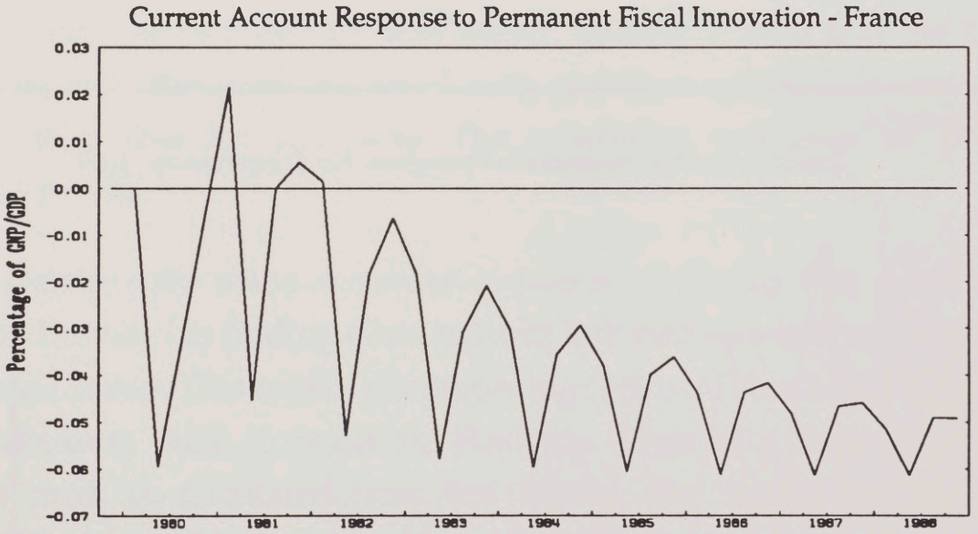
Current Account Response to Permanent Fiscal Innovation - Germany



In the case of France (Figure 5.4) the response of the current account is again contrary to expectations. Despite wide oscillations in the impulse response function, apparently due to some seasonal elements remaining in the data, the current account follows a deteriorating trend, approaching one-twentieth the size of the fiscal shock in the long term.

Figure 5.4

Current Account Response to Permanent Fiscal Innovation - France

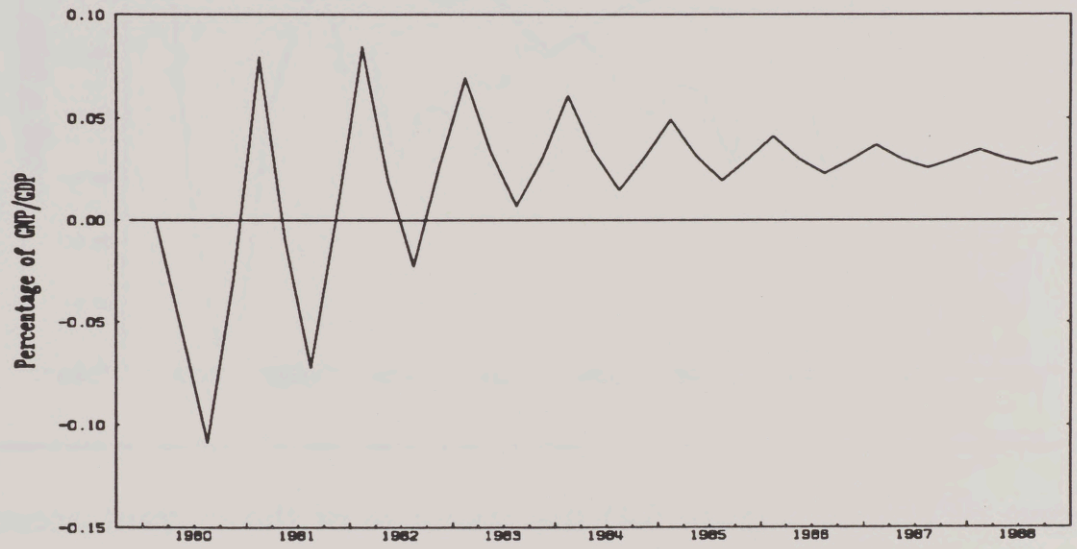


In the case of the United Kingdom (Figure 5.5) the initial response is perverse, but positive impulses begin to dominate soon thereafter. In the

long run the effect of the shock on the current account is positive, but very small in magnitude.

Figure 5.5

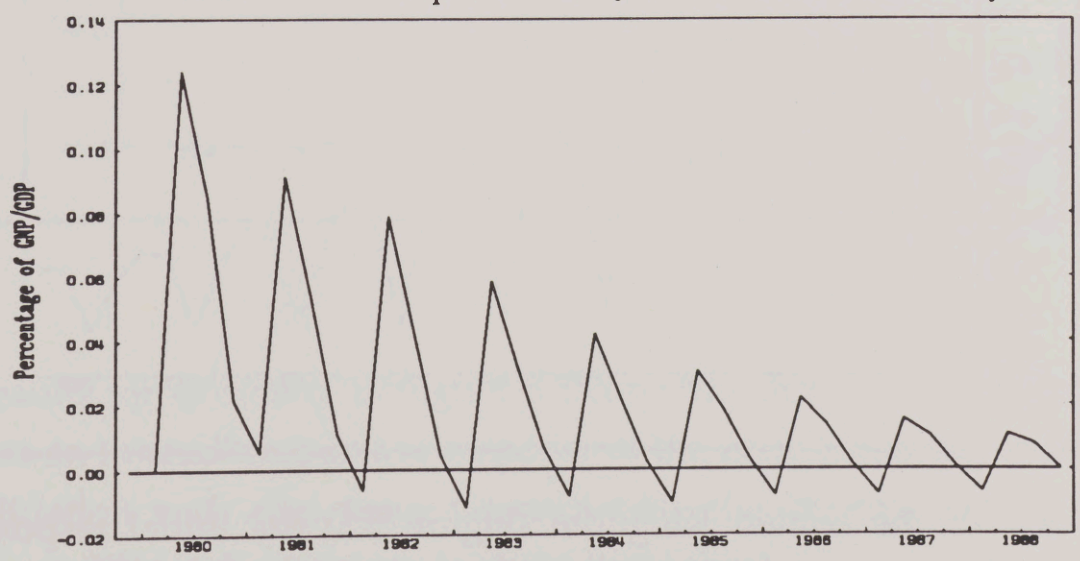
Current Account Response to Permanent Fiscal Innovation - United Kingdom



The initial response of the Italian current account to the fiscal consolidation (Figure 5.6) accords with the theory, with a response coefficient of around 12 per cent of the size of the fiscal shock. However, the subsequent oscillations are negative on average, bringing the cumulative effect on the current account back to zero in the long run.

Figure 5.6

Current Account Response to Permanent Fiscal Innovation - Italy



Finally, the results for Canada are shown in Figure 5.7. As was the case for the United States, the initial response runs counter to theory, and the long-run effect is essentially zero.

Figure 5.7

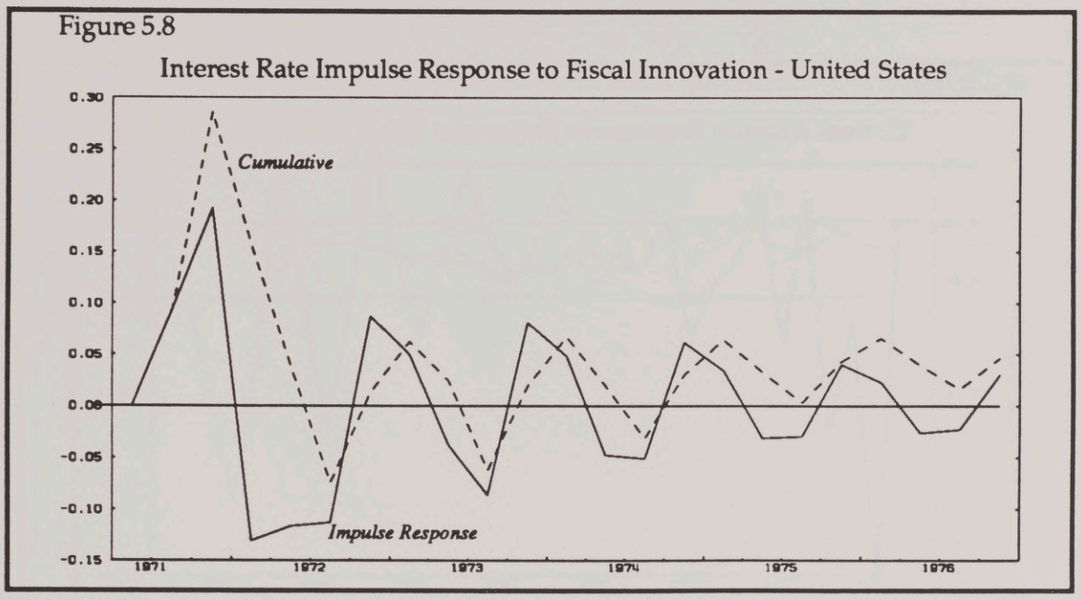
Current Account Response to Permanent Fiscal Innovation - Canada

It is interesting to note that the country whose simulation results accord best with expectations - Germany - is the same country for which the marginal significance of the fiscal measure in the current account equations was weakest. Also, of the two countries for which a statistically significant link between the two deficits was found, namely France and the United Kingdom, only the latter fits the theory, and its magnitude is very much smaller than that for Germany. The remaining countries all produce perverse results.

I now consider the same recursive sequence of shocks that Abell (1990) used to illustrate his finding of an indirect link between the two deficits for the United States. This entails decomposing the fiscal shock into three parts and examining them in isolation. First, the effect of a fiscal impulse on interest rates is calculated from the model; the results are shown in Figure 5.8 along with the cumulation of the interest rate response, which indicates the effect of the shock on the level of the interest rate. The estimated VAR suggests that the initial effect on interest rates would be to raise them, not lower them, as theory would suggest. While the effect

subsequently oscillates between positive and negative values, the long-run effect remains slightly positive.

Figure 5.8



Second, the effect of an interest rate shock on the exchange rate is considered; thus the system is reinitialized and simulated with only an interest rate shock, and the effect on the exchange rate is calculated. The result is presented in Figure 5.9. There the relationship between these two variables is positive, as expected. Finally, the system is again reinitialized and the impact of a shock to the exchange rate on the current account is calculated; the result is given in Figure 5.10. The model suggests that an exchange rate appreciation results in a deterioration in the current account, as expected. Thus, the model makes a clear inference possible on two parts of this three-part decomposition. However, with movements in the current account clearly related to movements in exchange rates, which in turn may be the result of a movement in interest rates, the critical connection between fiscal balances and interest rates is found to be perverse. This contrasts with the results of Abell (1990), who finds reasonable evidence in favour of the latter link, but accords with the evidence presented by Evans (1987a). Possible reasons for these differences are considered at greater length below.

Figure 5.9

Exchange Rate Impulse to Interest Rate Innovation - United States

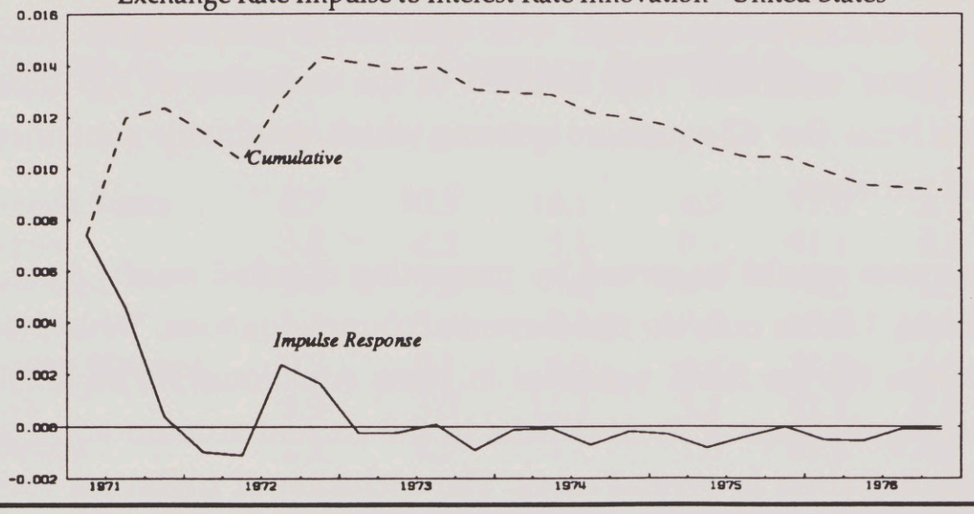
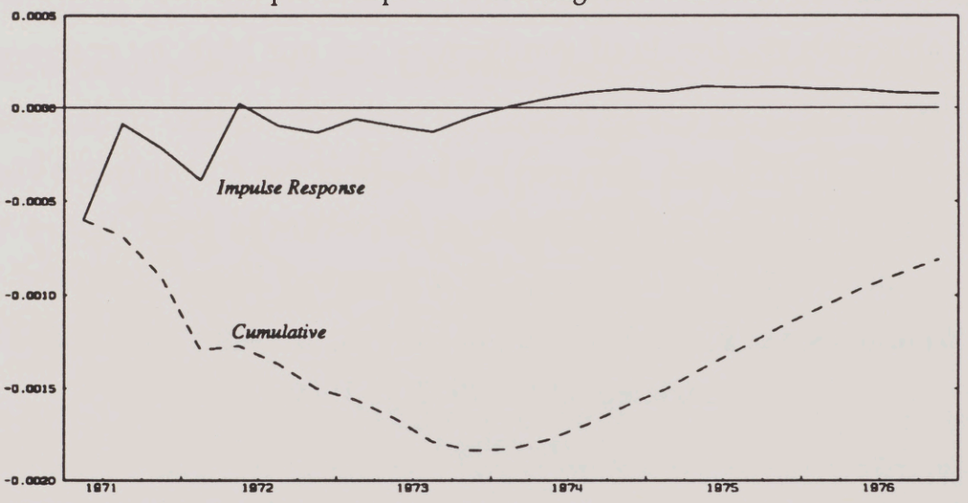


Figure 5.10

Current Account Impulse Response to Exchange Rate Innovation - United States



Evidence from Restricted VARs, 1972Q2-1990Q3

In this subsection the VARs that were analyzed in the previous subsection are re-estimated subject to a number of exclusion restrictions. To avoid re-estimating the system repeatedly while deleting individual variables, the restrictions were determined in a single step with reference to Table 5.1. A

conservative exclusion criterion was used: all blocks of variables with a joint marginal significance of less than 75 per cent (or, in other words, with a p-value exceeding 0.25 in Table 5.1) were excluded, except for the fiscal deficit variables, which were always retained in the current account equations, and own-lags, which were retained to maintain the quality of the equations' residuals. This resulted in the exclusion of 123 blocks of variables from the 42-equation system, which originally contained 256 blocks of variables.

Little purpose would be served by presenting detailed results from these VARs. Here, I focus only on the current account equations; Table 5.4 gives the p-values for the fiscal variables in these equations. As expected, the marginal significance of fiscal deficits in the current account equations of the VARs has risen in several cases. The exclusion of irrelevant variables has raised the significance level to 20 per cent for the United States, but has failed to raise it for Japan or Germany. For France and the United Kingdom, the link between the two balances is now significant at the 98 and 99 per cent levels, respectively. For Italy and Canada the exclusion restrictions have also strengthened the rejection of the null hypothesis of no link, although the levels of significance are not high by conventional standards.

Table 5.4
Significance of Fiscal Variables in Current Account Equations
Restricted VARs, 1972Q2-1990Q3
(p-values)

United States	0.20
Japan	0.48
Germany	0.80
France	0.02
United Kingdom	0.01
Italy	0.16
Canada	0.22

Table 5.5
Decomposition of Variance of Current Account Variables
Restricted VARs, 1972Q2-1990Q3
(8-quarter horizon)

Country	*Percentage Explained By:*					
	y	*p*	*r*	*s*	*c*	*d*
United States	8.7	10.9	16.1	4.6	57.0	2.7
Japan	1.2	0.2	5.1	0.1	91.1	2.3
Germany	3.9	3.6	0.0	11.7	79.5	1.3
France	1.5	3.4	0.8	12.0	78.8	3.5
United Kingdom	0.3	0.1	6.3	3.8	75.0	14.5
Italy	9.9	3.0	11.7	5.4	62.1	7.9
Canada	2.3	0.9	1.1	1.0	89.8	4.9

Table 5.5 gives the variance decompositions of the current account variables as explained by the restricted VAR, again using the ordering (y, p, r, s, c, d). The evidence of a link between the two deficits is now stronger than it was in the unrestricted VAR for five out of seven countries, the exceptions being Germany and Canada. The proportion of variance of the U.K. and Italian current accounts explained by the fiscal variables is now relatively high, at 14.5 per cent and 7.9 per cent, respectively. Surprisingly, despite a high level of statistical significance, the fiscal balance explains only a relatively small proportion (3.5 per cent) of the variance of the French current account.[6]

Figures 5.11-17 give the simulated effects on the current account variables of a permanent fiscal consolidation based on the restricted VARs. As done previously, I have plotted the cumulated impulses so that effects of the shock on the level of the current account are evident. For the United States the pattern is quite similar to that found in the unrestricted VAR, except

6. I also calculated the decomposition of variance of the current account variables using the second ordering from the previous subsection (d, r, s, c, y, p). It was found that the proportion of the variance of the current account variables explainable by the fiscal balance was lower than shown in Table 5.5 for all countries except France, and the results were relatively robust to the change in ordering in the cases of France and Canada only. Thus, it seems that the imposition of zero restrictions throughout the systems has increased their sensitivity to the ordering issue.

that in the restricted VAR there is a negative long-run effect on the current account. Imposing the restrictions therefore has not altered the qualitative nature of the estimated link, which is signed opposite to the theory. In contrast, in the case of Japan, imposing restrictions has produced a current account - fiscal balance link which, although numerically very small, no longer runs counter to expectations. The German restricted VAR continues to produce the strongest apparent link between the two balances, with a long-run current account response in excess of 20 per cent of the size of the fiscal shock. However, it remains the case that this effect is not statistically significant, as indicated in Table 5.4.

The results for France are virtually unchanged from those based on the unrestricted VAR. However, in the case of the United Kingdom, the restrictions have produced a relationship that now runs counter to the theory, in contrast with the unrestricted results. For Italy the nature of the response is not greatly changed, except that now the long-run response appears to be significantly positive rather than zero. Finally, the response of the Canadian current account to the fiscal shock continues to be perverse, but now also has a negative long-run response rather than zero.

In addition, using the restricted VAR for the United States, I repeated the sequential shock exercise performed above in attempting to produce results akin to Abell's (1990). The impulse responses were very similar to those presented in Figures 5.8-10, and they are not presented here.

In summary, imposing zero restrictions in the VARs has produced somewhat stronger statistical evidence in favour of a link between the two balances. However, the mixed qualitative nature of the results remains. On balance, the only case for which the evidence is compelling is Italy; although I obtain correctly signed estimates of the linkage between the two balances for Germany and Japan, they are not statistically significant. For the other countries firmer statistical evidence of a twin deficit link exists, but the signs run counter to theory.

Figure 5.11

Current Account Response to Permanent Fiscal Shock - United States

Figure 5.12

Current Account Response to Permanent Fiscal Shock - Japan

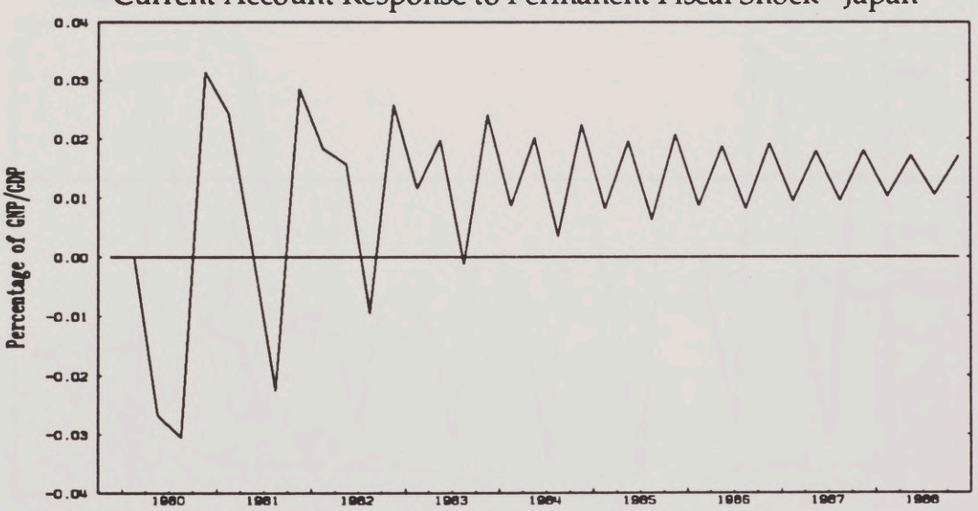


Figure 5.13

Current Account Response to Permanent Fiscal Shock - Germany

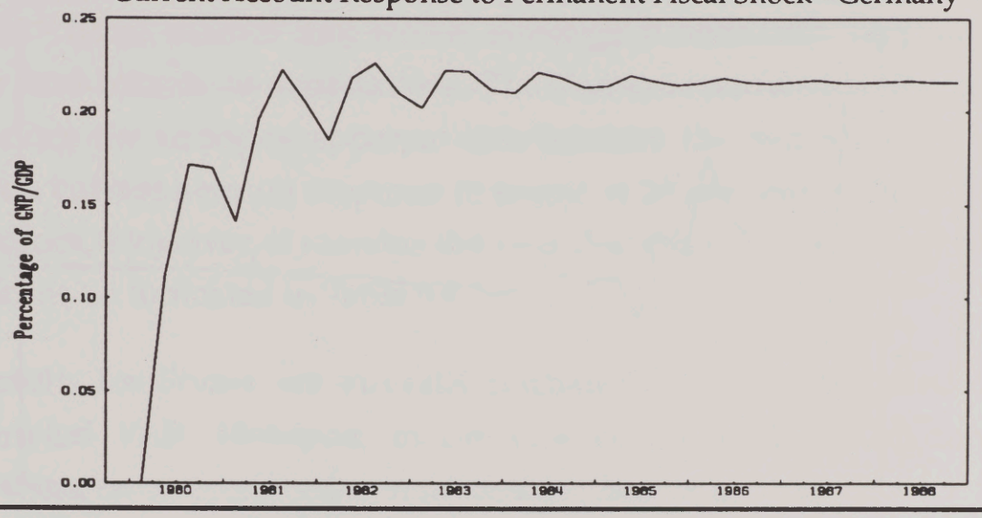


Figure 5.14

Current Account Response to Permanent Fiscal Shock - France

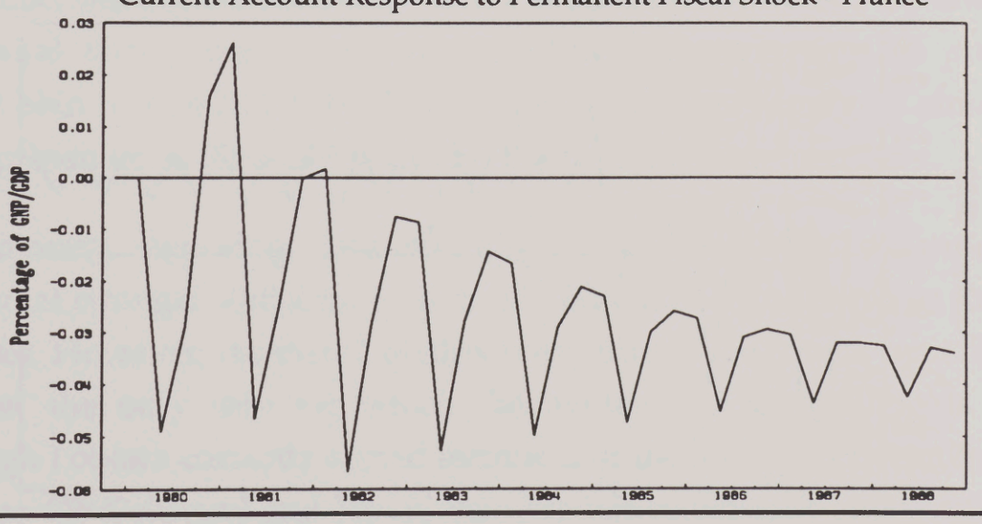


Figure 5.15

Current Account Response to Permanent Fiscal Shock - United Kingdom

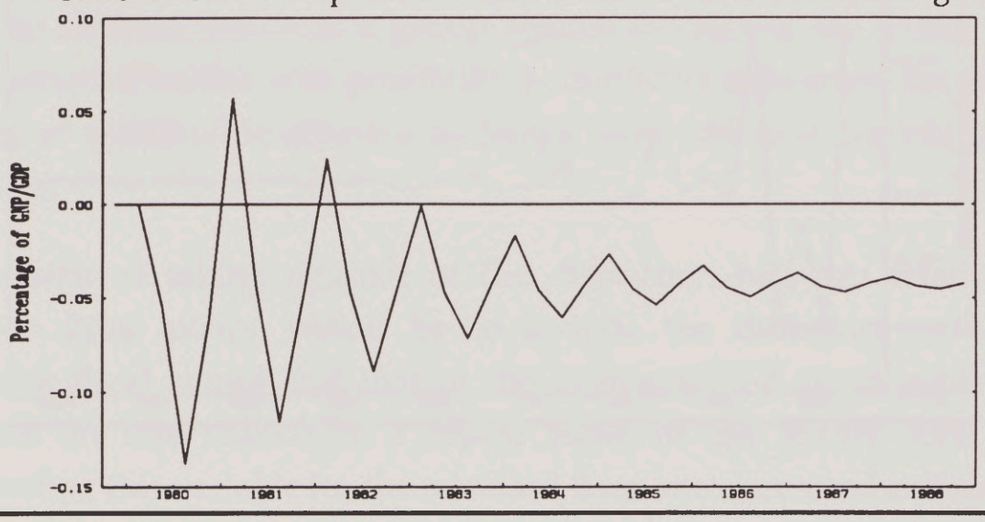


Figure 5.16

Current Account Response to Permanent Fiscal Shock - Italy

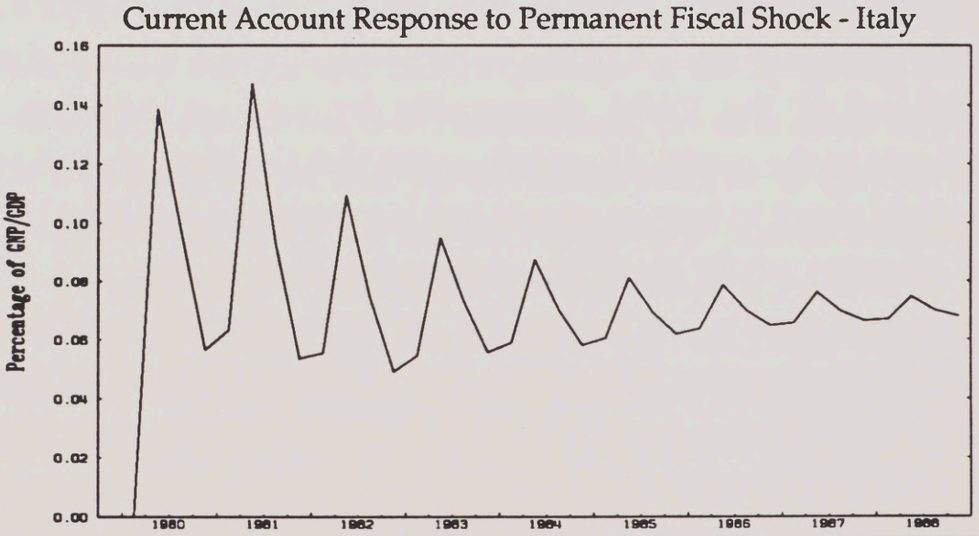
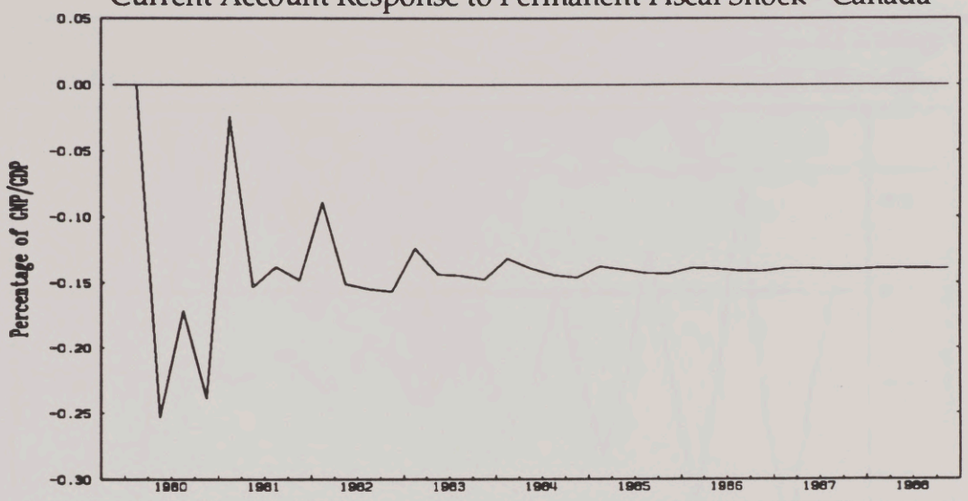


Figure 5.17

Current Account Response to Permanent Fiscal Shock - Canada



Relative Fiscal Shocks

As suggested in Section 4, the TDH is intrinsically a concept involving more than one country, for one country cannot incur an external deficit in response to a fiscal expansion unless some other country goes into surplus. The previous subsection showed that there was only relatively weak statistical evidence of such a cross-country link, beyond what had already been captured in the VARs, presumably by way of inclusion of the exchange rate in the model. However, notice that the presumption at work is that a fiscal shock in one country is not accompanied by a fiscal shock in another country; while such an assumption lies at the root of most econometrics, it does so only when the variables that are supposed to be held constant also appear in the estimated equation. Thus, to be certain of capturing the effects of fiscal policy in a single country with the fiscal policy in all other countries held constant, it would be necessary to include fiscal variables from all seven countries in the current account equations of each of the seven countries.

To consider the issue from another perspective, suppose a fiscal expansion in one country is accompanied by a similar expansion in all of the G-7 countries. Abstracting from differences in dynamics and in fundamental

economic behaviour across countries, one would expect little by way of exchange rate or current account reaction, at least between the seven major countries. Of course, it would be possible for all seven currencies to appreciate against the rest of the world, and then for the seven countries to incur an external deficit as a group against the rest of the world; in the work reported earlier, this possibility is implicitly accounted for through the use of world-wide effective exchange rates and total current account balances.

One means of taking account of the distinction between relative and absolute fiscal policy would be to include the difference between a country's fiscal stance and that of the aggregate G-7 as an explanatory variable. In this subsection I repeat some of the earlier tests while substituting this variable for the standard fiscal measure used earlier in the VARs. Figures 5.18-24 illustrate the evolution of each country's fiscal surplus minus the fiscal surplus of the G-7 as a whole, both deflated by nominal GDP. For purposes of aggregation, the fiscal surpluses and GDPs have been converted into U.S. dollars, as was done to construct Figure 2.5 above.

Figure 5.18 illustrates the situation for the United States. Not surprisingly, the graph reveals that the U.S. fiscal expansion in the 1980s was not shared by the other members of the G-7. Furthermore, the data show that by mid-1990 the U.S. fiscal deficit had yet to decline relative to the G-7 average. The corresponding figure for Japan, Figure 5.19, shows essentially the opposite pattern, with a movement towards surplus relative to the G-7 average in the early 1980s that has persisted into the 1990s. This pattern is quite different from that of the Japanese fiscal surplus as a percentage of GDP (see Figure 2.3). Thus, this alternative means of measuring fiscal stimulus may turn out to bear a stronger link with the Japanese current account than does the standard measure. Figure 5.20 provides similar data for Germany: as expected, there is a move towards relative surplus in the first half of the 1980s, but an offsetting deterioration in the relative fiscal position in the second half of the decade. Referring back to Figure 2.2, it is interesting to note that, as was the case for Japan, this pattern seems to

accord better with the behaviour of the German current account than does the absolute measure of the fiscal surplus.

Figure 5.18

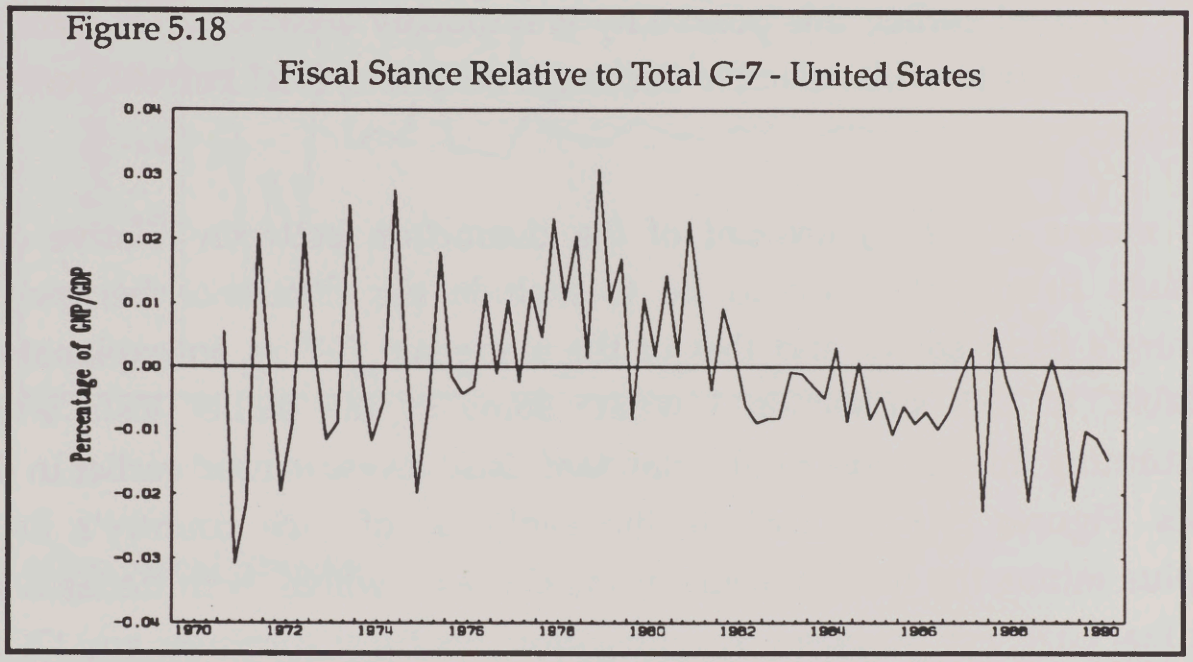


Figure 5.19

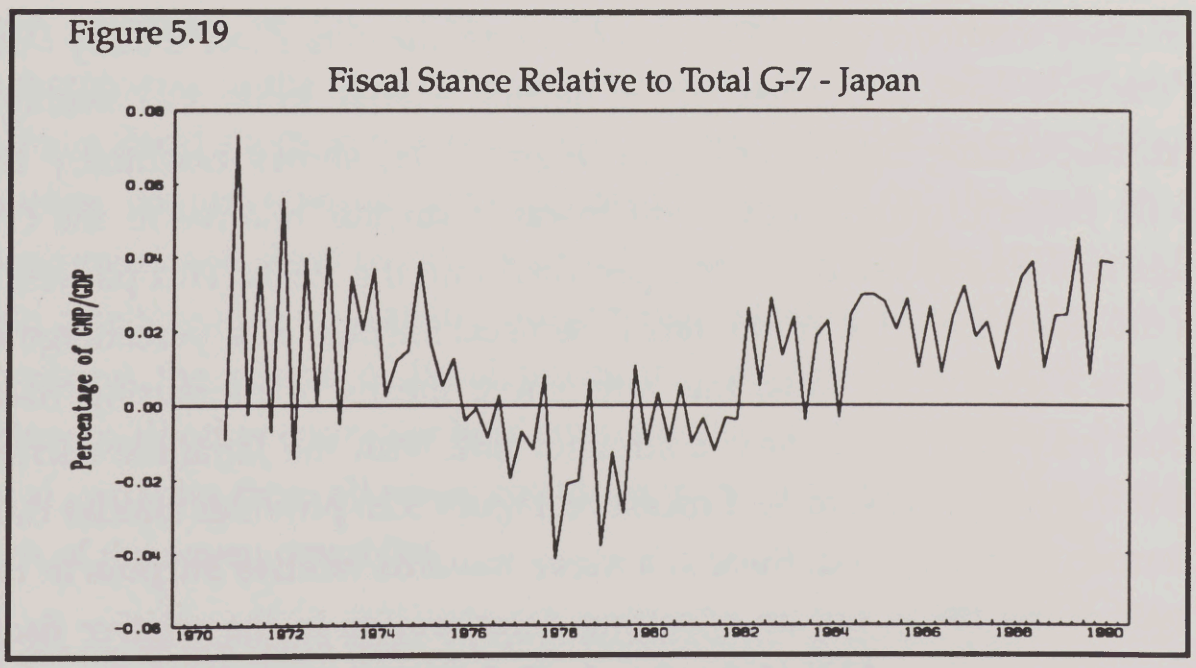


Figure 5.20

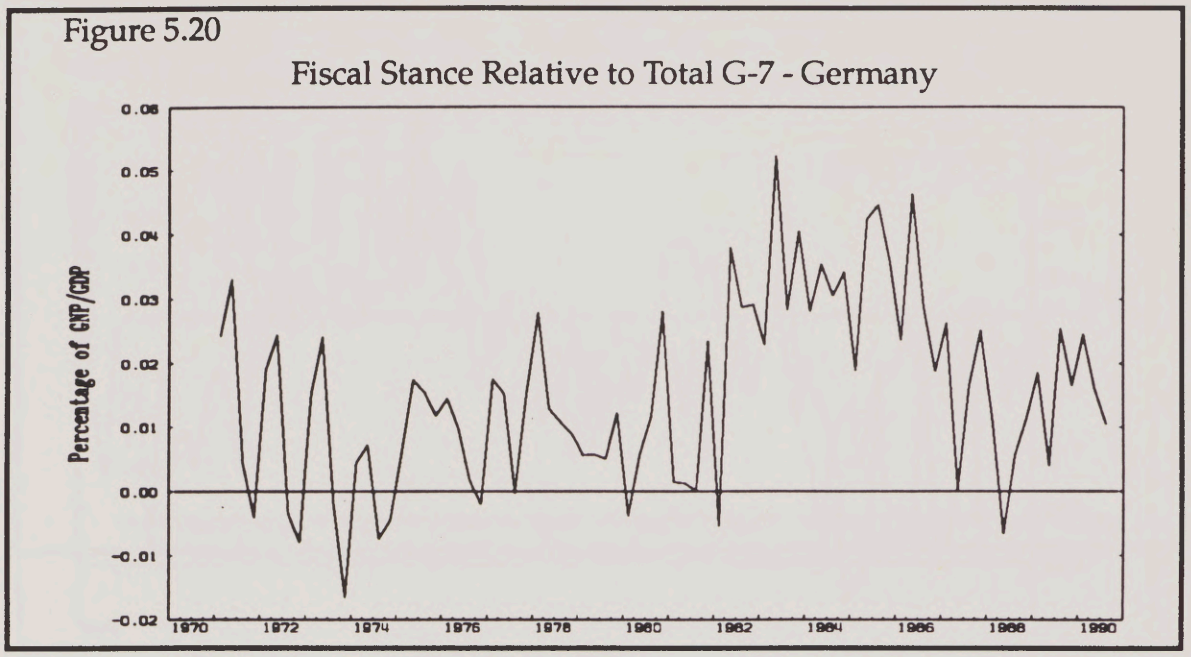


Figure 5.21

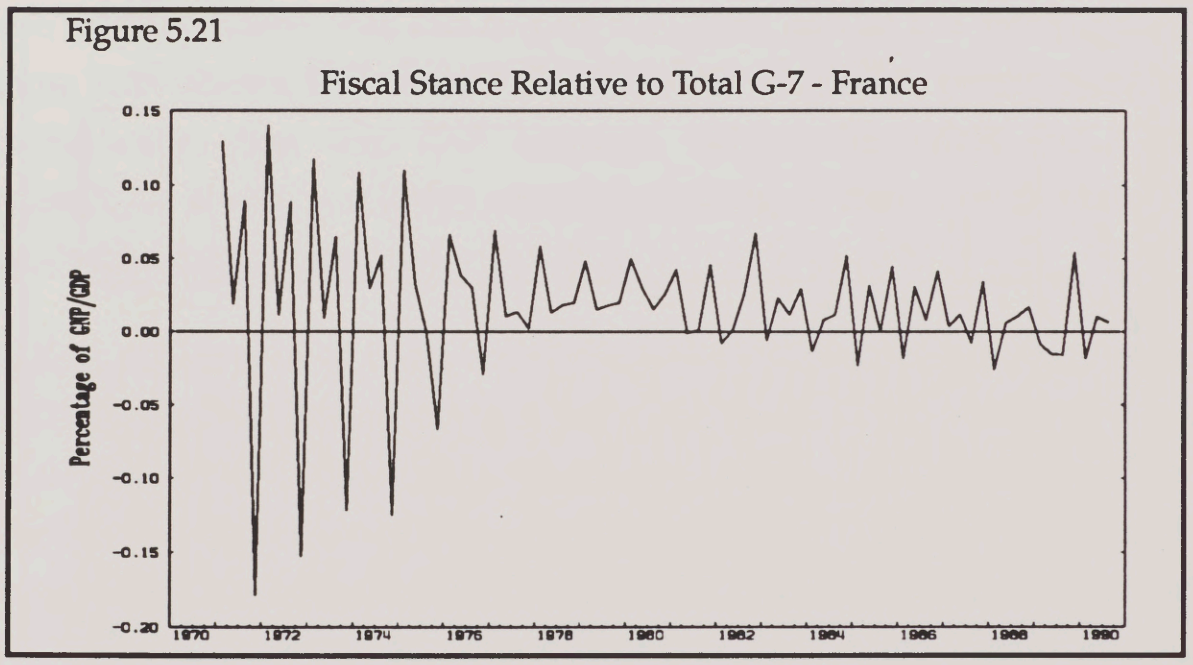


Figure 5.22

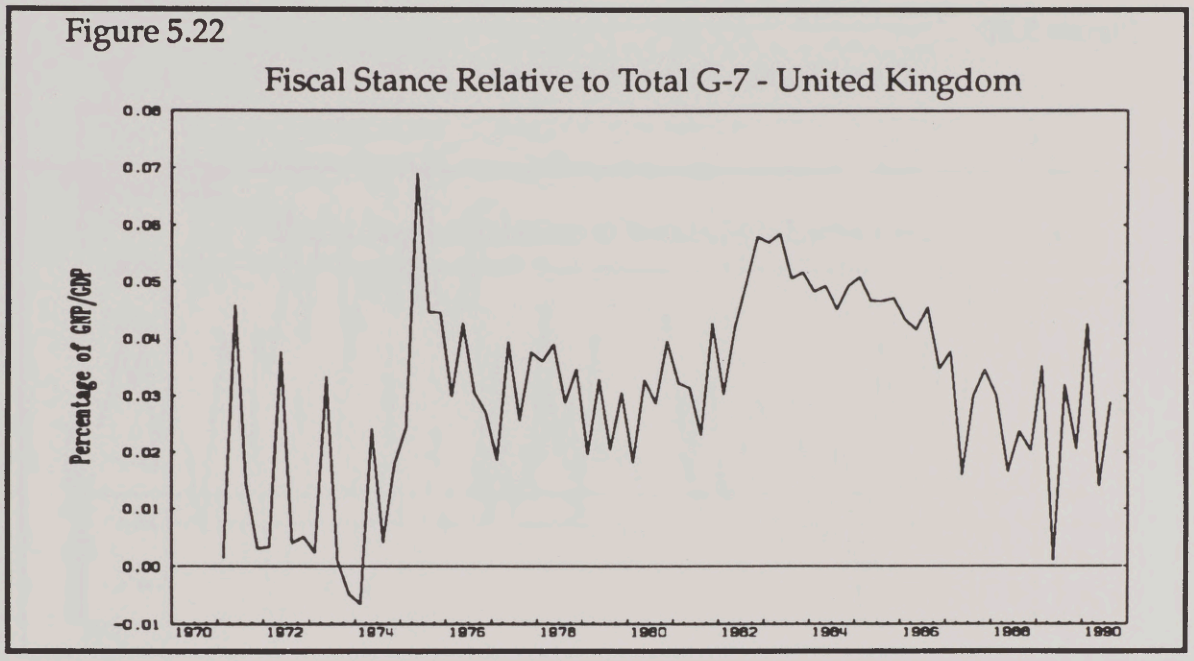


Figure 5.23

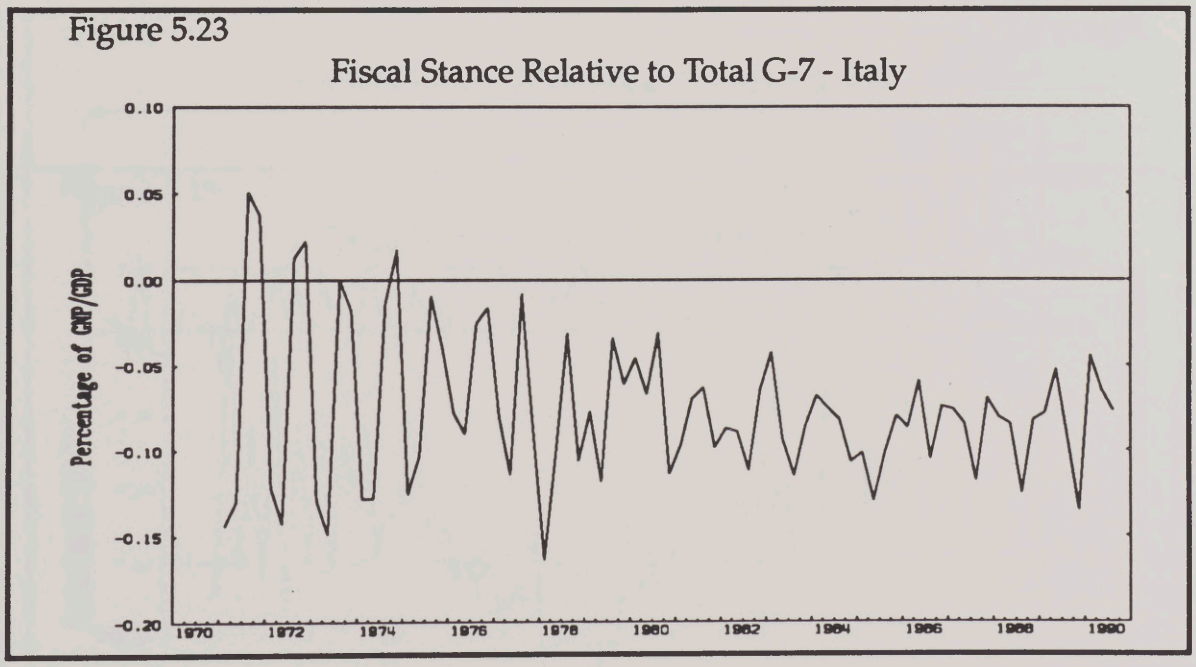


Figure 5.24

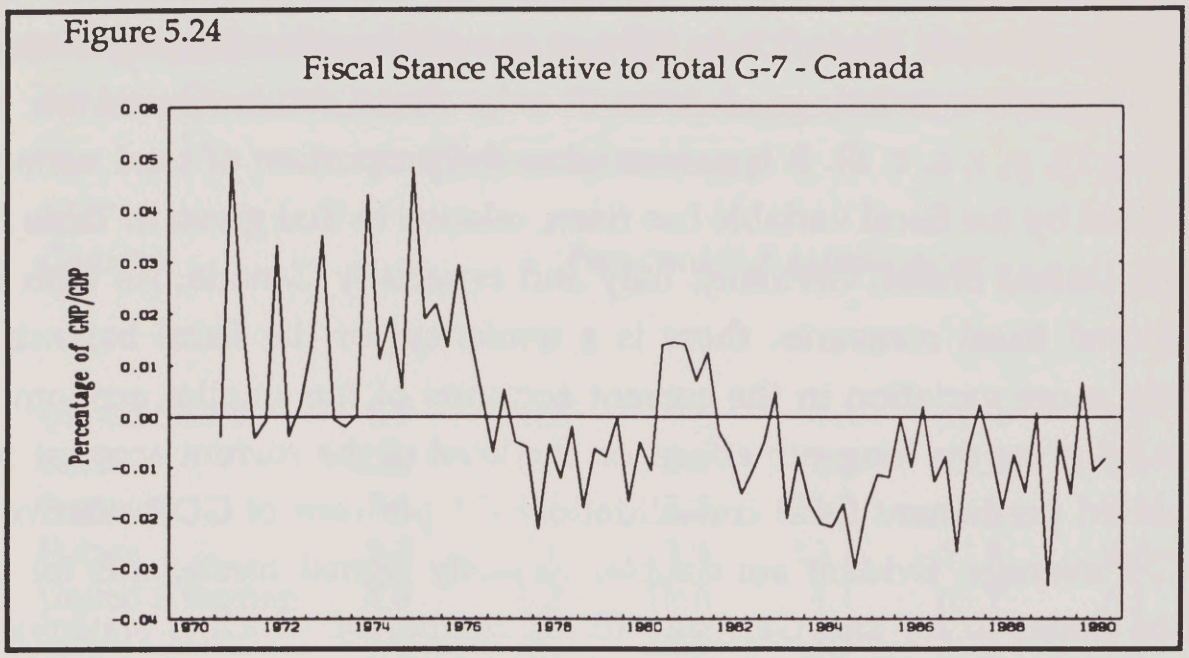


Figure 5.21 reveals that, except for some variability, the French fiscal stance corresponded well to the G-7 average throughout the period under study. The same cannot be said of the United Kingdom, however, which has shown a bias towards relative surplus since the mid-1970s (Figure 5.22). Some of this ground was lost during the latter half of the 1980s, however. Figure 5.23 shows that Italy's fiscal stance has been persistently more expansionary than the G-7 average, while the chart for Canada (Figure 5.24) shows a relative movement towards deficit in the late-1970s and no discernible trend since that time.

The first differences of these relative fiscal variables were incorporated in the VARs in place of the standard fiscal measures. The p-values of the four lags of this variable for each of the current account equations are given in Table 5.6. A comparison of these results to those in Table 5.1 reveals that the strength of the statistical link between the two deficits has increased or remained the same for all countries except the United Kingdom. In the latter case the relative fiscal measure is statistically insignificant, while the conventional measure was significant. Large increases in the explanatory power of the fiscal variable are observed for the United States, Japan and Canada.

The decomposition of variance of the current account variable for each country is given in Table 5.7. In light of the results of earlier experiments with alternative orderings, I present only those results based on the ordering (y, p, r, s, c, d). It is evident that the proportion of total variance explained by the fiscal variable has risen, relative to that given in Table 5.3, for the United States, Germany, Italy and especially Canada. As with the traditional fiscal measures, there is a tendency for the fiscal balance to explain more variation in the current accounts of the smaller economies. Table 5.8 gives the long-run effects on the level of the current account of a simulated permanent fiscal consolidation of 1 per cent of GDP, relative to the G-7 average. Evident are sizable, correctly signed coefficients for the United States (0.20) and Germany (0.10), neither of which is statistically significant according to Table 5.6. For those countries with fiscal balance - current account links that are statistically significant at the 90 per cent level or better (Japan, France and Canada), the sign of the effect is contrary to expectations. Finally, it should be noted that the apparently perverse long-run result for the United Kingdom masks the fact that in the first five periods the effect is as expected, with the current account response reaching a peak of 0.36.

Table 5.6

Significance of Fiscal Variables in Current Account Equations
Unrestricted VARs, Relative Fiscal Measures, 1972Q2-1990Q3
(p-values)

United States	0.22
Japan	0.09
Germany	0.58
France	0.09
United Kingdom	0.25
Italy	0.25
Canada	0.01

Table 5.7

Decomposition of Variance of Current Account Variables
Unrestricted VARs, Relative Fiscal Measures, 1972Q2-1990Q3
(8-quarter horizon)

Country	*Percentage Explained By:*					
	y	***p***	***r***	***s***	***c***	***d***
United States	8.9	11.2	19.8	4.3	51.9	3.8
Japan	20.8	6.9	5.4	8.2	58.2	0.4
Germany	7.8	6.1	2.7	31.3	48.8	3.2
France	5.2	7.6	3.9	13.1	67.8	2.3
United Kingdom	4.8	6.2	10.6	4.1	68.1	6.1
Italy	8.0	4.1	22.3	5.5	52.3	7.8
Canada	3.7	5.7	4.8	4.6	62.4	18.9

Table 5.8

Long-Run Current Account Response to Permanent Fiscal Consolidation
Unrestricted VARs, Relative Fiscal Measures

United States	0.20
Japan	-0.02
Germany	0.10
France	0.01
United Kingdom	-0.11
Italy	0.04
Canada	-0.16

In summary, this section has shown that the relative fiscal measures may have greater explanatory power for some countries. However, none of the results are fully satisfactory, since those that accord with our priors are statistically insignificant, while those that are contrary to expectations tend

to explain the data well. Thus, while the notion of relative fiscal stances seems to have some empirical content, it does not clarify very much the mixed results reported previously.

Sample Sensitivity

At various stages of the work presented, a tendency for a stronger link between the fiscal and external balances in the 1980s than in the 1970s has been evident. When approaching this project in the beginning, I wanted to bring as many data to bear on the issue as possible. This was necessary because the VARs use up many degrees of freedom, as there are 25 parameters to estimate in each equation. Restricting the study to the post-1979 period, for example, would have left only 18 degrees of freedom.

However, it is possible that, to the extent that behaviour has not been constant over time, the extended sample period may be hiding important correlations that have become more important in the latter part of the sample period. Notice in particular that Abell (1990) estimates his equations over the 1979Q2-1985Q2 period; although there are other differences between his study and the present one, the difference in sample period could conceivably be a key explanation for the differences in results. To examine this question, some of the exercises performed earlier were repeated for the 1975-90 and 1980-90 sample periods. These choices were made arbitrarily, rather than by giving any attention to the data themselves.

Table 5.9 compares the p-values of the standard and relative fiscal measures in the current account equations of the unrestricted VARs across the three sample periods. As noted above, the 1980Q1-1990Q3 sample period leaves only 18 degrees of freedom; however, the p-values are marginal significance levels based on F-ratios which are exact, and therefore do not depend on asymptotics for the testing of hypotheses. Thus, the p-values can be considered to be of comparable quality across the three samples. The results in Table 5.11 are mixed. For Italy and Canada, the standard fiscal measures indicate a large increase in the statistical significance of the fiscal variables as the sample period is shortened. For

Table 5.9

Significance of Fiscal Variables in Current Account Equations

Unrestricted VARs, Alternative Sample Periods

(p-values)

	72Q2-90Q3	75Q1-90Q3	80Q1-90Q3
Standard Fiscal Measures			
United States	0.44	0.19	0.25
Japan	0.35	0.13	0.24
Germany	0.71	0.61	0.93
France	0.09	0.31	0.89
United Kingdom	0.03	0.16	0.09
Italy	0.27	0.41	0.15
Canada	0.43	0.21	0.05
Relative Fiscal Measures			
United States	0.22	0.09	0.59
Japan	0.09	0.27	0.06
Germany	0.58	0.75	0.26
France	0.09	0.30	0.97
United Kingdom	0.25	0.35	0.68
Italy	0.25	0.52	0.13
Canada	0.01	0.02	0.11

the United States and Japan, the strongest results are obtained over the 1975-80 period; nevertheless, the significance is higher for the 1980s than for the full sample period. For France and Germany, on the other hand, there is a clear deterioration in significance as the sample period is shortened. The results based on the relative fiscal measures show an even less obvious pattern. While the 1980s give stronger evidence in favour of the TDH than does the full sample period for Italy and Germany, for the remaining countries the opposite is true. Also, the addition of the 1975-79 period to the regressions based on the 1980s only reduces the significance of the fiscal variables for some countries and raises it for others. These results may be taken to support the view, expressed above, that the two

balances may or may not be correlated, depending on the prevailing circumstances at the time of the shock.

Table 5.10 reports the proportion of total variance of current account variables explained by the traditional and relative fiscal measures over the three sample periods. In 12 of 14 cases the fiscal measures explain more of the variance of current account balances over the 1980s sample period than over the full sample period. As for the comparison between standard and relative fiscal measures during the 1980s, in four cases out of seven the standard measure has higher explanatory power, while for the remaining three countries the reverse is true. These inferences, of course, may be quite fragile, since very few of the blocks of coefficients are statistically significant at conventional confidence levels.

Table 5.10

Percentage of Variance of Current Account Variables Explained by Fiscal Variables

Unrestricted VARs, Alternative Sample Periods
(ordering: y, p, r, s, c, d; 8-quarter horizon)

	72Q2-90Q3	75Q1-90Q	80Q1-90Q3
Standard Fiscal Measures			
United States	2.6	3.6	11.2
Japan	1.4	2.9	4.8
Germany	1.8	2.1	7.5
France	3.4	2.9	8.3
United Kingdom	9.6	8.6	22.9
Italy	7.1	4.7	12.8
Canada	6.7	12.1	18.9
Relative Fiscal Measures			
United States	3.8	5.1	4.2
Japan	0.4	1.4	7.9
Germany	3.2	5.2	9.3
France	2.3	3.3	5.0
United Kingdom	6.1	5.4	4.4
Italy	7.8	4.2	11.9
Canada	18.9	18.3	25.2

While the results of these sample-sensitivity tests are mixed, they nevertheless leave the qualitative impression that the TDH is more evident in the 1980s data than in the data for the 1970s. This finding may indicate greater variability among the variables of interest - in other words, more and/or larger fiscal shocks - or may perhaps reflect an increase in international capital mobility resulting from efforts by some countries to liberalize cross-border financial transactions. The implications of these two explanations are very different. The former would suggest that the TDH may only be evident when shocks are large, and therefore may be less of a consideration for the future than it is for the 1980s. The latter interpretation would suggest that the stronger results for the 1980s could be expected to persist into the future, regardless of the magnitude of fiscal shocks. Very little can be said on this issue with the data at hand.

CONCLUSION

In this paper I have reviewed the evidence in favour of the twin deficits hypothesis. Because the inferences varied according to the country, sample period and methodology used, the evidence of a systematic link between fiscal and external balances is not compelling. Nevertheless, it is apparent that the twin deficits hypothesis is not empirically empty either. In instances where statistically significant evidence was uncovered, however, it was always the case that the link was substantially less than proportional. Elsewhere in the literature, stronger evidence has been found in estimated structural empirical models. Yet even in those models most estimates of the response of external balances to domestic fiscal shocks lie around one-half. Research based on non-structural models, as conducted here, generally indicates a substantially weaker linkage. Furthermore, the evidence strongly suggests that the situation varies across countries. Thus, a rule of thumb might be that the coefficient linking the two deficits lies somewhere between zero and one-half. However, the finding that inferences in this literature may be heavily influenced by events of the 1980s should make one wary of counting on such a relationship to hold in all circumstances in the future. Indeed, the most prudent approach probably would be to examine each fiscal episode independently.

The foregoing suggests several avenues for future research. First, it may be useful to attempt the construction of cyclically adjusted current account balances, complementary to existing similar measures of fiscal balances, to see whether the correspondence between the two would be greater or less than in the standard data. This adjustment might also be expected to reduce the sensitivity of variance decompositions to the ordering issue. Second, in terms of econometric methodology, it is important to clear up the question of stationarity in the data, as Rosensweig and Tallman (1991) have found much stronger evidence of the twin deficits linkage in levels data than in differenced data.

References

Abell, John D. 1990. "Twin Deficits During the 1980s: An Empirical Investigation." *Journal of Macroeconomics* 12: 81-96.

Ahmed, Shughil. 1986. "Temporary and Permanent Government Spending in an Open Economy: Some Evidence for the United Kingdom." *Journal of Monetary Economics* 17: 197-224.

Ahmed, Shughil. 1987. "Government Spending, the Balance of Trade and the Terms of Trade in British History." *Journal of Monetary Economics* 20: 195-220.

Andersen, Palle S. 1990. *Developments in External and Internal Balances: A Selective and Eclectic Review.* BIS Economic Papers, no. 29. Basel: Bank for International Settlements.

Barro, Robert J. 1989. "The Ricardian Approach to Budget Deficits." *Journal of Economic Perspectives* 3: 37-54.

Bernheim, B. Douglas. 1989. "A Neoclassical Perspective on Budget Deficits." *Journal of Economic Perspectives* 3: 55-72.
sizablemulti countrymulti country
Carroll, Chris and Lawrence H. Summers. 1987. "Why Have Private Savings Rates in the United States and Canada Diverged?" *Journal of Monetary Economics* 20: 249-79.

Dewald, William G. and Michael Ulan. 1990. "The Twin-Deficit Illusion." *Cato Journal* 9: 689-707.

Ebrill, Liam P. and Owen Evans. 1988. *Ricardian Equivalence and National Saving in the United States.* IMF Working Paper WP/88/96. Washington: International Monetary Fund.

Enders, Walter and Bong-Soo Lee. 1990. "Current Account and Budget Deficits: Twins or Distant Cousins?" *Review of Economics and Statistics* 72: 373-81.

Evans, Paul. 1985. "Do Large Deficits Produce High Interest Rates?" *American Economic Review* 75: 68-87.

Evans, Paul. 1986. "Is the Dollar High because of Large Budget Deficits?" *Journal of Monetary Economics* 18: 227-49.

Evans, Paul. 1987a. "Do Budget Deficits Raise Nominal Interest Rates? Evidence from Six Countries." *Journal of Monetary Economics* 20: 281-300.

Evans, Paul. 1987b. "Interest Rates and Expected Future Budget Deficits in the United States." *Journal of Political Economy* 95: 34-58.

Evans, Paul. 1988. "Are Consumers Ricardian? Evidence for the United States." *Journal of Political Economy* 96: 983-1004.

Feldstein, Martin. 1982. "Government Deficits and Aggregate Demand." *Journal of Monetary Economics* 9: 1-20.

Frenkel, Jacob A. and Assaf Razin. 1987. *Fiscal Policies and the World Economy.* Cambridge: MIT Press.

Helliwell, John F. *Fiscal Policy and the External Deficit: Siblings but Not Twins.* Working Paper No. 3313. Cambridge, MA: National Bureau of Economic Research.

Johnson, David. 1986. "Consumption, Permanent Income, and Financial Wealth in Canada: Empirical Evidence on the Intertemporal Approach to the Current Account." *Canadian Journal of Economics* 19: 189-206.

Knight, Malcolm D. and Paul R. Masson. 1988. "Fiscal Policies, Net Saving and Real Exchange Rates: The United States, the Federal Republic of Germany, and Japan." In *International Aspects of Fiscal Policies*, edited by Jacob A. Frenkel, 21-66. Chicago: University of Chicago Press.

Kuszczak, John and John D. Murray. 1987. *A VAR Analysis of Economic Interdependence: Canada, The United States, and the Rest of the World.* Technical Report 46. Ottawa: Bank of Canada.

Leiderman, Leonardo and Assaf Razin. 1988. "Testing Ricardian Neutrality with an Intertemporal Stochastic Model." *Journal of Money, Credit and Banking* 20: 1-21.

Rosensweig, Jeffrey A. and Ellis W. Tallman. 1991. *Fiscal Policy and Trade Adjustment: Are the Deficits Really Twins?* Working Paper 91-2. Atlanta: Federal Reserve Bank of Atlanta.

Roubini, Nouriel. 1988. *Current Account and Budget Deficits in an Intertemporal Model of Consumption and Taxation Smoothing: A Solution to the "Feldstein-Horioka Puzzle"?* Working Paper No. 2773. Cambridge, MA: National Bureau of Economic Research.