The Current Account and Foreign Debt

John Pitchford

ROUTLEDGE

The current account and foreign debt

It is often assumed that current account deficits are intrinsically bad and in need of correction *The Current Account and Foreign Debt* argues that this is, at best, misleading The author analyses a broad range of issues in support of this argument. These include:

- Approaches to current account balance
- Short run issues
- Longer run issues
- Policy

The book can be read as an integrated whole or, alternatively, each chapter can be consulted without reference to the others. *The Current Account and Foreign Debt* provides the counterbalance to a common misapprehension in economic theory. It will be a valuable guide for all those interested in international monetary theory.

Professor **John Pitchford** has held a chair of economics at the Australian National University since 1965. His fields of interest include population economics, inflation, economic growth and international monetary economics.

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Preface

At the end of the last year of my undergraduate degree at the University of Tasmania, I applied for a rather prestigious postgraduate scholarship. The interview took place in Government House and was chaired by none other than the Governor of the State. The United Kingdom had experienced repeated balance of payment and currency crises following World War II and with the collapse of wool prices after the Korean war, Australia had recorded a current account deficit of over 15 per cent of GDP. 'Why', the Governor (a citizen of the United Kingdom) asked me, 'are politicians so concerned about a trade deficit when it means that a country is acquiring a greater value of goods than it is sending abroad?' My courses had not prepared me for this. Current account deficits had to be 'corrected'. I answered in terms of balance of payments crises and the need for exchange rate devaluation, but I could see he was not impressed. This was a time before analyses of foreign investment such as that by Kemp (1962) had made explicit the advantages of current account and trade deficits. The identity establishing the connection between the current account deficit and the excess of investment over saving was not in common use and ideas of intertemporal optimising were not touched on in undergraduate courses. I knew he had a point and resolved to find the answer one day.

In the late 1970s the Australian current account deficit moved from around 2 to 4 per cent of GDP and foreign indebtedness as a percent of GDP started to rise. By the mid 1980s many in authority were talking about the need for monetary and fiscal policies to restrain the current account deficit. Nominal interest rates reached 18 per cent by early 1989 and were over 10 per cent in real terms. Australia had floated its exchange rate in December 1983 so that the justifications for this in terms of balance of payments deficits and currency crises, whatever their validity, were not applicable. It was time to look for an answer to the Governor's question.

Not that the answer was particularly hard to find, at least when conventional wisdom was discarded. An economy that has a current account deficit is absorbing a greater value of goods than the value of its income. Consequently it is increasing its indebtedness to foreigners and had better be prepared to meet the obligations of this indebtedness if it did not wish to

suffer the consequences of default. In the case where borrowing has been used to finance investment that earned rates of profit at least as high as abroad, the expectation would be that it could discharge its debt obligations. The presumption is that market forces would achieve this in the case of private sector borrowing. Problems might well be created for future generations if the foreign borrowing originated from government consumption. For poor countries with little to lose, it might even be optimal to go into debt to foreigners and subsequently default. In short, current account imbalances allow international and intertemporal trade in saving. As a consequence, policy toward current account deficits and foreign indebtedness cannot be evaluated simply by looking at the size of these magnitudes. If there were problems in their generation, these need to be evaluated at their source and in their own right. However, this was a message that was not readily accepted by policymakers and some economists, at least until the Australian economy was deeply into one of the most severe and prolonged recession since the 1930s.

This book is a selection from my tool kit for working on and understanding these and other important issues in international monetary economics. I have used much of this material in graduate and honours courses in this field to supplement and codify journal articles. Feedback from successions of students is gratefully acknowledged. The list of references will make clear some of the intellectual debt I owe to the originators of the key ideas in international monetary economics in the last several decades. Chapters 4, 5, 6 and 7 are based on five papers I have previously published, but for the most part this material has been substantially rewritten and extended. I am pleased to be able to include Chapter 9 by George Fane and Craig Applegate on the question of optimal and negotiated default. I am also grateful to colleagues Neil Vousden and Ngo Van Long for many discussions about the theory of open economy macroeconomics and economic growth. Some of the more intricate diagrams were prepared by Clare Martin. Tracy Chang, Yvonne Dunlop and Betty Pitchford checked drafts and proofs. I should also thank Bob Gregory in the Economics Programme in the Research School of Social Sciences, Australian National University, for providing resources, facilities and an atmosphere conducive to writing and research.

John Pitchford
Canberra
August 1994

Part I

Introduction

Chapter 1

External balance

Aside from national income and employment, few macroeconomic aggregates have received the prominence that is commonly accorded to the current account balance. The objective of this book is to elucidate the significance of this account in the balance of payments.[1] Other macro magnitudes which governments attempt to influence, such as unemployment, growth and inflation, have welfare implications that are reasonably intuitive. The current account balance, being the net outcome of sources and uses of foreign currency for 'current' purposes, is much less transparent. Indeed, it is curious that an imbalance on the current account in the balance of payments is sometimes regarded as detrimental and sometimes beneficial depending on the focus of the analysis. In particular, if the current account balance is viewed as a net use of foreign exchange, deficits have often been taken to signal problems for macroeconomic policy, particularly exchange rate management. On the other hand, when a perspective recognising that current account imbalances allow for differences to exist between national investment and saving is taken, a favourable judgement is often made. From this viewpoint it identifies the potential for a more efficient use of world saving made possible by financial capital mobility. Another interpretation stems from the fact that current account imbalances are the source of a country's net obligations to foreigners. Net indebtedness to foreigners is sometimes held to be a burden for domestic residents. Because these different perspectives on the current account are connected by identities, divergent judgements on its ultimate net benefit cannot all be right. Moreover, it is important to be clear about these issues because governments have often used a variety of macro- and microeconomic policies to affect current account balances.

To understand whether there are circumstances that might justify such policy intervention, it is necessary to analyse the various roles taken by the current account and related magnitudes. In the first section of this chapter the current account is considered as one source of net supply of foreign exchange. In the second section it will be looked at as the source of trade in saving and, in the third section, from the viewpoint of the net foreign indebtedness it generates. The fourth section outlines the content of the

various chapters, and various conventions that will be followed are set out in the final section.

I. THE CURRENT ACCOUNT AS A NET SOURCE OF FOREIGN EXCHANGE

The Bretton Woods Conference in 1944 established a system of adjustable pegged exchange rates by which balance of payments disequilibria of a short term nature were to be accommodated by fluctuations in reserves and those regarded as 'fundamental', which must have meant long term, by changing exchange rates. The period following World War II was characterised by a need for the reconstruction of many economies damaged by war and their conversion to peace time needs. This underlying shortage of physical capital was accompanied by controls on the movement of financial capital and controls over the convertibility of sterling and other currencies into US dollars. In these circumstances of pegged exchange rates and controls on capital flows, managing an economy to avoid exchange rate crises became an important part of macroeconomic policy, particularly for deficit countries. The objective of 'external balance' was added to those of full employment and low inflation.

When international flows of financial capital are tightly and effectively controlled, the current account balance becomes the only factor making for fluctuations in the balance of payments. If current account transactions imply a greater demand for foreign exchange than supply at the given exchange rate, this deficit can be made up either by borrowing from foreigners (capital inflow) or depletion of reserves of foreign currency. The current account balance is then a critical variable for economic policy. If the current account deficit is persistently greater than the available capital inflow, one or both of these policies must be adopted to reduce this deficit, or the exchange rate must be adjusted. In such a system it is natural for macro policy to aim at some target value of the current account which would avoid the running down of reserves and currency crises associated with persistent balance of payments deficits. Because shifting levels of international financial capital flows can also produce balance of payment disequilibrium at a given exchange rate, there is a tendency for governments to try to control these flows directly in a pegged rate system. However, the practical difficulties of managing this mean that when the exchange rate appears overvalued, unregulated capital movements speculating on devaluation will exacerbate the balance of payments problem.

'External balance' should mean balance of payments equilibrium, which in turn translates into a reasonably stable level of reserves in the short run.[2] However, because of the circumstances described above it was frequently interpreted as 'current account equilibrium'. In the context of pegged rates and limited capital mobility this could be taken to mean that balance on the

current account which is consistent with the available capital inflow. In practice, little care was exercised in specifying the nature of the target. Frequently, the target balance in theoretical exercises was taken to be zero because this was analytically convenient. Another possible reason why a zero balance could often have been chosen is that it features in the classical specie flow mechanism for the adjustment of international payments imbalances suggested by David Hume.[3] To illustrate this, suppose that countries peg their exchange rates to gold and also, importantly from the present point of view, do not engage in international borrowing and lending. An exogenous rise in imports by one country will produce a current account and balance of payments deficit financed by an outflow of gold. According to the quantity theory of money, this would lower prices at home and raise them abroad. In turn, this would reduce imports and stimulate exports so restoring the current account balance to zero.[4] However, the equilibrium level of the current account is zero only because of the assumption that there are no long run capital flows between the countries. In the contrary case where a country is borrowing from (lending to) the rest of the world, the equilibrium current account balance will be a deficit (surplus) which matches this capital inflow (outflow).

The conventional wisdom that the current account balance had to be managed so as to achieve some target value reached its zenith in the 'internal/external balance' open economy model. Using this structure it was argued that the manipulation of two policy instruments, for example wage and expenditure policy, could achieve both zero domestic excess demand and the target level of the current account. It may have been an appropriate analysis for the particular circumstances of pegged exchange rates and limited and/or controlled financial capital mobility, but it was not universally valid. Whether the exchange rate is pegged or floated and whether financial capital flows between countries are free or constrained makes a great deal of difference to the significance of the current account for macroeconomic policy. If exchange rates are market determined and financial capital is highly mobile between countries, any given current account balance can be accommodated without pressure on reserves.

Although exchange rates were pegged, they could be altered in the face of a long term disequilibrium in the balance of payments. Exchange rate adjustments were then an additional instrument for the achievement of external balance. Hence an important question was thought to be whether a devaluation of the exchange rate would help reduce a balance of payments deficit.[5] If longer run capital inflow was taken to be given this amounted to the question of whether a devaluation would reduce the current account deficit (or as was often said 'improve' the current account). It was not uncommon for countries that devalued to find that their current account deficit did not fall, or even increased. There are many reasons why this might happen.[6] For example, if the country was a net debtor with a large

proportion of its foreign liabilities denominated in foreign currency, a devaluation would increase the domestic currency value of the net interest item in the current account and this effect could dominate any tendency for a fall in trade balance. Beyond this, doubt was often expressed about whether an exchange devaluation would reduce the trade balance. Devaluation is liable to make exports cheaper in foreign currencies and imports dearer in domestic currency thus increasing the former and decreasing the latter. However, the rise in the domestic currency price of imports could mean that the value of imports could rise despite the fall in volume. It could even be that this effect could outweigh both volume effects and so result in a rise in the trade balance.

Hence, an important question, particularly for pegged exchange rate regimes was whether devaluation would reduce a trade deficit. Its answer depended in the standard simple cases on the size of elasticities of demands by domestic and foreign residents for imports. If a particular elasticity condition, often referred to as the Marshall/Lerner condition, were satisfied the trade balance would 'improve', that is deficits would fall and surpluses would rise. There were many who felt that elasticities were too small to satisfy this condition, a view referred to as 'elasticity pessimism'. They saw the possibility that deficit countries could be trapped in perpetual disequilibrium by this perceived 'failure of the price mechanism'. The way out was taken to be through regulations and controls such as subsidies to exports and duties and quotas on imports and macroeconomic measures to reduce the deficit.[7]

The Bretton Woods system survived for close to thirty years, coming to an end in the early 1970s when major currencies were floated. However, it is interesting that there is little evidence that, in this era of pegged rates, economies were managed according to the tenets of the external/internal balance model. Rather, this period was characterised by recurring currency crises in countries with current account and balance of payments deficits who were frequently forced to devalue by 'speculative' capital flows.[8] Deficit countries were reluctant to depreciate and surplus countries felt no pressure to appreciate. When reserves have begun to fall, by what criterion can it be judged that the process is short or long term? It was difficult, perhaps impossible, for governments to recognise when a balance of payments situation had reached the stage of 'fundamental disequilibrium' which under the Bretton Woods arrangements would justify an exchange rate adjustment. It was perhaps equally difficult for them to admit the potential existence of a long term problem, given the loss of international prestige that this involved.[9]

Policy towards external balance appeared more like opportunistic reaction to external pressures on the balance of payments rather than the rational choice of instruments to move the economy towards equilibrium. Economies with current account deficits were regarded as being in economic

difficulty while those in surplus were judged to be fortunate and successful. In the context of shortages of world capital this correctly reflected the ease of access of investment to saving. However, the habit of judging economic performance in this way was carried over quite inappropriately to periods in which capital shortages were not pressing and even to the era of floating exchange rates and highly mobile international capital.

The Bretton Woods system was a product of its times. The competitive devaluations of the inter-war period and the concern that floating might engender 'destabilising speculation' against currencies had given the concept of market determined exchange rates a bad name. In the sense that it was a way of avoiding these feared consequences, the Bretton Woods system was a success. However, it is not clear that it was an unqualified success. Regulations on capital flows, exchange rates and trade may have had some value in preventing post World War II shortages from spilling over into inflation, but probably only for a transition period. The costs in terms of the misallocation of resources from disequilibrium levels of real exchange rates, the periodic currency crises of the deficit countries and the low morale which they thereby suffered were all produced by the artificial way of determining the relative price of currencies. Although surplus countries were regarded as economically fortunate, they too suffered from resource allocation losses due to exchange rate settings that did not always reflect fundamentals. Some of the habits of thought of this system have continued into the present era of significant exchange rate flexibility and capital mobility.

II. THE CURRENT ACCOUNT AS A SOURCE OF TRADE IN SAVING

In the case of a floating exchange rate system with reasonably freely mobile capital the balance of payments is brought to equilibrium by market forces. Exchange rates move to equate the sum of net demands for foreign currency on current and capital account to zero. Currency crises in the old form do not exist. From time to time large changes in rates may be necessary, but these are judged to be adverse only where they appear inconsistent with 'market fundamentals'. It is not necessary for the current account deficit to be a target for macroeconomic policy in the sense of external balance. Macroeconomic policy is free to pursue internal balance. Nevertheless, some governments continued to operate with the modes of analysis of the Bretton Woods era in the age of floating rates, arguing that current account imbalances should be 'corrected' by standard macro policies. Examples are not hard to find. For instance, although the Australian dollar was floated in December 1983 the Reserve Bank of Australia Report for 1988 argued:

> Australia's external imbalance and the high level of external debt were major issues for general economic policy throughout 1987/88. It was of

> some concern, therefore, that strong domestic demand boosted imports over the year. Also in the second half of the year, earnings and prices appeared to be growing uncomfortably quickly, threatening the downward course of inflation and the improving trend in the balance of payments.
>
> The tightening of monetary policy in the second half of the year was in response to those developments.
>
> (*Reserve Bank* 1988:8)

Made six years after the Australian dollar had been floated, this assessment embodies views about the role of the current account better suited to the context of pegged than of floating rates. For a start, the notion of an 'improving trend in the balance of payments' would seem to have little or no meaning in a flexible rate context. The balance of payments is brought to zero by capital flows and exchange rate changes. The reference to external debt shows that it is the *current account* not the balance of payments deficit that was the focus of concern. In a floating rate system it does not automatically follow that a rising current account deficit is a problem requiring correction. To establish this it would be necessary to identify some significant source of cost which it produces. In addition, the quote shows that monetary restraint was used to target the current account deficit.

Underlying the discussion of the balance of payments problems of the Bretton Woods era was the question of the appropriate level of the current account (or equivalently the capital account) balance. As has been noted, it was not unusual to take it as zero or leave it vague. The current account deficit can be shown to be identically equal to the excess of private investment over private saving plus the government fiscal deficit. Leave discussion of this last item aside for the moment by assuming it zero. The appropriate size of the current account deficit is then determined by the appropriate size of the excess of investment over saving in the private sector. It is unlikely that this would be zero. The boundaries of countries are products of history and geography that may have little to do with the economic factors determining the profitability and thrift of nations. If it were claimed that a country should finance its investment entirely out of its own saving, then would not the principles involved apply also to regions within nations, to the different generations and to individuals? In consequence, borrowing and lending, the essence of the capitalist system, would be prevented.

In fact, the private component of current account imbalances measures the extent to which countries trade in saving. Countries whose age structure or other circumstance make them relatively high savers may not find sufficient investment opportunities at home that are as profitable as those abroad. Countries with profitable investment opportunities but relatively low saving may well benefit from borrowing from abroad. This process of

foreign investment or capital importing and exporting can be shown to be normally of benefit to both borrowers and lenders. Just as the appropriate supply of eggs is a matter which *prima facie* is best left for market forces to solve, the appropriate level of the excess supply of saving, or current account balance, is that which is determined by the market.

Qualifications can be made to this, but they need to be mentioned more by way of recalling other principles of economic management rather than as basic modifications of the fundamental principle. First, an economy experiencing an investment boom that threatens to produce inflation may well have a larger current account deficit than otherwise. This is a matter for internal not external balance. When an economy experiences demand for domestic output in excess of supply, a variety of variables will have values which do not accord with their equilibrium levels. Nevertheless, these further problems will be cured when equilibrium is restored between the demand for and supply of domestic output. In a similar way, externalities in and distortions to all sorts of economic processes can cause a country's current account deficit and all other endogenous magnitudes to vary. Suppose that some distortion due to the tax system causes saving to be lower than otherwise. The costs and benefits of reforming the system to remove the source of the distortion should be assessed. This process is probably not enlightened by direct examination of and policies to affect the current account deficit. On the contrary, it is better that it concentrates on the source of the distortion and suitable remedies for that.

Secondly, if a decision has been made to peg the exchange rate, circumstances may well occur in which macroeconomic and other policies are needed to control the current account balance. The art of this practice requires economic managers to be able to tell whether falls in reserves arise from fundamental or short term considerations. When the managers believe they are short term but the market believes they are fundamental, control of the current account balance rather than devaluation may well be appropriate. The source of this problem is the exchange rate system that requires guesses to be made about exchange rate determinants.

If then the appropriate current account deficit is normally the level determined by the market, why do current account imbalances get such a bad press? One reason has already been examined. These imbalances figure importantly in the process of managing an adjustable peg (or heavily managed) exchange rate system. But it can be seen that this obscures the true significance of the deficit, namely as a measure of international trade in saving. There are other possible reasons, though they are even less persuasive than the exchange rate management one. Issues of trade and the current account imbalance between the US and Japan amply illustrate this. For much of the 1980s the combined value in US dollars of the current account surpluses of Japan and West Germany closely matched the US deficit. In part at least, the United States deficit was due to their large fiscal deficit. A

dispassionate observer might conclude that the surpluses of Japan and West Germany were of considerable assistance to the United States in financing its fiscal deficit. Yet vocal opinion in the United States has maintained that Japan is a culprit in these matters and should consume more US products so as to increase its imports and reduce the US trade deficit.[10] Of course, there is no good reason why particular countries should balance their trade against each other. If the real issues are the merits and demerits of Japanese trade policies or US farm policies, there is no logical alternative to concentrating on these rather than irrelevant issues of essentially meaningless bilateral trade balances.

The government's fiscal deficit is an issue of considerable importance in its own right and is best treated as such. Incidentally, it is definitionally related to the current account deficit. Governments can benefit from trading in saving just as private agents can. For example, it is not clear that investment in public infrastructure which may benefit future as well as present generations should be financed by taxation which falls solely on the present generation. Fiscal deficits have a definite role in this sense and also, some would argue, as a way of stimulating recovery from recession. On the other hand, governments often benefit politically from higher spending and lower taxes so that there is a tendency for them also to run deficits for political rather than economic reasons.

Although from the national income identity there is a close association between fiscal and current account deficits, it does not follow that a change in the fiscal deficit will imply an exactly or even approximately equal increase in the current account deficit. Changes in government expenditure and tax rates will induce changes in private saving and investment which will also change the current account. On the other hand changes in private saving and investment will in turn bring about changes in tax revenue and activity related government spending. However, it is probably the case that a programme of sustained fiscal deficits could result in sustained increases in the current account deficit. The fact remains that in all these cases the problem is best treated at its source, which is the fiscal deficit. Attempts to control the current account outcome will have little effect on the origin of any difficulty.

III. NET FOREIGN INDEBTEDNESS

From the standpoint of the capital account side of the balance of payments identity, the history of current account balances is often judged by claims that levels of foreign indebtedness are 'too high'. Again the argument has no content unless some distortion or externality causing actual or potential loss of welfare can be identified. If this can be done, progress is made in understanding and dealing with the problem by concentrating on the externality the debt involves, rather than just on its level. For example, some nations may have reasons to fear political domination by foreign countries

who invest heavily in their industries. Governments may encourage excessive levels of private investment and so foreign borrowing, by explicit or implicit promises of support in times of financial difficulty. Alternatively, it could be that governments might threaten nationalisation or publicly controlled default so that the expected return to lenders is thereby reduced and investment discouraged. The current account deficit is then lower than otherwise. Until the precise nature of such a problem is identified it is not obvious how best to tackle it. Blanket efforts to decrease foreign debt by actions to reduce current account deficits could do more harm than good in that they do not distinguish between debt supported by government guarantee and that engaged in on the basis only of commercial risk.

The private sector will contribute to an increase in foreign debt if private investment exceeds private saving. Basically, all investment is financed by some form of borrowing.[11] Foreign private borrowing is different in that it will involve 'exchange risk' for either borrower or lender and 'sovereign risk' because of the difficulties lenders might have in enforcing their rights in domestic courts and because of the danger of some form of nationalisation. However, agents transacting in foreign exchange can hedge against currency movements and lenders can impose a premium to cover any special risks associated with country specific default problems. These risks may well raise the cost of borrowing to domestic firms, but given that, foreign borrowing for investment is not different from domestic borrowing.[12] Privately generated foreign debt would be backed by capital with an earning rate and expectation of default probably not significantly different from those of the average for the economy. Statements about the level of a country's private foreign indebtedness are pointless without some statement about the asset backing they involve.

Government debt like government fiscal deficits is an issue in its own right. Governments that run fiscal deficits may finance them by borrowing from domestic agents or foreigners. Hence a government that borrows from foreigners will owe debt to foreigners and the taxpayers will be liable ultimately for the servicing of that debt. This was typically the way in which the 'Third World Debt' was acquired in the 1970s. At the other extreme, governments can finance deficits by selling debt to domestic residents which can lead to a situation where entrepreneurs are forced to borrow abroad to finance private investment. There is no simple correlation between fiscal deficits and government holdings of foreign debt nor between private deficits (the excess of private investment over private saving) and private indebtedness.[13]

IV. OUTLINE

This book has been written as a reaction against the view that current account deficits are intrinsically bad and in need of correction.[14] To this end the second chapter sets out the definitions necessary to an understanding of

balance of payments issues and then outlines a history of how approaches to the concept have evolved to meet changing circumstances and institutions. This completes the introduction begun with the present chapter. The remainder of the book is divided into an analysis of short run issues, longer run issues and questions of policy.

Two short run topics are considered. The first is the old problem of whether devaluation of the real exchange rate will reduce a trade deficit. As has been noted, this question was often phrased in the form of whether it would 'improve' the trade balance, by which the author meant reduce a trade deficit or increase a surplus.[15] Judgemental terms such as this abound in international monetary economics. Unfortunately, they often imply a welfare judgement which is by no means generally warranted and so will not be used here.[16] The standard answer, that the outcome of devaluation for the current account depends on the size of various trade elasticities (the Marshall/Lerner condition), is for several reasons inadequate. As is well known, the result depends upon the model used to analyse the issue.[17] Secondly, where the size of elasticities is critical, non-fulfilment of the elasticity condition can be shown to imply real processes which are unstable. Chapter 3 examines this stability issue allowing for international borrowing and lending and shows that there will be stable equilibria on each side of any unstable equilibrium. The consequence is that the economy will spend most of its time in the vicinity of a stable equilibrium where the Marshall/Lerner condition will be satisfied. Hence, for all practical purposes the elasticity condition is seen to be irrelevant.

Chapter 4 examines macroeconomic issues which involve the current account. The standard Mundell/Fleming open economy macro model is extended to include various degrees of wage indexation. It is then used to discuss several questions relevant to macro policy and the current account. These include the impact of monetary, fiscal and wage policies on real output and the trade deficit. In particular, the question of whether monetary restraint will reduce a trade deficit is of importance because from time to time governments have used monetary policy for this purpose. It is shown that the outcome is basically ambiguous. While Chapter 3 considered the relation between real exchange rate depreciation and the trade balance and current account, a prior question considered here is under what conditions a nominal depreciation will result in real depreciation? Monetary expansion when the economy is in some form of real equilibrium at 'full capacity' is one obvious case when it will not. Another which sometimes seems to be overlooked is the nominal depreciation resulting from the exchange rate response to foreign price shocks.

Part III considers issues that are longer run in two senses. First, the duration of the effects involved may well last beyond the macroeconomic short run. Secondly, the economy is supposed to be in a state in which flexibility of prices ensures that there are no unemployed resources. The decision to spend more or less than income and so borrow or lend is often, though not exclusively,

based on long run considerations. For this reason a number of aspects of the current account are better dealt with in such a context. Chapter5 examines the optimal response of consumers' spending and borrowing to several types of shocks to their real income. It shows how these reactions can vary from consumption smoothing in the face of a fluctuating income to an adaptation towards a new long run equilibrium, depending on the duration of the shock. It is also shown how uncertainty about the timing of the reversal of a temporary shock can induce caution in the responses to that shock.

If the current account balance is required to be zero, an economy is tied to spending no more nor less than its current income. The essence of the balance of payments constraint is that it allows countries to arrange their consumption and investment spending through time in patterns that suit preferences and productivity. The theory of foreign investment makes this process explicit, particularly with respect to the benefits for a borrowing economy from being able to develop more rapidly than otherwise and for a lending country to gain higher rates of return than are available at home. Chapter 6 first presents and discusses the results of a standard model of foreign investment. This shows how optimal processes of foreign investment in domestic capital will be governed by rates of return to capital, and interest and discount rates. However, this standard approach is capable of illustrating only a limited range of processes. In particular, it requires foreign investment to adjust instantaneously to equate the marginal product of capital to the marginal cost of borrowing.

In the second part of the chapter, a model with greater flexibility of choice in the use to which foreign borrowing is put and which allows for adjustment costs is presented. An interesting result of this is a formula relating the marginal product of capital, the marginal cost of borrowing and marginal adjustment costs. It turns out that it is not possible to solve for the time path of this system as it stands. Blanchard and Fischer (1989) who have investigated a similar model, overcome this with the simplifying assumption that the world real interest rate and the representative agent's discount rates coincide. Rather than solving the problem in this manner, it is here assumed that producers have constant marginal utility. The time paths of the resulting model of consumer and producer behaviour can then be solved, as can several comparative dynamic exercises.

Kemp (1962) and others have pointed to an externality in foreign borrowing stemming from a rising supply curve of foreign capital. In this case governments can exploit their monopsony power by imposing a tax on payments to foreign debt to equalise the marginal cost of borrowing with the marginal product of capital. This externality is illustrated in Chapter 6, as are others that work in the opposite direction.

Sometimes, proponents of the view that current account deficits and foreign debt lead to economic problems claim to be able to identify that particular levels of deficits and debt are 'unsustainable'. Chapter 7 takes up

the question of what might be meant by the 'sustainability' of private current account deficits and the foreign debt of the private sector. There is an extensive literature on the sustainability of public sector deficits and debt, but different considerations apply to the private sector. In this context sustainability is an elusive concept. It is concluded that while it is possible to give some forms of definition, it is doubtful whether these are operational or, indeed, have much policy relevance.

Part IV treats various policy issues. Arising from the pegged exchange rate experience of the Bretton Woods system it has become an article of faith for many that macroeconomic policy should be directed towards achieving external (or current account balance) and internal balance (or zero domestic excess demand). Chapter 8 deals with the question of whether this is appropriate when the current account deficit is being generated by the private sector. It is argued that in a floating rate system this view has little to commend it. While it is theoretically possible for macroeconomic policy to achieve some particular current account target, to do so requires either giving up internal balance and/or using fiscal variables for purposes that would conflict with intergenerational or other fiscal targets. In any case, there is no good reason to want to target the current account balance when it does not appear directly in individual utility functions. The issue is not so straightforward in a pegged exchange rate regime. If international capital mobility is limited there may be a case for intervention, but only if the economy concerned is not prepared to solve its balance of payments problems by floating.

A borrower whose resources are such as to preclude meeting the terms of a loan will be forced to default. It will pay individuals or governments to default on their debts if the cost of doing so is less than the obligations under the loan. Hence, if either the interest rate, the penalty for default, or the financial resources of the borrower is a stochastic variable, circumstances may arise where default occurs. In Chapter 9, Fane and Applegate deal with the issue of foreign indebtedness and sovereign risk in models based on those of Sachs (1984) and Aizenman (1989). They take the penalty for default to be the stochastic variable. It is supposed that governments will assume control of private sector obligations for the purpose of default when it turns out to be worthwhile to do so. They explore the nature of the externalities to which this gives rise and the tax rules needed to correct these externalities. The resulting externality has a form which is similar to that, discussed in Chapter 6, produced by the rising supply curve of foreign capital. In the second part of Chapter 10, they extend the analysis to the case in which there is negotiated default and again find a similar externality.

Policy issues are surveyed in Chapter 10. This is done in two parts, the first of which draws out the consequences of the preceding analysis with respect to intervention to affect the current account balance and foreign debt. It is concluded that macroeconomic policy is an appropriate response

to a current account deficit only when a country with a pegged exchange rate has been subject to protracted balance of payments crises. A preferable alternative policy would be to float their exchange rate. For countries with floating rates, there seems to be no case for using macroeconomic measures to control current account outcomes. However, it is possible that current account balances can be the result of distortions arising from externalities or government regulations. These are problems in their own right and need to be identified and treated at their source. Such action is justified only where it is clear that net benefits will result.

The second part of Chapter 10 supplements the first in that it surveys additional claims that have been made that current account imbalances and foreign indebtedness might signal the need for a policy response. These include arguments on the basis of supposed inefficiency of market outcomes, of excess demand in the goods market and of wages policy. It is found that any case for intervention has little or nothing to do with the current account outcome as such. Rather, it is better to look for and, where benefits can be established, treat externalities and distorting government regulations in their own right by microeconomic measures.

While there is substantial integration between chapters, I have attempted to make each readable separately. For instance, Chapter 4 on macroeconomic theory can be read without reference to earlier chapters, as can Chapter 6 on foreign investment. Chapter 8 is perhaps the only exception, being an extension of the analysis of Chapter 4. Even there the development is self contained, but familiarity with Chapter 4 would make the contents easier to absorb.

V. CONVENTIONS

The following conventions are used throughout the book:

$\dot{x} = \frac{dx}{dt}$ the absolute rate of change of x.

$\hat{x} = \frac{1}{x}\frac{dx}{dt}$ the proportional rate of change of x.

Unless otherwise stated, all functions are assumed to be continuous and differentiable and to possess continuous and differentiable partial derivatives of the second order. Equations and figures are numbered by chapter, for example, Figure 4.2 is the second figure in the fourth chapter.

Chapter 2

The evolution of approaches to the current account balance

The balance of payments and the balances on current and capital account figure prominently in international monetary economics. The so called 'pure theory' of trade deals mainly with various propositions about the determinants of commodity trade and its welfare implications. It is largely confined to situations of balanced trade, by contrast with the 'monetary theory' of trade which treats macroeconomic questions of usually unbalanced trade in both goods and financial instruments. The monetary theory of trade extends the closed economy treatment of traditional questions about the determinants of output, employment and unemployment in this unbalanced trade context. To do so it must treat the further issues of how exchange rates are determined and the significance of the balance of payments and related concepts. A variety of approaches to these concepts have evolved as changing circumstances have forced a reconsideration of their meaning. Important amongst the factors that have led to successive rethinking of international monetary economics have been shifts in institutional arrangements in relation to trade, exchange rates and the mobility of financial capital.

It turned out to matter a great deal for the conclusions of international monetary economics whether a country's exchange rates are pegged or floating and whether financial capital flows between countries are free or constrained. For instance, as noted in the previous chapter, the classical economists analysed the question of how the current account adjusted in a fixed exchange rate context without international financial capital flows. In particular, under the gold standard mechanism an excess of imports over exports meant an outflow of reserves of gold; a process that could not continue indefinitely. Adjustment to a stable level of reserves was supposed to be brought about by the price mechanism and took a form that would automatically stem the loss of gold. In the post World War II era of pegged exchange rates and regulated capital flows, some economists doubted the efficacy of the price mechanism to produce this adjustment and saw the need for controls on trade for balance of payments as well as more traditional reasons. However, not only did major countries float their exchange rates from the early 1970s, but there was also an accelerating move towards

loosening controls on the flows of financial capital. First, this added the potential for exchange rate movements to play a part in the adjustment of financial and product markets and secondly it removed the problem of disequilibrium in the balance of payments and associated fluctuations in reserves. These changes required a reassessment of the role of the current account in adjustment processes.

A variety of methods are available for analysing the behaviour and significance of the current account balance. They range from Hume's 'specie flow' mechanism, through the 'elasticities', the 'monetary', the 'portfolio balance' to the recent 'intertemporal optimising' approach to the balance of payments, to mention just a few. Their evolution has not only reflected changing international monetary institutions but also the failure of successive theories adequately to explain the behaviour of the current account and other aspects of the balance of payments in the face of changing economic circumstances. Further, many of the approaches are partial and so part of a larger structure. For this reason it is possible to produce misleading results even with good theory.

Definitions of concepts pertinent to international monetary economics are set out in section I. Following this a number of approaches to the current account and balance of payments will be outlined and critically assessed in section II. Finally, section III is devoted to a discussion of various theories of the determination of exchange rates. A number of the themes developed in these latter two sections are taken up again in later chapters.

I. DEFINITIONS

If countries traded entirely on a barter basis their current account balances would be zero. Introducing national monies enables any country to choose to make sales to and purchases from foreigners when it is convenient. Their current account balances then need not be always zero, if countries were prepared to accumulate or decumulate international currencies. Adding financial assets and liabilities enables current account balances to be in surplus or deficit for long periods.

The starting point of any analysis of the current account are the two sets of definitions which link it to international capital flows and the balance of payments on the one hand and saving and investment, on the other. Readers familiar with these definitions may wish to skip this section. The balance of payments definitions are as follows:

$$\text{CURRENT ACCOUNT SURPLUS} \equiv \text{EXPORTS } \textit{less} \text{ IMPORTS } \textit{plus} \text{ NET FOREIGN INCOME} \tag{2.1}$$

Net foreign income consists predominantly of net receipts from interest bearing securities and net dividends from equity associated with foreign lending. An economy earns foreign exchange from the goods and services it

sells and the income on its lending. Foreign exchange is used to purchase imports from and pay interest and dividends to foreigners.[1]

As well as through trade in goods and services, foreign exchange can be acquired for use by the private or public sector, by borrowing from abroad and by the drawing down of official foreign exchange reserves. It can also be disposed of by lending or by adding to official reserves. Such transactions are entered in the capital account.

CAPITAL ACCOUNT SURPLUS≡NET BORROWING FROM FOREIGNERS *plus* DECREASE IN OFFICIAL RESERVES (2.2)

Whereas the current account records receipts from and payments to foreigners associated with income and expenditure, the capital account lists transactions in titles to assets. A capital account surplus records a provision of foreign exchange to the market in return for a net transfer of titles to assets to foreigners. Borrowing from foreigners provides foreign exchange and lending to foreigners uses it. A capital account surplus means that over the period concerned a country is a net borrower abroad, increasing its foreign exchange holdings thereby, provided there is no central bank intervention to buy or sell foreign exchange. If the central bank sells foreign exchange to the market this provides a further source of these funds for commercial use. A capital account deficit means that over the period concerned the country is a net lender and/or that the central bank has reduced funds in the market by buying foreign exchange, so adding to its foreign currency reserves.

To understand the balance of payments it is helpful to appreciate that the essence of a pegged exchange rate system is that the authorities agree to buy and sell foreign currency at the price they have chosen to peg the rate.[2] By contrast, in the pure floating rate case the authorities would not intervene to buy and sell currencies for the purpose of affecting the exchange rate. The balance of payments is conventionally defined so that it records both sides of every transaction. If, as is usual, central bank transactions which draw on or add to official reserves of gold and foreign currency assets are included in the capital account then it follows that

BALANCE OF PAYMENTS≡CURRENT ACCOUNT BALANCE *plus* CAPITAL ACCOUNT BALANCE≡ZERO (2.3)

This conveys the information that foreign exchange provided by current transactions and by borrowing and lending adds up to the change in reserves. However, it results in a concept of the balance of payments which is identically zero and so may not appear to be the most helpful. *Ex post* the balance of payments always balances, while *ex ante* there could be excess supply of or demand for foreign exchange.

The second set of definitions elucidates the way in which the current account balance relates to the concepts of national income and expenditure,

the fiscal deficit, consumption C, saving S, and investment I. Start from the standard definition of gross domestic product (GDP). It is

$$GDP \equiv C+I+G+X-M \equiv E+X-M \tag{2.4}$$

where X is the value of exports, M the value of imports, G government expenditure and E total government and private expenditure. Note that the sum of consumption, investment and government expenditure is the total national expenditure on goods and services E. Subtracting net interest and dividends paid to foreigners R from both sides of (2.4)

$$NNP \equiv GDP-R \equiv C+I+G+[X-M-R] \tag{2.5}$$

The bracketed term on the right hand side is the current account surplus (from (2.1)) and NNP is net national product.[3] Introducing total tax collections T and rearranging the identity (2.5)

$$[X-M-R] \equiv [\{NNP-T-C\}-I]+[T-G] \tag{2.6}$$

Now savings is NNP-T-C, that is income remaining after taxes less spending on consumer goods, so (2.6) becomes

$$[X-M-R] \equiv [S-I]+[T-G] \tag{2.7}$$

This simple identity is basic to understanding the significance of the current account deficit. Failure to appreciate its implications is at the root of many fallacies about the current account. Finally, rearranging (2.5) using the definition of total expenditure E

$$[X-M-R] \equiv NNP-E \tag{2.8}$$

Equation (2.8) tells us that when the current account is in surplus, net national product exceeds national expenditure, while from (2.7) total excess spending consists of the fiscal deficit (G-T) and the private deficit (I-S).[4]

These definitions give a valuable additional insight into the meaning of the current account deficit. Although it seems natural to approach questions about changes in this deficit by going directly to the definition (M+R-X), it can readily be seen that working from the private deficit (I-S) and the public deficit (G-T) must give the same results.

Although consideration of the determination of the exchange rate is the subject of section III in this chapter, it is helpful to define both the 'nominal' and 'real' exchange rate here. For theoretical purposes it is often convenient to define the nominal exchange rate as the price of foreign money, that is the number of units of domestic currency required to purchase a unit of foreign currency. This is the definition used here, though for some purposes it can be useful to work with the reciprocal, that is the foreign currency price of domestic money. The real exchange rate concept is meant to represent some relative price which is significant for trade issues. Let P be the consumer price index, P_T, P_N the prices of traded and non-traded goods respectively and e the

nominal exchange rate (the price of foreign money). The symbol * indicates foreign country and currency magnitudes. One measure of the real exchange rate π is

$$\pi = eP^*/P \tag{2.9}$$

This is the ratio of consumer prices in the two countries compared in domestic currency. A commonly used alternative measure is

$$\varphi = 1/p = eP^*_T/P_N \tag{2.10}$$

where p is the ratio of non-traded to traded goods prices. These are only two samples of a number of definitions that might be used. In all cases they involve a ratio of foreign prices to domestic prices. While this is not the place to debate the merits of alternative measures, it should be noted that, as they all attempt to summarise relative price effects in a single ratio, no one concept can ever be entirely satisfactory in a world with more than one relative price. Also, there will be some purposes for which one measure is better suited than others.

II. APPROACHES TO THE CURRENT ACCOUNT AND BALANCE OF PAYMENTS

The behaviour of the current account and associated components of the balance of payments have been of interest to economists and others for a variety of reasons, some spurious, some generally valid and some valid only in certain circumstances. In the first category, the notion that individual countries should balance their trade with each other has many adherents, despite being patently fallacious. The idea that Japan should import as much from the US as the US imports from Japan has no basis in theory, but seems to have enjoyed popular support in the US. The mercantilists were interested in the trade balance because they favoured trade surpluses rather than deficits or balanced trade outcomes. Observing that under a system where gold is used for international payments, countries which ran a current account surplus accumulated gold, they believed surpluses were a means by which a country could amass wealth. However, importing less than was exported meant that present consumption was being traded for future consumption (that could be bought with gold). This would be desirable only if it was consistent with domestic spending, investment and saving plans. Otherwise it might be preferable to run a trade deficit and decumulate gold or hold a constant gold stock.

Because of their decision to manage exchange rates, countries in a pegged rate system would be interested in the way their trade balances would respond to a variety of shocks such as exchange rate movements or fluctuations in income. If financial capital were perfectly mobile any current account deficit could be financed at the going world interest rate plus an

allowance for any risks specific to the country concerned. However, with restricted mobility there would be legitimate fears that financing a current account deficit could be costly and could not continue indefinitely. The response of the current account to macroeconomic variables was an issue of considerable importance in pegged rate regimes. By contrast, in a floating rate system with highly mobile financial capital, policy makers have no direct interest in these questions, though indirectly they are of concern because they inform the process of influencing macroeconomic magnitudes such as the level of economic activity. That is, the balance of payments and its components are worthy of attention because of the desire to understand the way the macroeconomy works. Thus, for instance, the trade balance usually enters macroeconomic models as part of the national income identity, so the effect of devaluation on the trade balance is crucial to appreciating its effect on national income. However, interest in the behaviour of the current account as one of the targets of macroeconomic policy in a floating rate system with mobile capital is not so easy to justify.

A desire to explain exchange rate behaviour has been another reason for studying balance of payments concepts. Indeed, a once popular view was that the exchange rate was determined by the balance of payments, until Kouri (1976) and others showed the limitations of this approach. Nevertheless, it is instructive to appreciate the role of the current account in exchange rate determination. Arguably the most important reason for understanding the significance of the capital and current accounts is because they are the vehicles for trade in saving between countries. Studies of economic growth in open economies cannot ignore the fact that current account imbalances facilitate foreign investment. Finally, the close definitional association between the fiscal and current account deficits warrants study in order to appreciate the effects of fiscal deficits. Nevertheless, in the following survey the fiscal deficit is taken to be zero. This is not because fiscal deficits and government debt are not of significant interest in their own right, but because the emphasis chosen here is mainly on private rather than government borrowing and debt. Public debt raises questions which are often altogether different from those involving private borrowing and debt and these issues are addressed in Chapters 9 and 10.[5] It should also be noted that the terms 'debt' and 'external debt' will be used to refer to equity, direct investment and fixed interest loans unless the context explicitly suggests otherwise.

1. Mercantilism and the balance of trade doctrine

The term 'mercantilist' has been used to describe the views of a number of writers over the period from 1500 to 1800 who sought to promote the prosperity of the European business classes by a variety of policies, but particularly with respect to the balance of trade.[6] Broadly, the mercantilists

believed that the wealth of the merchants and the power of the nation could be promoted by the accumulation of specie, that is precious metals used as money in international transactions. This led them to advocate that a desirable state for trade was one of surplus on the balance of trade.[7] Gold and silver were seen by some as the essence of wealth, while others saw an inflow of specie as beneficial in producing rising prices and an associated increase in real activity and employment. Commodity imports were thought of as undesirable because of the resulting outflow of specie, though to some extent they were needed to placate the wish of foreigners to export their products. These views did not stem from a desire to improve the welfare of the community at large. Although there was a concern to promote employment of the working classes, this was to provide the potential for large armies to back up the power and wealth of the state. Intervention by the state was regarded as desirable to sustain the trade surplus.

Hume's (1752) exposition of the 'specie flow mechanism' showed that attempts to sustain trade balance surpluses would be defeated because the accumulation and decumulation of specie itself would tend to eliminate trade surpluses and deficits in a world without international capital flows. Adam Smith and David Ricardo, through their elucidation of the bases for the gains from domestic and international trade and specialisation, are credited with refuting the mercantilist balance of trade doctrine.

2. The specie flow and gold standard mechanisms

Hume set out to show that imbalanced trade would be brought to balance by an automatic mechanism implicit in the use of precious metals as an accepted means of settling international obligations. It turns out to be a useful example of the way in which monetary adjustments and price flexibility might work to determine adjustment of the trade balance. The mechanism he suggested became the intellectual foundation for the operation of the gold standard system, an arrangement in which each country's currency supply was restricted to a fixed ratio to the stock of gold. Suppose that gold is the only form of currency and that there are no financial capital flows, so that the capital account balance consists solely of the change in the economy's stock of gold. The trade and current account balances are then the same. Also make the classical assumptions that general price levels at home and abroad are determined by the quantity theory of money, and output in each country is fixed.

Initially, let the home country have a surplus in its trade balance with the rest of the world. The result is an inflow of gold domestically and an outflow abroad which increases the domestic and reduces the foreign money supply. By the quantity theory, prices rise at home and fall abroad. The volume of home country exports will fall and imports will rise. Under certain conditions this will reduce the trade surplus.[8] If this occurs, gold flows and

the consequent price movements will eventually bring the trade surplus to zero. Hence trade deficits are automatically moved to equilibrium, where this state is defined as a situation of zero flows of gold.

This simple model demonstrates how the price mechanism can 'equilibrate' the trade balance, current account and balance of payments, provided classical assumptions hold. The acceptance of Keynesian notions in the 1940s led many to question whether the adjustment would be as smooth as the gold flow mechanism suggests. If real income can vary, deflation to reduce a trade deficit might well involve falling income and employment which reduces home demand for the domestic and the foreign good, so reducing the trade deficit by that route. Adjustments of this nature would seem undesirable. Another interesting aspect of the model is that it shows how a fixed exchange rate system leads to the loss of monetary independence, that is the loss of control of the money supply and so control over inflation and deflation.

Perhaps the most important criticism of this and related types of analysis is the neglect of the behaviour of variables on the other side of the national accounts identity to the current account. This identity is given, for instance, by (2.8) from which it follows that the current account cannot change unless expenditure and/or output also change. Suppose England's product is wheat and that an initial trade deficit is caused by a poor wheat harvest which means a reduced output. One type of rational consumer response is to reduce spending on consumption of wheat, but by less than output and income because of a desire to smooth consumption flows. For instance, this could mean that exports of wheat fall as consumers try to minimise the fall in home consumption. From this perspective, the whole basis of the need for an adjustment process to 'restore equilibrium' must be questioned. The trade deficit is not then seen as an imbalance in need of correction, so much as a rational response to an income fall. On this basis, a better than normal harvest would produce a rise in consumption of a smaller amount than the increase in income and so a trade surplus. Further, these fluctuations in supplies will cause movements in relative prices not allowed for in the specie flow structure. Hence it should be carefully noted that any analysis faces a danger of overlooking important aspects of current account processes if it neglects one or other side of the national income identities (2.6) to (2.8). Related to this issue is the neglect of international flows of financial capital which enable countries to invest more or less than saving for substantial periods of time.

3. The elasticities approach

Early approaches stressed the role of trade elasticities in the response of the trade balance and current account to changing circumstances. The elasticities notion was typically set in a pegged exchange rate framework, and capital account issues played a minimal and usually implicit part in the

analysis. Suppose an economy in balance of payments equilibrium (no undesired accumulation or decumulation of reserves) suffers a trade shock which reduces net exports. Reserves of foreign exchange start to fall and speculation develops against the currency. The key question was whether an exchange rate devaluation would raise net exports and the current account balance and so restore balance of payments equilibrium? The answer usually given was that it depended both on the size of key elasticities and on the model one had in mind.[9]

In order to reproduce the flavour of the analysis this question is first examined in the context of what could be called the 'one home good' model. The essential features of this extremely popular model of international monetary economics are that the home country produces a single good which is consumed at home and exported, and imports a different single good from the rest of the world. The trade balance (net exports) NX, measured in units of the home good, is determined by

$$NX = \underset{+}{X}(\pi) - \pi \underset{- \ +}{Im}(\pi, y) \tag{2.11}$$

where X is the export volume, Im import volume, y real income and *p* the relative price of imported to home goods, which in this model is both the (reciprocal of the) terms of trade and the real exchange rate. X and Im are foreigners' demand for the home good and domestic demand for the foreign good, respectively. Each demand function depends on relative prices and real income in the country concerned, though the foreign income effect is suppressed for simplicity. The sign of the partial derivates, indicated under the appropriate argument, are based on the assumption of gross substitutes. The supply of the foreign good is perfectly elastic at the world price. Differentiating (2 11) totally

$$dNX=(X_{\pi}-pIm_{\pi}-Im)d\pi-\pi Im_{y}dy \tag{2.12}$$

and converting to elasticities

$$dNX = \frac{X}{\pi}\left(\eta^* + (\eta - 1)\frac{\pi Im}{X}\right)d\pi - m^*dy \tag{2.13}$$

where η and η^* are the price elasticities of domestic demand for foreign goods and foreign demand for the home good, both measured positively, and m^* is the marginal propensity to import.

The sign of the partial effect of a devaluation of the real exchange rate (rise in π) on the trade balance is thus ambiguous because while export volumes rise and import volumes fall, there is an offsetting effect in the rise in import value. The condition for NX to rise is that

$$\eta^* + (\eta - 1)\frac{\pi Im}{X} > 0 \tag{2.14}$$

If the trade balance NX were initially zero this would reduce to

$$\eta^{*}+\eta>1 \tag{2.15}$$

and is known as the Marshall/Lerner condition that the sum of the home and foreign demand elasticities for imports must be greater than unity.

While this result has been obtained for changes in the real exchange rate, it is the nominal exchange rate which the authorities can control. One way to give it validity with respect to the nominal exchange rate in the limited framework in which it was usually presented is to assume that the price of each country's output is held constant by monetary policy. This would enable π to be replaced in the equations above by the price of foreign money e. However, such an assumption sits uneasily with the notion that countries with pegged exchange rates have little control over their money supply when there is perfect mobility of capital. The further conditions that there is zero mobility of financial capital between countries and that open market operations are used to sterilise the effects of changes in levels of reserves of foreign currencies on domestic money supplies would need to be added to justify the fixed nominal price assumption.[10]

There are no theorems in demand theory that will ensure that the inequality (2.15) holds. However, it does appear in pure trade theory as a stability condition. Using offer curves and the postulate that price rises when there is excess demand, it can be shown that an exchange system will be unstable if (2.15) does not hold.[11] Despite this, it is common to regard the possible non-fulfilment of the Marshall/Lerner condition as a serious problem for the economy concerned. Considerable econometric effort has gone into the task of estimating these trade elasticities and in some cases the results have suggested non-fulfilment of the Marshall/Lerner condition.

Another application of this approach was to suggest that countries with low price and high income elasticities of demand for imports would run into increasing current account deficits if they tried to expand faster than their trading partners. Imports would rise faster than income if the elasticity were greater than unity, while low price elasticities imply that large devaluations would be necessary to offset the increase in the deficit consequent on a rise in income. To see why a rising deficit might be regarded as undesirable note that, if the market comes to feel that the currency is overvalued because the current account deficit has increased, agents will prefer to hold foreign currency in the expectation of a devaluation. If no action to devalue is taken, a currency crisis will develop with the monetary authorities losing reserves rapidly, perhaps even choosing to borrow in an attempt to maintain confidence that the exchange rate can be supported. Eventually they may be forced to devalue. Such currency crises were an undesirable intrinsic feature of pegged exchange rates, and one of the reasons behind the widespread move to floating rates in the early 1970s.

On the face of it a country that chooses to invest and grow rapidly would

merely seem to be following the dictates of its profit opportunities and intertemporal preferences. Why should it be more liable to economic difficulties than one for whom the income elasticity of import demand was low? Required exchange rate adjustments merely mirror relative price shifts necessitated by growth. In fact, there are many deficiencies with the elasticities approach, stemming mainly from the things which it leaves out and which later developments have attempted to remedy.

What becomes of this issue if it is examined in the context of the somewhat less popular traded/non-traded goods framework? Net exports, measured in terms of traded goods are now

$$NX = S_T(\underset{-}{p}) - D_T(\underset{+}{p}, \underset{+}{\xi}) \tag{2.16}$$

where S_T is the supply and D_T the demand for traded goods, p the relative price of traded goods and ξ real expenditure, measured in units of traded goods.[12] Goods are gross substitutes in demand and substitutes in supply, $p=P_N/eP_T^*$ is the reciprocal of the real exchange rate for this system. Differentiating (2.16) with respect to p,

$$\frac{\partial NX}{\partial p} = \frac{\partial S_T}{\partial p} - \frac{\partial D_T}{\partial p} < 0 \tag{2.17}$$

Devaluation of the real exchange rate (fall in p) now *always* raises net exports If, as is usual with this model, the economy considered is taken to be small in world trade, the price of traded goods is determined in world markets. Adding the assumption that domestic monetary policy holds the nominal price of non-traded goods constant ensures that a fall in p is equivalent to a nominal devaluation.

Some of the issues which the elasticities approach addresses are clearly not relevant when exchange rates are floating, though it can still be of interest to know how devaluation affects the trade balance. Nevertheless, it is difficult not to conclude that much of the theoretical and empirical elasticities literature has little relevance in a world of flexible exchange rates and highly mobile international capital. Finally, the qualification made in the previous section that the specie flow mechanism neglects the spending/income side of the national accounts identity applies equally here. The elasticities approach is partial, so that it may be misleading unless incorporated in a wider framework.

4. The absorption approach

As has been noted, by manipulating national income identities it can be shown that the balance on current account is equivalently equal to the excess of expenditure over income. The insight, due to Alexander (1952), provided by this idea liberated thinking from the restrictive view that the current

account involved purely trade questions.[13] Definitions (2.6) to (2.8) establish that the trade balance and current account at any time must be jointly determined by the variables which affect trade magnitudes and those on which expenditure, income, saving and investment depend. By explicitly bringing out the relationship between excess spending and the current account, the approach also makes clear that a current account deficit leads to rising levels of public and/or private net debt. This follows because excess spending must be financed by running down assets or borrowing; a process made explicit in the capital account.

To see some of the implications of this approach consider the one home good model used in the previous section to elucidate the elasticities approach. In addition to the assumptions made previously, it will be supposed that the gross output of the home good $y(\pi)$ is an increasing function of its relative price, that is a decreasing function of the real exchange rate. Net income from abroad is taken to be zero. The trade balance NX and the income expenditure balance Z are related by

$$NX \equiv X(\pi) - \pi Im(\pi, \xi) \equiv y(\pi) - \xi \equiv Z \tag{2.18}$$

Treating real expenditure ξ as a parameter in the income-expenditure side of the identity, Figure 2.1 plots NX and Z against the real exchange rate π. The slope of the income expenditure curve is negative as

$$\frac{dZ}{d\pi} = y_\pi < 0 \tag{2.19}$$

For expositional convenience, the slope of the net export locus is obtained as the total derivative of (2.18)[14]

$$\frac{dNX}{d\pi} = ((X_\pi - \pi Im_\pi - Im) - \pi Im_\xi y_\pi)/(1 - \pi Im_\xi) \tag{2.20}$$

Taking the marginal propensity to import πIm_ξ to be less than unity, it can be seen (from 2.12) that the condition for the derivative (2.20) to be positive is that the Marshall/Lerner condition is satisfied. Figure 2.1 illustrates the joint determination of the trade balance and the real exchange rate by the two sides of the trade balance identity, assuming the Marshall/Lerner condition holds.

This approach gives a very different explanation of the trade balance from that of the elasticities approach. Thus the real exchange rate is seen to be an endogenous variable and its manipulation for policy purposes would require special conditions, such as those set out under the elasticities approach. Further, the trade balance is determined as much by saving, investment, income and expenditure as by trade magnitudes.

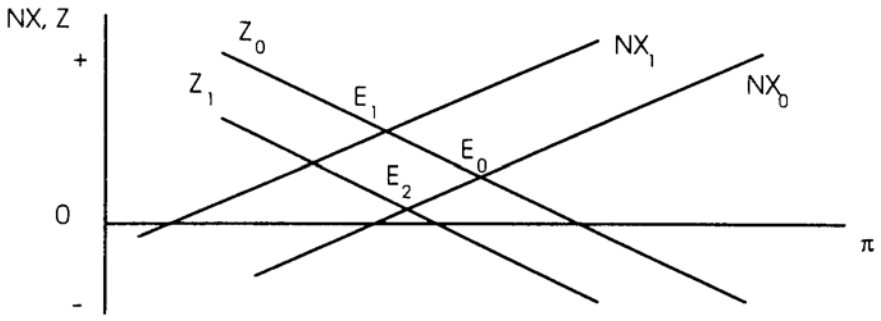


Figure 2.1 The determination of the trade balance

Two exercises can help to illustrate the jointness of the determination of the trade balance and real exchange rate. First suppose that increased foreign demand for the domestic good raises net exports for any given level of the real exchange rate. The NX locus rises, moving the economy from E_0 to E_1, so increasing the trade surplus and appreciating the real exchange rate. The rise in the trade surplus stems from the price elasticity of the supply of the home good. The rise in income for a given level of expenditure explains the increased trade surplus from the other side of the national accounts. If home output were not responsive to its relative price there would be no increase in net exports. The appreciation of the exchange rate would be just sufficient to absorb the favourable trade shock in decreased exports and increased imports.

For the second exercise suppose an exogenous increase in aggregate expenditure. This shifts the income-expenditure Z locus down, moving the economy from E_0 to E_2, so reducing the trade balance while appreciating the real exchange rate. Again the demand for home output and its relative price has risen but, as the additional demand has originated domestically, exports fall. Net exports fall by less than the initiating rise in expenditure because the appreciation induces a rise in production of home goods. Finally, it should be emphasised that results of this nature will vary from model to model, but the principle that the income-expenditure side of the economy must be included in any examination of the trade balance remains valid. Further, it should also be recognised that the model given here is still incomplete in several respects. First, the capital account of the balance of payments and hence the financing of the excess of spending over income has not yet been discussed. Secondly, the level of expenditure has been taken to be exogenous. The factors which might determine it are covered in Chapters 3, 4, 5 and 6.

5. Internal/external balance

The internal/external balance model clearly illustrated many of the consequences of balance of payments crises to which pegged rate systems could be subject. It is based on the traded/non-traded goods model, already touched on in section II.1, and features the trade balance as dependent on aggregate real expenditure in units of traded goods ξ and the relative price of traded to non-traded goods p.[15] Assume the country is small in world trade so that foreign currency prices of traded goods are determined in world markets. Goods are supposed to be gross substitutes in demand and substitutes in production. Domestic demand D_i and supply S_i functions for each class of goods are taken to have the form

$$D_i=D_i(p, \xi) \qquad \text{demand,} \quad i=N, T \tag{2.21}$$

$$S_i=S_i(p) \qquad \text{supply,} \quad i=N, T \tag{2.22}$$

Because the assumption that foreign currency traded goods prices are given means traded goods are in perfectly elastic supply, the market for these goods is always cleared at any level of domestic excess demand or supply. Hence, market clearing for the economy as a whole (internal balance) is established by market clearing for non-traded goods, that is

$$D_N(p, \xi)=S_N(p) \qquad \text{internal balance} \tag{2.23}$$

The definition of external balance is much less straightforward. For the present assume that it means a zero trade balance. The trade balance for this model is constructed using the assumption on which the model is based that the relative price of imports to exports π is constant. Thus

$$\begin{aligned} X-\pi Im&=(S_X-D_X)-\pi(D_M-S_M)=(S_X+\pi S_M)-(D_X+\pi D_M)\\ &=S_T-D_T \end{aligned} \tag{2.24}$$

External balance, where that concept is defined as a state of zero net exports, is

$$D_T(\pi, \xi)=S_T(p) \qquad \text{external balance} \tag{2.25}$$

It is readily seen that internal balance can be represented by a positively, and external balance a negatively, sloped locus in the (ξ, p) space in Figure 2.2. Both conditions are satisfied where the loci intersect. The economy is then said to be in global balance.

While concentration on the current account captures one aspect of the balance of payments, the approach often pays little or no attention to capital account issues. This is unfortunate as one of the justifications for an external balance target in a pegged rate regime is where capital mobility is considerably limited. Further, as has been seen, there is a need to examine the

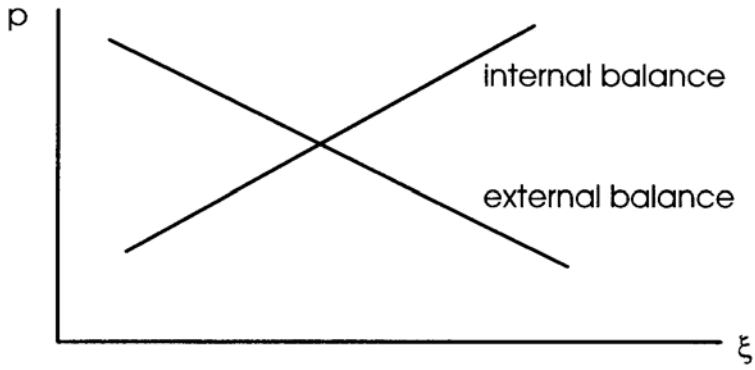


Figure 2.2 Internal and external balance

saving-investment side of the national accounts explicitly in order to treat trade balance issues adequately. These issues are taken up in detail in Chapters 4 and 8.

Notice that there is no mechanism in the model as it stands to adjust the economy towards internal and external balance, or in any way at all. Hence the model is loaded towards a need for active macro policy intervention to achieve global balance. Starting from any arbitrary position in the (ξ, p) space, two independent policy instruments would be required to bring the economy to the desired joint balance. For example, if monetary policy were assigned to holding the price of non-traded goods constant, the two instruments could be the nominal exchange rate and the level of government expenditure.

6. The monetary approach to the balance of payments

Being set in a classical framework of full employment output ensured by price flexibility, the 'monetary approach to the balance of payments' can be regarded as a direct descendant of the specie flow mechanism for the case of fixed exchange rates.

Suppose a two country world in which the classical assumptions of a fixed output corresponding to equilibrium in the product and factors markets and the quantity theory of money hold. For simplicity, assume no international flows of financial capital, although these can be readily added without upsetting the principles of the monetary approach. With a pegged exchange rate, balance of payments balance will be assured by fluctuations in foreign exchange reserves. Unless these effects are sterilised, the domestic money supply will move in line with reserve shifts. Suppose a domestic monetary expansion, unmatched by an increase in the demand for money, leads to a rise in expenditure and so a current account deficit. Reserves must fall to equilibrate the balance of payments with a consequent fall in the domestic

money supply and expenditure. The process continues until the money supply is restored to its level before the monetary expansion. As with the specie flow mechanism the system is supposed to 'correct' current account imbalances.

Now consider a floating exchange rate system. Because of the classical assumptions the quantity theory of money will apply domestically and in the rest of the world. If there is only one good in the world and the law of one price P=eP* applies, it follows that the exchange rate is connected via prices and the quantity theory to the money supply in both countries. Hence, exchange rate movements will exactly reflect relative inflation in the two countries as well as their relative money growth rates. It follows that the exchange rate can be thought of as the relative price of foreign and domestic money and that exchange depreciation is due to the domestic monetary authorities expanding the money supply faster than does the foreign country.

In this form the monetary approach clearly omits factors that might cause departures from full employment. It can, of course, be modified to include such influences, but then loses its simple conclusions. The approach was an outgrowth of monetarism and lost its appeal for similar reasons. First, its prescriptions often failed to take account of real departures from full employment so that their relevance appeared slight. Secondly, the simple money supply rules which emerge from the analysis have no real counterpart. In practice, it was found that the many possible measures of the money supply not only behave very differently, but also that control of any one of them does not effectively control others. Financial innovation could find a way around money supply constraints.

Nevertheless, its propositions when amended to apply in contexts that allow for other than classical assumptions form an essential part of open economy macroeconomics.

7. Current account feedback and portfolio balance

As its name suggests, current account feedback is another suggested mechanism for automatic adjustment of the current account balance.[16] The capital and current account balances must be equal and opposite in sign. With no intervention in the foreign exchange markets a capital account surplus can be taken to consist entirely of an inflow of private financial capital. The capital account balance measures the increase (if in surplus) or decrease (if in deficit) in net obligations to the rest of the world. Thus the current account balance is reflected in a change in the net foreign assets of the economy, so that when the fiscal balance is zero, a current account surplus represents an increase in private net foreign assets. To illustrate this, assume perfect capital mobility, static exchange rate expectations, a foreign interest rate r* determined in world markets, and no intervention of any kind in foreign exchange markets. It follows that

$$\dot{F} = NX^*(e) + r^*F \qquad (2.26)$$

where F is domestic holdings of foreign currency valued bonds, NX* the foreign currency value of net exports and r*F net interest receipts. The price of the domestic output is assumed constant. The domestic economy is taken to hold all its foreign lending in foreign currency bonds and foreigners are assumed not to hold domestic currency bonds.[17] (2.26) is a differential equation in F and e. The system is completed by adding determinants of e and there are several ways in which this can be done.

For instance, the portfolio balance structure employed in Branson's (1979) models explains the determination of the exchange rate at any time by the demands of domestic residents for domestic and foreign currency bonds and money (B, ϕ, L, respectively) and the supplies of these assets (B, eF, M). The model is

$$M = L(\underset{-}{r}, \underset{-}{r^*}, \underset{+}{W}) \qquad (2.27)$$

$$B = B(\underset{+}{r}, \underset{-}{r^*}, \underset{+}{W}) \qquad (2.28)$$

$$eF = \phi(\underset{-}{r}, \underset{+}{r^*}, \underset{+}{W}) \qquad (2.29)$$

$$W = M + B + eF \qquad (2.30)$$

Total wealth W, defined in (2.30), is the sum of the three asset supplies. (2.27) to (2.29) are market clearing conditions and the signs for the partial effects are based on the assumption that the three financial assets are gross substitutes. The four equations involve four variables r*, M, B, F which are treated as exogenous to them. By Walras Law one of (2.27) to (2.30) is redundant and any three determine the endogenous variables e, r, W. It is readily shown that

$$e = e(r^*, M, B, \underset{-}{F}) \qquad (2.31)$$

so that a rise in the (foreign currency) supply of foreign currency bonds appreciates the nominal exchange rate.[18] This result is sufficient to complete the system. Substituting (2.31) in (2.26)

$$\dot{F} = NX^*(e[\underset{-}{F}]) + r^*F \qquad (2.32)$$

(2.32) is a differential equation in the single variable F where NX* is the foreign currency value of net exports. If the right hand side is a continuous function of F the system will be stable provided that it is also decreasing in F when evaluated at the steady state NX*+r*F=0, that is

$$\frac{\partial \dot{F}}{\partial F} = \left\{ \frac{NX_e}{e} - \frac{NX}{e^2} \right\} \frac{\partial e}{\partial F} + r^* < 0, \qquad NX^* + r^*F = 0$$

$$= -\frac{1}{e}\left\{ NX_e - \frac{NX}{e} \right\}\frac{e}{F} - \frac{NX}{eF}$$

$$=-NX_e/F \tag{2.33}$$

using the relation between foreign currency and the domestic currency valued net exports

$$NX^*=NX/e \tag{2.34}$$

For a creditor (F>0) country, as $\partial e/\partial F$ is negative, it is necessary and sufficient for stability that the Marshall/Lerner condition is satisfied. That is

$$NX_e/F>0, \text{ evaluated at } NX^*=-r^*F \tag{2.35}$$

Figure 2.3 illustrates this. One major problem with this class of model is that it is rife with possibilities for instability. It follows from (2.35) that for debtor countries, the system will be unstable if the Marshall/Lerner condition is satisfied.[19] It is hardly likely that in a world of debtors and creditors some systems will be stable and others not.

Another serious problem is that the accumulation of foreign assets or liabilities is modelled in a way that does less than justice to motives for accumulating them. For instance, assuming the fiscal deficit is zero, residents in a country with a current account deficit are spending more than their income. The reasons for this and the plans made to service the debt so incurred have little or no role in the many portfolio balance models. Unless these decisions are explicitly modelled, conclusions about them are likely to be misleading. Moreover, the factors making for instability in systems such as this often arise because of the lack of a thorough and consistent treatment of intertemporal optimising by the agents concerned. It is likely that many sources of instability would be removed from such systems if full account were taken of dynamic optimisation processes.

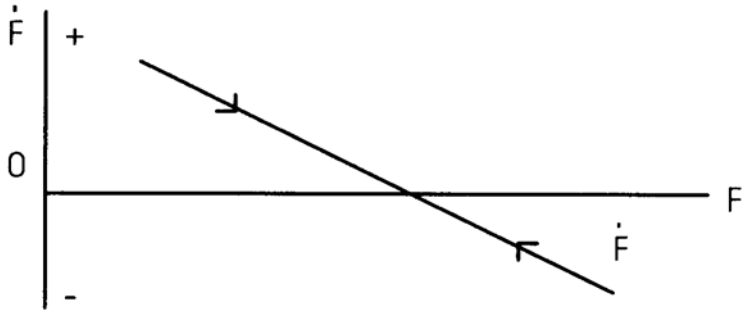


Figure 2.3 Dynamics of current account feedback

In summary, the portfolio balance approach recognised that the exchange rate would in part be determined at any time by the supply and demand for assets denominated in the currency concerned, both at home and abroad, as well as by the supply and demand for those goods and services whose relative prices were affected by the rates. Current account imbalances would change asset supplies, so *inter alia,* ultimately affecting the exchange rate and this could provide a mechanism which could work to 'correct' current account deficits. An insight of this approach is that the exchange rate is affected by preferences for holding assets and debt dominated in particular currencies. This notion would seem to give ample justification for short term movements in exchange rates based upon shifting expectations about the future value of a currency as events unfold.

The picture of adjustment conveyed by these ideas suggests that both changing asset supplies and exchange rate movements could be potential mechanisms for bringing an economy to equilibrium. However, as noted they present a rather mechanical view of the significance of the balance of payments and its capital and current accounts. In particular, they do not exploit the fact that the private sector could be expected to choose excess spending and borrowing simultaneously and optimally. Like Hume's specie flow mechanism, they make no allowance for the possibility of advantageous trade in saving between countries.

8. Gains from foreign investment

In a competitive environment without restrictions on international capital movements, capital will tend to flow towards those countries and sectors with higher rates of return. A real capital transfer between any two countries can only occur when the current account deficit of the lender is in surplus and of the borrower is in deficit. Such capital flows can be shown to maximise world income (appropriately defined) and to raise the income of both borrower and lender.[20] Moreover, given discount rates and profit schedules, it will in general pay some countries to be net lenders and others to be net borrowers indefinitely. Analyses of foreign investment establish the conditions that determine the size of any increment to the capital stock that would be financed from abroad. They amount to models of economic growth in a full employment, open economy context and illustrate both social and private optimal choices.

Supposing the fiscal deficit and government investment to be zero, foreign investment is defined as the excess of private investment over private saving. The equations of the absorption approach make it clear that the extent of this excess will be equal to the current account deficit. From this perspective it follows that a current account deficit may be the desirable consequence of real capital movements which can confer considerable benefits on the borrower and lender. Indeed, other things being equal, real capital inflow

will normally tend to raise real wages because it raises the capital/labour ratio. It also produces the potential for benefits from technology transfer. This topic is addressed further in Chapter 6.

9. Optimal intertemporal consumption choice and the current account

Although an approach to the current account stressing optimal choice of expenditure over time is credited with having started in the 1980s, it was always implicit in Fisherian models of consumption and borrowing. As well, the models of foreign investment underlying the previous section had basically been about this issue. The insight that the current account allows intertemporal resource transfers was firmly in the foreign investment literature of the 1960s.

Consumers who can borrow or lend abroad are likely to be subject to one or other of a variety of shocks. These shocks might be temporary or permanent, long term or short term, of certain or uncertain duration. For instance, assume a fall in real household income occurs and is taken to be temporary. It is likely that an optimal response is for households to reduce their consumption by a lesser amount than income, that is save less.[21] Other things being equal, this will increase the current account deficit and raise foreign indebtedness. Subsequently, it will be optimal to raise consumption towards its pre-shock level and eventually to create a current account surplus so as to repay foreign borrowing. Hence it is appropriate for households indirectly to use the facility to borrow abroad which the balance of payments involves. Under reasonable circumstances, this type of *smoothing* consumption response to fluctuating real income can be shown to be optimal behaviour. What is more, it implies that a current account balance which is steady as a level or a proportion of GDP is unlikely and has no merit when such fluctuations are common. These issues are the subject of Chapter 5.

Combining the approaches of this and the previous section, saving and investment plans can be thought of as the optimising response of private agents to the situation in which they presently find themselves, and their forecasts of future circumstances. With qualifications about the absence of distortions and cycles, the current account outcome, whether deficit or surplus, is simply the best outcome in the situation. By contrast, some appear to believe that the private sector is short-sighted, irrational, or not in possession of the information available to governments. If this were true it would justify a case for intervention if it were supposed that government authorities are far-sighted, rational and well informed. It is more likely that those bearing the risks and obligations of debt and lending have the incentives to seek the appropriate information and make the right decisions for themselves. If there is a case for intervention with respect to debt or the

current account it must then rest with the violation of some of the qualifications that were made above.

One of the shortcomings of these models is their neglect of the role of cyclical effects. If decisions are made on an optimising basis with as full information as is possible about past, present and future events, the existence of problems of disequilibrium in factor and product markets is virtually excluded. However, some such disequilibrium in factor and/or product markets appears to be a feature of modern economies and the conclusions of the intertemporal optimising approach need to be qualified and perhaps one day extended to take account of this. Nevertheless, the notion that individual agents make decisions involving future events in some form of optimising framework is of crucial importance to the understanding of current account issues.

III. EXCHANGE RATE DETERMINATION

Traditionally, balance of payments and exchange rate issues have been thought to be closely related. One such view held that when it is free to find its equilibrium level the exchange rate is determined by the balance of payments. Closer attention to the determinants of exchange rates since floating became widespread in the 1970s, has led to questioning of such views. The level of the nominal exchange rate must be influenced by the absolute prices which feature in the definition of the real exchange rate and the factors which influence this relative price. This implies that a complete model of the economy is needed to ascertain the nominal exchange rate. It is interesting that partial approaches which fall well short of being based on a complete model abound in this area. It would seem that economists value short cut methods of determining the nominal exchange rate.

1. Purchasing power parity

Suppose all countries in the world produce and consume the same good, which could be a composite good whose components are consumed in the same proportions everywhere. Abstracting from transport and other transactions costs, arbitrage suggests that a 'law of one price'

$$P=eP^* \tag{2.36}$$

should hold, where P and P* are the prices of the good at home and abroad in their own currencies, respectively. From (2.36)

$$\hat{e}= \hat{P} - \hat{P}^* \tag{2.37}$$

where ^ represents the proportionate rate of change of a variable. Hence movements in the nominal exchange rate would reflect the relative inflation rates of the two countries.

This approach neglects differences in consumption patterns between countries as well as the presence of non-traded goods. It is clearly partial, as it is not based on a complete model of the economy. Nevertheless, continuing in the same vein, if the quantity theory of money is also supposed to hold it follows that

$$\hat{e} = \hat{M} - \hat{M}^* \tag{2.38}$$

Hence, exchange rate movements reflect the different rates of monetary expansion in the two countries, a prediction of the monetary theory of the balance of payments.

2. Interest parity

If the expected rates of return on interest bearing assets are equated across countries, then

$$i = i^* + E[\hat{e}] \tag{2.39}$$

where i and i* are the domestic and foreign nominal interest rates and $E[\hat{e}]$ the expected rate of depreciation of the exchange rate. This provides a theory of the determination of the exchange rate, though it is better to think of it as a part, rather than the whole of any theory. Rearranging (2.39)

$$i - \hat{P} = i^* - \hat{P}^* + \{E[\hat{e}] + \hat{P}^* - \hat{P}\} \quad \text{or} \tag{2.40}$$

$$r = r^* + E[\hat{\pi}] \tag{2.41}$$

where r and r* are the respective real interest rates, π is the real exchange rate and price changes are those expected. (2.41) is the real interest parity condition that the domestic real interest rate should equal the foreign real interest rate plus the expected change in the real exchange rate.

Interest parity is clearly not a complete theory of exchange rate determination as the factors determining interest rates must be added to the system. Nor would it necessarily hold without modification in conditions of uncertainty.

3. Overshooting

As was noted in section III.1, the monetary theory of the balance of payments implies that exchange rates will move according to the relative rates of monetary expansion at home and abroad, that is

$$\hat{e} = \hat{M} - \hat{M}^* \tag{2.42}$$

Dornbusch (1976) observed that whereas floating exchange rates often tend to fluctuate markedly, money supply growth rates are normally relatively stable. Hence, (2.42) was inadequate as a theory of exchange rate changes. He suggested an amendment that would allow for monetary changes to

produce significantly greater exchange rate fluctuations. The model also has the merit of being complete rather than partial. It consists of a money demand function, the interest parity condition and a sluggish price adjustment to excess demand. For simplicity, real output y is taken to be constant at the natural rate.

$$M = PL(\underline{i}, y) \qquad \text{money demand} \qquad (2.43)$$

$$i = i^* + E(\hat{e}) \qquad \text{interest parity} \qquad (2.44)$$

Combining (2.43) and (2.44)

$$M = PL(i^* + E[\hat{e}], y) \qquad (2.45)$$

To complete the system it is necessary to add the price adjustment equation involving aggregate excess demand. However, it is straightforward to infer results without writing down this equation. Aggregate demand is taken to be of the standard IS format with the consequence that, for present purposes, there will be excess demand for goods when price is below its equilibrium level.

Consider the effect of an unanticipated increase in the money supply. First, the equilibrium price and exchange rate will rise in the same proportion as the money supply, and the equilibrium point will move from A_0 to A_1 in Figure 2.4. Being sluggish, prices will not adjust at the moment when the money supply rises, but exchange rates are supposed to be capable of jumping to eliminate disequilibrium in the money market. To sustain this market in equilibrium the nominal interest rate must fall, hence increasing the demand for money to match the increase in supply. From (2.44) this requires that an expectation of an appreciation of the exchange rate be

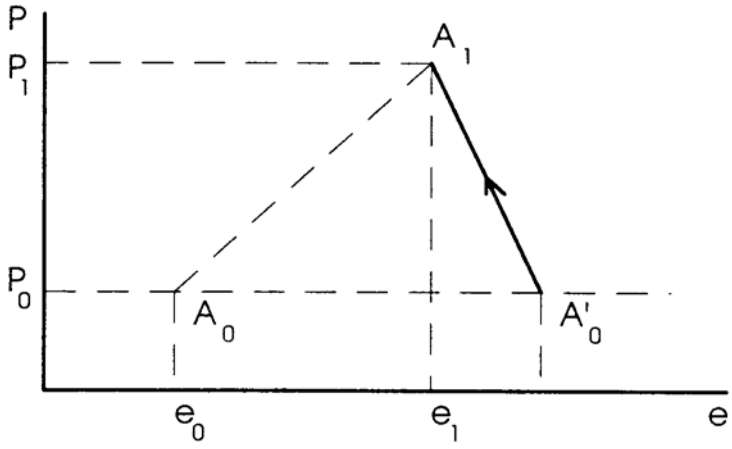


Figure 2.4 Overshooting

generated. Under any reasonable expectations mechanism this would mean that the actual exchange rate must jump to a level above its new equilibrium. In Figure 2.4 it follows that the system moves from A_0 to A'_0. Hence the exchange rate has overshot equilibrium. Subsequently it is expected to appreciate and will do so in a stable system with monotonic convergence. Further, prices at A'_0 are below equilibrium and so will follow a rising path from there to the new equilibrium at A_1.

Overshooting is one theory which can account for exchange rate volatility, but it is not inevitable that it must happen in this class of model, nor is it the only explanation. Fane (1982) has shown that undershooting is also quite possible under reasonable alternative assumptions. Another mechanism which might sometimes be at work to raise exchange rate volatility is the effect of terms of trade fluctuations which are discussed in section III.6.

4. The exchange rate and the balance of payments

The popular view of exchange rate determination is that it is set by the demand and supply of foreign exchange F which, in turn, comes from the various items of the balance of payments. This is how financial commentators often seem to think about the influences on the exchange rate. As Kouri (1976) pointed out it is true in a formal sense, but, except in special circumstances, is not a basis for a rigorous theory of exchange rate determination. That this is so can be seen from the fact that the balance of payments equation is not a complete model of the economy.

The approach is based on a demand curve for foreign exchange to finance imports and a supply of foreign exchange from the sale of exports.[22] These are assumed to be downward and upward sloping, respectively, in Figure 2.5.[23] Add, say to the supply curve from exports, the net supply of foreign

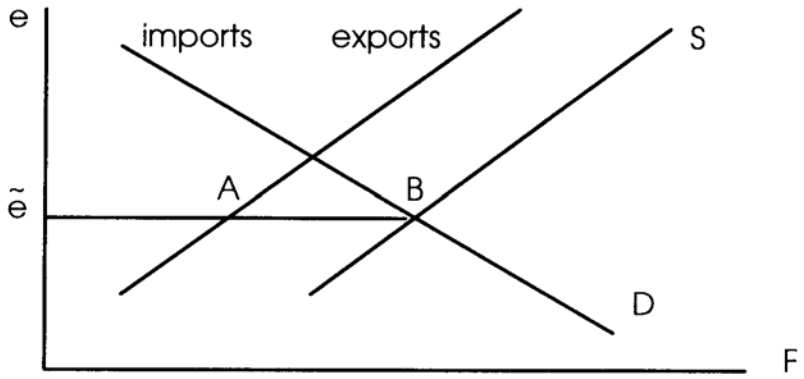


Figure 2.5 The foreign exchange market

exchange AB provided by capital inflow and undeniably the exchange rate is e~ if the foreign exchange market clears. It would appear to be determined by the supply and demand for foreign exchange. However, this is not a useful way of thinking about the issues as can be seen by referring to the following simple Mundell/Fleming system.

$$M=PL(i^*, y) \qquad \text{LM} \qquad (2.46)$$

$$y=C(y)+I(i^*)+G+NX(\pi, y) \qquad \text{IS} \qquad (2.47)$$

$$\pi=eP^*/P \qquad \text{real exchange rate} \qquad (2.48)$$

where the symbols have the usual meanings and NX is net exports. Capital is assumed perfectly mobile at the world interest rate, exchange rate expectations are static and domestic and foreign prices are taken to be constant. It follows that (2.46) to (2.48) solve for $\tilde{y}$, $\tilde{\pi}$ and $\tilde{e}$. The exchange rate is determined without reference to the balance of payments.

These two analyses are reconciled by substituting the value of the exchange rate $\tilde{e}$ found from (2.46) to (2.48) into Figure 2.5. The gap between the supply and demand for foreign exchange from trade in goods and services will be filled by a capital inflow AB. The result that the exchange rate is determined independently of the balance of payments holds true for much more complex models than the present. The problem with an analysis such as that in Figure 2.5 is that the factors that shift the curves, rather than their shapes in relation to the exchange rate are dominant in determining the rate. Despite this, the analysis involved in Figure 2.5 is a commonly used and sometimes convenient way of thinking about exchange rate issues. When it is used, care must be taken to avoid possible errors which can arise because of the partial nature of the approach.[24]

5. The exchange rate and the current account

A similar proposition to that of the balance of payments determining the exchange rate is that it is determined by the current account balance. This approach, sometimes held by media commentators, is more a folk view than a serious theory of exchange rate behaviour when capital is internationally mobile. Nevertheless, from Figure 2.5 it can be seen to have a degree of validity if capital flows are zero. In that case the equation

$$NX(\pi, y)=0 \qquad (2.49)$$

must be added to the system (2.46) to (2.48). The model becomes separable with (2.46) to (2.48) determining output, and (2.49) determining the real exchange rate. This special case, which McKinnon (1981) has referred to as 'the insular economy', has some relevance to the post World War II circumstances of limited capital mobility. It will be discussed further in Chapter 4.

As well, there is a definitional sense in which the current account balance determines the exchange rate. To see this substitute for y and π from (2.46) and (2.48) in (2.47), leading to an expression for net exports as a function of the single variable e and all the exogenous variables in the system. Only in this reduced form sense does the current account balance determine the exchange rate when there is perfect capital mobility. The same process applied to the LM and IS curves could demonstrate that the exchange rate is determined in the money or goods market. Hence, such a result has little significance.

6. The exchange rate and the terms of trade

The usual definitions of the real exchange rate are often closely related to, or even identical with, the terms of trade. Hence the terms of trade can be expected to have considerable influence on exchange rate movements. Particularly for countries with volatile terms of trade, understanding their relationship to the exchange rate is of fundamental importance.[25] Consider the standard set of assumptions about the goods structure of macroeconomic models where there is supposed to be a single good produced at home and exported and a different foreign good imported. The terms of trade is then the reciprocal of the real exchange rate as defined in (2.9). A version of this model, set out in (2.46) to (2.48) in the previous section, jointly determines real income and the terms of trade or real exchange rate. Hence the terms of trade are endogenous in this model and questions about the effects of terms of trade shifts must be asked with care. It would be necessary to specify the underlying exogenous shocks which move the terms of trade and other magnitudes of interest.

The terms of trade may be treated as an exogenous variable in a system in which exportables, importables and non-traded goods with prices P_X, P_M, P_N are separately identified and traded goods prices are determined in world markets. It is interesting that as there are now two relative prices, there is no longer a unique way of defining a real exchange rate. For the terms of trade to be exogenous it must be assumed, as is frequently thought reasonable, that foreign currency valued traded goods prices $\mathbf{P}^*_\mathbf{X}$, $\mathbf{P}^*_\mathbf{M}$ are set in world markets which are not influenced by events in the home country. Notice that when the terms of trade change the relative prices P_X/P_N and P_M/P_N will change, suggesting a case for defining two real exchange rate measures whenever the three prices involved move in significantly different ways.

To get an idea of the effects of a terms of trade shift on the nominal exchange rate suppose that relative prices are flexible and adjust to clear the non-traded goods market, that is

$$X_N(P_X, P_M, P_N, E)=X_N(P_X/P_M, P_N/P_M, \xi)=0 \qquad (2.50)$$

where X_N is excess demand for traded goods, assumed homogenous of

degree zero in nominal magnitudes, E is nominal expenditure and ξ is real expenditure measured in terms of imports. Suppose ξ is held constant. Differentiating (2.50) it can be shown that

$$\hat{P}_N - \hat{P}_M = \alpha(\hat{P}_X - \hat{P}_M) \tag{2.51}$$

where α is positive if gross substitutes are assumed and it can be shown that $(1-\alpha)$ is also positive.[26] From the law of one price

$$\hat{P}_T = \hat{e} + \hat{P}^*_T, \quad T = X, N \tag{2.52}$$

and (2.51)

$$\begin{aligned}\hat{e} &= \hat{P}_N - \hat{P}^*_M - \alpha(\hat{P}_X - \hat{P}_M) = \hat{P}_N - \hat{P}^*_X + (1-\alpha)(\hat{P}_X - \hat{P}_M) \\ &= \hat{P}_N - [\alpha\hat{P}^*_X + (1-\alpha)\hat{P}^*_M]\end{aligned} \tag{2.53}$$

The way in which terms of trade movements affect the nominal exchange rate depends on how the terms of trade changes come about. Take the non-traded goods price to be constant. A terms of trade improvement caused by a rise in the price of exports alone appreciates the nominal exchange rate, whereas if it arises solely from a fall in import prices, the nominal exchange rate depreciates.

Rearranging (2.53) it may be written

$$\hat{P}_N - \hat{P}_X = -(1-\alpha)(\hat{P}_X - \hat{P}_M) \tag{2.54}$$

(2.51) and (2.54) are expressions for the effects of terms of trade changes on two possible measures of the real exchange rate. It is notable that for a given terms of trade shift the two relative prices move in opposite directions.

The small degree of complexity introduced by separating traded from non-traded goods and exportables from importables would seem a reasonable extension of the meagre one home good models. Yet the simple notion of a unique real exchange rate which responds in an unambiguous fashion to various exogenous changes is no longer available. The widespread use of this concept in policy discussions without any qualification for these complications must be regarded as potentially inaccurate and misleading.

Part II

Short run issues

Chapter 3

Devaluation and the trade balance

One of the best known propositions of international monetary economics is the Marshall/Lerner condition that, for an exchange devaluation to reduce a trade deficit, trade elasticities must be sufficiently high. This chapter is devoted to showing that in a model allowing both trade in goods and services and international borrowing and lending by rational agents, this condition emerges as a requirement of stability. Moreover, if it is not satisfied the system will always move to a region where it is. Hence, it is reasonable to assume that the condition is satisfied in the vicinity of equilibrium and that if it does not hold this will be only a transition phase. Incidentally, if this is the case one of the main reasons for the considerable econometric effort aimed at estimating trade elasticities would not apply.

Undoubtedly the most popular system for analysing open economy macro issues is the one-home-produced-good (or HG) model that was used on several occasions in Chapter 2. With a second good imported but not produced domestically, the model allows trade issues to be considered along with macro and monetary questions, but still retains the conventional national income structure with respect to aggregate demand for domestic output. The class of models with one single good in the world economy scarcely does justice to trade matters, while the additional complexity of the traded/non-traded goods model often means that its analysis and prescriptions tax the attention span of the practical practitioners of macroeconomics. Because a great deal of policy analysis is conducted in the context of the HG system, it is important to be clear about the nature and limitations of its conclusions. One of the more celebrated of its results is that the effect of a devaluation on the trade balance is ambiguous in sign.[1]

In any system in which the exchange rate is pegged or heavily managed, changing circumstances will from time to time require an adjustment of the rate. Hence, for such systems a central topic in the study of external economic issues is the question of the effect of a devaluation of the nominal or real exchange rate on the balance of payments and specifically on the current account balance.[2] In particular, there was considerable interest in this issue for some time following World War II. Exchange rates were pegged and foreign currency transactions and capital flows were heavily regulated. Post war

shortages and the need for reconstruction meant that current account deficits in some countries tended to be larger than levels which the authorities judged could be supported by capital inflows and reductions in reserves. The Bretton Woods agreement allowed devaluation when there was a 'fundamental disequilibrium' in the balance of payments. But would devaluation reduce the current account deficit and so take pressure off the balance of payments?

In appropriate circumstances, a devaluation will increase the trade component of the current account surplus or reduce the deficit if the Marshall/Lerner condition (hereafter referred to as M/L) is satisfied.[3] This condition requires that domestic and foreign elasticities of demand for imports are not 'too small' and a variety of problems for the economy in question are supposed to ensue if it is not satisfied. Yet the constraints of demand theory do not confine elasticities to lie in the range necessary to satisfy the M/L condition. So if M/L were not met, a devaluation would increase a current account deficit or reduce a surplus, except in the borderline case (which will be neglected in subsequent discussion) where it will have no effect at all.

Perhaps a significant explanation of why there has been such interest in this question is that in practice devaluation did not inevitably reduce current account deficits or 'cure' balance of payments problems. There are good reasons why this might have been so. The real exchange rate is an endogenous variable and need not move in the direction or to the extent that the nominal exchange rate is adjusted. Net exports depend on real aggregate income or expenditure as well as the relative prices that the real exchange rate measures. A rise in domestic expenditure could well undo the effects of a devaluation Further, the current account balance cannot be altered by measures which solely affect trade magnitudes because it is identically equal to the sum of the fiscal surplus and the excess of private saving over investment. Unless devaluation, or the actions accompanying it, affected this side of the identity appropriately, net exports would not increase. These considerations reduce, but do not eliminate, interest in the elasticities issue.

In itself, non-fulfilment of the M/L condition would not seem too much of a problem. The nominal exchange rate then needs to be appreciated to ensure an increase in net exports. However, this is not the whole story, for it can be shown that the real economy will be unstable if M/L is not satisfied. Instability can be seen to exist in the sense that a rise in the relative price of a good will increase the excess demand for it. Thus there is a potential quandary if the elasticity condition is not satisfied, because a system which seems perfectly reasonable without trade appears unstable and so not viable when trade is allowed. The problem is resolved by observing that a real model can still be globally stable when M/L does not hold because it is most likely that the unstable equilibrium is bounded on both sides by stable equilibria. The practical effect of such a proposition is that we would expect almost never to observe a situation in which M/L fails to be satisfied. An economy would not settle in such a region, but would move away from it.

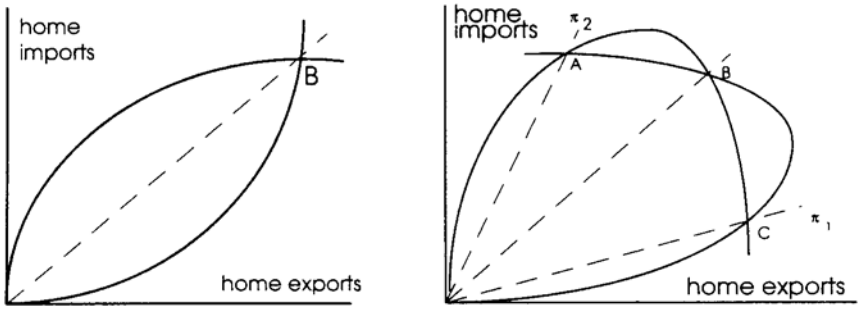
But there is still a problem with this result because the stability analyses on which it is based take no account of the intrinsic dynamics of the current account and the balance of payments. Thus when the current account is in deficit the matching capital account surplus means that net foreign liabilities must rise and/or reserves of foreign exchange must fall. Changes in net foreign liabilities may cause a variety of changes in expenditure variables, which in turn will have an impact on the current account deficit. This chapter attempts to add to the understanding of the Marshall/Lerner condition in two ways, first by examining the question in a context that recognises the intertemporal aspect of the balance of payments constraint and secondly by basing the analysis of stability on the dynamics of the current account and net asset relationship rather than the somewhat arbitrary price adjustment rule which previous stability analysis used. It will be shown that, as a consequence of combining intertemporal optimising expenditure choices with the elasticities approach, equilibria where the M/L condition is satisfied are stable, whereas when it is not met they are unstable. These results parallel those of pure trade theory and is not based on *ad hoc* dynamics.

The first part of this chapter briefly discusses the nature of the M/L condition in the pure and monetary theory of trade. In the second part the behaviour and stability of a model in which the current account balance is jointly determined by the real exchange rate on the one hand, and intertemporally optimal choice of the level of spending relative to income on the other, is investigated.

I. THE MARSHALL/LERNER CONDITION

In the two good model of the pure theory of trade, a country's offer curve is the locus of combinations of excess demand (demand for imports) and excess supply (supply of exports) at various values of the relative price of the commodities. The M/L condition appears as a requirement on the slopes of the domestic and foreign offer curves that ensures that their intersection is a stable equilibrium. In this analysis the concept of stability is used in the sense that a rise in the relative price of a commodity will reduce the level of excess demand for that commodity.[4] Where at some point of intersection of the offer curves the M/L condition is not satisfied, it would seem that except in unlikely cases there would exist stable equilibria for relative prices on either side of the unstable one. These cases are illustrated in Figure 3.1. In Figure 3.1a the equilibrium at B is stable, whereas in Figure 3.1b there is instability in the neighbourhood of B. However, this unstable equilibrium has stable equilibria A and C on either side, corresponding to the relative prices π_1 and π_2.

It should be noted that offer curves are normally drawn on the assumption that the trade and current account balances will be zero and because they are both equal, it is implied that there are no foreign assets or debt. The question addressed is how much exports can be exchanged for a



Figures 3.1a and 3.1b Offer curves and multiple equilibria

given quantity of imports? However, there is no reason why unbalanced trade should not also be featured in offer curves. Then the question is how much exports can be exchanged for a given amount of imports and a specified change in net foreign assets? By this means the offer curve concept can be extended to the situation of unbalanced trade.

The M/L condition has featured prominently in open economy macro models where it is conventional to assume that it will be satisfied. Without such an assumption most of the results of the HG model would be ambiguous. Further, a prevalent theme of international monetary policy discussions used to be the issue of elasticity pessimism or optimism. Depending on whether one thought M/L would be satisfied, one had more or less faith in the price system and devaluation to ensure some form of international equilibrium. For instance, Kindleberger (1963) devoted a chapter to so called 'structural disequilibrium problems', defining them as:

> a maladjustment of the price system. At the goods level, it is a misallocation of resources relative to prices, generally arising from a change in demand or supply for internationally traded goods. It calls for a reduction in expenditure and a shift in resources.
>
> (Kindleberger 1963:595)

Elasticity pessimists were likely to suggest that economies experiencing the demand and supply shifts of 'structural disequilibrium' would require intervention to direct resources into 'appropriate' areas and possibly also the use of macro policies to adjust the current account because of the perceived failure of the price mechanism. The strength of interest in this question is indicated by the many empirical studies of the price and income elasticities of exports and imports.[5] It seems inappropriate to be concerned about a situation which, because of its instability, is unlikely to be encountered. However, it is probable that the frequent 'failure' of devaluation to result in a significant 'improvement' in the trade balance for the reasons mentioned in the introduction, accounts for the attention the topic has received.

The M/L condition also plays an important role in certain dynamic open economy systems such as the portfolio balance models.[6] The intrinsic dynamics in such models comes through the foreign asset or debt accumulation and decumulation process given by the balance of payments equation. If M/L does not hold, such a system could be unstable. Presumably the authors could have taken comfort from the pure theory of trade and argued that in any case, unstable equilibria are bounded by stable equilibria where M/L is met.

II. A MODEL OF INTERTEMPORAL CHOICE AND REAL EXCHANGE RATES

Suppose that there is a single good produced at home, while two goods are consumed, the second good being imported (the HG model). As well, the market for the home good is taken to clear and there is supposed to be an infinitely elastic supply of imports at the world price. The output of the home good is assumed to be fixed, though this assumption can be readily relaxed. The demand of the rest of the world for the home good depends on its price relative to that of the import and on foreign real income, the latter being assumed to be a given parameter.

Households are taken to consist of infinitely lived maximising consumers with identical tastes and endowments who choose time paths for the consumption of both goods, subject to their incomes, the prices of the goods and the rate of interest they receive for lending or borrowing. It will be supposed first that consumers operate in competitive markets in the sense that they take prices and interest rates as given, with the consumption of each of the two goods being the control variables. This provides first order conditions that determine consumer responses at any values of the interest rate and relative prices. When these are put into the market clearing and balance of payments conditions, they provide the solution for the course of all variables in the economy through time. Alternatively, consumers could be assumed to make forecasts of the future course of prices and interest rates and use these in calculating their optimal behaviour. If their forecasts are assumed to be correct, this amounts to assuming rational expectations.

Utility w is supposed to depend on the consumption of the home good c and the imported good m and this function w is assumed to be additively separable[7] so that

$$w(c, m)=u(c)+v(m) \quad u_c>0, \quad u_{cc}<0, \quad v_{mm}<0$$

The problem is to maximise the integral of discounted utility

$$\max_{c,\,m} \int_0^{\infty} e^{-\rho t}[u(c) + v(m)]dt$$

subject to the balance of payments (debt generation) constraint

$$\dot{D} = \xi - \bar{y} + rD \tag{3.1}$$

where ρ is the discount rate, $\xi = c + \pi m$ is aggregate expenditure measured in terms of the home good, while the relative price of imported to home goods (that is, the real exchange rate) π and the real interest rate r are taken as given by households.[8] All foreign obligations are assumed to be held as interest bearing liabilities D denominated in terms of the home good. Define the Hamiltonian H and the shadow price of debt ψ so that

$$H = u(c) + v(m) + \psi(c + \pi m - \bar{y} + rD)$$

Necessary conditions for a maximum are[9]

$$\frac{\partial H}{\partial c} = u_c + \psi = 0 \tag{3.2}$$

$$\frac{\partial H}{\partial m} = v_m + \psi\pi = 0 \tag{3.3}$$

Combining (3.2) and (3.3) yields the static optimisation condition that the marginal rate of substitution equals the price ratio

$$\frac{v_m(m)}{u_c(c)} = \pi \tag{3.4}$$

A further necessary condition is

$$\dot{\psi} = \rho\psi - \frac{\partial H}{\partial D} = \psi(\rho - r) \tag{3.5}$$

The Ramsey equation is derived from differentiation of $u_c(c) = -\psi$ and substitution in (3.5), so that

$$\dot{c} = \frac{u_c}{u_{cc}}(\rho - r) \tag{3.6}$$

The demand condition (3.4), the Ramsey rule (3.6) and the balance of payments constraint (3.1) represent consumer responses. In aggregate these reactions have the potential to cause the relative price of traded goods to change as demand for the two classes of goods interact with supply. It will be assumed that foreign demand for the home good x (equals exports) is a decreasing function of the relative price of home goods to imported goods and so an increasing function of the real exchange rate π.

Equation (3.6) demonstrates the need for a further market reaction mechanism. The rate of change of consumption is determined by the

difference between the discount rate and the interest rate. If these two rates are initially different, the system will not have an equilibrium unless one or both of the rates is endogenous. Some authors assume that the discount and interest rate are always the same.[10] For any given initial conditions determining the strength of time preference and the level of interest rates available to borrowers, this could only be the outcome of an improbable accident. Alternatively, with one or other of the rates endogenous, analyses with equal rates might be regarded as confined to the endpoint of a stable process. In this case they cannot contribute reliably to an understanding of the process of reaching equilibrium. The consequences of making the discount rate endogenous will be explored in Chapter 5. Here it will be assumed that the interest rate, though determined in world markets, is an increasing function of total borrowing D such that

$$r=r(D),\ r'>0,\ r''>0 \tag{3.7}$$

This also requires that the rate of interest increases in debt at an increasing rate, an assumption that has frequently been used in models of foreign investment. It could reflect a rising opportunity cost of capital because the borrowing economy was not small in world capital markets. Alternatively, it could imply judgements of lenders that the risk of default (not explicitly modelled here) grows with the size of net indebtedness. These propositions are considered further in Chapters 5, 6 and 9.

Using (3.7) the balance of payments equation (3.1) becomes

$$\dot{D}=c+\pi m-\bar{y}+R(D),\ R=rD \tag{3.8}$$

(3.4), (3.6), (3.8) and the home goods market clearing condition

$$c = \bar{y} - x(\pi) \tag{3.9}$$
$$+$$

are four equations in the four variables c, m, π and D and various time derivatives. It turns out to be critical to the solution, to reduce the system to two equations in the variables D, π and their time derivatives. Debt is obviously central to the problem, so should be one of the variables selected, while working with the real exchange rate π will be seen to reveal the possible phases of the M/L condition. Notice that aggregate expenditure is also an important concept in relation to the balance of payments and for some purposes it will be convenient and/or instructive to work with it.

To convert the system to two equations in debt and the real exchange rate, note first that expenditure can be written as a function solely of the real exchange rate. By definition expenditure is equal to output minus the trade balance, that is

$$\xi=\bar{y}-x(\pi)+\pi m \tag{3.10}$$

Differentiating with respect to π

$$\frac{d\xi}{d\pi} = -x_\pi + m + \pi\frac{dm}{d\pi} \tag{3.11}$$

The derivative $dm/d\pi$ can be found from the interaction of demand (given by (3.4)) and the home goods market clearing condition (3.9). Differentiating the latter condition with respect to π,

$$\frac{dc}{d\pi} = -x_\pi \tag{3.12}$$

From (3.4)

$$\frac{dm}{d\pi} = \frac{u_c}{v_{mm}} + \frac{\pi u_{cc}}{v_{mm}}\frac{dc}{d\pi} = \frac{u_c}{v_{mm}} - \frac{\pi u_{cc}x_\pi}{v_{mm}} < 0 \tag{3.13}$$

Substituting in (3.11)

$$\frac{d\xi}{d\pi} = \frac{d(\xi - \bar{y})}{d\pi} = -x_\pi + m + \pi\left(\frac{u_c}{v_{mm}} - \frac{\pi u_{cc}x_\pi}{v_{mm}}\right) \tag{3.14}$$

This expression is the derivative of the trade deficit with respect to the real exchange rate. Hence it is the counterpart of the Marshall/Lerner condition for this model. It is shown in the Appendix that this condition can be translated into the familiar elasticity relationship. As a consequence of devaluation of the real exchange rate, the trade deficit will be reduced, stay constant, or rise as

$$-x_\pi + m + \pi\frac{dm}{d\pi} \lesseqgtr 0 \tag{3.15}$$

Thus satisfaction of the Marshall/Lerner condition requires a negative sign for (3.15).

It has been shown that relative prices may be treated as a function of total expenditure ξ. This arises because the demand for and thus the expenditure on each commodity depends on relative prices and expenditure. Before using this to analyse dynamic choices it is useful to summarise the model by showing how relative prices and the trade balance are determined. The trade balance NX, measured in units of the home good is

$$NX \equiv \bar{y} - \xi \equiv x(\pi) - \pi m(\pi) \tag{3.16}$$

Both sides of the identity (3.16) are plotted in Figure 3.2. In this model it turns out that the trade balance is completely determined on the expenditure side of the identity, once expenditure is chosen, because income $\bar{y}$ is taken as

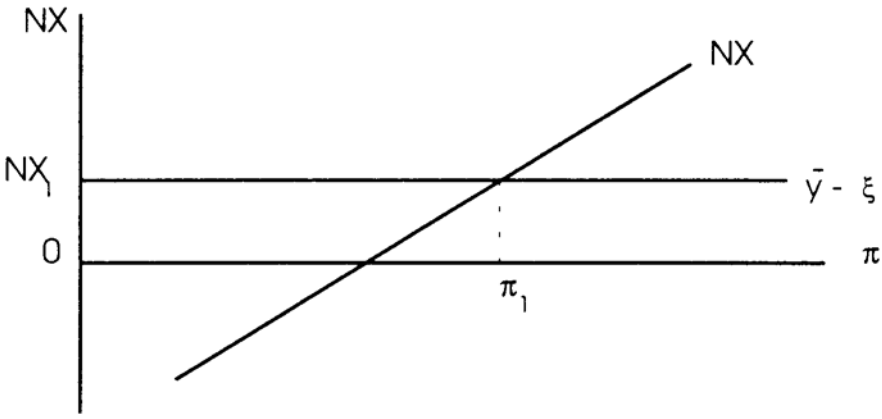


Figure 3.2 Determination of net exports

given. The relationship between net exports and the real exchange rate is shown as a positively sloped curve so implying that the M/L condition is satisfied. In this case, when expenditure rises the trade surplus is reduced by an appreciation of the real exchange rate. If M/L did not hold the real exchange rate would have to depreciate.

First consider the derivation of the equation for the dynamics of prices. From the home goods market clearing condition $x(\pi)=\bar{y}-c$ and the Ramsey equation (3.6), it follows that

$$\dot{\pi} = -\frac{1}{x_\pi}\dot{c} = \frac{-u_c}{x_\pi u_{cc}}(\rho - r) \tag{3.17}$$

Recognising that from (3.7) the interest rate is a function of the level of debt, (3.14) becomes

$$\dot{\pi} = \frac{-u_c}{x_\pi u_{cc}}(\rho - r[D]) \tag{3.18}$$

It follows from (3.18) that when prices are in equilibrium there is a steady state level of debt given by $\rho=r(D^*)$.

The balance of payments condition (3.1) is the equation providing the dynamics of debt accumulation. Using the relationship between expenditure and relative prices given by (3.14) the balance of payments condition becomes

$$\dot{D}=\xi(\pi)-\bar{y}+r[D]D \tag{3.1'}$$

and equilibrium of the balance of payments, using (3.7) can be written[11]

$$\xi(\pi)-\bar{y}=R(D)=0, \quad R(D)=r(D)D, \ R'>0 \tag{3.19}$$

Differentiating and rearranging shows the slope of the $\dot{D}=0$ curve in the (D, π) space to be

$$\left(\frac{d\pi}{dD}\right)_{\dot{D}=0} = -\frac{1}{d\xi/d\pi}R' \tag{3.20}$$

If the Marshall/Lerner condition is satisfied the sign of (3.20) is positive, but from (3.15) it may be negative, or infinite, if it is not met.

Suppose first that the M/L condition is met. The $\dot{D}=0$ curve is positively sloped in the (D, π) space and its intersection with the vertical line D* defines the equilibrium (D*, π*) in Figure 3.3. This equilibrium is then a saddle point and the unique stable branch is taken to be the path that will be followed. As is usual in these models, it is necessary to assume that the agents concerned have some way of choosing their initial expenditure that will put them on the stable branch. With M/L satisfied there will be a unique relationship between expenditure and relative prices. Consumers are taken to operate in competitive markets both with respect to the interest rate and goods prices. Thus they make the assumption that their actions as individuals will have no influence on these variables. However, consistent with rational expectations, they are assumed to know the aggregate economic model and so to recognise that the choice of an unstable path would be non-optimal. There are two types of non-optimal paths. First there are those which lead to infinite asset accumulation. It is readily seen that these are dominated by paths with slower accumulation but higher consumption of at least one of the goods and the same consumption of the other.[12] Secondly, there are those paths which are characterised by high consumption and indefinite debt accumulation.

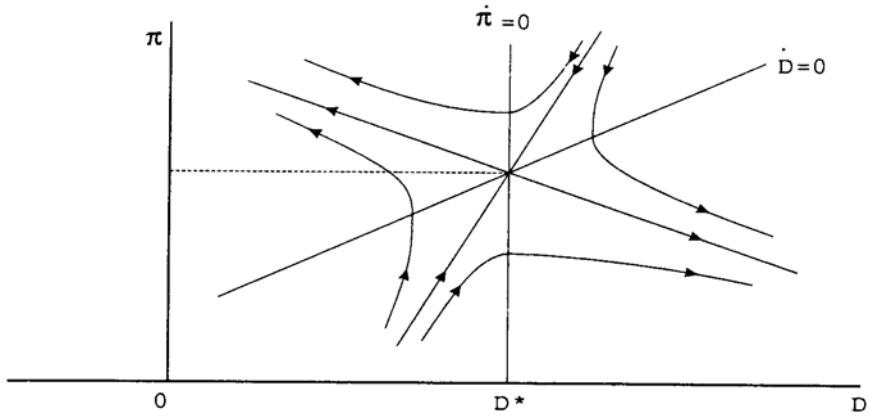


Figure 3.3 Marshall/Lerner satisfied

These are ruled out because they must lead in a finite time to negative net worth measured by ($\bar{y}$/r)-D. Hence only stable paths can be regarded as optimal.

The case of the non-fulfilment of M/L must now be considered. Linearising the system (3.1'), (3.15) in the neighbourhood of a steady state D*, π* it becomes

$$\begin{bmatrix} \dot{D} \\ \dot{\pi} \end{bmatrix} = \begin{bmatrix} R' & d\xi/d\pi \\ -r' & 0 \end{bmatrix} \begin{bmatrix} D - D^* \\ \pi - \pi^* \end{bmatrix} \tag{3.21}$$

The product of the roots of (3.21) is r($d\xi/d\pi$) and their sum is R'. It follows that when M/L is not satisfied ($d\xi/d\pi>0$), both the product of the roots and their sum are positive, so the node D*, π* is unstable.[13] Earlier, all unstable paths were ruled out as being non-optimal. However, it is reasonable to suppose that the zone in which M/L is not satisfied is surrounded by zones in which it is met. This treatment parallels that of the pure theory of trade as shown in Figure 3.1b. These zones are illustrated in Figure 3.4 where π_1, and π_2 are the boundaries of the zone in which M/L is not fulfilled.

It follows that, in general, in this version of the system there will be a typical pattern of three equilibria where the one in the zone of non-fulfilment of M/L will be unstable while the other two will be stable. Where debt levels allow, there will be stable (saddle point) paths which may be chosen.[14] In the zone of non-fulfilment of M/L the economy will be moving away from the equilibrium, but towards a stable equilibrium in one of the bordering zones. The problem of instability essentially does not exist. Hence it follows that it is unlikely that the non-fulfilment of M/L will be observed for long periods of time.

The Appendix translates the Marshall/Lerner proposition given by (3.15) into the more usual elasticity form

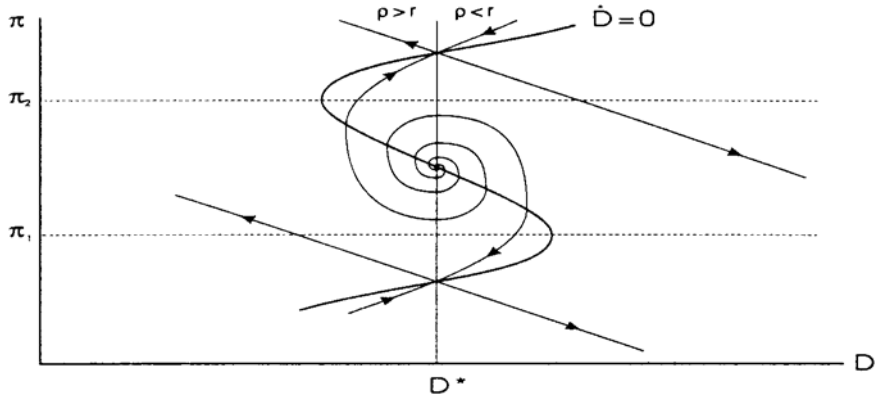


Figure 3.4 Non-fulfilment of M/L

$$\eta_x + \left(\frac{\pi m}{x}\right)(\eta_m - 1) > 0 \tag{3.22}$$

The satisfaction of (3.22) ensures that net exports will rise with real devaluation. A more familiar condition is

$$\eta_x + \eta_m > 1 \tag{3.23}$$

which follows from (3.22) when the trade balance is zero. The satisfaction of (3.23) at a steady state is necessary and sufficient for saddle point stability. However, the stronger form (3.22) is required to ensure that the trade balance rises when there is real devaluation.

Because the real exchange rate is an endogenous variable, the proposition that devaluation raises a trade surplus has limited direct policy implications for a pegged exchange rate system and no direct policy application when the exchange rate floats. However, indirectly this effect is of considerable policy importance. In particular, the sign of the partial derivative of net exports with respect to the real exchange rate will influence the way in which monetary and fiscal policy will affect real variables. Hence, in what follows it will normally be assumed that (3.22) holds.

APPENDIX: THE MARSHALL/LERNER CONDITION IN ELASTICITY FORM

Consider the conversion of the M/L condition given in the text by (3.14) and (3.15) to conventional elasticity form. The trade balance equation (3.16) shows imports as a function of the single variable π, but this has used the functional relationship between ξ and π. In elementary demand theory the import function has the form

$$m = m(\pi, \xi) \tag{A3.1}$$

where from the structure of the model ξ is a function of π. It follows that the total derivative of expenditure with respect to the real exchange rate is

$$\frac{d\xi}{d\pi} = -x_\pi + m + \pi\left[\frac{\partial m}{\partial \pi} + \frac{\partial m}{\partial \xi}\frac{d\xi}{d\pi}\right] \tag{A3.2}$$

Hence

$$-\frac{d\xi}{d\pi} = \frac{dNX}{d\pi} = \frac{x_\pi - m - \pi\dfrac{\partial m}{\partial \pi}}{1 - \pi\dfrac{\partial m}{\partial \xi}} \tag{A3.3}$$

Converting these expressions to elasticity form

$$\frac{dNX}{d\pi} = \frac{\frac{x}{\pi}\left[\eta_x + \left[\frac{\pi m}{x}\right](\eta_m - 1)\right]}{1 - \frac{\pi m}{\xi}\eta_\xi} \tag{A3.4}$$

where η_x, η_m and η_ξ are the price elasticities of demand of foreigners for the home good, of domestic residents for the imported good and the expenditure elasticity of domestic residents for the imported good, respectively. The price elasticities are defined so as to be positive and the expenditure elasticity is taken to be positive. The marginal propensity to spend on imports $\pi(\partial m/\partial \xi)$ is less than unity. The numerator of (A3.4) is the usual M/L expression, and when evaluated at a zero trade balance the M/L condition takes the familiar form

$$\frac{dNX}{d\pi} \gtreqless 0 \quad \text{as} \quad \eta_x + \eta_m \gtreqless 1 \tag{A3.5}$$

Chapter 4

Macroeconomic theory

Discussion of macroeconomic policy in an open economy often assigns a crucial role to the current account balance. This chapter surveys the issue of how exogenous factors, in particular, macro policy settings, affect the current account and other macro variables in a floating rate system. This will be followed up in Chapter 8 with a discussion of whether it is ever appropriate to use macroeconomic policy to control the size of the current account balance. Apart from conventional macroeconomic questions about the effects of monetary, fiscal and wage policy on output, prices and the current account, the present chapter also treats additional topics arising from the use of the predictions of the model to examine policy problems. For instance, governments often apply monetary restraint to reduce a current account deficit, but the models studied can imply that this will increase the deficit. Another issue is what is meant in a floating rate regime by the commonly held notion that devaluation is expansionary?

There are various contexts in which these questions about macroeconomic variables and the current account might be examined. Define the 'natural rate of unemployment' as that rate at which there is no pressure for real wages to change. The 'natural rate of output' would then be the output level corresponding to the employment of the labour consistent with the natural rate of unemployment and of a normal capacity utilisation of the capital stock. Some systems explain fluctuations in output and employment as due to departures from their respective natural rates, while others recognise that these natural rates are themselves endogenous variables. This latter approach is the one followed by the class of models used here. For instance, it will often be assumed that wages are indexed to some degree to consumer prices. Provided there is some unemployed labour, this implies a perfectly elastic supply curve at the going wage. The labour market is then supposed to clear at any time at the ruling wage.

An open economy macro model that allows for various such types of wage setting is the extended Mundell/Fleming (M/F) model exposited by Bruce and Purvis (1985). The original M/F systems extended the Keynesian closed economy model (that is, fixed money wages or prices) to HG economies (one home produced and one imported good) open both to trade

and to capital flows, for the case of fixed money wages or prices. Confining the analysis to the case of a flexible exchange rate system with perfect capital mobility, the chief results were, first, that fiscal expansion will not raise real output, because it tends to raise interest rates which tends to attract a capital inflow so appreciating the exchange rate and reducing demand for domestic output.[1] With perfect capital mobility the offsetting effect of appreciation will cancel out all the expansionary effect of the increased government expenditure. Secondly, monetary expansion will tend to lower interest rates and cause a capital outflow, so depreciating the exchange rate. This will reinforce the expansionary effect of an increase in the money supply. With a flexible exchange rate system and perfect capital mobility, monetary expansion is effective in raising output, but fiscal expansion is not.

When full indexation of wages is introduced into the M/F system these results are completely reversed.[2] Fiscal expansion, taken to be an increase in government spending on domestic output, will raise the home good's relative price. At the same time the real wage cost of domestic output will fall because wages are indexed both to domestic and foreign goods prices.[3] Thus fiscal policy induces a rise in output. By contrast monetary expansion raises the general level of prices, including import prices because it depreciates the exchange rate, and nominal wages rise in proportion to prices, so there are no real effects. For these short run M/F exercises it will be shown that partial indexation leads to results which for monetary policy are qualitatively the same as for the Keynesian case of fixed money wages, but for fiscal policy resemble the full indexation (market-clearing) conclusions. Partial indexation results are not then merely the qualitative equivalent of the Keynesian outcomes and so deserve study in their own right. Indeed, with partial indexation an increase in government demand for the home good produces a smaller increase in output than with full indexation.

Of the many further possible applications of this class of model, four major questions will be considered here. First, it is usually assumed that depreciation of itself will tend to be expansionary in a pegged exchange rate context. However, there is a tendency among macroeconomic commentators to argue that expansion will follow from exchange depreciation even when the exchange rate floats. What could such a proposition mean? As the exchange rate is an endogenous variable the answer depends on what causes the depreciation. The second issue is how monetary policy affects the current account and real exchange rate. Governments from time to time have used monetary restraint in attempts to reduce current account deficits. However, there is debate as to whether this policy is liable to have the desired result. Thirdly, macro policies will usually change the current account balance, so affecting the supply of net foreign assets. This in turn affects domestic net wealth and hence aggregate demand. What then will be the outcome of these policies when the process of current account feedback is taken into account? This mechanism is exposited and critically assessed. Finally, it is often the

case that nominal depreciation will not result in real depreciation and so will have no effect on the current account. This proposition is illustrated and discussed for the cases of fluctuations in the foreign currency price of imports and for monetary changes.

The first section of this chapter sets out the extension of the Mundell/Fleming HG model to the case of wages indexed to various degrees and explores the effects of fiscal, monetary and wage policy in that context.[4] The second section deals with the four questions about the current account balance posed above.

I. THE EXTENDED MUNDELL/FLEMING MODEL

Underlying the extension of the M/F model, analysed for instance by Bruce and Purvis (1985), is a real HG system in which the only good produced at home is the exportable. Home consumption involves both exportables and imports. The standard model is extended by a supply function which, in the general case, relates the output of the home good to both its relative and absolute price. As this is a key part of the model, it is worth starting with the derivation of this function.

To begin with, consider the case of full indexation given by

$$y = F(\underset{+}{N}) \tag{4.1}$$

$$N = N^D(\underset{-}{W/P}) \tag{4.2}$$

$$I = aP + (1 - a)eP^* \tag{4.3}$$

$$W = \omega I = \omega\{aP + (1 - a)eP^*\} \tag{4.4}$$

where

- y real output=output of exportables=output of the domestically produced good
- F production function, $F'>0$, $F''<0$
- N employment
- N^D labour demand
- P price of the domestic good
- a the weight of domestic goods in the price index of consumption
- W nominal wage
- ω real wage implicit in indexation
- e nominal exchange rate=price of foreign money
- P^* price of imports in foreign currency, a parameter
- π real exchange rate ($=1/\sigma$)

σ the relative price of domestic goods to imported goods, ($P/eP^* = 1/\pi$)
I index of consumption prices

Following Bruce and Purvis, all prices and the exchange rate are taken to be unity initially. Note that the consequence of this is that $dP/P = dP$ measures a proportional as well as an absolute price change. (4.1) is the production function for the home good and (4.2) the demand function for labour based on the product real wage measured in terms of the home good. The consumer goods price index is defined by (4.3) and wages are assumed to be adjusted to preserve the consumption real wage level ω indexed as in (4.4). This situation could result from a centralised wage setting authority or a contract agreed to between unions and firms. In the full indexation case the supply of the home good is given by

$$y = y(N^D) = y(N^D\{\omega[aP + (1-a)eP^*]/P\}) = y(N^D\{\omega[a + (1-a)\pi]\})$$
$$= y(\pi) = y(\underset{+}{\sigma}) \tag{4.5}$$

Notice that this implicitly assumes that there is an infinitely elastic supply of labour to meet labour demand at the going real wage, an assumption that needs to be justified. In these circumstances the supply of the home good is an increasing function of its relative price.

The assumption that labour supply N^S is infinitely elastic at the going wage is often implicit in this type of model. However, as this can result in some aspects of the labour market being overlooked, it is better to treat labour supply explicitly. Suppose that there is also a supply curve of labour, taken to depend on the real consumption wage so that

$$N^S = N^S(\underset{+}{W/I}) \tag{4.6}$$

This supply curve would stem from the preferences of individual workers. The labour demand curve (4.2) can be arranged to make labour demand a function of the real consumption wage as well as the relative price of home goods. Thus,

$$N^D = N^D([W/I][I/P]) = N^D([W/I][a + (1-a)\pi]) = N^D(\underset{-}{W/I}, \underset{+}{\sigma}) \tag{4.7}$$

Figure 4.1 depicts this labour market situation, showing several demand curves for different values of σ and an indexed real wage ω. This fixed real wage embodied in wage setting becomes the effective labour supply curve, provided that at any level of employment, ω exceeds or is equal to the real wage which, from (4.6), would induce that labour supply. Hence the effective labour supply curve is ωBC in Figure 4.1.

At A there is unemployment of BA. As σ rises, the demand curve shifts to the right. In Figure 4.1, a shift is shown which raises labour supply to that

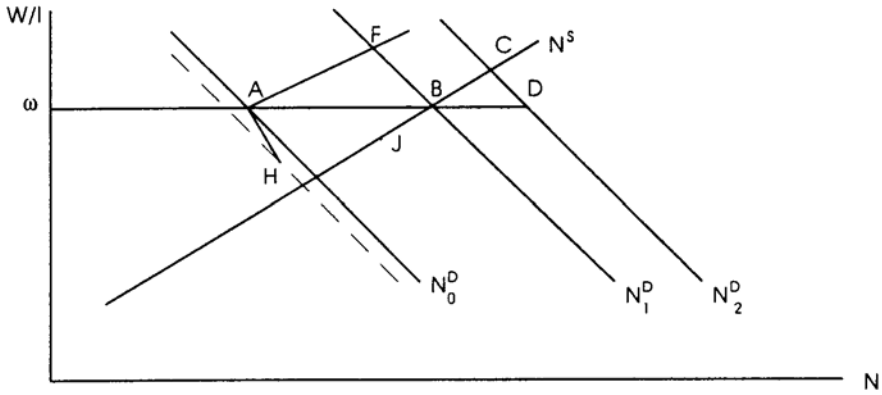


Figure 4.1 Labour market

appropriate to point B. This move from to eliminates unemployment, but there is further scope for employment to rise in response to rises in the relative price of home output. Hence, suppose a further rise in σ from B sufficient to bring the demand curve to D. With a real consumption wage indexed so as to remain constant, employment would not increase beyond B. However, if the wage system were such that ω was a minimum real wage and it was possible to pay a higher market clearing real wage beyond B, an increase in the relative price of the home good raises the supply of labour and the real wage to C. Hence, the supply curve of output is upward sloping in the (y, σ) space. Such a positively sloped curve might represent the move AB, for the case of full indexation, or BC, for the case of market clearing with no imposed wage. Hence a purely market determined wage or a fully indexed wage system will have an output supply function of the form

$$y=S(\sigma) \tag{4.8a}$$

Partial indexation is given by

$$dW=\theta\{adP+(1-a)(de+dP^*)\},\ 0<\theta<1 \tag{4.9}$$

It could arise from the actions of wage fixing authorities to adjust wages by proportionately less than prices, or it could be thought of as a transitional phase of a market adjustment in which wages lag prices. The real consumption wage (W/I) will shift according to

$$dW-dI=(\theta-1)dI=(1-\theta)[(1-a)d\sigma-dP] \tag{4.10}$$

For a given relative price of the home good, the consumption real wage falls as the absolute price of the home good rises. For a given absolute home goods price, the consumption real wage rises as the relative home goods price rises. This reflects the fact that a rise in $\sigma=P/eP^*$, with P constant, means that

the domestic currency price of the imported good must fall, and that the nominal wage is only partly adjusted downward for this fall. Hence the path taken as σ rises, with P constant, involves a rising real consumption wage and is shown by AF in Figure 4.1. The consequent supply curve for partial indexation involves a lower employment and output for each value of σ at a given P than if there were full indexation. It is shown in the Appendix that the supply curve of output in this case depends positively on both the relative and absolute price of the home good.

$$y = S(\underset{+}{\sigma}, \underset{+}{P}) \tag{4.8b}$$

For the case of zero indexation the demand curve for labour becomes

$$N^D = N^D(\underset{+}{P}) \tag{4.11}$$

so that the output supply curve is an increasing function solely of the absolute price of the home good.

Incorporating supply curves for the general case $0 \leq \theta \leq 1$, allowing all degrees of indexation, into the M/F model, the system is

$$y = \tilde{S}(\underset{+}{P/W}) \qquad \text{supply of output} \tag{4.12}$$

$$dW = \theta[adP + (1 - a)(de + dP^*)] \qquad \text{wage indexation} \tag{4.13}$$

$$y = S(\sigma, P) \qquad \text{aggregate supply} \tag{4.8}$$

$$\sigma = P/eP^* \qquad \text{relative price of home goods} \tag{4.14}$$

$$M = PL(\underset{+}{y}, \underset{-}{r^*}) \qquad \text{money market} \tag{4.15}$$

$$\begin{aligned} y &= E(\underset{+}{y}, \underset{-}{r^*}) + G + G_m + NX(\sigma, \underset{-}{y}, \underset{-}{G_m}) \\ &= D(\underset{-}{r^*}, \underset{-}{\sigma}, \underset{+}{G}) \end{aligned} \qquad \text{goods market} \tag{4.16}$$

where symbols not previously defined are

r^*	foreign interest rate
E	real private expenditure on both goods
M	the nominal money supply
L	liquidity preference function
G	government real demand for the domestic good
G_m	government expenditure on the imported good
NX	net exports

Equation (4.16) specifies that real demand for the home good is composed of total private demand for both goods E, plus government demand for the home and foreign good,[5] plus foreign demand for the home good less

imports, the last two terms being taken together as net exports NX.[6] Notice that government expenditure on the imported good will not affect overall demand for the home good because it is both added to and subtracted from (through net exports) the aggregate demand equation.[7] Embodied in (4.16) is the assumption of perfect capital mobility plus static expectation about exchange rates. This ensures that the domestic interest rate equals the foreign interest rate r* which will be taken to be a constant parameter. If, as is usual, consumption is taken to depend solely on income and investment solely on the interest rate, the marginal propensity to consume equals the marginal propensity to spend E_y and is taken to be less than unity, as also is the marginal propensity to spend on the home good E_y+NX_y. These assumptions will be reviewed in section II.1. Equation (4.15) is the familiar money market equilibrium relationship, while (4.14) defines the relative price of home goods to foreign goods (measured in domestic currency).

The assumption of the Mundell/Fleming model that exchange rate expectations are static, enables the system to be kept in a static framework and hence avoids the dynamic analysis necessary to treat non-static expectations. It might be thought that this is a rather special case. Up to a point this is so, but the static expectations assumption also coincides with the proposition that expected exchange rate changes are zero because the system is in equilibrium. Hence the model can be thought of as analysing the comparative statics of more general expectations assumptions as between equilibria in which the dynamic consequences of evolving exchange rate expectations have worked themselves out.[8]

The form of the aggregate supply function (4.8) has already been discussed. In the general case it relates output to the relative and absolute price of home goods. For completeness, it is noted that it is derived from (4.12), a conventional supply function, in which the real wage in terms of home goods determines output, and (4.13) which describes the indexation of wages. The sub cases are

$$y = S(P/eP^*) = S(\sigma) \qquad \text{full indexation} \qquad (4.8a)$$
$$\quad\;\; + \quad\quad +$$

$$y = S(\sigma, P) \qquad \text{partial indexation} \qquad (4.8b)$$
$$\quad\;\; + \;\; +$$

$$y = S(P) \qquad \text{zero indexation} \qquad (4.8c)$$
$$\quad\;\; +$$

The formal derivation of these supply curves is given in the Appendix (see pp. 85–6).

It can be seen that both demand and supply depend, at least in part, on the relative price of the home good. This suggests that one useful way of depicting the model is in the relative price-output space and this approach is followed in most of this chapter and in Chapter 8. This contrasts with the common representation of M/F models using LM and IS curves in the interest rate-

output space. The advantage of the method used here is that the behaviour of the real exchange rate is a critical part of the response to shocks, whereas the interest rate is a constant equal to the world interest rate.

Equations (4.8), (4.14), (4.15), (4.16) solve for the four variables σ, P, e and y. However, the description of the open economy is incomplete without a specification of the state of the current account (or net exports). With capital mobile internationally, the current account can be in deficit or surplus in the short run, depending upon the values of the above variables and the parameters of the system. The current account NX measured in terms of units of the home good can be written

$$NX = X(\underset{+}{\pi}) - \pi Im(\underset{-}{\pi}, \underset{+}{y}) - G_m \tag{4.17'}$$

where X is exports and Im is private sector imports. This relationship has been analysed in Chapter 2, section II.3 and the Appendix to Chapter 3. Differentiating (4.17') totally

$$dNX = \frac{X}{\pi}\left\{ \eta^* + (\eta - 1)\frac{\pi Im}{X} \right\} d\pi - m^* dy - dG_m \tag{4.18}$$

where η and η* are the elasticities of domestic and foreign demand for imports, respectively, while m* is the marginal propensity to import. A depreciation of the real exchange rate, other things being constant, raises a current account surplus if

$$\eta^* + (\eta - 1)\frac{\pi Im}{X} > 0 \tag{4.19}$$

(4.19) is the Marshall/Lerner condition as defined in Chapter 3. If the current account is initially balanced (4.19) reduces to the familiar proposition that the sum of the home and foreign elasticities of demand for imports should exceed unity. For the most part it will be assumed that the current account balance is zero initially and the Marshall/Lerner condition holds.[9] Recalling that $\sigma = 1/\pi$ this implies

$$NX = NX(\underset{-}{\sigma}, \underset{-}{y}, \underset{-}{G_m}) \tag{4.17}$$

It turns out that the effects of increases in G, G_m and M can be studied without significant resort to calculus.

1. Fiscal expansion in the standard case; a rise in G

It is usually assumed, often implicitly, that from an expenditure viewpoint fiscal expansion implies increased government expenditure on the home good. It could equally be a rise in public spending on the imported good, or a combination of both. The effects of an increase in demand for the home

good in the context of partial indexation can be best appreciated when compared with the full and the zero indexation cases. Following this discussion the model is reformulated so as to examine longer term results. The form the system takes is now

$$y = S(\sigma) \quad \text{full indexation} \tag{4.8a}$$

$$y = S(\sigma, P) \quad \text{partial indexation} \tag{4.8b}$$

$$y = S(P) \quad \text{no indexation} \tag{4.8c}$$

$$\sigma = P/eP^* \quad \text{relative price of home goods} \tag{4.14}$$

$$M = PL(y, r^*) \quad \text{money market} \tag{4.15}$$

$$y = D(r^*, \sigma, G) \quad \text{aggregate demand} \tag{4.16}$$

$$NX = NX(\sigma, y, G_m) \quad \text{net exports} \tag{4.17}$$

Equations (4.8),...(4.14),...(4.16) may be solved for the short run equilibrium of the system, the endogenous variables being y, e, σ, P while M, G, r*, P* are exogenous. The assumption that the marginal propensity to spend is less than unity is used in deriving the signs of (4.16).

Start with the zero indexation case. Because (4.8c) and (4.15) each involve only the variables y and P, the essential features of the solution can be depicted by plotting these relations as in Figure 4.2. Home goods supply and

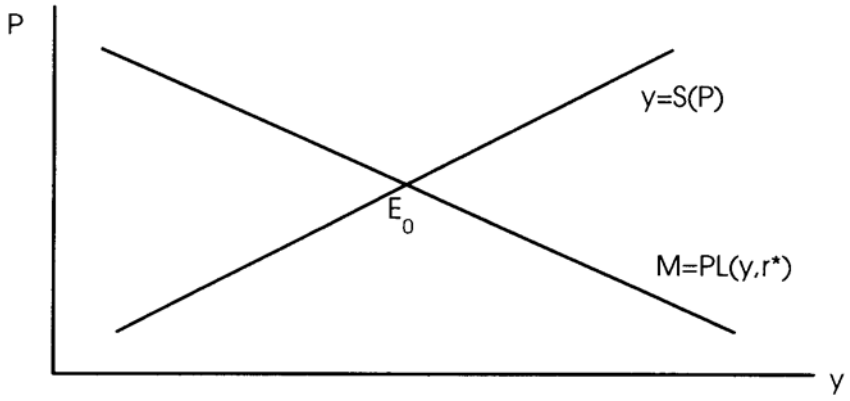


Figure 4.2 Income determination with zero indexation

the LM curve determine the home good price and output and a shift in G does not affect them, so that equilibrium remains at E_0. From (4.16) a rise in government expenditure on the home good must raise its relative price (σ), that is appreciate the real and (to ensure that P does not change, the nominal) exchange rate, thus crowding out an equal amount of private demand for the home good.

This is the M/F conclusion that fiscal policy will be impotent with perfect capital mobility. There are a number of reasons why this conclusion, while strictly correct in its context, is nevertheless misleading. Perhaps the most significant of them is that the nominal wage is hardly likely to be unresponsive to changes in economic conditions. Further, as is shown in section I.6, if real money demand is measured by deflating the nominal money supply by an index of prices, rather than just the price of home goods as in this standard model, real effects are possible.

With full indexation, aggregate demand (4.16) and aggregate supply (4.8a) jointly determine real output and the real exchange rate for any given level of government spending on the home good as shown in Figure 4.3. The rise from G_0 to G_1 shifts the aggregate demand curve to the right, raising the level and relative price of home output, that is appreciating the real exchange rate. Supply depends solely on the relative price of the home good so that the increased demand for the home good, by raising its relative price, induces an increase in output. An interesting aspect of this process, arising out of its money demand effects, is that with the money supply held constant, the nominal price of the home good will *fall*. This occurs because, with no monetary expansion, the increased income can only be financed if prices fall. It will be seen in section I.6 that this result needs to be qualified if real money demand is constructed using a price index, rather than just the price of the home good.

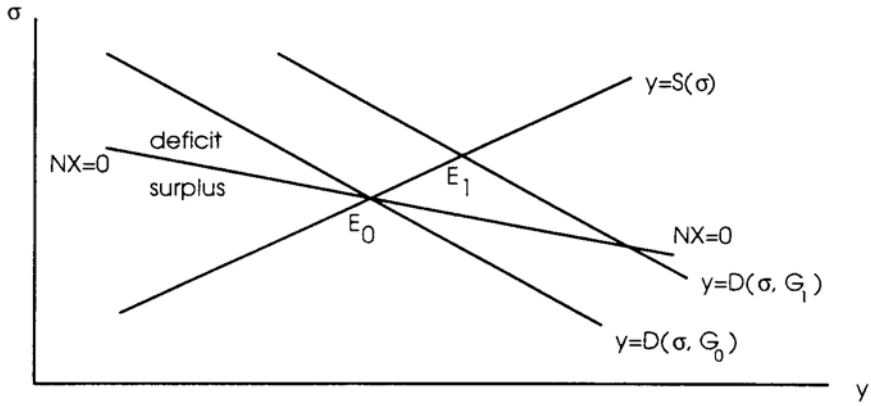


Figure 4.3 Fiscal expansion with full indexation

For partial indexation, a simple case to consider first is that in which the expansion in output is financed by raising the money supply just sufficient to hold the price of home goods constant. It would seem reasonable that any fiscal expansion liable to raise real output should be accompanied by an adequate increase in the money supply, but the policy then amounts to a combination of monetary as well as fiscal expansion. With P constant it is clear that the qualitative effect of a rise in G can be depicted as in the full indexation case of Figure 4.3. The slope of the supply curve is still positive and it follows from Figure 4.3 that the real exchange rate appreciates and output rises. From (4.14), with P constant the nominal exchange rate also appreciates.

All of these results carry over, for variables other than price, to the case in which the price of the home good is not held constant by monetary policy. In addition, the price of the home good will fall in order to allow financing of an expansion in output. To see this eliminate P between (4.8b) and (4.15) so that output supply can be written

$$y = S(\sigma, M/L(y, r^*)) = S(\underset{+}{\sigma}, \underset{+}{M}, r^*) \tag{4.8b'}$$

For a given money supply, the output supply curve has a positive slope as in Figure 4.2, so the real results are qualitatively the same as for full indexation. From (4.15) the price of the home good must fall and, with σ rising and P falling, from (4.14) there must be nominal appreciation.

What are the effects on the current account of increased government spending on the home good? Suppose, in order to establish a reference point, that the current account balance is zero in the initial situation, then

$$NX(\underset{-}{\sigma}, \underset{-}{y}, \underset{-}{G_m}) = 0 \tag{4.17}$$

This locus has a negative slope in the (y, σ) plane, given by

$$\frac{d\sigma}{dy}[NX = 0] = \frac{-NX_y}{NX_\sigma} \tag{4.20}$$

This must be compared with the slope of the aggregate demand curve

$$\frac{d\sigma}{dy}[y = D] = \frac{-NX_y + (1 - E_y)}{NX_\sigma} \tag{4.21}$$

Provided the marginal propensity to spend is less than unity, it follows that

$$\frac{d\sigma}{dy}[NX = 0] > \frac{d\sigma}{dy}[y = D] \tag{4.22}$$

Figure 4.3 illustrates these two curves, together with the home good supply

curve. From (4.22) the aggregate demand curve is steeper than the zero net export locus in this figure. The increase in G creates a deficit on net exports and so, for a given level of net income payments, a deficit on the current account. Notice that the rise in income and the appreciation of the real exchange rate both work in the same direction to produce this result.

It is sometimes argued that, contrary to the result above, fiscal expansion will depreciate the exchange rate. The sort of logic behind such a view can be rationalised if it were believed that the exchange rate is determined by the balance of payments. Indeed, there is a model in which such an outcome is valid, namely the case where there is zero international mobility of capital and no official monetary movements so that the current account must always balance.[10] As a consequence the zero current account condition is an extra equation to determine short run equilibrium, while the domestic interest rate becomes an extra variable. For simplicity, assume a monetary policy that holds the price of domestic output constant. With P constant and net exports zero, aggregate demand reduces to a conventional closed economy form of IS curve. Together, the LM and IS determine r and y, namely

$$y=E(y, r)+G \qquad \text{IS} \qquad (4.23)$$

$$M/P=L(y, r) \qquad \text{LM} \qquad (4.24)$$

The economy now behaves as if it were closed, with the real exchange rate adjusting to keep the current account in balance. A rise in G now raises the domestic interest rate and real output. The real exchange rate depreciates because, from $NX(\sigma, y)=0$, a rise in y reduces the current account surplus so this effect must be offset by a fall in σ, provided the Marshall/Lerner condition is satisfied. With P constant the nominal exchange rate must also depreciate. Because of the extreme assumption about capital mobility, this result must be regarded as applicable to circumstances which for many countries would now be thought unusual.[11]

Before moving to the case of monetary policy, it is useful to consider one method by which aggregate demand conclusions such as these fiscal policy results have been extended to a longer run context.

2. Current account feedback and longer run effects

Properly defined, the current account balance measures the increment in net obligations to foreigners.[12] Therefore, starting from a zero current account balance, any change in macro policy settings which alters the balance will eventually have significant effects on the stock of net foreign assets and hence on a variety of other economic variables. As was seen in Chapter 2, the current account feedback approach incorporates these longer run consequences into a dynamic analysis of macroeconomic changes. A simple

way of introducing these long run effects into the extended M/F model is demonstrated in this section. To avoid making a host of qualifications about the effects of government assets and liabilities on private sector behaviour, consider the effect of an exogenous rise in domestic consumption demand C for the home good.

When the currency floats freely a current account deficit is matched by a capital account surplus involving an equivalent capital inflow. An excess of purchases of goods and services from foreigners over sales abroad must be financed by borrowing from foreigners or reducing holdings of foreign assets. In this way current account imbalances feed back to the domestic economy, changing the level of real net wealth. While these wealth changes may be insignificant in their effects in the short run, they must affect domestic decisions in the long run if large changes in asset stocks occur. Moreover, the mechanism which might make the economy stable must work, in part, through these effects. Hence, to model the long run, demand functions must be modified to incorporate the asset effects produced by current account imbalances on the path to equilibrium. The zero current account condition in this section is the criterion for long run equilibrium.

Another aspect of the long run has to do with the determination of wages. Is it possible to hold wages at a partially indexed level over a period of time such as that required for this type of current account adjustment? Certainly if the economy is at or close to full employment it is unlikely that partial indexation could persist. On the other hand, with significant unemployment, there may be situations in which workers and unions will accept the cuts in real wages which less than full indexation may imply, in return for higher employment and output. In any case, if the assumption is made that the rise in C is accompanied by a monetary policy that holds P constant, the full and partial indexation cases can be handled together and will give the same qualitative results. Consider the partial indexation case in which the money supply is adjusted to keep the price of home goods constant. The system, amended to take account of long run issues, is

$$y = S(\underset{+}{\sigma}, \underset{+}{P}) \tag{4.8b}$$

$$M/P = L(\underset{+}{y}, r^*, \underset{+}{A}) \tag{4.15}$$

$$y = C(\underset{+}{y}, \underset{+}{A}) + I(r^*, \underset{+}{A}) + G \tag{4.16a}$$

$$NX(\underset{-}{\sigma}, \underset{-}{y}, \underset{-}{A}) = 0 \tag{4.17}$$

In (4.16a), private expenditure is split into demand for consumption and investment. In the model A is a measure of real wealth in terms of units of the home good. It is assumed that the real capital stock is held constant in these processes. Thus the variable parts of real wealth will consist of money

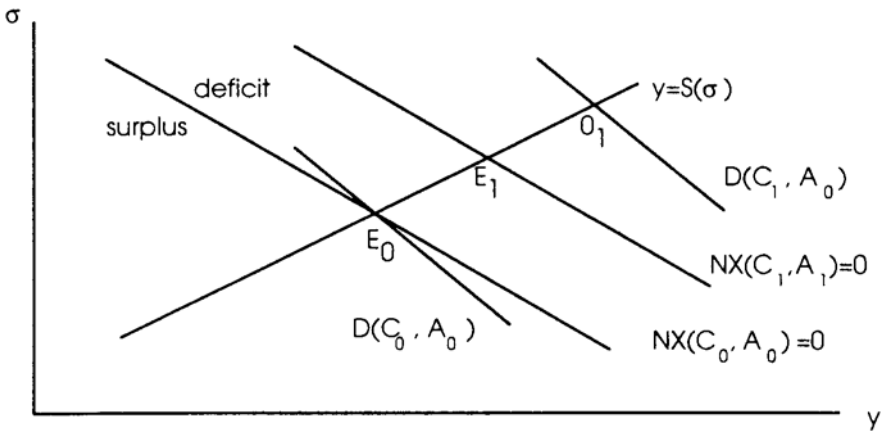


Figure 4.4 Fiscal expansion and current account feedback

and bonds. Some of these bonds can be classified as net foreign assets in that they represent obligations by or to foreigners and it is these obligations that will rise or fall with imbalances in the capital and hence current account. A is given in the short run, but in the long run is endogenous and in the current account feedback approach all of its movement will occur because of current account deficits.[13] In Figure 4.4 the supply curve for home goods (4.8b) (drawn for a constant price), the current account equilibrium curve and the aggregate demand curve initially all intersect at E_0 to determine σ_0, y_0 and A_0. Note that to the right of the NX=0 curve there is a current account deficit (raising y increases a deficit) and to the left a surplus. Out of long run equilibrium, the state of the economy is determined (as in the short run analysis) by the intersection of the demand and supply curves, for instance at 0_1.

Raising the exogenous element of spending on the home good from C_0 to C_1 has the impact effect of raising aggregate demand and output to $D(C_1, A_0)$ and creating a current account deficit at 0_1. Current account deficits lead to a reduction in real net foreign assets which reduces private expenditure on both domestic and imported goods. A fall in A shifts the NX=0 curve to the right and the aggregate demand curve to the left and so to eventual equilibrium at E_1. In the aggregate demand equation (4.16a), reduced net foreign assets rather than higher interest rates, as in the closed economy or zero capital mobility cases, leads to the required reduction in private expenditure. Reduced foreign assets, rather than real income, curb spending on traded goods. The real exchange rate appreciates (from Figure 4.4) and given the constancy of P, so does the nominal exchange rate.

The major drawback with this approach is that it does not allow for the changes in real asset supplies induced by current account imbalances and

hence gives a misleading picture of current account adjustment. This issue will be discussed in section II.3.

3. Government expenditure on imports

G involves government real demand for the home/export good. From (4.16) (aggregate demand) and (4.17') (current account) it is clear that a change in government spending on the imported good has no short run effects on real or nominal variables, other than the current account balance which falls by the same amount as any rise in spending. The effects in the longer run depend on the nature of the spending and on whether tax-payers incorporate the future tax liability involved in their present decisions. It would seem advisable for government spending on imports to be treated separately from that on domestically produced goods if the short run effects of government spending on real and nominal variables are to be properly assessed. To simplify the models that follow, it will be assumed that government spending on imports is zero, unless otherwise specified.

4. Monetary policy

If wages are fully indexed, monetary expansion leaves real variables unchanged, raising the price of home goods and depreciating the exchange rate in the same proportion as the increase in the money supply. This classical result is easily derived.

The system is

$$y = S(\underset{+}{\sigma}), \quad \text{or} \tag{4.8a}$$

$$y = S(\underset{+}{\sigma}, \underset{+}{P}) \tag{4.8b}$$

$$\sigma = P/eP^* \tag{4.14}$$

$$M = PL(\underset{+}{y}, \underset{-}{r^*}) \tag{4.15}$$

$$y = D(\underset{-}{r^*}, \underset{+}{\sigma}, G) \tag{4.16}$$

From (4.8a) and (4.16), with full indexation the level of output and relative price of traded goods are determined independently of monetary policy. It follows from (4.15) that a monetary expansion must raise home goods prices proportionately and from (4.14) that the nominal exchange rate depreciates in the same proportion as the rise in M.

Now consider partial indexation. As before, combine (4.8b) with (4.15) to yield

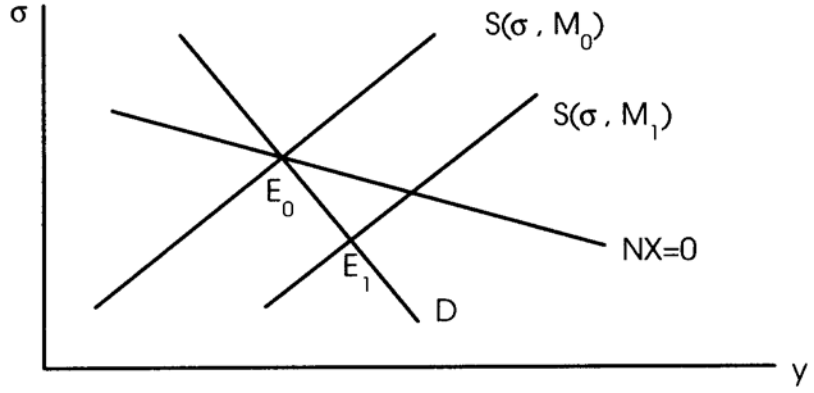


Figure 4.5 Monetary expansion, partial indexation

$$y = S(\underset{+}{\sigma}, \underset{+}{M}, r^*) \qquad (4.8b')$$

Figure 4.5 illustrates the supply curve (4.8b') and demand curve (4.16). A rise in M is seen to shift the supply curve rightward raising output and lowering s, that is depreciating the real exchange rate. Intuitively, a rise in M will tend to raise the absolute price level of home goods which, with partial indexation, induces a less than proportional wage response and so raises output. To verify that P rises note that in (4.8b), as σ has fallen, P must rise to induce a rise in y. To find what happens to the nominal exchange rate, note that from (4.14), as σ has fallen and P has risen, e must rise. Indeed, the depreciation in the nominal exchange rate must be by a greater proportion than the rise in P.

The effect of monetary expansion on the real consumption wage is shown by

$$dW\text{-}dI=(\theta\text{-}1)(adP+(1\text{-}a)P^*de) \qquad (4.10')$$

As both P and e rise, the real consumption wage falls. This is illustrated in Figure 4.1 by the line AH. The relative price of home goods σ falls, but the rise in the absolute price of home goods results in a fall in the product wage sufficient to raise employment and output. Monetary expansion with partial indexation moves the supply price of labour down towards the labour demand curve. This is the way in which partial indexation is traditionally supposed to work. Prices rise and the real consumption wage falls sufficiently to reduce the real product wage and so induce an expansion of home output.

Because a rise in output and exchange rate depreciation affect net exports in opposite directions, it might be thought that the outcome for net exports would be ambiguous. In fact it is not, for assuming $E_y<1$, from (4.17)

$$\frac{dNX}{dM} = [NX_\sigma \frac{d\sigma}{dy} + NX_y] \frac{dy}{dM} = (1 - E_y) \frac{dy}{dM} > 0 \quad (4.25)$$

where ds/dy is evaluated from the aggregate demand condition and is given by (4.21). For changes in both G and M, the effects on the current account have been found to be unambiguous, producing a deficit in the case of fiscal expansion and a surplus in the case of monetary expansion. The reason can be seen from (4.16) which can be arranged as

$$NX(\sigma, y)=y-E(y, r^*)-G=S(y, r^*)-I(y, r^*)-G \quad (4.16')$$

where S is saving and I is investment.[14] Factors that change net exports must produce or be accompanied by an equivalent change in the total of saving *less* investment *less* government spending. Any change which generates a rise in y, with the interest rate and government expenditure remaining constant, must increase a current account surplus provided $1-E_y>0$. The ambiguity about the effect of expansionary monetary policy on net exports is resolved on the other side of the national accounts. This point will be returned to in section II.1, where these results and the assumption about the marginal propensity to spend on which they depend, are questioned.

5. Monetary and fiscal policy to affect the current account

It has been suggested that a combination of fiscal and monetary policy could be used to achieve particular changes in the current account balance.[15] Monetary expansion has been shown to increase and fiscal expansion to reduce net exports. For example, to reduce a current account deficit while holding output constant, it would be necessary to find the right combination of fiscal contraction and monetary expansion. Differentiating (4.16') yields

$$\begin{aligned} dNX &= NX_\sigma ds + NX_y dy = S_y dy + dG \\ &= NX_\sigma ds = dG, \text{ for } dy=0 \end{aligned} \quad (4.26)$$

The effect works through depreciating the real exchange rate on the trade side and reducing government spending (on the home good) on the saving, investment, fiscal balance side. A sufficient monetary expansion would be needed to engineer the amount of real depreciation necessary to keep output constant. The home good output not bought by the government is then sold abroad. The appropriateness of such a policy to affect the current account will be considered in Chapter 8.

6. Money demand, a qualification

The money demand function used in the above analysis defines real money balances using the price of the home good. This approach could be justified

on the basis that the transactions being financed involve the production of domestic output, but it also has much to do with convenience. Alternatively, if it is thought that domestic expenditure is the appropriate magnitude that gives rise to transactions demand, then money demand should be related to an index involving the prices of both goods and having the form

$$M = L(\underset{+}{E}(\underset{+}{y}, \underset{-}{r^*}, \underset{+}{A})\underset{+}{I}, \underset{-}{r^*}) = \underset{+}{I}\underset{+}{L}(\underset{+}{y}, \underset{-}{r^*}, \underset{+}{A}) \tag{4.15'}$$

where I is an index of the price of expenditure. Two properties basic to any price index are that it should depend positively on each price and should be homogeneous of degree unity in all prices; that is, an equal proportionate rise in all prices raises the index in the same proportion. Thus

$$I = \underset{+}{\psi}(\underset{+}{P}, \underset{+}{eP^*}) = \underset{+}{\psi}(1, \pi)P \tag{4.27}$$

Now (4.15') becomes

$$M = \underset{+}{\psi}(\pi)P\underset{+}{L}(\underset{+}{y}, \underset{-}{r^*}, \underset{+}{A}) \tag{4.15′}$$

Write (4.15')

$$P = M/\psi(\pi)L(y, r^*, A) = P(M, \pi, r^*, A) \tag{4.15″}$$

This more general and satisfactory form of the money demand function does not make significant differences to the main results for either fiscal or monetary policy. To illustrate this, consider the case of partial indexation and examine the short run consequences of a rise in G, as in section I.1. Substituting for (4.15”) in (4.8b)

$$y = \underset{+}{S}(\underset{+}{\sigma}, \underset{+}{P}\{\underset{-}{M}, \underset{-}{\pi}, \underset{+}{y}, \underset{-}{r^*}, \underset{+}{A}\}) = \underset{+}{S}(\underset{+}{\sigma}, \underset{+}{M}, \underset{+}{r^*}, \underset{-}{A}) \tag{4.8b'}$$

using $\pi=1/\sigma$. Now the real results will be the same as before with the supply curve upward sloping as in Figure 4.3. A rise in G will cause a rise in y and in σ, that is a fall in π. From (4.15”) it does not now follow that P must fall, its direction of change being ambiguous. One different result that can be reached using (4.15”) is that with fixed money wages, fiscal expansion will now raise output. This is easily seen from substituting (4.15”) in the output response function (4.8c). Because the relative price now enters the money demand curve, the result is a supply/money market curve of the form of (4.8b’) and the real effect of a rise in the government spending on the home good is now to raise output. This contrasts with the earlier M/F result that output would be unchanged.

7. Wages policy

This policy could take the form of a negotiated or imposed change in the real wage ω. Thus the adjustment equation for money wages becomes

$$dW=\theta[adP+(1-a)(de+dP^*)]+d\omega \tag{4.13}$$

and the related supply curve, for partial indexation, is

$$y = S(\sigma, M, \underline{\omega}) \tag{4.8b'}$$

A fall in ω would have the same qualitative effects as a rise in M and hence could be depicted as in Figure 4.5 with ω substituted for M. Output would rise, the real exchange rate would depreciate and the current account would go into surplus. In addition, it can be shown that the fall in ω would increase employment. However, it should be noted that the conclusion that a cut in the real wage ω would result in a current account surplus depends on the NX= 0 curve being flatter, as shown in Figure 4.5, than the aggregate demand curve. This is the case if the marginal propensity to spend is less than unity. However, in section II.1 it is argued that this condition need not hold. In this case a cut in the real consumption wage can produce a current account deficit.

There is an important sense in which partial wage indexation must also be seen as wage policy. While it does not operate directly on the real wage ω implicit in the indexation formula, the outcome of a falling real wage induced, say, by monetary policy could well require negotiation with unions or other labour market policies of a significant kind. Indeed, it is arguable that reductions in real consumption wages through less than full adjustment to price increases, is liable to be easier to achieve than their reductions through cuts in nominal wages.

II. FURTHER TOPICS ON MACRO POLICY AND THE CURRENT ACCOUNT

1. Monetary policy and the current account deficit

When governments judged that current account deficits were excessive they often resorted to macroeconomic policy to reduce them. The question here is not the desirability of this, a topic discussed in Chapters 8 and 10, but the issue of how this might take place. As has been seen, standard macroeconomic theory suggests that macro policy can affect the current account. Indeed, it has been shown that a combination of contractionary fiscal and expansionary monetary policy would, in theory, seem capable of reducing the deficit while having a neutral effect on the level of output. However, in the face of an increasing deficit a more usual policy has been restrictive monetary policy, sometimes combined with a tighter fiscal stance.

The reason for this is that an increasing current account deficit often seems to be encountered in the upswing of a cycle and this is a time when tighter monetary policy to moderate the growth in output and any tendency towards a higher inflation rate might seem appropriate. But the type of macroeconomic model used in this chapter would give the result that tighter monetary policy would increase rather than reduce a current account deficit.

To see why this is, differentiate (4.16') totally to get

$$dNX=NX_{\sigma}d\sigma+NX_{y}dy=(S_{y}-I_{y})dy+(S_{r^*}-I_{r^*})dr^*-dG \tag{4.28}$$

where it has been assumed that investment is a function of income as well as the interest rate. As long as the interest rate is constant, monetary policy must work through changes in income. Monetary restraint which reduces output must reduce net exports, that is, increase a current account deficit as

$$S_{y}-I_{y}=1-C_{y}-I_{y}=1-E_{y}>0 \tag{4.29}$$

Provided the marginal propensity to spend is taken to be less than unity (or, equivalently, the marginal propensity to save exceeds the marginal propensity to spend on investment) the effect of monetary restraint must be to raise the deficit. Notice that the fact that a fall in output reduces the demand for imports and so increases net exports is incidental. It cannot affect the outcome. On the other hand, if the interest rate were variable, monetary restraint would raise the rate, increasing saving and reducing investment, hence reducing the current account deficit. However, it is just not possible in the strict context of the model for monetary restraint to cause a lower current account deficit. Nevertheless, it does seem that in practice there is often a strong association between tight monetary policy, recessions and reduced current account deficits, which means that the assumptions of the model must be questioned.

As is suggested by (4.28) and (4.29), there are two ways in which monetary restraint might reduce a current account deficit, that is by it inducing a rise in interest rates, or if the marginal propensity to spend were greater than unity. Consider first the possibility of it happening through a rise in interest rates. The model so far has assumed that exchange rate expectations are static so that the domestic interest rate cannot diverge from the given foreign rate. It is therefore appropriate to relax the static expectations assumption so as to explore the question in the context of endogenous domestic interest rates.

Two crucial aspects of this change of assumptions must be recognised at the outset. First, the model becomes dynamic rather than static, because it involves the expected rate of change of the exchange rate. Secondly, as between equilibria, the effects of monetary restraint must remain as before. This follows because in equilibrium the domestic interest rate must equal the foreign interest rate. Hence, if the model is to give the result that monetary restraint reduces a current account deficit, it can do so only during the

transition between equilibria. Thus, the next step is to include endogenous exchange rate expectations in a version of the model of previous sections. However, it will be shown that, starting from a zero current account deficit, a policy of monetary constraint causes the current account balance to move to and remain in deficit even in the transition between equilibria.

The starting point for the present system is the extended M/F model for the case of zero wage indexation. As the question to be asked has to do with monetary restraint and hence downward pressure on nominal variables, the assumption of fixed money wages is not unreasonable. Endogenous expectations are added in a way that is similar to that used in the Dornbusch (1976) overshooting model. Prices are assumed sticky, adjusting with a lag to excess demand, and the exchange rate is allowed to jump to ensure continual clearing of the money market. The system is

$$y = S(P) \tag{4.8c}$$

$$\hat{P} = \phi\{C(y) + I(r) + NX(\sigma, y) - y\} \tag{4.30}$$

$$r = r^* + \mu \tag{4.31}$$

$$M = PL(y, r) \tag{4.15}$$

$$\mu = \theta(\tilde{e} - e) \tag{4.32}$$

The new symbols are

μ	the expected rate of exchange depreciation
$\tilde{e}$	the equilibrium exchange rate
$\phi, \theta > 0$	adjustment parameters for price and exchange rate expectations, respectively

With nominal wages fixed, output is a positively sloped function (4.8c) of the absolute price of the home good. Prices are supposed to rise or fall according to excess demand or supply as in (4.30). Interest parity is given by (4.31) while (4.15) is the LM curve. (4.32) implies that exchange rate expectations are determined regressively so that the expected exchange rate rises when the actual is below the equilibrium. The system can be reduced to two equations in the two variables e, P

$$\hat{P} = \phi\{C(S(P)) + I(r^* + \theta(\tilde{e} - e) + NX(P/eP^*, S(P)) - S(P)\} \tag{4.33}$$

$$M = PL\{S(P), r^* + \theta(\tilde{e} - e)\} \tag{4.34}$$

It is shown in the Appendix that the solution can be depicted in the (e, P) space as in Figure 4.6. The loci AA and IS represent asset market and goods market equilibrium, respectively. Above IS there is excess supply and prices fall along AA towards the equilibrium point E.

To appraise the effect of monetary restraint on the current account it is useful to plot the zero net export locus. Its slope is

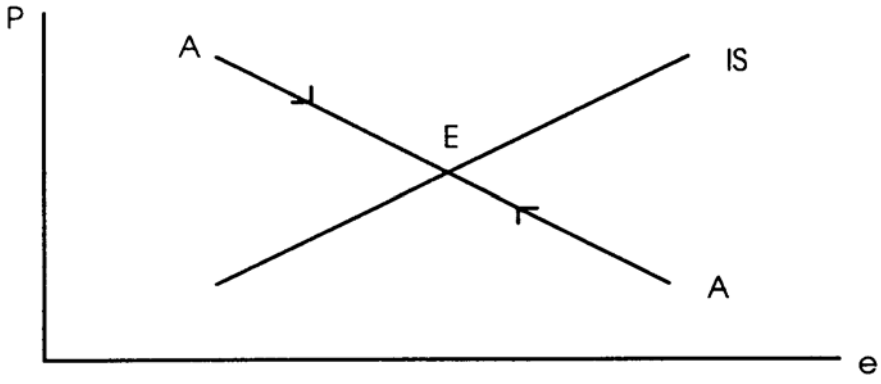


Figure 4.6 Dynamics arising from exchange rate expectations

$$\frac{dP}{de}[NX = 0] = \frac{-NX_\sigma/e^2}{-NX_y S' - (NX_\sigma/e)} > 0 \tag{4.35}$$

and the curve is illustrated in Figure 4.7. Starting at E_0, suppose a fall in M. This will push the AA curve to the left and the new equilibrium of the system will be at E_1. Denote equilibrium values by a ~. To see that E_1 will lie above the NX=0 curve compare the slope of the locus of equilibrium values for different values of M. This locus involves $\hat{\mathbf{P}}$=0 and e= $\tilde{e}$ in (4.33). (4.34) establishes what the money supply has to be to yield a particular equilibrium price. This slope is

$$\frac{d\tilde{P}}{d\tilde{e}} = \frac{-NX_\sigma/e^2}{S'(1 - C_y - NX_y) - (NX_\sigma/e)} \tag{4.36}$$

and can be compared with that of zero net exports (4.35). Assuming that the marginal propensity to consume home goods C_y+NX_y is less than unity, the comparison shows that the net export locus has the higher slope, establishing that E_1 lies above the locus NX=0.

Hence when M falls the exchange rate appreciates to E', so overshooting equilibrium. Prices then fall along the AA locus and the exchange rate depreciates. As the expected rate of exchange depreciation is then positive, the domestic interest rate must be above the foreign rate, so reducing investment. Nevertheless, the current account remains in deficit throughout the process. Again, monetary restraint does not produce a current account surplus either in equilibrium or in the transition to it.

The most promising explanation for monetary restraint causing a surplus would appear to arise from the marginal propensity to spend exceeding unity.

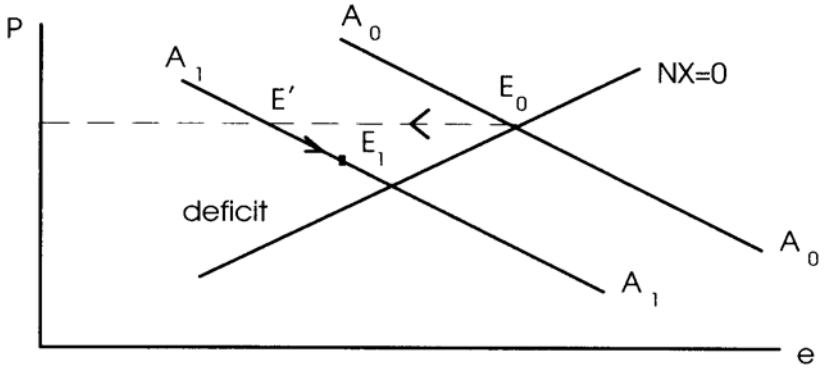


Figure 4.7 Monetary restraint

The notion that the marginal propensity to spend out of income should be less than unity is often taken as basic to macroeconomic models. Without this proposition there may be instability as an increment in income generates greater additional spending and income than the original increment. However, while this proposition may hold in a closed economy, it is not a relevant stability condition for an economy open to international borrowing and lending. To see this suppose that expenditure decisions are based on last period's income and prices so that the system, reverting to static exchange rate expectations, is[16]

$$y_t=C(y_{t-1})+I(r^*, y_{t-1})+NX(\sigma_{t-1}, y_{t-1}) \tag{4.37}$$

$$y_t=S(\sigma_t, M) \tag{4.38}$$

The system can, in principle, be reduced to one of the form $\varphi(y_t, y_{t-1})=0$. It is necessary and sufficient for stability that the derivative

$$\frac{dy_t}{dy_{t-1}} = \{C_y + I_y + NX_y\} + \frac{NX_\sigma}{S_\sigma} \tag{4.39}$$

should be less than unity when evaluated at a steady state. Note that the sign conventions used imply that $NX_\sigma/S_\sigma<0$. Even if spending on traded goods is completely insensitive to prices so that $NX_\sigma/S_\sigma=0$, it does not follow that the marginal propensity to spend must be less than unity for stability. The requirement is that the marginal propensity to spend on home goods must be less than unity, that is $C_y+I_y+NX_y=E_y+NX_y<1$, recalling that $NX_y< 0$ is minus the marginal propensity to spend on foreign goods. Hence, the model can remain stable if the marginal propensity to spend is greater than unity.

If $E_y>1$ it follows from (4.20) and (4.21) that the slope of the NX=0 locus in Figure 4.5 can be less than that of the aggregate demand curve. Monetary contraction would then reduce a current account deficit. In fact, imposing the requirement that the marginal propensity to spend be less than unity is tantamount to ensuring that monetary restraint would increase a current account deficit. Monetary restraint works through reducing real income, and as a current account deficit is identically equal to the excess of spending over income, a marginal propensity to spend of less than unity means that spending falls less than income, so that a current account deficit must rise.

The view of the world implied by the concept of the marginal propensity to spend can sometimes be misleading. The relationship between spending decisions and income is not likely to be one that retains anything like a simple proportionality between their increments. It is likely to depend on the stage of the cycle, the level of real interest rates and profit prospects. In a context in which spending responses are generated by optimal adjustments to exogenous shocks, Chapter 5 demonstrates, for consumption decisions, that the nature as well as the size of such shocks is crucial to their effects. Thus, it matters as to whether the income change is thought to be permanent or temporary, long term or short term. For instance, a permanent fall in income might induce a greater reduction in expenditure than income if an economic agent wishes to hold lower debt at the lower income. It is likely that such factors will apply with greater force to investment decisions. In appropriate circumstances, considerations such as these could well from time to time produce a marginal propensity to spend in excess of unity.

2. Is devaluation usually expansionary?

Obviously, this question is of some significance in a pegged rate regime, where the nominal exchange rate is in the control of the authorities.[17] Suppose the question is about the effects of real exchange rate changes and leave until section II.4 the issue of the relationship between nominal and real exchange rate movements. However, it is not unusual for the judgement to be made that devaluation will be expansionary in a floating rate system. There are then two possible meanings this question might have. The first relates to the sign of the partial derivative of the net export function with respect to the real exchange rate. The second has to do with the total derivative of output with respect to exogenous variables.

First consider the sign of the partial derivative. In the HG model the aggregate demand function is

$$y = \underset{+}{E}(\underset{+}{y}, \underset{-}{r^*}) + G + G_m + \underset{-}{NX}(\underset{-}{\sigma}, \underset{-}{y}, \underset{-}{G_m}) \tag{4.16}$$

If the Marshall/Lerner condition is satisfied ($NX_\sigma<0$), a real depreciation will produce a rise in y.[18] But this condition is not basic. Actually, the goods

market equilibrium condition (4.16) can readily be rearranged so that its elements involve the demand for home goods rather than the demand for both goods. It then follows that a necessary condition for real depreciation to raise aggregate demand is that home and imported goods are substitutes.

If there are both non-traded goods as well as traded goods produced domestically, a relative price shift towards traded goods may not raise the value of total output. Consider the traded/non-traded goods model. Output now consists of two goods, non-traded X_N and traded X_T, the latter being importables and exportables combined at an assumed fixed relative price. Let P_N and $\mathbf{P_T = eP_T^*}$ be their absolute prices and $p=P_N/P_T$ their relative price so that its reciprocal is the real exchange rate. $\mathbf{P_T^*}$ is exogenous, being determined in world markets. Using the same production and wage formation concepts as before it can be shown that in the full indexation case, outputs are determined by

$$\begin{aligned} X_N &= X_N(\underset{+}{p}) \\ X_T &= X_T(\underset{-}{p}) \end{aligned} \tag{4.40}$$

Demand for non-traded goods can be written

$$D_N = D_N(P_N, P_T, E) = D_N(\underset{-}{p}, \underset{+}{E/P_T}) \tag{4.41}$$

The assumption that foreign currency traded goods prices are determined in world markets means that the market for traded goods always clears. Interpreting an expansionary effect as one that creates excess demand or reduces excess supply domestically, means that it must increase excess demand in the non-traded goods sector. From (4.40) and (4.41) it can be seen that a real depreciation, that is a fall in p, will fulfil this criterion, other things being equal. Notice that this conclusion need not follow if the assumptions of the model were changed so that the supply curve of traded goods was not perfectly elastic at the world price all the time.[19] There could then be excess demand in traded goods as well as in non-traded goods markets. A relative price change which raised excess demand in the non-traded goods market would lower it in the market for traded goods and real devaluation need not be expansionary.

Alternatively, if the criterion of expansion is that real income measured in terms of a price index based on the consumption of the two goods should rise, it can be seen that the outcome is ambiguous. A relative price shift in favour of the traded goods sector will raise the output of those goods and reduce that of non-traded goods. It can be shown that real income so measured need not rise.

Hence, while there is a sense in which devaluation is expansionary in each of the HG and the traded/non-traded goods models, it is a more dubious proposition in the non-traded goods model. The proposition must be carefully

interpreted to apply to the partial derivative of the demand or excess demand for home goods with respect to the real exchange rate. Moreover, the wider question of what will follow from any particular depreciation can only be answered by examining the total derivative with respect to the exogenous change involved. Because the real exchange rate is an endogenous variable, it certainly does not follow that any observed depreciation of the real exchange rate must be part of an expansionary process.

It is necessary to ask how the real depreciation is engineered and then look at and compare the total derivative of the real exchange rate and of output with respect to the selected exogenous variable. One way of producing a real depreciation is through a fall in government spending on the home good, or an exogenous decrease in any other component of demand. This will reduce the relative price of that good P/eP^* and so depreciate the real exchange rate. The effect is contractionary, rather than expansionary, even though there is real depreciation. On the other hand, monetary expansion will depreciate the real exchange rate, except when there is full indexation, and this will result in a higher output.

It follows that it is not correct to interpret every real depreciation as expansionary. It must be recognised that real depreciation is a relative price change with the potential to raise demand and output in the traded goods sector, but reduce them in the non-traded sector. Further, the exogenous causes of the real depreciation cannot be ignored when looking at its total effects. The popular HG model can give misleading results on this issue.

3. Current account feedback

The treatment in section I.2 of the interaction of the current account and the real economy follows the literature on current account feedback. However, it must be recognised that this approach as conventionally presented has a basic problem which limits its relevance to current account issues. The difficulty is that if the time horizon is long enough to allow the current account balance to approach zero, it should be longer than the macroeconomic short run in which investment does not perceptively affect the capital stock. However, allowing the capital stock to vary will greatly complicate the dynamics of the processes to be described and so is usually not incorporated in these systems. To illustrate this, suppose an upward shift in the investment schedule. A mechanical application of the feedback analysis would have this causing exactly the same results as the rise in spending on home produced consumption goods illustrated in Figure 4.3. Output and the relative price of home goods would rise in the short run and the current account would go into deficit. However, this rise in foreign debt would result in reduced spending and so in a subsequent fall in output.

This is misleading. Any rise in the current account deficit certainly increases foreign indebtedness. However, offsetting this, investment will be

higher than it could have been without access to foreign lending and so there will be a higher private capital stock than otherwise. Neglecting this gives a biased picture of the process. Unless entrepreneurs have badly overestimated the productivity of this addition to capital stock, the economy's gross assets will rise to at least match the increase in indebtedness. The asset effects will not then work in the direction of a fall in spending and so a fall in the current account deficit. Some form of growth model is needed to capture such effects. The analysis of the long run in Chapter 6 gives a more satisfactory picture because it includes current account feedback to the capital stock. However, the cost is that short run disequilibrium issues are neglected.

4. Nominal and real depreciation and the current account

Nominal depreciation does not, of course, always lead to real depreciation. One well known case is that of nominal depreciation as a result of monetary expansion. As was shown in section I.4 if there is complete indexation, monetary expansion will lead to a proportional rise in prices and depreciation of the nominal exchange rate without any real effects. With less than full indexation there will be real depreciation following monetary expansion and hence an impact on the current account. There is another, perhaps less well known case, in which nominal depreciation need not lead to real depreciation and that involves a shift in the foreign currency price of the imported good. In either the full or the partial indexation case (4.8a) or (4.8b) and (4.15), (4.16) (shown below) solve for σ, P, y. Hence, (4.14) determines e. Any change in P* will be offset by a proportional change in e of the opposite sign. This is the 'foreign inflation insulation' property of flexible exchange rates and, of course, applies equally for price rises or falls. Foreign deflation or inflation is not imported. A fall in the world price of traded goods causes an offsetting nominal, but not real, depreciation. These conclusions can be deduced from

$$y = \underset{-}{S}(\sigma) \tag{4.8a}$$

$$y = \underset{+}{S}(\sigma, \underset{+}{P}) \tag{4.8b}$$

$$\sigma = P/eP^* \tag{4.14}$$

$$M = PL(y, \underset{+}{r^*}) \tag{4.15}$$

$$y = D(\underset{-}{r^*}, \sigma, \underset{+}{G}) \tag{4.16}$$

While on the subject of the effects of a rise in the foreign currency price of imports, it is worthwhile making a digression to see the differing consequences of the full and partial indexation cases when the exchange rate

is pegged. In this context, the full and partial indexation cases differ in an important respect. First, with full indexation, (4.8a), (4.16) solve for σ, y. From (4.14) if, say, P* rises, P rises in the same proportion and from (4.15) so does the money supply. Foreign inflation is fully imported and the money supply rises proportionately to accommodate this. If indexation is partial, substitute for P from (4.14) in (4.8b) to get

$$y=S(\sigma, \sigma eP^*) \tag{4.8b'}$$

Now (4.8b') and (4.16) determine σ, y. The rise in the price of the imported good shifts the supply curve to the right because real wages fall if indexation is partial, and this effect reduces the current account deficit.[20] From (4.8b), because σ falls and y rises, P must rise, but from (4.14), in a smaller proportion than P*. Inflation is imported, which, with partial indexation, reduces the real wage and expands output. The money supply rises to accommodate the higher demand for money from both sources.

APPENDIX

Derivation of the output supply curve for varying degrees of indexation

Differentiating (4.12) and substituting from (4.13) enables specification of output supply for these various cases.

$$dy = \tilde{S}'[(1 - \theta\alpha)dP - \theta(1 - \alpha)(de + dP^*)] \tag{A4.1}$$

$$\begin{cases} dy = \tilde{S}'(1 - \alpha)d\sigma \\ y = S(\sigma) \end{cases} \quad \text{full indexation} \tag{A4.2a}$$

$$\begin{cases} dy = \tilde{S}'[\theta(1 - \alpha)d\sigma + (1 - \theta)dP] \\ y = \underset{+}{S}(\underset{+}{\sigma}, P) \end{cases} \quad \text{partial indexation} \tag{A4.2b}$$

$$\begin{cases} dy = \tilde{S}'dP \\ y = \underset{+}{S}(P) \end{cases} \quad \text{fixed money wages} \tag{A4.2c}$$

Derivation of the phase diagram, Figure 4.6

The slope of the AA locus is

$$\frac{dP}{de} = \frac{\theta L_r}{L_y S'} < 0 \tag{A4.3}$$

and of the IS or $\hat{\mathbf{P}}$=0 locus is

$$\frac{dP}{de}[\hat{P} = 0] = \frac{-(NX_\sigma/e^2) - I'\theta}{S'(1 - C_y - NX_y) - (NX_\sigma/e)} > 0 \qquad \text{(A4.4)}$$

This establishes that there is a unique equilibrium at E. As the IS function is increasing in P with the Marshall/Lerner condition satisfied, the dynamics of the system follow as in Figure 4.6.

Part III

Longer run issues

Chapter 5

Optimal responses of expenditure and debt

Recent approaches to the balance of payments seek to explain the relation between current and capital account transactions in terms of optimal borrowing and spending. The analysis of the connections between expenditure, borrowing and relative prices in Chapter 3 is an example. With such an approach it is possible to attempt an assessment of the optimal response of the current account and debt to various parametric changes both temporary and permanent, present and future, certain and uncertain. In the present chapter the responses investigated are those of consumers, while Chapter 6 examines systems that explicitly incorporate investment responses. Two propositions pertinent to the current account are demonstrated here. First, the apparently simple notion that borrowing and lending can be beneficial to economic agents is again implicit in the analysis. Put in this form it seems so obvious as to be almost trivial. Put in the form that current account imbalances and foreign indebtedness are often likely to benefit those involved it is not automatically or readily accepted by policy makers and some economists. The other issue investigated is the role of borrowing and lending in helping to offset the effect on consumption and welfare of various types of shocks.

The parameter whose changes are investigated is income, and there are several strands of literature that can justify this. One is the Harberger-Laursen-Metzler (HLM) proposition that a permanent worsening in the terms of trade would raise the current account deficit.[1] As a major effect of a worsened terms of trade is to reduce real income, this change can for many purposes be modelled by a permanent fall in income.[2] The oil-price-shock, 'booming-sector' literature treats another class of events whose essence in some cases is a real income shift. Some salient features of changes in oil prices, of an investment boom, or of discovery and exploitation of natural resources can be captured by modelling their impact as an income change.[3] Of course, where relative price effects are essential to the analysis, representing a shock as an overall income change cannot do justice to the problem.

A number of different types of income change are treated in this chapter. In the first part, income is supposed to fall permanently. It turns out that the

response to this will differ considerably according to the form of the discount and interest rate functions. For instance, a fixed discount rate and variable interest rate produces an immediate fall in consumption equal to the fall in non-interest income with no change in the current account balance or net foreign assets. On the other hand, a fixed interest rate, but variable discount rate can be shown to result in a constant steady state consumption level. Hence the reaction to a permanent non-interest income fall is a current account surplus which persists until total income has been built up to the previous level.

Temporary income falls are investigated in the second part of the chapter. Here, the context is that of a fixed discount rate and variable interest rate and income changes are supposed to be known with certainty.[4] It is shown that short-lived falls in real income should call forth a consumption smoothing response in the balance of payments so that consumption falls less than income and the current account deficit increases. On the other hand, long term falls in income might require an optimal response more like that appropriate for permanent falls in income and these may in some cases involve an initial increase in the current account surplus.

The third part of this chapter is concerned with the effects of a particular type of temporary income shift under uncertainty, again in the context of a fixed discount rate and a variable interest rate.[5] Such assumptions ensure that when the characteristics of a temporary income fall are assumed to be known with certainty, the optimum response is always of the smoothing variety. In reality, when a change in income is brought about, say, by a change in the terms of trade, it will be rare for it to be known with certainty whether it is temporary or permanent, short term or long term. In practice, both the timing and amplitude of changes in future income are likely to be uncertain. Here the problem treated is simplified by assuming that the only uncertainty involved relates to the timing of a reversal of an initial fall in income.

Even so there are many forms such a proposition could take, but in this chapter it is assumed that there is an approximately constant probability in any given small interval of time, that a change will be reversed. This allows the uncertainty involved to be modelled as a Poisson Process. If this probability is very 'low' then the situation approximates to a permanent change, while if it is 'high' it has the features of a temporary fluctuation. When this approach is adopted, it is shown that optimal responses under uncertainty have some but not all the characteristics of the certainty case. There is still a consumption smoothing response. The chief difference is that, with risk aversion, uncertainty induces caution in that optimal responses are conditioned by the ruling level of income to an extent not found in the certainty case. When a fall in income occurs, consumption still falls by less than income, but remains low while income is low. It is only when the expected income rise is realised that consumption will start to increase. With uncertainty there is no process of anticipation of the future rise in income as there is in the certainty case.[6]

From the viewpoint of understanding the current account, the models of this chapter make clear that deficits and surpluses arise as optimal responses to a variety of shocks. It follows that without knowing the source of any change in the current account balance it is not appropriate to judge that policies are needed to 'correct' imbalances.

I. A PERMANENT FALL IN INCOME

In the model studied agents earn a parametrically given income from their ownership of factors of production and can consume, borrow and lend. These activities mean that spending can exceed or fall short of income plus net interest, that is the 'current account' may be in deficit or surplus. The representative consumer solves the following problem.

$$\max_{c} \int_0^{\infty} e^{-\rho t} u(c)dt, \tag{5.1}$$

subject to

$$\dot{A}=R(A)+y-c. \tag{5.2}$$

Here c is consumption, u utility, R net interest, A net assets, ρ the constant discount rate and y income arising from factor inputs. R is taken to be an increasing function, where R(A)=r(A)A and r is the interest rate paid on borrowing (A<0) or earned on lending (A>0). The conditions assumed on u and R are

$$u>0, \quad u'>0, \quad u''<0, \quad u'(0)= \infty \tag{5.3}$$

$$R(A)=r(A)A, \quad r'(A)<0, \quad r''(A)>0; \quad R'>0, \quad R''<0 \tag{5.4}$$

The form of the utility function is standard. That of the net interest function is shown in Figure 5.1 where y+R(A) is plotted. The justification for this form of the net interest function is the same as given in Chapters 3 and 6. Net interest rises at a decreasing rate for lending and an increasing rate for borrowing where the marginal cost of borrowing is

$$R'(A)=r(A)+r'(A)A.^{7} \tag{5.5}$$

Finally, to prevent consumers from borrowing without limit it is assumed that if assets are insufficient to enable the formulation of an optimal plan ($A\leq\bar{A}$, Figure 5.2) the agents involved are bankrupt and their consumption becomes zero. That is

$$\text{Bankruptcy} \Leftrightarrow A>\bar{A} \Rightarrow c=0 \tag{5.6}$$

Several variants of this problem are possible. The discount rate is often assumed fixed, but a case can be made for it being endogenous. Rather than being variable, the interest rate can be treated as a constant. The case in

which both the interest rate and the discount rate are constants would seem to have little interest and is not treated here.[8] A rigorous solution to the problem described will be given in the next section. However, for the purpose of studying the effects of permanent shocks, many features of the solution can be understood from a simple diagram showing optimal consumption and borrowing. To see this, first note that an optimal borrowing/consuming path will lead to a long-run steady state, if y stays constant, in which A and c are at optimal levels determined by

$$\tilde{c}=y+R(\tilde{A}), \tag{5.7}$$

$$\rho(\tilde{c})=R'(\tilde{A}). \tag{5.8}$$

Condition (5.7) is derived from the budget constraint and simply requires borrowing to be constant. Condition (5.8) comes about because agents will change consumption and borrowing if the discount rate ρ (here made a function of c) is not equal to the marginal cost of borrowing R'(A). These two steady-state conditions determine $(\tilde{c}, \tilde{A})$ and are shown in Figure 5.1. The stationary state budget constraint in the general case is a positively sloped concave function with intercept y on the c-axis. When the interest rate is constant it is linear. The slope of condition (5.8) is

$$\frac{dc}{dA}=\frac{R''(A)}{\rho'(c)} \tag{5.9}$$

and depends on the sign of ρ'(c). The necessary and sufficient condition for $(\tilde{c}, \tilde{A})$ to be the endpoint of a stable optimal path can be shown to be

$$-R'(A)\rho'(c)+R''(A)<0.^{9} \tag{5.10}$$

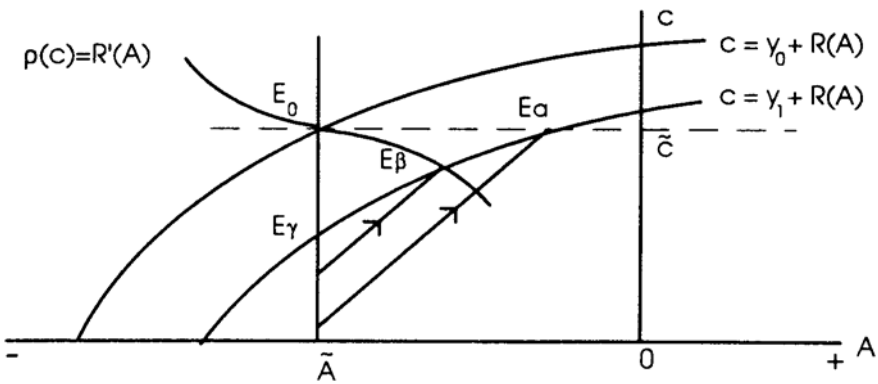


Figure 5.1 Responses to a permanent fall in income

From (5.4) and (5.10) it follows that $\rho'(c)>0$ is a sufficient condition for (5.10) to be satisfied, and is both necessary and sufficient if the interest rate is constant so that $R''(A)=0$. In what follows it will be assumed that $\rho'(c)\geq 0$, the equality allowing for the constant discount rate case. When both the interest and discount rates are endogenous, it follows that (5.8) has a negative slope in Figure 5.1.

Figure 5.1 illustrates the solution to three versions of the problem. First, when both the discount rate and the interest rate are variable and for the particular cases when *one* of them is fixed. If the interest rate is fixed, (5.8) solves for $\tilde{c}$ and is represented by that horizontal line in Figure 5.1. If the discount rate is fixed (5.8) solves for $\tilde{A}$ which is a vertical line in the figure. It is now possible to derive the effect of a *permanent* change in income. In Figure 5.1 y falls from y_0 to y_1 when the system is in equilibrium at point E_0.

1. Fixed interest rate

This case has the somewhat unusual property that steady-state consumption does not vary with y. The long run equilibrium moves to E_α. The associated reduction in debt (rise in assets) requires a period of frugality. Initially, consumption falls by more than income so producing a current account surplus. Thereafter consumption is gradually raised, assets are gradually built up and the current account surplus reduced with the system approaching a steady state at E_α involving the original steady-state consumption $\tilde{c}$. This is the Obstfeld (1981) result, and the initial current account response is the opposite of that envisaged by HLM.

It is of interest to examine what values are taken by the marginal propensity to spend in the various cases. With respect to long-run total income including factor and net interest income, the marginal propensity to spend must be unity, as this is a condition of equilibrium. However, the marginal propensities measured immediately after the change are not restricted. In the case where the interest rate is fixed, consumption has fallen more than income, so that the marginal propensity to consume is greater than unity.

2. Fixed discount rate

With the discount rate constant the marginal borrowing cost determines the desired asset level (from (5.8)). Now a permanent fall in income means an identical fall in consumption. The current account balance is unchanged and the transition to the long term equilibrium E_γ is completed instantaneously. The marginal propensity to consume is unity in both the short and long run, and there is no HLM effect.

3. Both interest and discount rates variable

In this case a permanent fall in income induces a reduction in both steadystate consumption and debt. To reduce long-run debt, consumption must initially fall by more than income, producing a current account surplus and so implying a perverse HLM effect. Consumption and net assets rise thereafter towards E_{β}. The consumer in this case is willing to be somewhat frugal in order to prevent long term consumption falling as much as income. The short run marginal propensity to consume is greater than unity.

The propositions about the way in which the marginal propensities to spend depend on the circumstances involved and may well exceed unity, contrast with the assumptions usually made about these parameters in macroeconomic models. The standard treatment holds that there is an invariant functional relationship between spending, income and other variables such that the marginal propensity to spend is less than unity. The results here support the point made in Chapter 4, section II.1, that the conclusions of macroeconomic systems that take the marginal propensity to spend to be less than unity may be misleading with respect to the effects of various changes on the current account.

II. REVERSAL OF AN INCOME FALL UNDER CERTAINTY

Consider first the solution of the problem (5.1) to (5.6) for a constant income. The case taken will be that of a constant discount rate and a variable interest rate. To solve the problem define a Hamiltonian H and a costate variable Ψ,

$$H = u(c) + \psi[y - c + R(A)] \tag{5.11}$$

$$\partial H/\partial c = u'(c) - \psi = 0 \tag{5.12}$$

$$\dot{\psi} = \rho\psi - \partial H/\partial A = \psi(\rho - R'(A)) \tag{5.13}$$

where R'(A) is the marginal cost of borrowing. The transversality condition is

$$\lim_{t\to\infty} e^{-\rho t}\psi(t)A(t) = 0 \tag{5.14}$$

Because c is a monotonic decreasing function of ψ from (5.12), differentiation of (5.12) with respect to time and substitution in (5.13) yields

$$\dot{c} = -(u'/u'')(R'(A) - \rho) \tag{5.15}$$

The dynamics of the solution involving (5.2) and (5.15) are shown in Figure 5.2. The steady state ($\tilde{A}$, $\tilde{c}$) will satisfy

$$\rho = R'(\tilde{A}), \quad \psi = u'(\tilde{c}), \quad \tilde{c} = y + R(\tilde{A}); \tag{5.16}$$

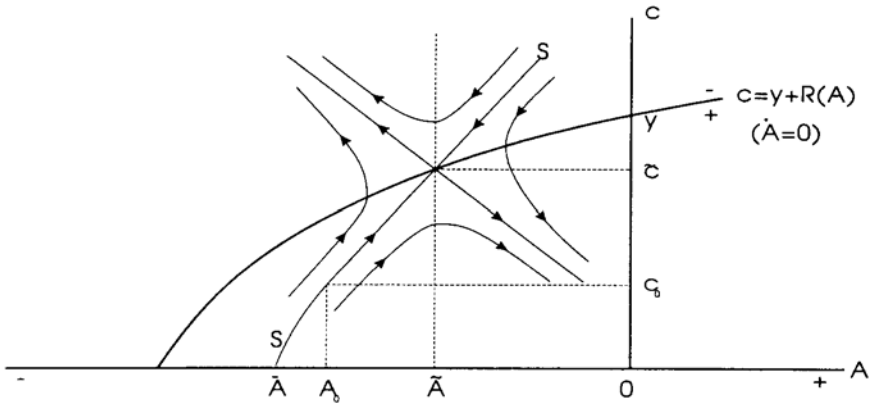


Figure 5.2 Optimal paths for consumption and debt

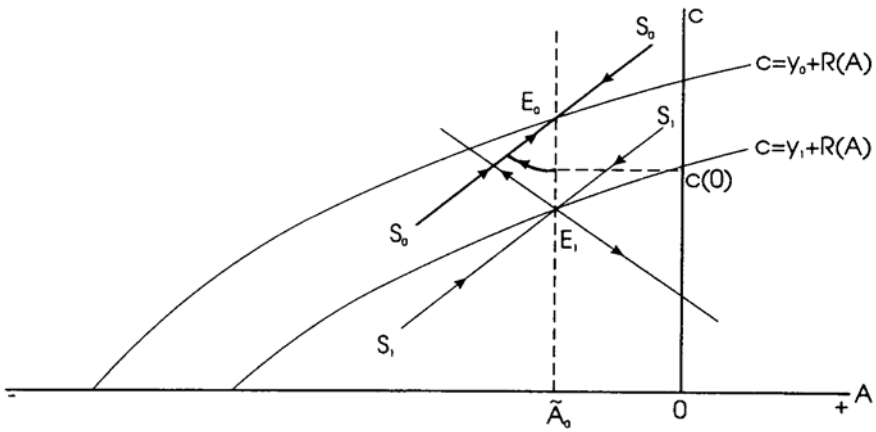


Figure 5.3 Response to a temporary fall in income

If $A>\bar{A}$ the optimal solution involves the stable branch of the saddlepoint. If $A<\bar{A}$ all paths lead to bankruptcy and there is no optimal solution to the problem.

Suppose now that a fall in income occurs at time zero from y_0 to y_1 and that it is known that it will last for exactly T periods. The optimal solution can be shown to have the form illustrated in Figure 5.3.[10] S_0S_0 is the stable branch for the problem when income is permanently y_0 and S_1S_1 that when income is permanently y_1. When income falls it is optimal for consumption to fall to c(0) where $\tilde{c}_1<c(0)<\tilde{c}_0$, and $\tilde{c}_1(0)$, $\tilde{c}_0(0)$ are the steady state levels of consumption for the two levels of income. The level of c(0) is chosen so that, using the trajectories relevant to the lower income y_1, the stable branch S_0S_0

is reached in exactly T periods. It is clear that the longer the duration of the income fall, the lower will be c(0). Thus the fact that income is expected (with certainty) to rise at time T means that consumption rises in anticipation of this throughout the interval (0, T). Subsequently consumption and debt follow the stable branch S_0S_0.

The current account deficit is identically equal to c-[y+R(A)] and can be seen to rise initially because consumption falls less than income. Debt rises in the phase (0,T) because consumption is above the locus $\dot{A}(y_1)=0$, but falls after the rise in income as consumption is then below the new steady debt locus $\dot{A}(y_0)=0$.

This type of reaction may be called a smoothing response because the intertemporal flexibility embodied in the capital account/current account is used to reduce the fall in consumption to be less than that of income. The longer T the greater the consumption fall and as T approaches infinity, the fall in consumption approaches the fall in income. For the present case of a fixed discount rate and variable interest rate, it was shown in the previous section that, for a permanent fall in income, the optimal response is for consumption to fall by the same amount as income. This is because the steady-state level of debt is determined from

$$R'(\tilde{A})=\rho \tag{5.17}$$

so that $\tilde{A}$ is invariant to changes in income y. The short run marginal propensity to consume and spend out of income is now seen to be less than unity.

It remains to be seen which if any of these results remain qualitatively the same when there is uncertainty about the timing of the income fall.

III. UNCERTAINTY ABOUT REVERSAL OF AN INCOME FALL

It will now be assumed that after the initial fall from y_1 to y_0, income will rise to y_1+g at some time in the future (where $y_0-y_1=g$).[11] The only uncertainty is the time T at which the rise will take place. Events such as this can be modelled by a Poisson process where in any small time interval (t, t+Δt) the probability of a jump occurring is $\lambda\Delta t+o(\Delta t)$. The probability of this single Poisson event is distributed through time according to $\lambda e^{-\lambda t}$, and it can therefore be shown that the expected time until the occurrence of the event is $1/\lambda$.[12] Now it is a property of the Poisson process, arising from the constant probability of the event in any given time interval, that no matter how long has elapsed since the start of a programme the expected time to the occurrence of the event is still $1/\lambda$. Some economic processes may have uncertainties of this nature, but there are others that this model may not fit too well. For instance, if income fluctuations are thought to be due to reasonably regular cyclical factors where there is some uncertainty about the period of the cycle, the expected time to the income rise should fall through time. There do not seem to be simple ways of modelling such cases.

The dynamics of debt accumulation is given by

$$dA=[R(A)-c+y]dt \tag{5.18}$$

$$dy=gdq \tag{5.19}$$

and the bankruptcy condition (5.6), where dq is a Poisson process taking on values 0 or 1, with the probability that dq=1 being distributed through time according to $\lambda e^{-\lambda t}$. As in the system of section II, the problem has two phases, with the second phase being a certainty one of the form

$$\max_{c} \int_{T}^{\infty} e^{-\rho t}\, u(c(t))dt \tag{5.20}$$

subject to (5.18), (5.19), (5.6) and

$$A(T) = A_T \tag{5.21}$$

The solution to this problem is the stable branch S_0S_0 in Figure 5.4, and the equation of S_0S_0 is taken to be

$$c = c^{+}(A;\, g), \quad \partial c^{+}/\partial A > 0 \tag{5.22}$$

In the Appendix it is shown that a necessary condition for the solution of the first phase before the rise in income is

$$-u'' \frac{dc}{dt} = [R'(A) - (\rho + \lambda)]u'(c) + \lambda u'[c^{+}(A;\, g)] \tag{5.23}$$

(5.18) and (5.23) determine the dynamics of the system. The curve for $\dot{c}=0$ is

$$u'(c) = \frac{\lambda u'(c^{+}(A;\ g))}{\rho\ +\ \lambda\ -\ R'(A)} \tag{5.24}$$

Assuming $c^{+}(A; g)$ is defined for relevant values of A, this curve can readily be seen to pass through $(A^*, 0)$ and E_0 in Figure 5.4. Its slope is

$$\frac{dc}{dA}(\dot{c} = 0) = \frac{\lambda u''(c^{+}) \dfrac{dc^{+}}{dA} + R''u'(c)}{u''(c)\{\rho + \lambda - R'(a)\}} \tag{5.25}$$

which is positive for $\rho+\lambda>R'(A)$. There may be multiple intersections between $\dot{A}(y_1)=0$ and $\dot{c}=0$, but at the intersection for which A is highest (when $A=\tilde{A}_1$ in Figure 5.3) $\dot{c}=0$ is the steeper curve. It will be shown that the equilibrium E_1 so defined is the only one relevant to the present problem.

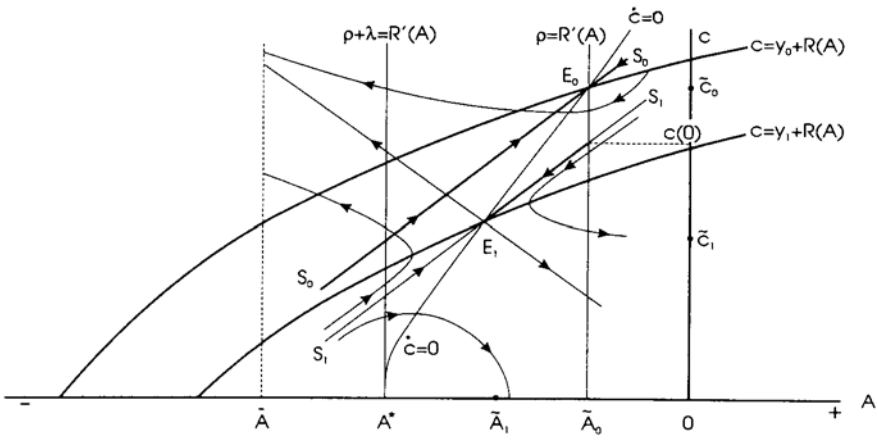


Figure 5.4 Optimal response under uncertainty

Further it can be shown that E_1 is a saddlepoint with stable branch S_1S_1.

To see that S_1S_1 is the solution for the first phase note first that assets cannot fall below $\bar{A}$ as this would produce bankruptcy. Now consider paths above S_1S_1 for $A_0>\bar{A}$. It can be seen that these all lead eventually to $A\leq\bar{A}$ and bankruptcy. There can be no guarantee that the jump in income will have occurred before $A=\bar{A}$, so that such paths cannot be part of an optimal programme. Paths below S_1S_1 will reach the zero consumption level in a finite time. To see this, note that the slope of these trajectories from (5.18) and (5.23), is

$$\frac{dc}{dA}=\frac{-\dfrac{u'(c)}{u''(c)}[R'(A)-(\rho+\lambda)]-\dfrac{\lambda u'(c^+)}{u''(c)}}{R(A)-c+y} \tag{5.26}$$

As $c\to 0$, $dc/dA\to-\infty$, which is sufficient to ensure that along these paths zero consumption is reached in a finite time. Again, as there can be no guarantee that the Poisson event will occur before c=0 these paths cannot be optimal. Only S_1S_1 avoids zero consumption over the indefinite future during which income is at y_1. Of course there are many possible realisations of the income rise which will give superior values of the objective function *ex post* along paths other than S_1S_1. However, because of the possible zero consumption outcome along paths other than S_1S_1, the expected value of the objective function along S_1S_1 will exceed that along the unstable paths.[13]

Initially the system is at E_0 with income y_0, consumption $\tilde{c}_0$ and debt $\tilde{A}_0$. The fall in income to y_1 means an initial fall in consumption by less than

income to c(0), where, $\tilde{c}_0 > c(0) > \tilde{c}_1$. The current account deficit and subsequent debt both rise, and consumption falls along S_1S_1 until the expected rise in income occurs. At that time consumption jumps to $c^+(A; g)$ with the system attaining the stable branch S_1S_1. Thereafter, consumption rises and debt falls as they monotonically approach the steady state at E_0.

There are important similarities and differences between this outcome and the certainty case. The initial jump in the current account deficit with a fall in income is qualitatively the same in both cases, so there is a smoothing response to an income fall in both cases. This leads in both cases to a consequent rise in debt. The major difference is that when there is uncertainty there is no phase of increasing consumption in anticipation of the rise. Thus uncertainty induces caution in that optimal paths lead towards a steady state based on the temporarily low income level.

The type of uncertainty modelled in this chapter could be thought of as corresponding to a real world situation where infrequent changes in income occur and where agents look to the next fluctuation as the last that will happen. However, there is a way of modelling repeated Poisson events in the present framework, as long as there are a finite number of them. Suppose two levels of income are possible. Starting after the last of the finite number of Poisson events has occurred places the system on the stable branch of a certainty case. It is then possible to work back through each realisation of an income jump constructing the stable branch for each preceding regime. The consequence is that consumption will behave in a cyclical fashion, jumping down and then gradually falling when income falls, and jumping up and gradually rising when income rises.

APPENDIX

The derivation of the differential equation

$$-u'' \frac{dc}{dt} = [R'(A) - (\rho - \lambda)]u'(c) + \lambda u'[c^+(A; g)] \tag{A5.1}$$

Consider the problem

$$\max_c E \int_0^\infty e^{-\rho t} u(c) dt, \tag{A5.2}$$

subject to

$$dA = [R(A) + y - c]dt, \quad A(0) = A_0 \tag{A5.3}$$

$$dy = gdq \tag{A5.4}$$

The Maximum Principle (see Malliaris and Brock (1982) Chapter 2, S.12) requires that

$$\max_{c} \varnothing(A, c, t) \tag{A5.5}$$

$$= \max_{c} \{e^{-\rho t}u(c) + J_t(A, t) + J_A(A, t)[R(A) + y - c] + \lambda[J(A, g, t) - J(A, t)]\}$$

$$= 0$$

where

$$J(A, t) = \max_{c} E_t \int_t^{\infty} e^{-\rho t}(c(\tau))d\tau, \tag{A5.6}$$

subject to (A5.3), (A5.4).

The problem has two phases, one before and the other after the jump in y has occurred. There is uncertainty about income only in the first phase, the solution for the second phase being the same as for the certainty problem. The derivations which follow apply only to the open interval (0, T) prior to the jump in income.

Define

$$W(A) = e^{-\rho t}J(A, t) \tag{A5.7}$$

then

$$J_t = -\rho e^{-\rho t}W \tag{A5.8}$$

$$e^{\rho t}J_t = -\rho W \tag{A5.9}$$

Multiply (A5.5) by $e^{\rho t}$ so that

$$0 = \max_{c} \{u(c) - (\rho + \lambda)W(A) + W_A(A)[y + R(A) - c] \tag{A5.10}$$

$$+ \lambda[W(A; g)]\}$$

Define $\psi = W_A(A)$ then

$$d\psi = W_{AA}dA \tag{A5.11}$$

Substituting ψ in (A5.10) and optimising with respect to c yields

$$\psi = u'(c) \tag{A5.12}$$

Differentiate (A5.10) with respect to A to obtain

$$0 = -(\rho + \lambda)\psi + \frac{1}{dt}W_{AA}(A)dA + \psi R'(A) + \lambda W_A(A; g) \tag{A5.13}$$

Substituting (A5.11) in (A5.13)

$$-\frac{d\psi}{dt} = [R'(A) - (\rho + \lambda)]\psi + \lambda u'[c^+(A; g)] \tag{A5.14}$$

Using (A5.12)

$$-u''(c)\frac{dc}{dt} = [R'(A) - (\rho + \lambda)]u'[c] + \lambda u'[c^{+}(A; g)] \tag{A5.15}$$

I am indebted to N.V. Long for pointing out the following alternative derivation similar to that used in Hillman and Long (1983). Let T be the date of arrival of the higher income level. Define

$$J(A(T), g) = \max_{c} \int_{T}^{\infty} e^{-\rho(\tau - T)} u(c(\tau))dt \tag{A5.16}$$

subject to

$$\frac{dA}{dt} = R(A) - c + y + g \tag{A5.17}$$

As T is generated by a Poisson process, its density function is

$$\Gamma(T) = \lambda e^{-\lambda T} \tag{A5.18}$$

with cumulative distribution

$$G(T) = \int_{0}^{T} \Gamma(\tau)d\tau = 1 - e^{-\lambda T} \tag{A5.19}$$

Hence the expected value to be maximised is

$$I = \int_{0}^{\infty} \Gamma(T)[\int_{0}^{T} u(c(t))e^{-\rho t}dt + e^{-\rho t}W(A(T); g)]dt \tag{A5.20}$$

where

$$W(A(T); g) = e^{-\rho t}J(A(T); g)$$

If I is integrated by parts it becomes

$$I = \int_{0}^{\infty} e^{-(\rho+\lambda)T}[u(c(T)) + \lambda W(A(T); g)]dT \tag{A5.22}$$

with constraints (A5.3) for the first phase and (A5.17) for the second phase. The necessary conditions for maximisation of (A5.22) in the first phase yield (A5.1).

Chapter 6

Foreign investment

The current and capital accounts in the balance of payments are a record of intertemporal and international trade in saving often called 'foreign investment' or 'capital importing'. Although it is related to financial capital flows it is not to be confused with them.[1] By lending abroad economic agents expect to make higher returns than domestically and by borrowing from abroad expect that returns will exceed the cost of borrowing. Building on the work of a number of authors, this chapter investigates the nature of these processes, thereby demonstrating some of the advantages to be gained from foreign investment. It also discusses whether any case for intervention can be inferred from this analysis.[2]

I. INTERNATIONALLY MOBILE PHYSICAL CAPITAL

The first model is based on those of Bardhan (1967) and Pitchford (1970) though its basic notions go back to early work such as that by Kemp (1962) and MacDougall (1960). As will later be seen, models of the process of optimal foreign investment can become complex at an early stage. Hence, to keep the problem manageable this class of models has a very simple structure. The domestic economy can borrow (lease) physical capital from abroad for which it pays a rate of interest specified by the supply curve of such capital. There is no other form of international borrowing allowed by the model, so that it is not possible to borrow for consumption. Identical capital can be produced by saving out of net income. However, the two sources of capital are treated somewhat differently in the model. Foreign sourced capital is taken to be a control variable whose value can be chosen freely at any level for the country concerned. This implies that such capital is perfectly mobile internationally so that real capital can be costlessly and instantaneously moved between countries. Some types of physical capital approximate to this idea of perfect mobility. Perhaps aircraft are a good example of highly mobile real capital, though their mobility is not costless. Other types of capital which must be constructed in the country concerned, such as roads and buildings, obviously have very limited or no mobility. In practice, there are two aspects to real capital mobility and foreign

borrowing. A given amount of foreign borrowing can be devoted either to importing capital goods from abroad, or producing capital domestically. Hence, a more realistic model would involve adjustment costs, both for importing and for constructing capital goods locally. This latter cost will be introduced later in the chapter.

The only ways of preventing ever-increasing borrowing and lending in the model are to make the world interest rate, the discount rate, or both, endogenous. As in Chapter 3 and some of the models of Chapter 5, and for the same reasons, the interest rate is assumed to rise with the amount of borrowing. Either the home country is a large enough borrower to cause a rising marginal product of capital in the lending countries as it borrows more, or it is one of a group of small countries all of which act independently but experience the group effect on interest rates. Alternatively, it could be a small country whose impact on lenders is now minor, but whose growth in the distant future will ultimately be constrained by the rising opportunity cost of capital. The discount rate is taken to be constant as are population and the labour force.

To begin with consider the problem of finding the social optimum.

1. A basic model

It is required to choose consumption and foreign capital to maximise the discounted sum of the utility from consumption:

$$\max_{c,K_f} \int_0^\infty e^{-\rho t} u(c)dt, \quad u' > 0, \quad u'' < 0, u'(0) = \infty \tag{6.1}$$

subject to

$$\dot{K}_d = F(K_f + K_d) - R(K_f) - c, \quad F' > 0, \quad F'' < 0 \tag{6.2}$$

$$R = r(K_f)K_f, \quad R' > 0, \quad R'' > 0 \tag{6.3}$$

and

- c consumption
- u utility
- ρ the discount rate
- K_f foreign sourced capital
- K_d domestically owned capital stock
- r interest rate
- R interest bill

The constraint (6.2) is a form of the national income identity and can be written

$$-\dot{K}_f = (F - R) - c - (\dot{K}_f + \dot{K}_d) = S - I \tag{6.2'}$$

to show that the capital account deficit equals the excess of net income over consumption plus investment or current account surplus, which in turn equals the excess of saving S over investment I. Note that (6.2') demonstrates that borrowing for consumption is not allowed in this model. A rise in foreign borrowing is offset exactly by an importation of foreign capital, leaving no scope for borrowing to finance consumption.

The maximand is standard. It is assumed that the social planner adopts the instantaneous uniform utility function and discount rate of the typical infinitely lived consumer. A part of the capital stock, given by K_f, is taken to have been financed by foreign borrowing at the world interest rate r and the remainder, given by K_d, is financed from domestic saving. Foreign lending is encompassed by allowing K_f to be negative.[3] The interest bill R is assumed to be increasing in the size of the foreign sourced portion of the capital stock. Behind this, the interest rate is an increasing function of foreign borrowing where

$$r'>0,\ r''>0 \tag{6.3'}$$

Consumption and foreign capital are control variables chosen to maximise discounted utility.

Define a Hamiltonian H and a shadow price of foreign capital ψ such that

$$H=u(c)+\psi[F(K_f+K_d)-R(K_f)] \tag{6.4}$$

Necessary conditions for a solution are

$$u'(c)=\psi \tag{6.5}$$

$$F'(K_f+K_d)=R'(K_f) \tag{6.6}$$

$$\dot{\psi}=\rho\psi-F'(K_f+K_d)\psi \tag{6.7}$$

(6.6) and (6.7) can be rearranged to eliminate ψ so that

$$\dot{c}=\frac{u'}{u''}[\rho-F'(K_f+K_d)] \tag{6.8}$$

Differentiating (6.6)

$$\frac{dK_f}{dK_d}=\frac{F''}{R''-F''}<0 \tag{6.9}$$

Using this, (6.8) can be written

$$\dot{c}=\frac{u'}{u''}[\rho-F'(\underset{-}{K_f}(K_d)+K_d)]=\frac{u'}{u''}[\rho-F'(\underset{+}{K_d})] \tag{6.10}$$

because

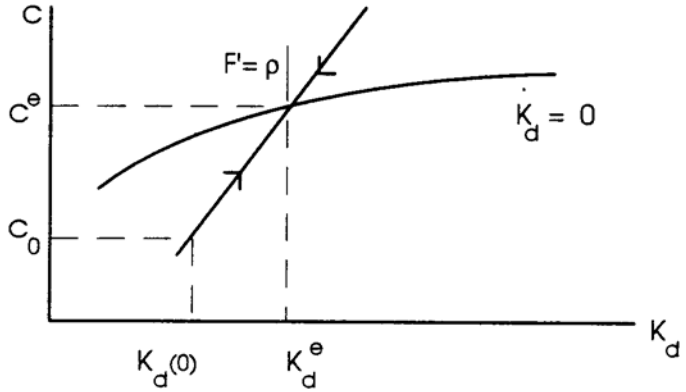


Figure 6.1 Optimal path of consumption and capital

$$0 < \frac{d[K_f(K_d) + K_d]}{dK_d} = \frac{R''}{R'' - F''} < 1 \tag{6.11}$$

Using (6.2), (6.9), and (6.10) the solution can be constructed in the standard way in the (K_d, c) space and is shown in Figure 6.1.

The steady state of the system, given by $\mathbf{K_d^e}$, c^e is characterised by

$$F'(K_f+K_d)=R'(K_f)=\rho \tag{6.12}$$

$$F(K_f+K_d)-R(K_f)=c \tag{6.13}$$

The marginal product of capital and the marginal cost of borrowing are brought to equality with the discount rate, and consumption equals net income. A way of interpreting (6.13) is that saving out of gross income must equal net interest paid abroad.

Applying the usual analysis, it can be shown that at any initial value $K_d(0)$ the shadow price $\psi(0)$ and the corresponding initial value of the control variables $c(0)$, $K_f(0)$ are chosen so as to place the system on the stable branch of the saddle point paths as in Figure 6.1.[4] If $\mathbf{K_d(0) < K_d^e}$ the shadow price falls and consumption and the domestically sourced component of the capital stock rise towards their steady state values.

A more informative way to display the solution is in the (K_d, K_f) space. In Figure 6.2, the curve $F'(K_d+K_f)=\rho$ is shown as a straight line with slope -1. Indeed, lines parallel to and higher (lower) than this are loci of lower (higher) profit rates. During the process of accumulation of domestic capital the supply of foreign capital is adjusted to satisfy (6.6), which requires the marginal product of capital to equal the marginal cost of borrowing. The economy moves along this curve to the steady state. There are two phases to the process as can be seen in Figure 6.2. Suppose the economy is initially at

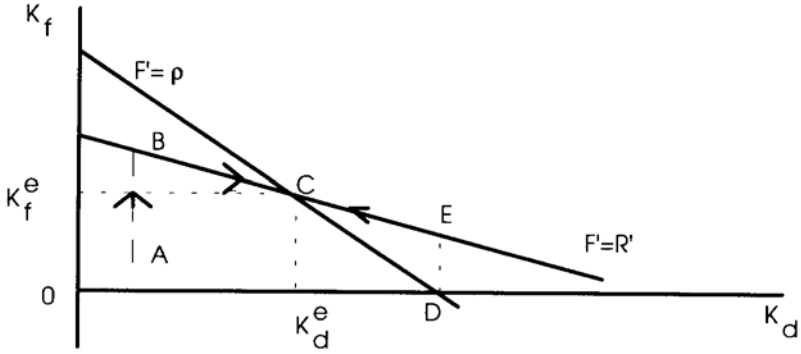


Figure 6.2 Paths of domestic and foreign capital

point A where the stock of both domestic and foreign capital is lower than the steady-state values. At this point the marginal product of capital exceeds the marginal cost of borrowing which in turn is greater than the rate of discount. There is then an initial jump in K_f to B after which K_d grows and K_f declines to the steady state at C.

It follows that:

1 It pays to engage in foreign investment (defined as a jump in K_f) when the marginal product of capital exceeds the marginal cost of borrowing.
2 After the initial jump, the stock of foreign capital is adjusted as the stock of domestic capital changes to keep the marginal cost of borrowing equal to the marginal product of capital.
3 In the steady state, net foreign indebtedness (K_f) may be positive or negative. It may be zero, but this would only occur by chance.

Point 3 is important because it suggests that international borrowing and lending could be expected to be widespread because it is not just a transitional phenomenon. Another way of making the same point is to examine the situation of an economy that neither borrows nor lends. Suppose a country began with a capital stock K_d which satisfied the equilibrium conditions (6.12), (6.13) to the extent that

$$F'(K_d)=\rho \qquad (6.12')$$

$$F(K_d)=c \qquad (6.13')$$

This economy is then 'self reliant' in terms of capital ownership and, indeed, has a higher rate of consumption than in the steady state defined by (6.12) and (6.13). However, it is not optimal to stay in that position. It would be better off borrowing foreign capital (jumping from D to E in Figure 6.2) and

consuming at a higher rate than given by (6.13'). Foreign capital would then be accumulated and domestic capital decumulated until the steady state is reached. Another way of making this point is that a country at point C might be tempted to default on its interest payments or nationalise all foreign capital with no compensation so as to bring itself to point D where, because (6.13') applies, it will have a higher rate of consumption. Apart from the fact that it will raise the cost of future borrowing against itself and incur penalties in relation to future trade, D is not the desired steady state.

One situation where countries may neither borrow nor lend is that where the conditions for factor price equalisation are satisfied. If this were the case the capital/labour ratio and the rate of profit would be the same in all countries and one of the major bases for foreign investment will have been removed. Conditions that will encourage foreign borrowing and lending are that among countries there are different technologies and specific factors making for a variety of rates of profit before foreign investment.

The path taken by foreign investment, first jumping and later being adjusted downward smoothly is partly a product of the nature of the assumptions chosen. The reason for this behaviour is that K_f is a control variable without restrictions on its level and without adjustment costs for altering that level. This economy can partly make up for its capital stock being lower than that of the optimal steady-state level by importing capital up to the point at which the marginal cost of borrowing equals the marginal product of capital. Because the marginal cost of borrowing exceeds the discount rate at point B the foreign component of the capital stock is then adjusted downward towards the steady state value. If allowances were made for adjustment costs and the use of foreign borrowing to finance capital accumulation from domestic output, it might be expected that the accumulation of foreign indebtedness would proceed gradually and in conjunction with the accumulation of domestically produced capital. It remains to be seen whether something like this can be established in a more complex model.

The behaviour of the system is dependent on various parameters, in particular, the discount rate, the labour force, the level of technical progress

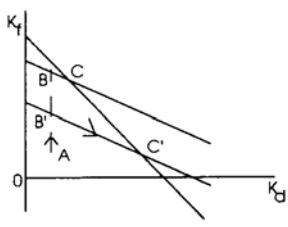


Figure 6.3a

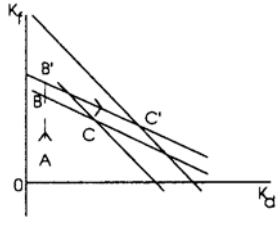


Figure 6.3b

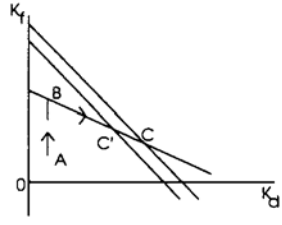


Figure 6.3c

Influence of parameters on adjustment paths

and the level of world interest rates. It is of interest to examine the effects of shifts in these parameters on the time path of the economy. There are several types of comparative dynamic questions that might be asked. Here the form of the question is: what would be the time path of an economy starting from the same initial point A as before, if various parameters had been different? The relationships needed to analyse this,

$$F_K(K_f+K_d, L)\theta=\rho \tag{6.14}$$

$$F_K(K_f+K_d, L)\theta=R'(K_f)=r(K_f)+r'(K_f)K_f \tag{6.15}$$

are illustrated in Figure 6.3, where L is the labour force and θ is a Hicks Neutral technical progress coefficient.

a world interest rates
The interest rate schedule $r(\cdot)$ has an intercept r_0 for zero K_f. Suppose this intercept increases while leaving the slope of the schedule unaffected at each K_f. This change will only affect (6.15), shifting it downward as in Figure 6.3a, because for any K_d

$$dK_f=[1/F_{KK}]dr_0<0 \tag{6.16}$$

Hence a higher world interest schedule means a lower initial jump in foreign investment (AB') and a subsequent path to a lower proportion of foreign capital in the total capital stock at C'.

b labour force
Assume that a rise in the employment of labour raises the marginal product of capital ($F_{KL}>0$). In this case, the rise in L shifts both schedules to the right. However, the steady-state level of foreign capital will remain unaltered as, differentiating (6.14), (6.15) totally

$$dK_f/dL=0, \quad dK_d/dL=-F_{KL}/F_{KK}>0 \tag{6.17}$$

As Figure 6.3b shows, the amount of initial foreign investment (AB') is increased as also is the size of the steady state capital stock at C'. These results would be reversed in the case in which $F_{KL}<0$. These are also the results for Harrod Neutral technical progress. Moreover, differentiating totally with respect to θ the same qualitative results apply for Hicks Neutral technical progress.

c discount rate
A rise in the discount rate (decrease in thrift) affects equation (6.14) only and requires a downward shift in that schedule as in Figure 6.3c. Hence the initial amount of foreign investment (jump in K_f) remains the same, while the subsequent path is towards a lower total capital stock with a higher proportion of foreign capital at C'. On the other hand an increase

in thrift leads to a higher total capital stock with a smaller foreign capital component.

All of these results have straightforward intuitive explanations.

2. Indirect effects of foreign investment

It has often been argued that foreign investment has effects beyond its direct impact on the capital stock examined in the previous section. For instance, it might employ technology or products not previously available in the country concerned or it might enhance the productivity of the labour force who learn new skills from 'on the job experience' which they can use widely. The previous model can readily be extended to illustrate this. The following example is worthwhile both for its intrinsic interest and because it helps illuminate the question, considered in section III, of whether there is a case for regulating foreign investment.

Suppose that the efficiency L of the given stock of labour is greater the higher the stock of foreign capital so that the production function becomes

$$F(K_f+K_d, L(K_f)),\ L'>0,\ L''<0 \tag{6.18}$$

With this psroduction function replacing that in (6.2) and otherwise the same assumptions as in (6.1) to (6.3) the main change to the results is that (6.6) is replaced by

$$F_K+L'F_L=R' \tag{6.19}$$

The impact on output of an increment in the stock of foreign capital is now greater than the marginal product of capital because of the effects of foreign investment on labour's productivity. However, it is quite possible that this benefit might accrue to the labour involved, because of its mobility, and not to those responsible for the borrowing. (6.19) has a slope

$$\frac{dK_f}{dK_d}=\frac{-(F_{KK}+L'F_{LK})}{F_{KK}+2F_{KL}+F_{LL}(L')^2+L''F_L-R''} \tag{6.20}$$

Together with the assumptions already made, a sufficient condition for this to be negative is that labour and capital are substitutes $F_{KL}<0$. In this case a solution along similar lines to that in section I.1 can readily be constructed.

Rewrite (6.19) as

$$F_K=r+r'K_f-L'F_L \tag{6.21}$$

Whereas the effect of a rising supply curve of foreign capital was to require a higher marginal product of capital than the foreign interest rate, the

influence of foreign capital on labour productivity requires it to be lower. This issue will be returned to in section III.

3. Government capital and foreign investment

Suppose government expenditure impinges on the economy through its output effects. Output of a single home good is assumed to depend on inputs of capital K and government services G. The government can borrow from abroad or tax to finance its expenditure. Its objective is to maximise discounted utility from consumption.

$$\max_{c,T,G} \int_0^{\infty} e^{-\rho t} u(c)dt, \quad u' > 0, u'' < 0, u'(0) = \infty \tag{6.22}$$

subject to

$$\dot{K} = F(K, G) - c - T, \quad F_K > 0, F_G > 0, \quad F_{KK} < 0, \quad F_{GG} < 0,$$
$$F_{KK}F_{GG} - F_{KG}^2 > 0 \tag{6.23}$$
$$\dot{b} = G + R(b) - T, \quad R' > 0, \quad R'' > 0 \tag{6.24}$$

where

T	tax collections
b	government borrowing from abroad
c	consumption per head
R	interest bill on borrowing

(6.23) is the private and (6.24) is the government's budget constraint. Output is assumed to be strictly concave in the arguments capital and government services, implying the presence of fixed factors such as labour. Technical details of the solution to this problem are given in the Appendix to this chapter. Briefly it can be reduced to two differential equations

$$\dot{K} = \left[\frac{1}{1 - b_K}\right]\{F(K, G(K)) - G(K) - R(b(K)) - c\} \tag{6.25}$$

$$\dot{c} = \left[\frac{-u'}{u''}\right](F_K(K, G(K)) - \rho) \tag{6.26}$$

where the functions G(·) and b(·) are defined by

$$F_G(K,G)=1 \tag{6.27}$$

$$F_K(K, G)=R'(b) \tag{6.28}$$

Hence, the marginal product of government services is set equal to the

resource cost of a unit of consumption and the marginal product of capital to the marginal cost of borrowing. From (6.27)

$$\frac{dG}{dK} = \frac{-F_{GK}}{F_{GG}} \tag{6.29}$$

which will be positive if capital and government services are substitutes and negative if they are complements. From (6.28) and (6.29)

$$\frac{db}{dK} = \frac{F_{GG}R''}{F_{GG}F_{KK} - F_{GK}^2} < 0 \tag{6.30}$$

In addition to (6.27) and (6.28), at a steady state

$$F(K)=c+G+R(b) \tag{6.31}$$

$$G=T-R(b) \tag{6.32}$$

$$F_K(K, G(K))=\rho \tag{6.33}$$

Although budget balance is a condition of the steady state, it can be seen from (6.28) that there is no reason for government debt to be zero in the long run. A phase diagram illustrating the time path of the system may be constructed from these equations in the usual way and is shown in Figure 6.4. There will be a unique path for government expenditure for each initial capital stock. Suppose the initial capital stock is low. It will then pay the government to borrow an amount in excess of the steady state level and subsequently to adjust its debt downward.[5] This follows from (6.30). If government services and private capital are complements G and K will rise together, if they are substitutes G will fall as K rises.

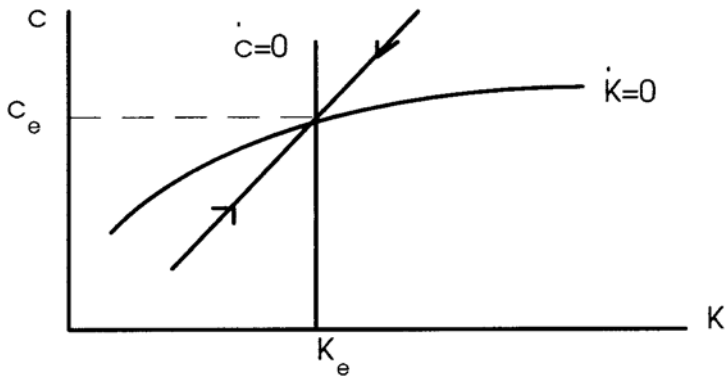


Figure 6.4 Accumulation with government capital

One simple but important principle this example establishes is that full employment government expenditure and taxation have functions that have nothing directly to do with the current account balance.[6] Secondly, it is optimal for the fiscal deficit to be zero only in the ultimate steady state. Government borrowing and debt can finance services that lead to higher utility than if the budget were continually balanced.

While this model has been interpreted as applying to government services, it could equally well apply to privately produced services. Reinterpret G as private productive inputs provided from domestic output in an amount T and private borrowing from abroad $\dot{b}$. The system then deals with the optimal provision of an additional input by the private sector and its financing from domestic saving or foreign borrowing. Hence, it can also be interpreted as a further model of private foreign investment.

II. BORROWING FOR CONSUMPTION OR INVESTMENT

A more satisfactory way of incorporating international borrowing into a theoretical model is not to associate it solely with the acquisition of capital equipment, but to allow borrowing to be used for either consumption or investment.[7] It is then possible, for instance, for there to be foreign borrowing whereby consumption goods are imported with or without a corresponding increase in the total domestic capital stock.

One such model of saving, investment, capital accumulation and borrowing is that of Blanchard and Fischer (1989). They consider the problem of maximising the present value of the discounted utility of the stream of future consumption when there are installation costs associated with investment and it is possible to borrow from abroad. The formulation they choose has a number of satisfactory features. However, the dimension of the problem makes the model difficult to solve without making compromises. Note that the assumption made here that the interest rate on borrowing varies with the size of debt is not made by Blanchard and Fischer who assume a constant interest rate. Apart from that, the model that follows captures the essence of their system.

The object is to the maximise the present value of household utility when it is possible to borrow or lend and consume or invest.

$$\max_{c,n} \int_0^{\infty} e^{-\rho t} u(c)dt \tag{6.34}$$

subject to:

$$\dot{b} = c+n+a(n)+R(b)-F(K),\ b(0)=b_0 \tag{6.35}$$

$$\dot{K} = n,\ K(0)=K_0 \tag{6.36}$$

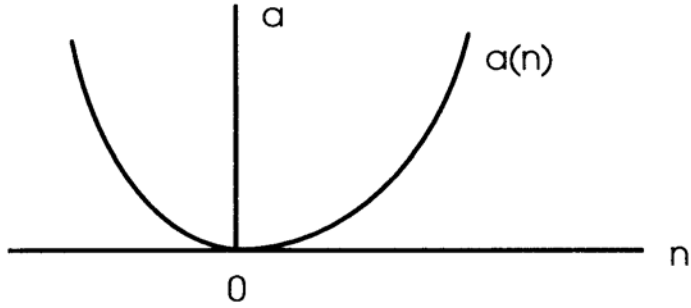


Figure 6.5 Adjustment cost of investment

$$a(0)=0, \quad a'(0)=0; \quad a'>0, n>0; \quad a'<0, n<0; \quad a''>0 \tag{6.37}$$

$$u'>0, u''<0; \quad F'>0, F''<0; \quad R(b)=r(b)b, R'>0, R''>0 \tag{6.38}$$

New variables are

- n investment
- b foreign borrowing
- a installation cost of investment

Unless there is some constraint on the adjustment processes in this system, the optimal solution to such a problem involves a jump in borrowing and the capital stock which will equate the marginal cost of borrowing to the marginal product of capital, as occurred in the first section of this chapter. Hence, it is here assumed that a unit of investment has to be installed before it can become capital, at a cost given by a. This makes it possible that the capital stock will not jump because of foreign investment. The adjustment cost function is of the simple form illustrated in Figure 6.5. Adjustment cost is incurred for both rising and falling investment and the marginal cost of installation or demolition rises with the level of investment or disinvestment.[8] The cost of borrowing function R has the same form as was used in the previous section.

(6.35) states that borrowing is necessary to the extent that consumption plus investment plus installation costs plus interest on borrowing exceeds income. Rewriting (6.35) in a form similar to (6.2') it becomes

$$-\dot{b} = [F(K)-R(b)-a(n)]-c-n=S-I \tag{6.35'}$$

Capital outflow equals the excess of net income over consumption and investment or the difference between saving and investment. From (6.35') an increase in the rate of borrowing can be used to finance either consumption

or investment. (6.37) states that the capital stock grows at the rate given by investment.

The problem involves two state variables b, K and two control variables n, c. Construct the Hamiltonian H where ψ is the shadow price of debt and ϕ the shadow price of capital.

$$H=u(c)+\psi(c+n+a(n)+R(b)-F(K))+\phi n \tag{6.39}$$

Necessary conditions for an optimum are

$$\psi=-u'(c) \tag{6.40}$$

$$\phi=-\psi[1+a'(n)]=u'(c)[1+a'(n)] \tag{6.41}$$

$$\dot{\psi}=\psi\rho-\partial H/\partial b=\psi(\partial-R'(b)) \tag{6.42}$$

$$\dot{\phi}=\phi\rho-\partial H/\partial K=\phi\rho+\psi F'(K) \tag{6.43}$$

These reduce to

$$\dot{c}=\left[\frac{u'}{u''}\right](\rho-R'(b)) \tag{6.44}$$

$$F'(K)=[1+a'(n)]R'(b)-a''(n)\dot{n} \tag{6.45}$$

(6.44) is a form of the Ramsey rule. (6.45) is analogous to (6.6) which, in the absence of adjustment costs, required the marginal product of capital to be equated to the marginal cost of borrowing. This is complicated in (6.45) because of the sensitivity of adjustment cost to changes in both the level and rate of change of investment. The marginal product of capital will be equated to the marginal cost of borrowing only in the eventual steady state.

It is often claimed that as a result of the mobility of real capital, real interest rates would be equalised across countries in the short run. Neglecting the difference between the marginal cost of borrowing and the world interest rate and taking the marginal product of capital to represent the domestic real interest rate, it is clear that equality of real rates is a long run, but not a short run product of mobility. From (6.45) the marginal product of capital may exceed or fall short of the marginal cost of borrowing in the short run.

The system to be solved is then (6.35), (6.36), (6.44) and (6.45). These necessary conditions will, as is usual, yield an infinite choice of potentially optimal paths. For the infinite time problem, it would be necessary to establish that a stable path to the steady state exists and, if so, that it was optimal to choose initial values of the control variables to put the system on the stable path.

If a steady state exists, it will satisfy

$$F'(K^*)=R'(b^*)=\rho \tag{6.46}$$

$$F(K^*)=c^*+rb^* \tag{6.47}$$

These conditions solve for optimal steady-state values of the stock of capital, the stock of debt and the level of consumption. Because the problem involves a fourth order differential equation system, methods for solving for its dynamic behaviour, given its present form, are not available.

Blanchard and Fischer (1989) simplify the system so as to be able to provide a solution to a variant of the problem. They assume that both the discount rate and interest rate are constant which implies that in the present system R'(b)=r. As can be seen from (6.44), this means that when the interest rate does not coincide with the discount rate consumption will continue to rise or fall indefinitely. No steady state is possible. Blanchard and Fischer get around this type of problem and reduce the dimension of the system by assuming that the interest and discount rates are equal. However, there is absolutely no reason why these two unrelated parameters should have the same value unless, contrary to their assumption, at least one of them is endogenous and they are brought to equality in equilibrium.[9]

Any alternative assumptions to those of model (6.34), (6.35), (6.36) will not involve full optimisation in the original system (by definition) and so in that sense is unsatisfactory. However, there is at least one alternative system that can be solved. The approach taken is to separate the behaviour of consumers and firms and to give each separate objective functions. In particular, while consumers' utility is taken to involve diminishing marginal utility of consumption, the criterion function of the firm is taken to involve a constant marginal utility of profits. Further, while consumers are supposed to use a positive discount rate, the discount rate for firms is taken to be zero. The assumption that it is only consumers whose choices involve diminishing marginal utility and discounting of the future is not without plausibility. Finally, the simplifying assumption is made that only consumers borrow abroad, so that firms are forced to make their investment out of domestic retained surplus. It is possible to solve this type of problem for its dynamic properties for arbitrary feasible initial conditions. This contrasts with the solutions of Blanchard and Fischer whose validity is limited to some possibly small neighbourhood of equilibrium.

It is assumed that there are the same number of (identical) consumers as (identical) firms and the analysis is carried out for representative agents. Firms pay their surplus after net of investment, y to consumers. Because of their linear objective function, the motivation for firms would be to make these payments zero whenever their capital stock was less than optimal. Hence it is taken that consumer-share holders require that dividend payments are at least equal to some minimum value, that is $y \geq y_0$.

The firm

A firm has an initial capital stock K_0. In a steady state its capital stock $\hat{K}$ maximises the surplus. The firm chooses to minimise the deviation of the

sum of its stream of surpluses y(t) from the maximum steady state level of the surplus $\hat{y}$. Hence it is required to

$$\min_{y} \int_0^{\infty} (\hat{y} - y)dt \tag{6.48}$$

subject to

$$\dot{K} = F(K) - y \tag{6.49}$$

$$y \geq y_0 \tag{6.50}$$

$$F'(\hat{K}) = 0, \quad \hat{y} = F(\hat{K}) \tag{6.51}$$

The production function is assumed to be defined net of depreciation in which case it is necessary to recognise that its form should be

$$F(0) = 0, F' \gtreqless 0 \quad \text{as} \quad K \lesseqgtr \hat{K}, \quad F'' < 0 \tag{6.52}$$

It should also be noted that when the capital stock is above $\hat{K}$ there will be practical limitations on the rate at which it can be reduced by 'transforming' it into consumption. Hence a further constraint that

$$y \geq y_1, \quad \text{for} \quad K > \hat{K} \tag{6.53}$$

is needed to define the maximum rate y_1 at which the capital stock can be consumed. Define the Hamiltonian H the costate ψ and the Kuhn-Tucker multipliers λ, μ so that

$$H = y - \hat{y} + \psi(F(K) - y) + \lambda(y - y_0) + \mu(y_1 - y) \tag{6.54}$$

Necessary conditions for an optimum are

$$\frac{\partial H}{\partial y} = 1 - \psi + \lambda - \mu = 0, \quad \lambda \geq 0, \quad \lambda(y - y_0) = 0, \quad \mu \geq 0, \quad \mu(y_1 - y) = 0 \tag{6.55}$$

$$\dot{\psi} = -\frac{\partial H}{\partial K} = -\psi F'(K) \tag{6.56}$$

This problem has the special property that it is linear in the control variables. The result is that the solution is one in which the surplus is at the extreme values of the allowed range except in the steady state. Using the methods in Pitchford and Turnovsky (1977) Chapter 6, it can be shown that the solution is, that for any initial capital stock capable of producing a greater output than y_0

$$\begin{cases} y = y_0, & \dot{K} = F(K) - y_0 > 0 \quad \text{when} \quad K < \hat{K} \\ y = \hat{y}, & \dot{K} = 0 \quad \text{when} \quad K = \hat{K} \\ y = y_1 & \dot{K} = F(K) - y_1 < 0 \quad \text{when} \quad K > \hat{K} \end{cases} \tag{6.57}$$

Note that the capital stock will reach $\hat{K}$ in a finite time from any feasible initial condition.

The consumer

The consumer's problem is to choose the level of consumption each period to maximise the discounted present value of utility. Identical, infinitely lived consumers are allowed to borrow or lend. They are assumed to know the future course of their income given by dividends y and also the function determining interest rates R. They choose to

$$\max_{c} \int_0^{\infty} e^{-\rho t} u(c)dt \tag{6.58}$$

subject to

$$\dot{b}=c+R(b)-y, \tag{6.59}$$

For any initial value of borrowing b_0, the consumer will choose c subject to (6.57). For instance, if the consumers' income is initially y_0 they are taken to know that income will stay at that level for T periods and then jump to y^ thereafter. This problem can be solved for the two phases of income and linked, as was done in Chapter 5.

Considering each phase separately, defining a Hamiltonian H applicable to any phase as

$$H=u(c)+\psi[c+R(b)-y] \tag{6.60}$$

necessary conditions are

$$u'(c)=-\psi \tag{6.61}$$

$$\dot{\psi}=(\rho-R'(b))\psi \tag{6.62'}$$

From (6.61) and (6.62')

$$\dot{c} = \frac{-u''}{u'}(R'(b) - \rho) \tag{6.62}$$

First examine the solution for consumers (given by (6.59) and (6.62)) for y constant at either boundary value and illustrated in Figure 6.6. For $\dot{c}=0$, (6.62) solves for a unique borrowing level $\tilde{b}$. From (6.59) the slope of the locus for $\dot{b}=0$ is given by

$$\frac{dc}{db}[\dot{b} = 0] = -R'(b) < 0 \tag{6.63}$$

The solution for any initial b_0 is an initial choice of c_0 on the stable branch

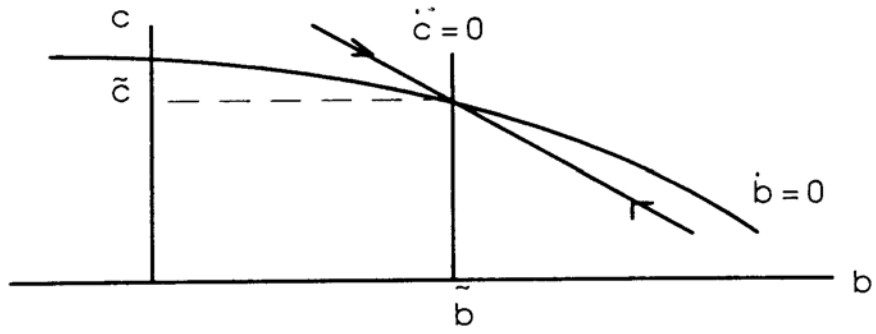


Figure 6.6 Optimal path for constant income

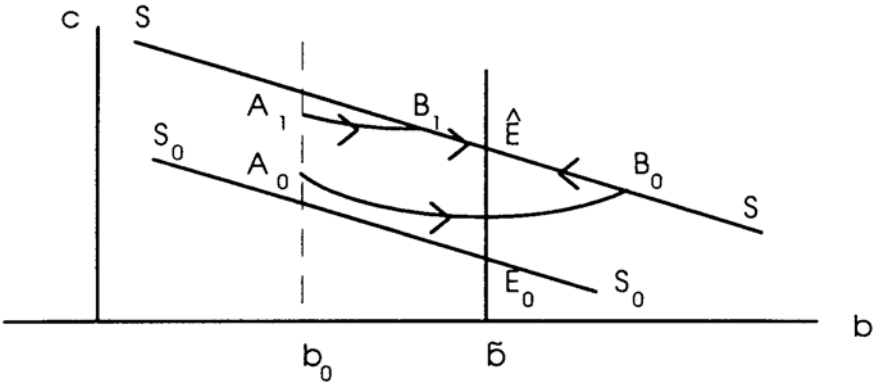


Figure 6.7 Two potential paths from an initial debt level

and a subsequent path towards the steady state $\tilde{b}$, $\tilde{c}$. This is illustrated in Figure 6.6. However, from (6.57) y will not be constant. Consider the case in which the capital stock is less than its steady-state value, so that dividends are expected to remain at y_0 for T periods and then jump to $\hat{y}$ thereafter. When $y=y_0$ and was expected to remain there, the saddle point solution had a steady state at E_0 in Figure 6.7 and when $y=\hat{y}$ the steady state is at $\hat{E}$. As shown in Chapter 5, the optimal solution is a path that will take exactly T units of time to reach the stable branch of the saddle point solution for the second phase SS. Figure 6.7 shows two potential paths from the initial debt level $b_0 < \tilde{b}$. If T is sufficiently long, initial consumption A_0 will be chosen so that debt overshoots the steady-state level with consumption first falling and then rising until SS is reached. The current account remains in deficit from A_0 to B_0 and is in surplus along SS. For T relatively short, initial consumption may be above or below SS. In both cases, consumption falls and the current account remains in deficit on the path to the steady state at $\hat{E}$.

Hence this model allows the solution where foreign borrowing might rise at the same time that domestic capital is being accumulated. However, a range of other outcomes is possible. For example, if debt had reached a value above the steady state level or its initial value were above, foreign borrowing could fall with capital accumulation.

III. A CASE FOR INTERVENTION?

Some authors have suggested that there is a case for intervention with respect to foreign investment based on the difference between the socially optimal solutions found in this chapter and the competitive solution.[10] This can readily be seen from the first model in the first section of this chapter. Whereas the socially optimal solution requires

$$F'(K_f+K_d)=R'(K_f)=r'(K_f)K_f+r(K_f) \tag{6.65}$$

the competitive solution could be expected to be

$$F'(K_f+K_d)=r(K_f) \tag{6.66}$$

on the basis that individual borrowers would neglect their effect on the interest rate. It would then be optimal to impose a tax t such that

$$t=\frac{r'K_f}{r} \tag{6.67}$$

Hence the tax rate will equal the reciprocal of the elasticity of the supply of foreign capital. It will have the effect of reducing the level of foreign investment below the competitive level.

On the basis only of this analysis the case for intervention seems clear, yet for several reasons it is dubious. For a start the authorities must have knowledge of the elasticity of supply of foreign capital. Not only that, but they must have similar information about all the other potential causes of divergence between social and market outcomes. For instance, it was suggested in section I.2 that foreign investment might have a positive impact on labour skills and productivity that was not adequately priced. For a social optimum this effect required

$$F_K=r+r'K_f-L'F_L \tag{6.68}$$

and so, of itself, needs a subsidy of $L'F_L/r$. Further, Kemp (1966) has shown that in the presence of distortions such as tariffs, it is not clear without detailed information whether a tax or subsidy might be optimal. It is most unlikely that the authorities would have the detailed knowledge to ensure that intervention improved on the competitive solution.

Another possible reason for concern is that imposing taxes on interest paid on foreign borrowing may well cause retaliation in lending countries in

the form of taxes on the earnings from lending. The consequence may well be that both countries end up worse off than if no tax had been imposed.

Two justifications have been offered for an upward sloping supply curve of foreign capital. For a large country it could arise because its borrowings had such a large impact on the supply of capital in the lending countries that it raised the marginal product of capital in their economies. On the other hand, a country too small to have such an influence by itself could nevertheless experience a rising marginal cost of borrowing as many small economies all expand their borrowing together in response to the same fundamentals.[11] The models are then analysing the experience of a representative country from a group of similar borrowers. The influence of any small country on the world interest rate would be too minor to justify intervention. The case for national intervention based on the market power of borrowers or lenders would seem to be dubious.

APPENDIX

Derivation of (6.25) and (6.26)

For the problem (6.22) to (6.24) define the Hamiltonian H and the costates ψ of capital and λ of borrowing such that

$$H=u(c)+\psi[F(K, G)-c-T]+\lambda[G+R(b)-T] \tag{A6.1}$$

The necessary conditions can be written

$$F_K(K, G) = R'(b) \tag{A6.2}$$

$$F_G(K, G) = 1 \tag{A6.3}$$

$$\dot{c} = \left[\frac{-u'}{u''} \right] (F_K(K, G) - \rho) \tag{A6.4}$$

$$\dot{K} = F(K, G) - c - T \tag{A6.5}$$

$$\dot{b} = G + R(b) - T \tag{A6.6}$$

These equation can be used to derive (6.25) and (6.26).

Chapter 7

Sustainability of private sector foreign indebtedness

One reason frequently given why current account imbalances are often condemned as being unfavourable is that 'they are unsustainable'. This is often just another way of saying that they 'should be corrected' and so of begging the question of what it is that is undesirable about them. Can any content be given to the definition of 'sustainability' in this context that clarifies the reasons for the disquiet that users of this concept have in mind?

A major application of the concept of 'sustainability' to economics has been in the area of government budgets and public debt, particularly but not exclusively, third world public debt. A fiscal deficit may or may not involve foreign debt questions, depending on how it is financed and the state of the private current account balance. An important aspect of the analysis of this issue is the question of whether public debt will rise faster than GDP, which in turn could signal unsustainability of the fiscal deficit. For instance, analysing this issue, Masson (1985) observes at the outset that:

> If the real rate of interest is above the real growth rate of the economy, then an expansionary fiscal policy at present must involve either contractionary fiscal policy at some time in the future or an increase in seigniorage from money creation. Otherwise the increase in government debt will feed on itself…
>
> If there were confidence in the ability or willingness of the government to make the needed adjustments to satisfy its intertemporal budget constraint, then there would be no question about the feasibility of its policies. It is precisely a conviction that governments are shortsighted in their policies, and that they are biased towards overspending because of the nature of the political system, that makes sustainability an issue.
>
> (Masson 1985:577, 578)

The question of sustainability of fiscal deficits is clearly an important and complex subject.[1] To that extent, at least, there is a valid aspect to the sustainability of a segment of the national income magnitudes to which the current account deficit is definitionally related. However, it has recently

become popular to ask whether private sector foreign debt, or sometimes the total of public and private sector net foreign debt, is 'sustainable'. It is this aspect of current account and foreign debt sustainability that will be investigated here.

The criteria used to investigate public debt are sometimes taken over with little or no modification to analyse private sector debt issues. For instance, the comparison between costs of borrowing and the growth rate is at times used to analyse the sustainability of private sector foreign debt, either by itself or as part of total debt.[2] The object of the chapter is to investigate whether the concept of sustainability applied to the foreign debt of the private sector in any way adds to or replaces standard economic notions for judging investment projects and the borrowing on which they are based. For convenience, the term 'debt' will be used generically to indicate both debt and equity and in an open economy context will usually refer to net foreign liabilities.

In so far as it involves public debt, it will be argued that sustainability is relevant as an example of the possibility of what will be defined as 'policy sustainability'. By contrast, the subject of this chapter is the notion that private sector foreign debt, or any other associated private sector variable, may become unsustainable for reasons essentially unrelated to policy settings. When a government runs a fiscal deficit in an open economy, it is quite possible that it can crowd out domestic private sector borrowers so that they borrow from abroad. The issue of sustainability then concerns not the private sector foreign debt, but the public sector deficit. Reduction of the deficit will allow private sector borrowers back into the domestic credit market and other things being equal they will reduce their foreign liabilities.

It is important to note that models of fiscal unsustainability usually accord little or no role to the effects of public investment on productive capacity. If they did it would have to be recognised that the level and growth rate of GDP would depend on the debt level. While for some classes of government expenditure it may well be appropriate to treat these variables as unrelated, this cannot apply to private sector foreign debt, which by definition arises from an excess of private investment over private saving. Hence the debt is matched by a capital stock and the interest obligations by capital earnings. Therefore, it is unlikely that sustainability criteria, developed to analyse public sector generated foreign debt, should carry over to the private sector.

To answer questions about the value of the notion of sustainability it is necessary first to look at possible definitions and then at the criteria which have been used to judge when a situation is sustainable. This is done in section I below. Noting that net private foreign borrowing equals the difference between private investment and private saving, the next step is to examine models of private borrowing for consumption and investment, to ask whether there are any forces making for unsustainability in their behaviour. The final question asked is whether sustainability of private sector foreign debt appears to be a useful concept.

The models examined fall into two classes, which I have called fully optimal or partially optimal. The second section is devoted to discussing four real models of optimal choices. The first is a model of borrowing and the consumer, the second treats investment, and the third and fourth are economy-wide models of foreign investment and debt. Optimal paths are liable to be sustainable, but as is shown this need not always be the case, even on a strict definition of sustainability. Also, many types of optimal paths may appear to be moving in an unsustainable way, when they are actually not. This will make it difficult at times to apply criteria of sustainability. Further, it will be shown that some criteria commonly used to judge sustainability need not be met along optimal paths. This being so, the value of such criteria is dubious. Indeed, the worth of the concept of sustainability may be limited if there are no criteria that can readily identify it.

Models that involve some form of non-optimal behaviour, may well have unsustainable paths. In the third section several classes of theories which can produce unsustainable private sector paths are considered. Paths exhibiting bubbles are those which are based on self-fulfilling expectations and are possibly unstable, though because they do not accord with 'market fundamentals', they will not be the best paths for every market participant. It has been claimed that some real world episodes, for instance the Dutch tulip mania, the South Sea Bubble and the boom preceding the 1987 stock market crash, have exhibited characteristics of bubbles. However, the consensus seems to be that useful ways of detecting possible unsustainable aspects of these processes are not at present available. It is concluded that a careful assessment of real profit prospects, sometimes referred to as market fundamentals, would seem to be the best way of assessing the value, including, where appropriate, the sustainability of investment prospects.

To summarise, the first section of this chapter examines definitions of and criteria for identifying unsustainability. The second section applies these ideas to four models which involve debt and are strictly optimal. The third and final section treats partially optimal situations and assesses what has been learnt about the concept of sustainability.[3]

I. DEFINITIONS AND CRITERIA

Unlike such notions as optimality, feasibility, equilibrium, steady state, and stability, 'sustainability' has no obvious mathematical counterpart. The *Shorter Oxford Dictionary* defines 'sustain' as, *inter alia,* 'to cause to continue in a certain state'; 'to keep going, keep up an action or process'. Consistent with this view, 'sustainable' could mean that a system was in an equilibrium or steady state. However, this is not a useful interpretation because economies can often be behaving impeccably when they are away from a steady state. Also, it cannot mean that a variable is above its equilibrium value as this also may be unexceptionable behaviour along an

appropriate time path. Stability is perhaps close to the notion of sustainability that some might want to apply to debt. Yet again it does not completely capture what they are trying to characterise by the concept. If a system has multiple equilibria, it can be on a path away from an unstable equilibrium towards a stable one.[4] Further, there are optimal processes which involve portions of unstable paths, the most obvious of which are the solutions to fixed time and fixed endpoint or other finite horizon problems. Many investment and other economic projects will naturally be of fixed duration and so their dynamics will fall into this category.

A process cannot continue indefinitely if to do so would bring it to the boundary of feasible values of some variable(s). In an economic problem, infeasible values of variables are those which cannot be attained, because they are simply not possible, or because the penalties for attaining them are prohibitively high. Thus the level of the capital stock cannot be less than zero, the level of output is bounded above by a maximum feasible quantity and while consumption can be zero, death is the consequence. It would seem that unsustainable economic circumstances, particularly with respect to debt, could be taken to be those which, without policy and other exogenous changes, would eventually lead to values of variables on the boundary of the feasible set. Sustainable paths are then all other paths. In many cases unsustainable paths will have some element of instability, though, as noted, this is not sufficient to make them unsustainable. The above definition gives precision to the concept of sustainability and will be used in what follows. However, there is a problem about the meaning of this definition when economic outcomes are uncertain. If a stochastic variable is subject to large enough fluctuations, almost any economic processes in which it is involved may be unsustainable. *Ex post* sustainability can have almost no meaning. To meet this difficulty the path referred to in the definition is taken to be the expected path of the variable.

One important source of bounds on private debt comes from the possibility of insolvency. Indeed, concern about insolvency is what appears to lie behind the way in which some would want to interpret the unsustainability notion. In the case of the individual firm this is a valid application. However, when the economy as a whole is involved it will be seen that it is not so easy to give it meaning.

Economic behaviour may be unstable because policy variables are set at particular levels, e.g. the fiscal budget is in deficit at some fixed real value so public debt grows indefinitely, threatening eventually to absorb all the tax base in its service. However, with sustainable levels of policy variables, the economy may find itself on an unstable path. This distinction between 'policy unsustainability' and 'private sector unsustainability' would seem to be basic. In the first case it is the policy which is the source of instability so that if it were changed, the instability would be removed, while in the second, instability is endemic in the path chosen by the private sector. Of course, both may be present

together and in addition it is conceivable that they might interact to produce instability. Moreover, if the private sector is found to be on an unsustainable path it may be that policy changes need to be invented to overcome the instability. The difference between the two cases lies in the factor(s) initiating and keeping the system on the unsustainable path. In the one case it is policy choices that start it going while in the other it is some form of private action. It is this latter category that is relevant in the present context.

Having defined unsustainability, it is appropriate to ask how it could be detected that an economy has that property. A number of criteria have been suggested, but some seem relevant more to public sector debt and policy sustainability. Salop and Spitaller make the suggestion that: 'a sustainable current account deficit is one that is consistent with continued financial solvency and economic viability' (Salop and Spitaller 1980:102). For an economy with a constant population, for instance, they translate this into the rule that net saving should be positive for the related current account deficit to be sustainable. They continue: 'Hence the maximum sustainable deficit corresponds to the economy's zero saving position' (ibid.: 107).

At that point, the current account deficit is wholly financing investment. Temporary factors may produce larger than 'sustainable' current account deficits so they argue that cyclically adjusted saving should be examined to assess sustainability. Because in an unsustainable situation so defined an economy is supposed to consume more than its income, it is running down its wealth. Therefore, their criterion is one of ensuring that wealth (or with population growth, wealth per capita) does not fall because of an accumulation of foreign liabilities. It seems a reasonable requirement that economies should not run down wealth, but it may not be a particularly sensitive indicator of unsustainability in relation to private foreign debt.

Perhaps the most widely quoted criterion of sustainability is based on the debt/GDP ratio. The argument goes that the debt/GDP ratio will be unstable under some circumstances and that this can be detected by examining the relation between the interest rate and the GDP growth rate. Notice that this refers back to the type of criteria that were argued to be relevant to the issue of sustainability of fiscal deficits. Let the deficit on trade in goods and services be T and external indebtedness be D, both measured in domestic currency. With an interest rate r the balance of payments constraint is

$$\frac{dD}{dt} = T + rD \tag{7.1}$$

Rearranging, this becomes

$$\frac{dx}{dt}\frac{1}{x} = (r - g) + \frac{T}{D} \tag{7.2}$$

where x is the debt/GDP ratio, and g the growth rate of GDP. If the ratio of debt to GDP is constant, the growth rate must equal the interest rate plus the ratio T/D. If r>g it is sometimes claimed that the economy is on an unstable path of private debt accumulation. What is true is that if also T/D>0, the debt/ GDP ratio is rising, but this does not necessarily imply instability or unsustainability. Obviously, the stability of (7.2) depends on the feedback of the endogenous variable x on the growth rate and the trade deficit.

Another criterion employs the debt/GDP ratio in a less sophisticated manner, taking some particular value of the ratio as a rule of thumb indicator of potential future problems. Thus financial market folklore has it that there is some particular ratio of foreign debt to GDP beyond which foreign debt must be called excessive. Presumably allowing such excessive ratios is thought to invite risking unsustainable paths. The problem with this approach is to justify why any specific value can be an indicator of an unsustainable process.

While instability may not be sufficient to identify unsustainability, for some models it may be necessary. Hence, indicators of instability may be of value. These could consist of conditions for instability, such as the Marshall/ Lerner condition for trade balance stability, though it has already been shown in Chapter 3 that this approach may be misleading, because an unstable equilibrium can be surrounded by stable equilibria. Alternatively, the practice seems to be that an observation of a more rapid rise than 'normal', or sometimes than can be justified by 'market fundamentals', is taken to suggest unsustainability. This criterion is at the heart of the judgemental type of economic management which Treasuries and Reserve Banks appear to practice. Clearly it is a very difficult criterion to apply in practice, but is there a viable alternative?

As was noted, questions of solvency are an important source of the bounds which sustainability involves. Could a high and increasing rate of bankruptcy of firms be an indicator of unsustainable behaviour? High bankruptcy rates can arise from factors quite unrelated to whether a path of saving, investment and foreign borrowing is sustainable. Bankruptcy rates vary over the cycle and will be high in a recession. Tight monetary policy will also induce a rise in the bankruptcy rate. Apart from separating out these causes from those involved in intrinsically unsustainable paths (if these exist), there is the difficulty of knowing how to associate particular 'high' rates with unsustainability. Part of this has to do with a general problem of any economy-wide unsustainability notion, namely that the boundary values which define it, at any time may be so far off in the future that they give little guidance to the existence of future trouble, or to policies to deal with it. In addition, while the bankruptcy of any particular investment project will define the boundary of sustainability, an economy-wide counterpart is difficult to envisage. It is hardly likely to be the failure of all firms or of all projects with foreign debt, but if not, by what means can some particular bankruptcy rate be chosen as the

boundary value of sustainability? It is by no means clear that a sensible macro counterpart exists for private sector insolvency.

II. OPTIMAL PROCESSES AND UNSUSTAINABILITY

Having defined the concept of sustainability and examined some of the criteria for identifying its presence, it remains to assess the value of these ideas. In this section sustainability is examined in the context of four optimising models involving debt. The first deals with issues involving borrowing and consumers, the second with a microeconomic model of investment and the last two with macroeconomic models of foreign investment. A full analysis is given only for the first case, the others being discussed in general terms only.

1. Consumers

The purpose of this section is to illustrate the possibility of unsustainable behaviour in optimal models. It is useful to examine consumer borrowing because it embodies a potential for unsustainable responses of a type not generally present in borrowing for investment. This has already been seen in Chapters 3 and 5 where solvency conditions need to be imposed in order to avoid unstable behaviour. Yet it is probably the case that the 'profligate' behaviour giving rise to these reactions is normally adequately controlled, so that it cannot be regarded as a serious source of unsustainability.[5] What the model below portrays is how transversality conditions may not be available to bound behaviour to stable paths and what other bounds might then be present.

Consider a representative infinitely lived consumer with a given (non-interest) income y and an initial net asset stock A, who consumes at rate c and can borrow or lend at an interest rate r. It will be supposed that the interest schedules are determined in world capital markets in such a way that the interest rate can vary with the amount borrowed.[6] Assuming a constant discount rate ρ the consumer's problem is

$$\max_{c} \int_0^{\infty} e^{-\rho t} u(c)dt \tag{7.3}$$

subject to

$$\frac{dA}{dt} = y - c + R(A) \tag{7.4}$$

where

$$u' \gtreqless 0 \quad \text{as} \quad c \gtreqless c^b, \quad u'(0) = \infty, \quad u'' < 0 \tag{7.5}$$

$$R(A)=rA \tag{7.6}$$

and $A(0)=A_0$.

Notice that in (7.5) a bliss level of utility u is supposed to occur at consumption level c^b. If this were not assumed it turns out that there would not be a solution to the problem, just a set of ever better and better paths.

The net asset stock may be positive or negative so there is no natural constraint on its value. If both the discount and the interest rates are constant it turns out that the consumer always only lends or only borrows, except in the unlikely case that these rates always coincide. To produce the possibility of an equilibrium debt, it will be assumed that the interest rate is a function of the level of net assets such that r'<0, r">0. Total interest receipts or payments are r(A)A=R(A) with R' the marginal return to lending. These assumptions ensure that R"<0 for the debtor case.

Constructing the Hamiltonian H

$$H=u(c)+\psi(y-c+R(A)) \tag{7.7}$$

where ψ is the shadow price of assets. Necessary conditions for an optimum are

$$\frac{\partial H}{\partial c} = u' - \psi = 0 \tag{7.8}$$

$$\frac{d\psi}{dt} = \rho\psi - \frac{\partial H}{\partial c} = \psi(\rho - R'(A)) \tag{7.9}$$

Combining (7.8) and (7.9),

$$\frac{dc}{dt} = \left(\frac{u'}{u''}\right)(\rho - R'(A)) \tag{7.10}$$

The solution paths of the pair of equations (7.4) and (7.10) is illustrated in the phase diagram, Figure 7.1. The optimal solution for any $A < A_2^e$ involves choosing the bliss level of consumption which for all but rich/high income consumers can be expected to involve falling assets and eventually rising debt. The point is that this choice clearly dominates the choice of the stable branch of the saddle point.

Hence the optimal path of debt is unstable and given that there will be an upper limit to the amount of lending to the consumer, unsustainable. It allows what could be called delinquent, profligate or extravagant behaviour. There are good reasons why this is not a particularly comfortable result. For one thing, the model given is incomplete in that it allows a minimal role for creditors. They come into the picture only with respect to one aspect of their behaviour, namely the offer of interest rate terms. Hence, the model lacks one

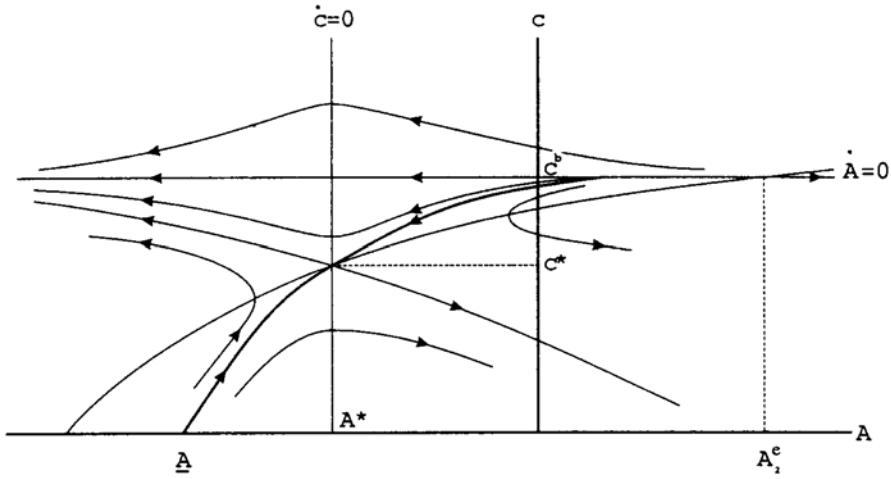


Figure 7.1 Optimal paths of consumption and debt

or more essential constraints on consumers' actions. Consider some of the possible restraints that might reasonably or unreasonably be applied or encountered:

1 In a finite world a consumer could eventually end up borrowing the equivalent of all the economy's real assets. In practice this constraint is so far off that it is unlikely ever to be effective and so has no significance.
2 Some authors simply assume that a consumer's net assets must be positive. While this might be a reasonable constraint for some problems, it reveals nothing about the process by which this might be enforced. Rather than an outright limit, the lenders could impose terms such that the marginal cost of borrowing goes to infinity as debt approaches a particular finite value. This would be an effective constraint, but again begs the question of which value of debt would form the boundary.[7] Of course, a common practice is to require that borrowers have collateral for their borrowing. Loans are usually made on the basis of asset backing being more than sufficient to ensure repayment of principal. But lenders often cannot monitor borrowers perfectly so that loan conditions are not always fulfilled.
3 In some models, authors choose to impose the intertemporal budget constraint not only in its incremental form (the balance of payments constraint), but in the integral form which requires that the discounted sums of consumption and income should be the same. Blanchard and Fischer (1989) refer to this as the no-Ponzi-games condition, commemorating a Boston chain letter specialist. While this condition will ensure that the

convergent path is chosen, it needs to be justified, otherwise it is just another way of saying that the stable branch will be chosen.

4 In practice, delinquent consumers face bankruptcy, that is the imposition of contingent penalties which will make them worse off than otherwise. It is possible to conceive of prohibitive penalties that would be so harsh as to deter all potential delinquents, at least in a certainty framework. Thus, in Chapter 4 it was assumed that what kept consumers on the straight and narrow of the stable branch was the penalty of zero consumption once debt exceeded a level which could optimally be repaid. As no one in their right mind would choose eventually to encounter zero consumption this was an effective curb. However, society does not now mete out debtors' prison or death for bankrupts and the monitoring of consumers' debt performance is not perfect. Given incomplete information available to lenders it is possible for consumers to borrow and spend in excess of levels which would be regarded as sustainable. Hence there is a need to consider the case of imperfect monitoring and non-prohibitive penalties.

Suppose now that uncertainty is present in that there is asymmetric information about the likely debt conduct of borrowing consumers, but that once found and penalised for being on an unstable path they will be perfectly monitored to see that they do not transgress again. Thus, if a consumer borrows so that his net assets become A_v, he will be prevented from borrowing and taxed an amount τ so that his consumption becomes $c_v=y-\tau$ and his assets are zero thereafter. Assume that the monitoring technology is such that along the unstable bliss path there is a constant probability per unit time of q that a transgressor will be caught and penalised.[8] It can be shown that at any time prodigals face an expected time T=1/q until they are caught. Once caught the borrowers have revealed their profligacy and from then on are not able to obtain loans. For simplicity, assume also that the penalty τ is applied indefinitely.[9]

Under what conditions will it pay a consumer to indulge in an initial period of extravagance? To simplify the exercise, with an initial net foreign asset position A* the consumer faces two prospects. Remain at the net asset level A* with consumption level c*. Alternatively, the bliss levels c^b can be chosen letting debt grow until caught. The profligate option will be chosen if

$$\int_0^T u(c^b)e^{-\rho t}dt + \int_T^\infty u(c_v)e^{-\rho t} \geq \int_0^\infty u(c^*)e^{-\rho t}dt \tag{7.11}$$

which reduces to

$$u(c^b)(1 - e^{-\rho T}) + u(c_v)e^{-\rho T} \geq u(c^*) \tag{7.12}$$

and can be rewritten

$$[u(c^b) - u(c^*)] \geq [u(c^b) - u(c_v)]e^{-\rho T} \tag{7.13}$$

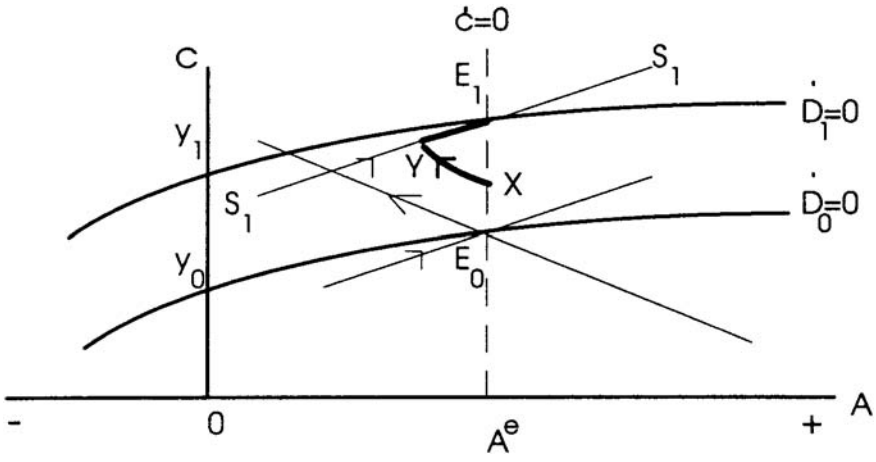


Figure 7.2 An apparently unstable path

The intuition behind this result is straightforward. Hence it follows that consumers are likely to be profligate borrowers:

(a) the higher the bliss level c^b;
(b) the higher c_v, that is the lower the penalty τ;
(c) the lower the equilibrium consumption of prudent borrowers c^*;
(d) the higher T, that is the lower the probability of being caught q.

Hence, the borrowing process for consumers can lead to unsustainable paths. Society chooses institutions to combat this and, given monitoring techniques and penalties, presumably an optimal monitoring cost emerges. As a consequence it is unlikely that the form of consumption unsustainability shown here will have much importance. Because the majority of consumers will prefer not to be profligate, and so will satisfy an intertemporal budget constraint, it is now possible to assume that the choice of the stable branch is made.

While this choice will obviously mean eventually stable behaviour, it need not always appear that this is the case. Consider the following example. Consumers expect to receive an increase in income from y_0 to y_1 in T periods of time. Starting from E_0 in Figure 7.2 the optimum trajectory involves an initial jump in consumption to X. Thereafter, the system follows XY, reaching the new stable branch S_1S_1 after exactly T periods. Because the XY path involves increasing consumption and debt it might be thought unstable and hence akin to a bubble. This would be a mistake, but it illustrates how difficult it could be distinguishing unstable or bubble-type paths from optimal responses.

2. Investment

For the usual problem of a producer choosing an investment plan, there would seem to be no deliberate choice of unsustainable paths. In the standard analysis the producer faces an adjustment cost of installing new capital and maximises some function of the discounted stream of net returns (e.g. Hayashi 1982, Pindyck 1982). The solution can be depicted in the capital stock-investment space and the necessary conditions imply a saddle point solution. The stable branch will be chosen by reference to a transversality condition. The intuition behind this is that divergent paths will move towards an infinite or a zero capital stock. The former are ruled out if there are any scarce resources limiting the scale of the project. If paths were optimal, zero capital would mean that the project was not sustainable because its long run profitability was inadequate. Unlike in the consumer case, borrowing contributes to the process only in that it provides resources to purchase capital. The reason for being profligate is absent as consumption does not enter the analysis. However, if the process of choice of investment also allowed borrowing for consumption the possibility of unsustainable behaviour would again arise. Another interesting case arises if agents gain utility from the size of the capital stock they control. It would then seem possible for unstable paths to be optimal choices.

3. A model of foreign investment

The conclusion of the previous section that there is no intrinsic unsustainability in investment planning carries over to some models of foreign investment. The key to this result again being that borrowing for consumption is not allowed. However, where the roles of the consumer and producer are not adequately separated, borrowing for consumption could be optimal so there may well be the potential for unsustainable paths.

This is not the case in the model of the first section of Chapter 6, which is based on the model of Bardhan (1967) in which he modified the neoclassical optimal growth model to include foreign investment. Briefly, population growth was assumed to be zero and labour to be immobile internationally. Domestic saving and foreign capital contribute to the stock of capital used at home. Foreign borrowing was limited to borrowing to finance the importation of capital equipment.[10] The interest rate was assumed to rise with the amount of foreign debt.

For present purposes there are two points to be made about this model. First, the divergent paths either approach zero consumption or a zero domestic capital stock (Figure 6.1). Such paths are not optimal. The optimal path approaches a steady capital stock and consumption level.

The second point about the model has to do with the criterion for sustainability based on the debt/GDP ratio that was formulated as equation

(7.2). Unstable processes were supposed to result from the interest rate exceeding the growth rate but it has just been shown that unstable processes are not optimal in the Bardhan model. Notice that the ratio of debt to output must converge to a constant value in the system. Consider the relation between interest cost and growth in the model. Net output is

$$q=F-R \tag{7.14}$$

using the symbols in the first section of Chapter 6, and its growth rate is

$$\frac{dq}{dt}\frac{1}{q} = F's \tag{7.15}$$

where s, the saving ratio out of net income must be less than or equal to unity because consumption must be positive. The relevant comparison in the context of the Bardhan model would seem to be between the marginal interest cost of borrowing and the growth rate of net income. This is

$$R' - \frac{dq}{dt}\frac{1}{q} = F'(1-s) > 0 \tag{7.16}$$

The saving ratio is less than unity and is positive whenever the domestically sourced capital stock is growing. Hence, the marginal borrowing cost exceeds the growth rate of net income in this model during a process of domestic capital formation. Far from being the signal of an unstable process, this is just a consequence of optimal choice. This type of criterion for unsustainability has been carried over from the public debt discussion. Its relevance to the private sector foreign debt question is debatable. A possible counterpart criterion for the private sector might be a comparison between the rate of profit and the marginal cost of borrowing. In the Bardhan model these will be equalised by capital mobility, but with adjustment costs the private sector return to capital in a borrowing country might well exceed the borrowing cost. Any criterion based on such ideas would not seem to be particularly different from the standard analyses of profitability.

One way to use a criterion based on (7.2) might be to ask for the right hand side to be negative, that is the interest rate less the growth rate plus the trade deficit be negative. When the debt/GDP ratio is above its equilibrium, this is a sufficient, but not a necessary condition for stability. However, it is quite possible that the system could be stable even though at some point in time both r-g and T/D were positive. As well, a judgement would need to be made about the very thing which could be in contention with respect to sustainability, namely whether the debt/GDP ratio was higher or lower than its equilibrium value.

4. A two-state-variable foreign investment model

Long (1991) has examined a model of foreign borrowing and lending between two economies. One of the countries is assumed to have a constant (and hence non-optimal) saving ratio while in the other, individuals save optimally. There are no adjustment costs associated with investment and the form of the problem does not allow consumption from foreign borrowing. It is concluded that international capital flows will be cyclical for some parameter values. The result is established by applying a sufficient condition for the presence of closed orbits around a steady state. No intuition is offered for the result. In the present context the significance of this outcome is that while limit cycles can be classified as sustainable, it is not clear that an observer would pick them as such.

Consider the conclusions about sustainability that can be drawn from these optimising models:

1 Optimising consumer borrowing behaviour need not always be sustainable. However, there are social mechanisms to limit the extent of such conduct.
2 There do not seem to be similar forces making for unsustainability in pure producer borrowing behaviour. This needs to be qualified where institutions exist which do not clearly separate the roles of producer and consumer. It could also be that an investing agent could gain utility from the size of and so perhaps the debt of an enterprise. The much discussed dubious financial practices of some entrepreneurs in the 1980s might be rationalised in some such fashion.
3 In the optimal model of Bardhan, non-zero saving is an outcome of optimal growth, except in the unlikely case in which the total capital stock is in excess of its equilibrium level. Hence, the criterion of Salop and Spitaller (1980) that sustainability means non-zero saving is met. Of course, the possibility that a community might regard its real wealth as too high and set out on an optimal path of reducing it cannot be completely ignored. Apart from this the criterion does not seem to have much power to predict unsustainability. Rather, it seems to be an attempt to say when unsustainability has arrived.
4 The sustainability criterion that the growth rate of income should be greater than the marginal cost of borrowing does not apply to Bardhan's simple optimal model of foreign investment. Optimal processes do not necessarily meet this condition.
5 It is not likely to be straightforward to distinguish unsustainable paths. The Long model is an example of this difficulty, as is the case of an optimal response to a future rise in income, shown in Figure 7.2. An economy in a process of foreign investment which involves a phase of a cycle away from equilibrium may well appear to be on an unstable path, but this is not so. Other examples are possible.

III. PARTIALLY OPTIMAL PROCESSES

Introducing the chapter treating bubbles in their macroeconomics text, Blanchard and Fischer (1989) remark:

> We have skipped some difficult issues at various points in the last four chapters. Confronted with saddle point equilibria, we proceeded to focus on the behaviour of the economy along the convergent path; in some cases restricting our attention to that path was indeed warranted, but in many others no formal argument was given to rule out other paths.
>
> (Blanchard and Fischer 1989:213)

While the choice by economic agents of convergent paths can often readily be justified from optimality criteria, this may not be so when complete optimality of all decisions is not present.

If behaviour is optimal the previous discussion implies that sustainability applied to private sector investment issues does not seem to have much point. This suggests that what the proponents of this concept might have in mind is a particular type of non-optimal behaviour which is unsustainable. Consider now the class of models with non-optimal features which impinge on investment. While individual agents may behave rationally, it is quite possible to have non-optimal outcomes as a result of their forecast methods of market variables. These may range from rules of thumb to rational expectations. One type of model that has been used involves assuming that while agents are rational in their responses, they forecast relative prices by taking them, in their planning, as given at whatever values the market establishes. This relieves agents of what could be a difficult task. Alternatively, it could be justified by appeal to the assumption of perfect competition, that is that agents expect to have no influence on prices.

These analyses could be labelled 'price-taking models'. In the deterministic rational expectations versions, despite the fact that agents forecast no feedback between their optimising decisions and the prices they face, they are supposed to be able to calculate exactly what prices will be once their decisions are made. In such models the saddle point property will frequently characterise paths. Agents are usually supposed to choose the stable branch, but often without it being clear how and why they do so, or as to the consistency of this choice with the proposition that agents take prices as given in planning.[11] In an investment model the variable whose value is chosen initially to locate the stable branch would be the shadow price of capital, or alternatively the level of investment. Such a choice is basic to any dynamic optimising process. The transversality condition associated with the solution will usually ensure that it is not optimal to choose an unstable path. Can it be taken for granted that this choice will be made when there is a possible inconsistency between the information used to make optimal

decisions and that used to make forecasts? Such models may be recipes for unsustainable paths very similar to those involved in bubbles.

Models of bubbles demonstrate that, even where expectations are rational and a stable path exists, it is possible for an economy to follow an unstable path along which expectations are fulfilled. Surveys of bubble behaviour are given in Blanchard and Fischer (1989) and Flood and Hodrick (1990). The market fundamentals price of an asset can be thought of as the discounted value of the stream of future dividends. It is an implication of this that there is a relationship between the expected increment in the value of an asset between t and t+1 and its expected dividend in t+1. However, this incremental relationship does not necessarily have the market fundamentals price as its only solution. Prices can be formed from market fundamentals plus bubble elements which must grow at the rate of interest, hence making the price unstable.

Testing for bubbles Flood and Hodrick contend that 'no econometric test has yet demonstrated that bubbles are present in the data. In each case, misspecification of the model or alternative market fundamentals seem the likely explanation.' (Flood and Hodrick 1990:87).

Gaber (1990) has examined the historical record of three famous bubbles, namely the seventeenth-century Dutch tulip mania, the English South Sea Bubble and the French Mississippi Company. For each case he finds that there were market fundamentals which could have explained the observed price behaviour so that resort to using the bubble phenomenon as an explanation could be incorrect. On the other hand, in an examination of the US stock market boom and crash of 1929, White (1990) comes to the conclusion that there were aspects of a bubble in the boom. The 1920s were a period of significant prosperity and growth due in part 'to the emergence of large-scale commercial and industrial enterprises that took advantage of new continuous process technologies' (White 1990:69). The fundamentals pointed to a boom, but new technologies made them difficult to appraise. Like that of Gaber, White's *ex post* appraisal is based on an assessment of the available evidence on these prospects. Unlike Gaber he sees insufficient evidence of fundamental prospects to rule out bubbles as a part of the 1929 boom. Market fundamentals that promise expansion and high returns to assets, but where there is significant uncertainty about their extent, seem to have characterised the episodes treated by Gaber and White. These papers tend to confirm the observation by Blanchard and Watson (1982), that prospects for bubbles would seem to be good when market fundamentals for a boom are present, but their extent is difficult to appraise. It is probably true as well that uncertainty about market fundamentals will also make it difficult even with hindsight for economists to establish whether bubbles have been present in such circumstances. Sustainability may well have an application to bubble phenomena as prices and associated real variables may move along unsustainable paths, though its practical application could be

limited by the fact that it has not yet proved easy to identify the presence of bubbles.

What then can be said about the value of the concept of the sustainability of private foreign debt? Sustainable paths have been defined as those which are not expected to bring an economy to the boundary of infeasible values. While insolvency might well define the boundary in the case of individual projects, a workable counterpart for the economy as a whole seems difficult to identify. It is in the nature of investment that individual agents must risk insolvency and that disappointment of expectations may result in its realisation. However, as insolvency of all projects at the same time seems remote, if not impossible, there does not seem to be an alternative to an arbitrary judgement about when the bankruptcy rate has become high? While this problem casts doubt on the value of sustainability, it will be contended that profitability embraces all that it attempts to convey.

Supposing a satisfactory definition were found, when might unsustainable private sector behaviour be observed? While it was shown that there is an inherent unsustainability in consumer borrowing, penalties make it unlikely that this could form the basis of an economy-wide problem. In the case of investment, the deliberate choice of an unsustainable path is unlikely, except in the case in which the role of consumer and producer are not separated, or entrepreneurs gain utility from the size of their enterprises. However, at the aggregate level, there are at least two classes of models which could give rise to unsustainable paths. First, the price-taking models are candidates for unsustainability because good reasons have not been given as to why and how agents choose the stable branch. This choice amounts to an evaluation of the shadow price of a significant stock variable, such as capital or debt. This is part of the logic of optimal choice, but where market variables are solved for in the phase diagram, but not by individual agents, it is not obvious that the stable branch need be chosen. Second, even with rational expectations, models of bubbles need not be fully optimal if initial asset valuations do not accord with market fundamentals. Clearly they are a potentially important and interesting source of unsustainability.

What criteria could be used to judge unsustainability? The Salop and Spitaller suggestion of negative saving would not appear likely to give an early warning of the problem. The same is true to some measure of the extent of insolvency. Comparisons of interest rates and growth rates could be unreliable indicators because they need not reflect instability of debt ratios. Choice of particular values of debt/GDP ratios are just that. Unless and until there is a theoretical justification for their use they cannot be taken as having any power to predict unsustainability. All that seems left is judgement about whether a particular process may involve 'too rapid' a rise in the value of an asset. But this amounts to attempting to assess the market fundamentals value, which is another way of saying the expected profitability of the asset.

In short, the notion of unsustainability of private sector debt does not

seem to be well defined at the economy-wide level, though at the micro level insolvency could define the boundary which it was desired to avoid. Nevertheless, there is a need for detecting phenomena such as bubbles that can lead to social losses. As well, there do not appear to be criteria for detecting possible unsustainability of private debt which add anything to appraising the prospects, including the expectation and risk of the future profit stream, on the basis of the fundamentals which determine profitability.

Part IV

Policy

Chapter 8

Macroeconomic policy in an open economy

It was common practice for orthodox economic management to require that macroeconomic measures should be taken to reduce 'excessive' current account deficits.[1] This was viewed as an additional task to that of achieving low unemployment without inflation. The open economy macroeconomic policy problem was supposed to be that of bringing the economy to target levels of domestic excess demand and the current account balance. This approach to policy arose when exchange rates were pegged or heavily managed and capital inflow to finance current account deficits was regulated or for some other reason in short supply. Governments faced with falling foreign exchange reserves and pressure for currency depreciation would be tempted to try to control the current account, the capital account and often both. A country whose current account was in surplus usually faced no such pressures.[2] Its currency would be judged to be 'high' and it could accumulate foreign exchange reserves or lend abroad without fear of disapproval. Deficit countries, on the other hand, would feel it necessary to impose tariffs and quotas on imports, to subsidise exports and to use macroeconomic policy in an attempt to control the current account. Frequently, they also regulated financial capital flows. The notion that macroeconomic instruments should be employed to manage the current account deficit was supposed to be clearly spelt out by the internal/external balance approach, where the external balance target stood for the balance on current account. Many papers were written on how best to reach the twin targets, with various assignments of instruments to targets being argued for by different authors.

The 'new view of the current account' takes an entirely different perspective on balance of payments issues.[3] First, it is mostly set in a regime of market determined exchange rates so that the authorities are relieved of the task of choosing the external value of the home currency. It is natural that this different exchange rate perspective should require a change in the perception of the significance of the capital and current accounts in the balance of payments. If the value of the currency is to be largely left to market forces, the sources and uses of foreign currency are no longer of pressing concern to the authorities. With free capital movements the balance

on current account can be financed by capital flows at an appropriate interest rate.

Secondly, parallel with the development of the instruments/targets approach to the current account, economists such as MacDougall (1960), Kemp (1962) and others were clarifying the nature of the process of foreign investment. This work, reviewed in Chapter 6, shows that for the borrowing country, foreign investment meant the running of a current account deficit in order to allow private investment to exceed private saving, hence ensuring a higher growth rate of the capital stock than otherwise. From this viewpoint, current account imbalances enabled faster growth and greater welfare than if the countries concerned were forced to constrain domestic investment to equal domestic saving. International borrowing and lending are thus seen as facilitators of investment and growth. The new view of the current account would require that any externalities and distortions in the process of foreign borrowing, saving and investment, be investigated and, where they can be clearly identified, corrected. Nevertheless, this analysis implies that there is a *prima facie* case for letting the market determine the current account and capital account balances along with exchange rates. Macroeconomic policy would then concentrate on attempting to match demand and supply for domestic output and employment and on seeking a moderate inflation rate.

Nevertheless, the habits of thought of the pegged exchange rate system appear to have persisted into regimes of floating rates where their prescriptions are not necessarily applicable. This chapter examines macroeconomic policy for a country with a floating exchange rate and facing a high degree of mobility of international financial capital. It has been contended that such economies need not pursue current account targets, although unless they are particularly fortunate, they will still need to pursue internal balance. In the present context this will mean trying to offset both inflationary and deflationary shocks from time to time and probably also attempting to reduce unemployment from an entrenched high level. This amounts to a goal of establishing 'full employment'. I argue that another objective is often overlooked, namely the task of achieving optimal fiscal policy. The fiscal stance at full employment has a role proscribed by considerations of welfare, growth and intergenerational equity that would appear to be generally incompatible with the use of that instrument to influence long term current account outcomes.

Hence, it is contended that macroeconomic policy has one major task, namely achieving internal balance defined as 'full employment' and low inflation. Fiscal settings at full employment will be determined by 'optimal fiscal policy'. These objectives are defined and their consequences for the macroeconomy are investigated. It is then shown that if these objectives are achieved there is no room for an independent current account outcome, except through microeconomic policies. The implication is that although macroeconomic analysis implies that it is possible to achieve various current

account targets by a combination of monetary and fiscal policy, this would conflict with the full employment and/or optimal fiscal targets.[4] These issues are discussed first in the context of a Mundell/Fleming model with wage indexation and subsequently using the internal/external balance approach based on the traded/non-traded goods model. The conclusions are set out in section II.

I. MACROECONOMIC POLICY AND THE CURRENT ACCOUNT

There are three objectives of this section. First, to argue that achieving an optimal fiscal outcome at full employment should be an important objective for society and that that objective does not depend in any direct way on the current account balance. Secondly, to define 'full employment' in the context of the macroeconomic model of Chapter 4 and to show that when the full employment and fiscal policy objectives are fulfilled there is no room for a further 'external balance' target. Finally, to consider these issues using the traded/non-traded goods model. The implications of these results are discussed in the conclusion.

Before turning to these questions it is important to be clear as to what is meant by 'macroeconomic' policy. For present purposes, it is here defined as one or all of monetary policy, fiscal policy and wage policy. Monetary policy is taken to be the setting of a particular money supply, although other methods of implementing it, such as setting interest rates, are possible alternatives. Wage policy is defined to be influencing nominal and real average wage outcomes through partial indexation or by direct action on real wages as described in Chapter 4, section I.7. Fiscal policy is the choice of aggregate government spending on home and/or foreign goods and/or the setting of an economy-wide income tax schedule.[5]

1. Optimal fiscal policy

In the context of models such as the extended Mundell/Fleming framework of Chapter 4, it is clear that there is scope for fiscal policy to influence output and employment when the economy is at less than full employment. However, in a fully employed economy, fiscal parameters should be regarded as control variables to be chosen optimally on the basis of the objectives of the government and subject to the constraints imposed by the economy. The following example was presented and solved in Chapter 6, section I.3 and serves to illustrate this point.

Suppose government expenditure impinges on the economy solely through its output effects. Output of a single home good is assumed to depend on inputs of capital K and government services G. The government can borrow from abroad or tax to finance its expenditure. Its objective is to maximise discounted utility from consumption c, that is

$$\max_{c,\,T,\,G} \int_0^{\infty} e^{-\rho t} u(c)\,dt, \quad u' > 0,\ u'' < 0,\ u'(0) = \infty \tag{8.1}$$

subject to

$$\dot{K} = F(K, G) - c - T, \quad F_K > 0, F_G > 0, F_{KK}, F_{GG} < 0,\ F_{KK}F_{GG} - F_{KG}^2 > 0 \tag{8.2}$$

$$\dot{b} = G + R(b) - T, \quad R' > 0, R'' > 0 \tag{8.3}$$

where

T	tax collections
b	total government borrowing from abroad
G	government expenditure
c	consumption per head
R	interest bill on borrowing

(8.2) is the private and (8.3) is the government's budget constraint.

There is no point in repeating the full details of the solution here, but it should be noted that it involves unique optimal paths for the capital stock, consumption, borrowing and the fiscal deficit given by

$$\dot{K} = \left[\frac{1}{1 - b_K}\right]\{F(K, G(K)) - G(K) - R(b(K)) - c\} \tag{8.4}$$

$$\dot{c} = \left[\frac{-u'}{u''}\right](F_K(K, G(K)) - \rho) \tag{8.5}$$

where the functions G(·) and b(·) are defined by

$$F_G(K, G) = 1 \tag{8.6}$$

$$F_K(K, G) = R'(b) \tag{8.7}$$

(8.6) requires the marginal product of government spending to equal the cost of a unit of consumption, while (8.7) requires the marginal product of capital to equal the marginal cost of borrowing.

The principle this example establishes is that in a fully employed system, government expenditure and taxation have functions that have nothing directly to do with the current account balance. Of course, the current account balance b appears in this model, but there is no imposed current account target nor is there any valid reason in the nature of the problem for it to enter the social welfare function. The same principle could be established readily by including government spending in the private utility function.[6] For reasons of simplification and convenience, macroeconomic analysis often neglects to assign a role to government spending in utility or

production functions. Examples such as the one above serve to remind that the full employment values of fiscal variables will be tied down by their contributions to production and welfare.

2. The Mundell/Fleming model with wage indexation

The model

This section briefly repeats the set up of this model given in Chapter 4. Those familiar with this system may wish to omit this section. The conditions relevant to the problem in hand are that there is a market determined nominal exchange and a high degree of mobility of international capital mobility. The object is to show something of what is involved in pursuing 'full employment' and an associated optimal fiscal policy.

Assume a Mundell/Fleming model of the type set out in Chapter 4, based on a real system in which the only good produced at home is the exportable. Home consumption involves both exportables and imports. The standard model is extended by a supply function that relates the output of the home good to both its relative and absolute price, in the general case. This output supply curve is derived from considerations of the demand and supply of labour. The objective is to define 'full employment' and to show that, in the context of the model, it can be reached by the appropriate use of monetary, fiscal and wage policy.[7] Finally, it will be demonstrated that once a decision has been made on optimal fiscal policy at full employment, there is no further scope for use of macroeconomic policy as defined above to achieve any imposed current account target without giving up one of the above targets.

It is necessary briefly to outline again the macroeconomic model used in Chapter 4. To begin with, consider the labour market and the associated output supply function for the case of full indexation. These are defined by

$$y = F(N) \quad (+) \tag{8.8}$$

$$N = N^D(W/P) \quad (-) \tag{8.9}$$

$$I = aP + (1 - a)eP^* \tag{8.10}$$

$$W = \omega I = \omega\{aP + (1 - a)eP^*\} \tag{8.11}$$

$$N^S = N^S(W/I) \quad (+) \tag{8.12}$$

where

y	real output=output of exportables=output of the domestically produced good
N	employment
N^D	labour demand
P	price of the domestic good
a	the weight of domestic goods in the price index of consumption
W	nominal wage
e	nominal exchange rate=price of foreign money
P*	price of imports in foreign currency, a parameter
σ	$(=1/\pi)$ the relative price of domestic goods to imported goods= P/eP*
π	real exchange rate $(=1/\sigma)$
I	index of consumption prices
ω	the real consumption wage implicit in wage indexation

As in Chapter 4, all prices and the exchange rate are taken to be unity initially. Note that as a consequence dP/P=dP measures a proportional as well as an absolute price change. (8.8) is the production function for the home good and (8.9) the demand function for labour, based on the product real wage measured in terms of the home good. The consumer goods price index is defined by (8.10) and wages are assumed to be adjusted to preserve the consumption real wage level ω by means of the indexation process given by (8.11). This situation could result from a centralised wage setting authority or a contract agreed to between unions or individuals and firms. The underlying labour supply function, based on the preferences of individual workers and depending on the real consumption wage, is given by (8.12).

In the full indexation case, the supply of the home good is given by

$$y=y(N^D\{\omega[aP+(1-a)eP^*]/P\})=y(\sigma) \tag{8.13}$$

Notice that this supposes that there is an infinitely elastic supply of labour to meet labour demand at the going real wage, an assumption that needs to be investigated. In these circumstances the supply of the home good is an increasing function of its relative price.

The labour demand curve (8.9) can be rearranged to show that labour demand depends on both the real consumption wage and the relative price of home goods. Thus,

$$N^D = N^D([W/I][a + (1 - a)\pi]) = N^D(\underset{-}{W/I}, \underset{+}{\sigma}) \tag{8.14}$$

Figure 8.1 depicts this labour market situation, showing several demand curves for different values of σ and an indexed real wage ω. Several implications of Figure 8.1 are worth noting. First, the existence of multiple intersections of the labour demand curve for different values of σ with the underlying labour supply curve suggests that 'full employment' is not the

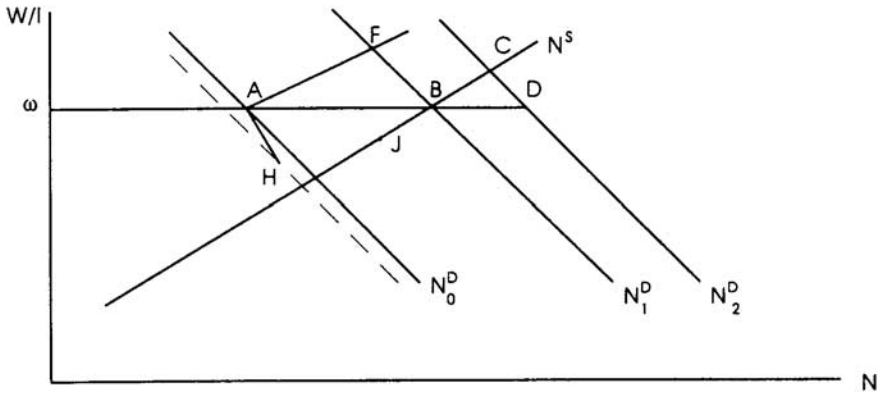


Figure 8.1 The labour market

same thing as labour market equilibrium. Secondly, the labour market can be in a form of equilibrium at the real wage ω at point A, as there is no pressure for the wage to move, despite the existence of unemployment of BA.

The real wage ω embodied in wage setting becomes the effective labour supply curve at any level of employment where ω exceeds or is equal to the real wage that, from (8.13), would induce that labour supply.

To trace out the labour supply curve for both the full indexation and market clearing cases it is necessary to consider the consequences of varying levels of σ. At A there is unemployment of BA. As σ rises, the demand curve shifts to the right. In Figure 8.1 a shift is shown that raises labour supply to that appropriate to point B. This eliminates unemployment, but there is scope for additional employment rises in response to increases in the relative price of home output. Hence, suppose a further rise in σ from B sufficient to bring the demand curve to D. With a real consumption wage indexed so as to remain constant, labour supply and hence employment would not increase beyond B. However, if the wage system were such that ω was a minimum real wage and it was possible to pay a higher market clearing real wage beyond B, an increase in the relative price of the home good raises the supply of labour and the real wage to C. Hence, the supply curve of output is upward sloping in the (y, σ) space. Such a positively sloped curve might represent the move AB, for the case of full indexation, or BC, for the case of market clearing with no imposed wage. Hence a purely market determined wage or a fully indexed wage system will have an output supply function of the form

$$y = \underset{+}{S}(\sigma) \tag{8.15}$$

The supply curve for partial indexation is derived in the first part of the Appendix to Chapter 4 (see p. 85). In brief, it involves

$$\begin{cases} dW = \theta\{adP + (1-a)(de + dP^*)\}, \quad 0 < \theta < 1 \\ dW - dP = -\theta(1-a)d\sigma - (1-\theta)dP \\ y = \underset{+}{S}(\sigma, \underset{+}{P}) \end{cases} \tag{8.16}$$

It could arise from the actions of wage fixing authorities to adjust wages by proportionately less than prices, or it could be thought of as a transitional phase of a market adjustment in which wages lag prices. The real consumption wage (W/I) will shift according to

$$dW\text{-}dI=(1\text{-}\theta)[(1\text{-}a)d\sigma\text{-}dP] \tag{8.17}$$

Because with partial indexation, the real consumption wage is increasing in σ and decreasing in P, the path taken as σ rises, with P constant, involves a rising real consumption wage and is shown by AF in Figure 8.1. From (8.16), the supply curve of output in this case depends positively on both the relative and absolute price of the home good. For a given relative price of the home good, the consumption real wage falls as the absolute price of the home good rises.

For the case of zero indexation the demand curve for labour becomes

$$N^D = \underset{+}{N^D}(P) \tag{8.18}$$

so that the output supply curve is an increasing function solely of the absolute price of the home good.

Incorporating supply curves for the general case $0 \leq \theta \leq 1$, allowing all degrees of indexation, into the M/F model, the system is

$$y = S(\sigma, P) \qquad \text{aggregate supply} \tag{8.19}$$

$$\sigma = P/eP^* \qquad \text{relative price of home goods} \tag{8.20}$$

$$M = \underset{+}{PL}(y, \underset{-}{r^*}) \qquad \text{money market} \tag{8.21}$$

$$\begin{aligned} y &= \underset{+}{E}(y, \underset{-}{r^*}) + G + G_m + \underset{-}{NX}(\sigma, \underset{-}{y}, \underset{-}{G_m}) \\ &= \underset{-}{D}(r^*, \underset{-}{\sigma}, \underset{+}{G}) \end{aligned} \qquad \text{goods market} \tag{8.22}$$

where symbols not previously defined are

- r^* foreign interest rate
- E real private domestic demand for both goods
- M the nominal money supply
- G government real demand for the domestic good
- G_m government expenditure on the imported good
- NX net exports

Equation (8.22) specifies that real demand for the home good is composed of total private demand for both goods E, plus government demand for the home and foreign good, plus foreign demand for the home good less imports, the last two terms being taken together as net exports NX. For this model the government fiscal position is taken to be summed up in G. Embodied in (8.22) is the assumption of perfect capital mobility plus static expectation about exchange rates. This ensures that the domestic interest rate equals the foreign interest rate r* which will be taken to be a constant parameter. It was argued in Chapter 4, section II.1, that the marginal propensity to spend on both goods E_y need not be taken to be less than unity. This is because it is the marginal propensity to spend on the home good E_y+NX_y that must be less than unity to fulfil the frequently used stability condition.[8] However, it will be taken that E_y is less than unity to fix ideas. Equation (8.21) is the money market equilibrium relationship, while (8.20) defines the relative price of home goods to foreign goods (measured in domestic currency).

The form of the aggregate supply function (8.19) has already been discussed. It is written for the general case relating output to the relative and absolute price of home goods. The sub cases are

$$y = S(P/eP^*) = \underset{+}{S}(\sigma) \qquad \text{full indexation} \qquad (8.19a)$$

$$y = \underset{+}{S}(\sigma, \underset{+}{P}) \qquad \text{partial indexation} \qquad (8.19b)$$

$$y = \underset{+}{S}(P) \qquad \text{zero indexation} \qquad (8.19c)$$

The formal derivation of these supply curves was given in the first part of the Appendix to Chapter 4 (see p. 85).

Equations (8.19)…(8.22) solve for the four variables σ, P, e and y. However, the description of the open economy is incomplete without a specification of the state of the current account (or net exports). With capital mobile internationally, the current account can be in deficit or surplus in the short run, depending upon the values of the above variables and the parameters of the system. Assuming for simplicity that foreign net interest obligations are initially zero, the current account or net export balance NX measured in terms of units of the home good can be written

$$NX = \underset{+}{X}(\pi) - \pi \underset{- \;\; +}{Im}(\pi, y) - G_m \qquad (8.23)$$

where X is exports and Im is private sector imports.

Differentiating (8.23) totally

$$dNX = \frac{X}{\pi}\left\{\eta^* + (\eta - 1)\frac{\pi/m}{X}\right\} d\pi - m^* dy - dG_m \qquad (8.24)$$

where η and η^* are the elasticities of domestic and foreign demand for imports, respectively, while m^* is the marginal propensity to import. A depreciation of the real exchange rate, other things being constant, raises a current account surplus if

$$\eta^* + (\eta - 1)\frac{\pi/m}{X} > 0 \tag{8.25}$$

(8.25) is the Marshall/Lerner condition. For the most part it will be assumed that the current account balance is zero initially and that the Marshall/Lerner condition holds. Recalling that $\sigma=1/\pi$ this implies

$$NX = NX(\underset{-}{\sigma}, \underset{-}{y}, \underset{-}{G_m}) \tag{8.26}$$

Macroeconomic policies

The model can be summed up in a diagram in the (y, σ) space such as Figure 8.2 showing an aggregate demand curve, aggregate supply curve and a series of iso-current account lines (that is NX=k, constant, for various values of k). The most interesting case is that of partial indexation, because as shown in Chapter 4, monetary policy cannot affect real variables when there is full indexation. In this case the absolute price of the home good can be eliminated between the aggregate supply curve (8.19) and the LM curve (8.21) to yield

$$y = S(\underset{+}{\sigma}, \underset{+}{M}) \tag{8.27}$$

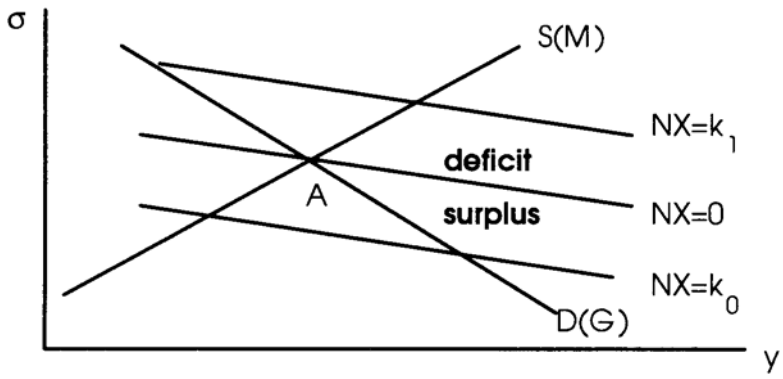


Figure 8.2 Determination of output and relative prices

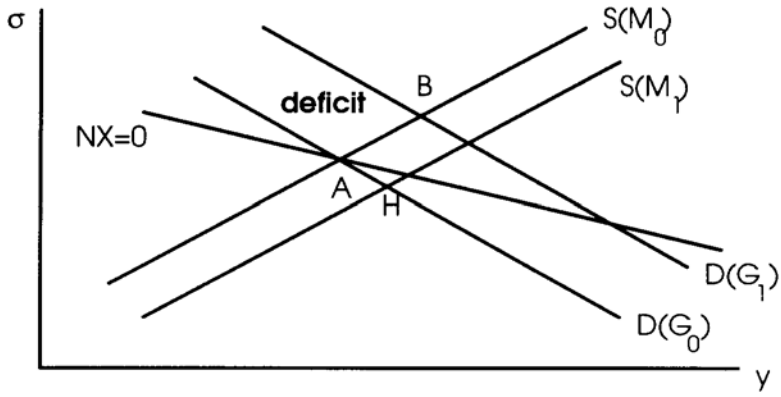


Figure 8.3 Fiscal and monetary expansion

Output and its relative price are determined where this positively sloped supply curve intersects the negatively sloped demand curve drawn for a given value of government expenditure G. The NX=k curves also have a negative slope and are shown flatter than the aggregate demand curve. This follows if the marginal propensity to spend is less than unity. If the marginal propensity to spend should exceed unity, the relative slopes of the aggregate demand and the net export loci are reversed.

Consider now how macro policy can affect employment and output. Suppose the economy starts at point A in Figures 8.1 and 8.3 where there is excess supply of labour of AB. An expansionary fiscal policy (increase in G) can be seen to raise the demand curve in Figure 8.3, raising output and the relative price of the home good. By this means the economy could be brought to point B where excess supply of labour is eliminated (Figure 8.1).

This is not the end of the possible reductions in unemployment that fiscal policy can achieve. Provided that ω is not a maximum real consumption wage, further increases in G will raise the relative price of the home good, shifting the labour demand curve rightward in Figure 8.1 to C.

Figure 8.3 also illustrates a monetary expansion from point A which brings the economy to H with a higher output and a lower relative price of home goods. The corresponding path in Figure 8.1 is AH and involves a falling real consumption wage and rising employment.

A major target for macroeconomic policy is to bring the economy to 'internal balance' or 'full employment', targets which are as yet undefined. Only full employment will be defined here because the form of the model is not well suited to discuss the problems associated with inflation. The first property of the definition is that the labour market should be in equilibrium

where the underlying supply curve intersects a labour demand curve. However, it has been seen that this does not define a unique employment or output level in this open economy system. The reason is that the labour demand curve shifts with the relative price of the home good so that there is a range of such labour market equilibria. In particular, the real exchange rate is affected by the stance of fiscal policy, because higher government demand for the home good increases its relative price and appreciates the real exchange rate. However, if it is accepted that there is some unique optimal level of government expenditure appropriate to full employment G_f, this will determine a unique full employment real exchange rate and level of output. Including the condition that the underlying labour supply curve intersects the labour demand curve, these conditions imply

$$y(N)=D(G_f, \sigma) \tag{8.19}$$

$$N=N^D(W/I, \sigma) \tag{8.20}$$

$$N=N^S(W/I) \tag{8.21}$$

and they solve for σ, W/I, N, and hence y. The resultant level of output is the full employment level y_f. The aggregate demand curve corresponding to G_f and the full employment output are shown in Figure 8.4. Where they intersect at F determines the real exchange rate. The corresponding point in Figure 8.1 is J.

Suppose the economy starts at point A in Figure 8.1 and it is desired to bring it to point J. Some form of wage policy will be needed to reduce the real consumption wage below ω. For instance, monetary expansion will reduce the

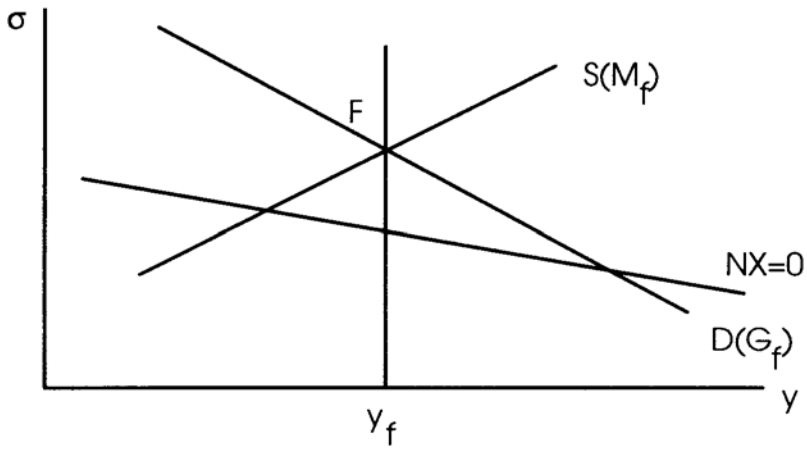


Figure 8.4 The determination of full employment output

real consumption wage if there is partial indexation, but fiscal expansion will increase it. Figure 8.4 shows that it will be possible to reach full employment by appropriate monetary policy which brings the output supply curve to an intersection with the aggregate demand curve at F. Of course, all this needs considerable qualification because, being argued in the context of a specific model, it omits many significant problems.

Suppose that is possible to reach full employment as defined in terms of an underlying labour supply curve and an optimal fiscal stance. Suppose also that the authorities have a target value of the current account of, say, NX=0. From Figure 8.4 it is clear that this will be attained only by chance. If, as shown in the figure, there is a deficit at F, *either* one of contractionary fiscal *or* expansionary monetary policies can attain NX=0, but only by departing from the full employment fiscal setting y_f. There is no scope for an independent current account target without dropping either the zero excess demand condition in the labour market or the optimal fiscal target.

Consider two possible objections. First, it might be thought that the potential for wage policy to reduce the current account balance has been overlooked. In Chapter 4 it was shown that wage policy, defined as reductions in the real wage ω embodied in indexation can reduce a current account deficit.[9] However, wage policy of this sort is not appropriate once full employment has been reached. If it were used it could create excess demand for labour.[10] The second objection has to do with the potential to change the monetary/fiscal policy mix so as to achieve a desired change in the current account. In Chapter 4 this was shown to be a way of changing the deficit while keeping output constant. However, this cannot be done without changing fiscal policy settings away from their full employment levels. Finally, it is possible to use other types of policy, which in the present context would not be macro policy, to influence current account outcomes. For instance, a tax on the earnings of foreign financial capital would reduce the capital inflow and so the current account deficit.[11]

The issue would be easier to investigate if those advocating macro policy control of the current account had provided some basis for their choice of this target. However, this was almost never done and the implication is that the practical goal behind the target was simply to reduce the current account deficit in an attempt to take selling pressure off a pegged currency. There must be doubt as to whether the distortions this could cause would have exceeded any possible advantages of pegging. Its application to a floating rate regime is then unclear. The current account does not appear directly in any individual utility function. Nor can its use as a target be justified on the basis of fiscal considerations, because optimal values of fiscal variables have been included in the choice of the internal balance target y_f. Perhaps there were supposed to be distortions in the saving/investment process which were in need of correction. However, as has been shown macro policy is not an appropriate way of achieving this. As with fiscal variables, the long run

intertemporal optimising conditions and the institutional framework that might be supposed to lie behind these functions would need to be investigated to see whether such problems exist. In short, an economy in internal balance will yield a unique level of the current account balance given optimal fiscal choices. Hence there is no scope for an independent current account target for macro policy. Any other policy directed at the current account would need to be based on an investigation of the source of any supposed problem in the generation of that balance and treated at that source.

2. The traded/non-traded goods model

The essence of the case for controlling the current account was usually thought to be based on an analysis of the concepts of internal and external balance in the context of the traded/non-traded goods model.[12] Both goods are produced and consumed domestically and in its standard version there is no investment or government expenditure in the system. Its demand side is a two good model of consumer choice plus a conventional treatment of domestic supply based on relative prices. The economy is assumed small in world markets and so unable to influence the world price of traded goods which is taken to be exogenous. The system, which was analysed in Chapter 2, section II.5 is

$$D_i=D_i(P_N, P_T, Z)=D(\pi, \xi),\ i=N,T \tag{8.22}$$

$$S_i=S_i(p),\ i=N,T \tag{8.23}$$

$$p=P_N/P_T \tag{8.24}$$

$$\xi=Z/P_T \tag{8.25}$$

$$\mathbf{P_T = eP^*_T} \tag{8.26}$$

$$Z=D_NP_N+D_TP_T \tag{8.27}$$

where symbols are

D_i	demand for good i
S_i	supply of good i
P_i	price of good i in domestic currency
$\mathbf{P^*_T}$	price of traded good in foreign currency
e	nominal exchange rate
Z	nominal expenditure
ξ	expenditure valued in terms of traded goods
p	the relative price of non-traded goods

This set of equations is not a complete model in that it gives no basis for determination of prices and quantities. Specifying any pair ξ, p will

determine values of demand and supply of the two goods. Instead of requiring any form of market clearing, the usual approach specified targets towards which macro policy could move the economy. These targets were internal and external balance defined by

$$D_N=S_N \qquad \text{internal balance} \qquad (8.28)$$

$$D_T=S_T \qquad \text{external balance} \qquad (8.29)$$

Internal balance is the condition that demand equals supply of non-traded goods. External balance is a somewhat less transparent concept. Noting that the system explicitly assumes that traded goods are a composite good formed on the assumption of a constant relative price of exportables to importables, it can be shown readily that D_T-S_T is the trade deficit. To keep the analysis simple, suppose external balance requires a zero trade deficit, though the target need not be as inflexible as that. Also assume that the initial value of net foreign liabilities is zero.

Assuming goods are gross substitutes, internal balance can be shown to be a positively sloped locus in Figure 8.5, while the locus for external balance is negatively sloped. The loci of several different values of the trade deficit are shown; the deficit increasing for loci further to the right. From any initial point, the object of policy was to change expenditure and relative prices so as to bring the economy to joint internal and external balance at E.[13] At this point values of all real variables are uniquely determined.

To appreciate what happens to nominal variables it is necessary to specify the nature of the exchange rate regime. With a pegged exchange rate, the domestic currency price of traded goods will move with the world price and the money supply would be endogenous. For any given p the price of non-

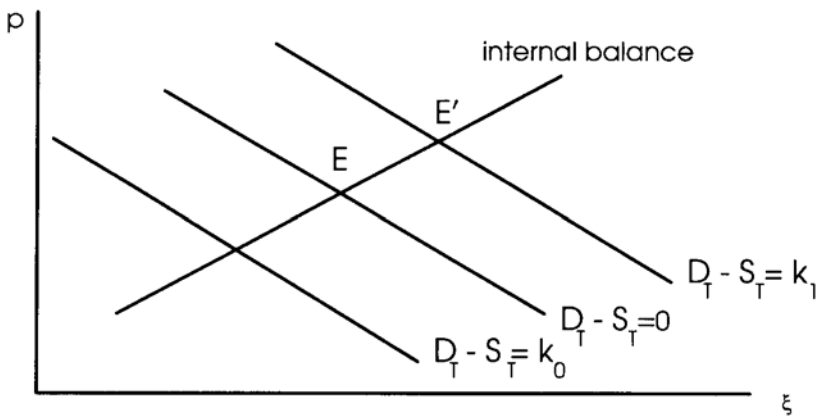


Figure 8.5 The traded/non-traded good model

traded goods can then be found from (8.24). The money supply would adjust to appropriate levels given these prices and real expenditure. If the exchange rate floats, the supply of money given by domestic monetary policy determines domestic currency prices and the nominal exchange rate adjusts accordingly. The discussion that follows can deal with real variables without reference to the exchange rate regime. However, the regime must be specified when treating nominal variables.

Consider what external balance meant in this framework. Suppose the economy is at E' with the trade deficit higher than the target. In the standard version there was no government expenditure or private investment, so consumers were the culprits who were spending at 'inappropriate' levels. Now it is entirely reasonable that consumers might choose to spend more or less than their incomes, as Fisherian models such as those of Chapters 3 and 5 demonstrate. Hence it is not appropriate to define external balance so as to rule out this desirable practice of intertemporal optimisation. However, for the purpose of analysing the conventional internal/external balance model, such motives for external imbalance will be assumed away.

The notion of 'hoarding and dishoarding' can be applied to this issue to account for expenditure falling short of, or exceeding, income. This idea has consumers spending more or less than their incomes as money balances exceed or fall short of desired levels, which has the advantage of bringing monetary policy into the analysis.[14] Thus, if money balances are greater than desired levels consumers will spend more than their incomes and hence produce a current account deficit. Though private decisions will eventually eliminate the excess spending, monetary policy was seen as a way of speeding up the adjustment. While monetary policy affects ξ, a further policy, for example exchange rate adjustment, fiscal policy or wage policy would be needed to bring relative prices to target levels.

As it stands the system neglects perhaps the most important reason for private sector current account deficits, namely the excess of private investment over private saving. To incorporate these variables in the analysis it is first necessary to use the definitional relations that hold between investment I and saving S, the excess of spending over income and the current account deficit. Neglecting government transactions, the difference between investment and saving equals total expenditure less total income:

$$\begin{aligned} I-S &= P_N I_N + P_T I_T - S = P_N I_N + P_T I_T - (Y-Z) \\ &= P_N I_N + P_T I_T + P_N D_N + P_T D_T - (P_N S_N + P_T S_T) \\ &= E-Y \end{aligned} \tag{8.30}$$

where

- I total investment
- I_i amount of good i devoted to investment

S saving
E total expenditure

Notice that the internal and external balance definitions, (8.28) and (8.29), now need to be revised to include investment demand (e.g. $I_N+D_N=X_N$).

Rearranging (8.30)

$$I-S=P_N(I_N+D_N-X_N)+P_T(I_T+D_T-X_T) \qquad (8.3\ 1)$$

so that the investment/saving gap equals the current account deficit plus excess demand for non-traded goods.

Before discussing the implications of investment and saving behaviour for the non-traded goods model, it is important to consider the implications of (8.31) for the system in its original form. In this case the level of investment is zero, but there must be saving (or hoarding) so that (from (8.30)) expenditure and income can differ. In particular, a current account deficit when there is internal balance requires saving to be negative. It is a limitation of the original model that it usually possessed no explicit behavioural function determining saving. It will be seen that this omission allowed the impression to be formed that there could be an external balance target independent of that for internal balance.

Consider now the completion of this system by conventional forms of explanation of saving and investment behaviour. Total investment will depend on the relative price of non-traded goods, although the direction of effect is unclear. For simplicity, it is assumed that it depends only on the interest rate. Supposing the interest rate is determined in world markets, the internal balance locus can be drawn as a positively sloped line in the (ξ, p) space, as before. Assume that saving is a function of income given by[15]

$$S=sY, \qquad 0<s<1, \text{ s constant} \qquad (8.32)$$

and substitute (8.32) in (8.31) to get

$$(I-S)/P_T=I(r^*)-s(X_N(p)p+X_T(p))=i(p) \qquad (8.33)$$

$$=p(I_N+D_N-X_N)+(I_T+D_T-X_T)$$

Differentiating totally through (8.33)

$$\{i'-(I_N+D_N-X_N)\}dp=[\partial D_T/\partial\xi]\partial\xi, \qquad i'=-sX_N<0 \qquad (8.34)$$

where the envelope theorems for demand and production have been used to eliminate various terms.[16] Denote the locus defined by (8.33) as the IS locus. It follows from (8.34) that where the IS locus intersects the internal balance locus, it will be negatively sloped as in Figure 8.6. Moreover the system must satisfy (8.31), so that only solutions on the IS curve are permissible. Hence, there is a unique point E, as shown in Figure 8.6, at which both internal balance and the saving/investment-income/expenditure identity are satisfied.

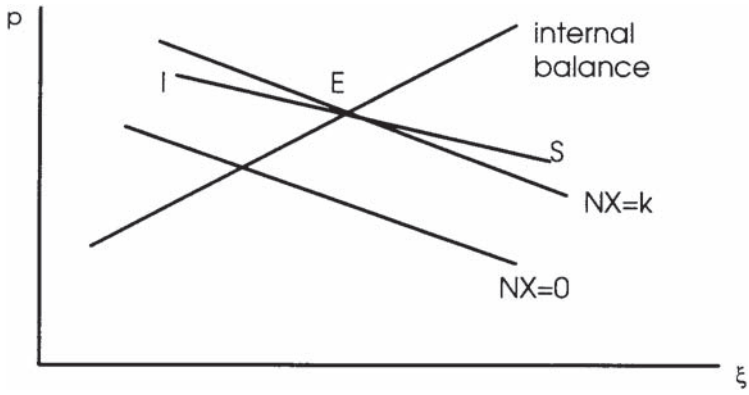


Figure 8.6 Internal balance

Just as in the Mundell/Fleming model, there is no scope for a separate current account target. The choice of internal balance determines the outcome for saving and investment and hence for net exports and the current account. Macroeconomic policy can move the economy along the IS locus to the point E. This is true either for a pegged or a floating rate system. For an economy with a floating rate facing a high degree of international capital mobility there is no problem about sustaining the equilibrium at E.

If the exchange rate is pegged and the zero net export locus intersects the internal balance line above E the current account will be in surplus at E. There will be no significant problems in sustaining equilibrium at E, though it would be necessary to further elaborate the model to show this. If, however, the zero net export locus intersects below E, the resulting deficit will be difficult to sustain if this target arises because capital inflow is zero. In that case reserves will fall continually and it will eventually be necessary to take macroeconomic action to move the economy along IS to a point of intersection with NX=0. This will involve either excess demand or supply of non-traded goods. The capital flow restriction need not be compatible with the economy achieving full employment in the short run. Once financial capital is mobile, there is no constraint preventing the attainment of internal balance. Of course, the agents generating excess spending will have to pay the requisite interest rate to finance their borrowing, but this will have been factored into their choices.

Notice that government expenditure has not been included in the model. If it were, the position of the IS locus would depend on government spending. Hence it would normally be possible to manipulate fiscal policy to achieve any specific current account target. Again this option would conflict with the fiscal stance regarded as appropriate to internal balance.

II. CONCLUSIONS

For both the models studied it was found that a unique level of the current account deficit is associated with internal balance or full employment for the economy, provided it is recognised that at that equilibrium there is some desirable fiscal stance. The consequence is that there is no scope for macroeconomic policies to pursue both full employment, an optimal fiscal outcome and an independent current account target. This proposition runs counter to the internal/external balance approach based on the traded/non-traded goods model which popularised the notion of two such independent targets. One limitation of this analysis was that it treated saving as a residual instead of establishing some behavioural function for its determination. Hence it neglected the possibility, recognised in most other macroeconomic models, that private individuals would choose their saving on some rational basis.

Of course, this does not mean that the current account balance cannot be changed by macroeconomic policy. If, for example, an economy is operating at a level of activity deemed excessive, action to reduce excess demand will frequently reduce the current account balance. However, this policy response is basically related to the level of excess demand and the effects on the current account balance are incidental. Further, government fiscal variables are related to the current account balance definitionally, so that action to change the size of the fiscal deficit is liable to affect the current account. Again these effects are an incidental part of the process of deciding on desirable values for fiscal variables. Fiscal policy changes certainly can and do affect the current account outcome, but that does not mean that a case can be made for fiscal policy action solely on the basis of its effects on the current account.

Finally, it is interesting to ask whether in a pegged exchange rate regime macroeconomic policy is ever an appropriate response to current account and balance of payments deficits. Countries which experienced falling reserves were liable to find that their exchange rates came under pressure to devalue. If the judgement was made that speculation against the currency was unfounded the authorities would protect it in various ways, such as by controls on capital flows and imports. In any case, the Bretton Woods agreement allowed devaluation only for a 'fundamental' balance of payments deficit and it was natural that the authorities should wait to see whether adverse trends were reversed. Markets were under no such restraints and movement out of suspect currencies was a sensible strategy for the private sector. The result often was speculation against currencies with falling reserves and consequent currency crises followed by forced devaluation. It is natural that the authorities concerned should seek ways of limiting their net demands for foreign exchange. They did this by systems of regulation likely to impede trade and investment and often by

macroeconomic policy of a deflationary nature. There may have been genuine reasons for contractionary monetary policy, such as domestic excess demand, but if this were not so, such measures would have adverse consequences for output and employment.

There may well have been good reasons for certain countries to run current account deficits, such as an excess of private investment over private saving. A basic problem for economies in the immediate post war period were the restrictions on the international mobility of financial capital with which to finance the deficit. By contrast, if capital is allowed to be mobile the problem of financing current account deficits becomes one of the cost of borrowing rather than the availability of funds. The profitability of investment, the cost of capital and the propensity to save then jointly determine the capital and current account balances along with world prices and the demand for domestic goods. When capital is internationally mobile, balance of payments problems for pegged rate regimes imply that there is doubt about the sustainability of the exchange rate. If macroeconomic measures are needed to achieve internal balance their implementation may incidentally support the exchange rate. However, if there is no justification for them, other than to attempt to reduce the economy's net demand for foreign exchange, the country concerned would be better off floating.

Chapter 9

Sovereign default risk and the social cost of foreign debt

George Fane and Craig Applegate

This chapter elucidates the externalities that are associated with foreign borrowing where there is sovereign default risk. We also derive expressions for the optimal taxes needed to internalise them. We argue that this helps to clarify the debate about whether foreign debt is a 'problem', which should be addressed by government, or the efficient outcome of optimising decisions by individuals and something which the government should leave to be determined by market forces. In our view this debate comes down to an empirical question: how large are the optimal taxes needed to internalise the externalities associated with foreign debt?

The possibility of sovereign default gives rise to three external effects of foreign borrowing. First, even in a country which is too small to affect the world risk-free interest rate, increased borrowing by any of the country's residents will generally raise the probability of national default and hence raise the interest rates specified in contracts between foreign lenders and all residents of the borrowing country. Secondly, increased foreign borrowing raises the probability that all domestic borrowers will be able to avoid making contracted repayments. Thirdly, when individuals choose their privately optimal levels of borrowing they are assumed to ignore the costs to others of the penalties imposed in the event of national default. Examples of such penalties include seizure or freezing of assets, exclusion from international capital markets, and restrictions on trade, or trade finance.

The externalities associated with foreign debt are of policy relevance in many countries even though most foreign debt in less developed countries (LDCs) is either directly owed, or at least guaranteed, by the government of the borrowing country.[1] Private foreign debt exists in LDCs, and makes up the bulk of foreign debt in some developed countries. Besides, even if all foreign debt were directly owed by the government, the externalities analysed here would be of relevance to policy making, since they would influence the gap between actual interest rates and the social opportunity cost of capital in public projects. Estimates of these externalities are therefore needed for efficient decision making within the public sector. They are also

needed if appropriate margins are to be set by the government when it borrows on behalf of private firms.

The first section of this chapter summarises a model due to Aizenman (1989) and clarifies the intuition underlying it. In this model the borrowing country is assumed to be too small to have any monopsonistic power in the world capital market. The risk-free interest rate is therefore treated as being exogenous and, for simplicity, foreign lenders are assumed to be risk neutral. However, the country is able to default, subject to stochastic default penalties. The probability of default therefore depends on the total amount which the country has contracted to repay and the interest rate specified in contracts between domestic borrowers and foreign lenders is therefore an increasing function of the total amount due to be repaid. An increase in this amount necessitates an increase in the contract interest rate so as to offset the increased probability of default and leave the expected rate of return to foreign lenders just equal to the world risk-free interest rate. Aizenman's model is similar to that of Sachs (1984), but whereas Sachs had focussed on positive questions, Aizenman analysed the optimal tax treatment of foreign borrowing.

We show that Aizenman's formula for the optimal tax can be expressed in a way which makes it formally identical to the expression for the optimal tax on foreign borrowing in the absence of sovereign default risk in a country with monopsony power in the world capital market. Kemp (1964), Hanson (1974), and others applied the traditional analysis of optimal tariffs to the case of a capital importing country with monopsony power in the world capital market, and their result is now well-known: the optimal proportionate rate of tax on interest payments abroad is the reciprocal of the elasticity of the supply of foreign debt with respect to the contract interest rate. In section I we show that the tax rule derived by Aizenman can be re-written to make it identical to this familiar rule, and we explain why the same rule is appropriate in these two quite different contexts.

Default is assumed to be all-or-nothing in section I. Either all debts are repaid in full, or the country entirely repudiates both the principal and the interest on all its foreign debts. Section II replaces this assumption of all-or-nothing default with the possibility of bargained partial default. The conclusions are summarised in section III.

I. A SIMPLE MODEL OF ALL-OR-NOTHING DEFAULT

Throughout this chapter we assume that the risk of default is the same for both public and private debt. In the event of default, the government is assumed to impose exchange controls which effectively control repayments of foreign debts by domestic private borrowers, and to stipulate that the proportion of their total contracted repayments of principal and interest which these private borrowers must actually repay is the same as the proportion of its contracted repayments to foreigners which the government proposes to repay. In these

circumstances, foreign lenders are assumed to be unable to take effective legal action against private (or public) debtors in the courts of the home country to retrieve more than the reduced payments stipulated by the government.[2] Similarly, we assume that if the government decides to repay its own debts in full then private domestic borrowers must also repay their debts in full, because otherwise foreigners would be able to take legal action against them in the courts of the home country. The analysis therefore deals only with country risk and ignores the specific risks associated with the possibility of bankruptcy of individual borrowers. Some support for the approximate realism of the above assumptions is provided by Folkerts-Landau (1985):

> If the foreign borrower is a large and nationally recognized private entity in a developing country, then its domestic assets have proven, in practice, to be immune from seizure by a foreign creditor. In addition, domestic courts in developing countries rarely give foreign lenders equal standing with the borrowers…
>
> In practice, most of the external private debt of developing countries has been transformed into publicly guaranteed debt in times of debt-service problems, since debt-servicing difficulties experienced by private borrowers have usually taken the form of liquidity constraints on foreign exchange. This de facto aggregation of external debt that results from public guarantees and cross-default clauses means that bank lenders need not be concerned with the ability of individual borrowers in a country to pay their external debt, but only with the ability of the country itself to pay. And indeed, the differences in lending rates paid by different borrowers within the same country have typically been less than 50 basis points.
>
> (World Bank, Debtor Reporter System, Washington DC 1984 quoted in Folkerts-Landau 1985:326–7)

To explain why sovereign borrowers make any repayments at all, it is assumed that lenders can impose some form of penalty z on defaulting sovereign countries. The default penalty is assumed to be non-negative and to depend positively on a non-negative random variable θ, with a known probability density function $f(\theta)$. Since many of the penalties for defaulting relate to disruption of international trade, and since the costs to a country of having its trade disrupted depend positively on its terms of trade, the random variable θ can be thought of as a measure of the terms of trade. In the second section of this chapter we allow for the possibility that the penalty also depends on the amount, R, contracted in period 0 to be repaid in period 1. In this section, however, we simply assume that

$$z=z(\theta), \quad z'>0 \tag{9.1}$$

The amount borrowed is denoted D and the amount contracted to be repaid is R. Therefore, by definition, the 'contract interest rate', denoted i, is (R- D)/ D. It is assumed here that the government decides to default if, and only

if, $z<R$, that is, if, and only if, $\theta<\theta^*$, where

$$z(\theta^*)=R \tag{9.2}$$

The probability of default p is therefore given by

$$\int_0^{\theta^*} f(\theta)d\theta \tag{9.3}$$

It is necessary to distinguish between the contract interest rate i and the expected real interest rate r. Foreign lenders are assumed to be risk-neutral and the home country is assumed to be small. Therefore, whatever the amount borrowed, the expected real return to foreigners remains equal to the exogenous risk-free interest rate r in the world capital market. In common with most of the literature, we ignore the problems of asymmetric information.[3] Because the probability of default π depends on the amount borrowed, and because lenders are assumed to be able to observe this amount, the contract interest rate i also depends on D. The expected interest parity condition is

$$1+r=(1-\pi)(1+i) \tag{9.4}$$

Given that $z(\theta)$ is an increasing function of θ, equations (9.2) and (9.3) ensure that the probability of default is a monotonically increasing function of the amount to be repaid R. Therefore, with the world interest rate given exogenously, equation (9.4) ensures that the contract interest rate i is also a monotonically increasing function of the amount to be repaid.

The government's objective is assumed to be the maximisation of the discounted value V of the present and expected future utility of a representative individual:

$$V = u(c^0) + \delta\left(\int_0^{\theta^*} f(\theta)u(c^d)d\theta + \int_{\theta^*}^{\infty} f(\theta)u(c^r)d\theta\right), \quad u' > 0, \quad u'' < 0 \tag{9.5}$$

where $(1-\delta)/\delta$ is the representative individual's rate of time preference, c^0 is consumption in period 0, and c^d and c^r denote consumption in period 1 in the events of default and repayment, respectively. The production level in period s is y^s, for s=0, 1; y^0 is assumed to be exogenous, y^1 is allowed to depend on θ.

$$c^0=y^0+D \tag{9.6}$$

$$c^d=y^1(\theta)-z(\theta) \tag{9.7}$$

$$c^r=y^1(\theta)-D(1+i) \tag{9.8}$$

If y^1 increases more rapidly with θ than does z, the model is consistent with the stylised 'fact' that default usually occurs in adverse circumstances. Substituting the three equations (9.6), (9.7) and (9.8) into (9.5), and

differentiating with respect to D, gives the following first-order condition for a social optimum:

$$u_c(c^0) = \delta(1-\pi)\bar{u}_c(c^r)(1+i+Di_D), \quad \text{where}$$
$$\bar{u}(c^r) = \left[\int_{\theta^*}^{\infty} f(\theta)u_c(c^r)d\theta\right] \Big/ [1-\pi] \tag{9.9}$$

Here and in what follows subscripts denote partial derivatives.

We now assume that the government imposes a tax on interest payments abroad at rate τ. In the event of default no tax is collected, while if default does not occur the revenue from this tax is returned in period 1 as a lump-sum subsidy S to the representative individual:

$$c^r = y^1(\theta) - D(1+i[1+\tau]) + S \tag{9.10}$$

where

$$S = \tau iD \tag{9.11}$$

Together, equations (9.10) and (9.11) imply equation (9.8). However, the representative individual borrower is assumed to treat the lump-sum subsidy S, the contract interest rate i, the default penalty z and the probability of national default π as being exogenously given. Therefore the first-order condition for private utility maximisation by an individual borrower is

$$u_c(c^0) = \delta(1-\pi)\bar{u}_c(c^r)(1+i[1+\tau]) \tag{9.12}$$

By comparing equations (9.9) and (9.12) it can be seen that, in order to ensure that utility maximisation by a self-interested individual is consistent with achieving the social optimum, the tax rate must equal the reciprocal of the elasticity of the schedule relating the supply of debt to the contract interest rate[4]

$$\tau = 1/\varepsilon \tag{9.13}$$

where

$$\varepsilon = (i/D)(\partial D/\partial i) \tag{9.14}$$

It is straightforward to substitute between Aizenman's equations (6) and (18) to show that his formula for the optimal tax is equivalent to equation (9.13), which is also formally equivalent to the expression for the optimal tax on foreign borrowing in the large country models, with no default risk, of Kemp (1964) and Hanson (1974).[5] Fane (1994) shows that the result in (9.13), i.e. that the optimal rate of tax on interest payments to foreigners is the reciprocal of the elasticity of the supply of foreign loans with respect to the contract interest rate, carries over to a many period model in which the penalty for default may be either a monetary penalty, or exclusion from future access to international capital markets. Of course, in the models of

Kemp and Hanson there is no distinction between the contract interest rate and the expected interest rate, since their analyses assumed away the possibility of default. In contrast, in the present small country case, with default risk, the expected interest rate is not i(D), but the world risk-free interest rate r. The exact equivalence between the results obtained from these quite different sets of assumptions requires some explanation.

The key to the explanation is that we have assumed, in equation (9.2), that the sovereign borrower sets the default threshold θ^* optimally. The envelope theorem therefore ensures that the effects of individual borrowing on θ^* cancel out in the social first-order condition, equation (9.9). Therefore, the second and third of the three externalities listed in the second paragraph of section I cancel out, and the only Pareto-relevant net external effect of an extra unit of foreign borrowing is its effect Di_D on the contracted interest payments made by other borrowers if default does not occur. This is also of course the external cost of a unit of foreign borrowing in the case of a monopsonistic capital importing country in a model with no default and no uncertainty.

II. A MODEL OF BARGAINED PARTIAL DEFAULT

In the all-or-nothing default model of the preceding section, the lenders obviously lose from default, but, in the neighbourhood of the critical value of θ^* the sovereign borrower is roughly indifferent between defaulting and repaying, since in the neighbourhood of θ^* the default penalty is roughly equal to the cost of repaying the principal and interest on the debt. Obviously this asymmetry between the consequences of default for the borrower and the lender generates bargaining opportunities, since partial default can lead to a Pareto improvement, relative to total default. Presumably for these reasons, bargained partial default has been very much more common in practice than total default.

In this section we relax the assumption of the previous section that default is all-or-nothing, and analyse optimal tax policies in a bargaining model that allows for partial default. The model set out below is a simplified two-period version of the multi-period model of Bulow and Rogoff (1989), in which the terms of partial default between a lender and a sovereign borrower are analysed using the method of Rubinstein (1982).

We assume that in the event of bargained partial default the proportion of private debt that is repaid is the same as for public debt. We now introduce the possibility that the default penalty depends positively on the amount contracted to be repaid R, as well as on θ.

$$z=z(\theta, R) \tag{9.1'}$$

The significance of allowing for this possibility will become clear later.

In period 1, after the value of θ has become public knowledge, the

government of the borrowing country has three options: to repay in full; to bargain over partial repayment, thereby avoiding the imposition of the default penalty; or to default entirely and incur the default penalty. The amount repaid in the event of bargained partial default is denoted x and the method of determining x, given θ and R, is set out below. If x would exceed the amount contracted to be repaid R the country repays in full; but if $x<R$ then bargained partial default occurs and only x is repaid. There is an asymmetry in the legal situation concerning foreign debt which is reflected in the assumptions made in this section: the lender can never recover more than the contracted repayment, but the borrower may be able to repay less than the contracted repayment. The bargaining model set out below implies that in period 1, with R predetermined, x is a monotonically increasing function of θ: $x=x(\theta, R)$; the critical value of θ at which the government is just indifferent between partial default and repayment in full is denoted θ*: $R=x(\theta^*, R)$.[6] If $\theta>\theta^*$ the government repays in full; if $\theta<\theta^*$ there is a bargained partial default and x is repaid. Finally, the assumption that bargaining is efficient ensures that total default never occurs and the default penalty is never actually imposed.

It is assumed that the repayment x in the event of a bargained partial default maximises W, the weighted product of the gains to the two parties from reaching an agreed partial repayment, relative to a disagreement or threat point, at which the lender gets nothing and the defaulting borrower suffers the penalty z. This threat point is therefore identical to the actual outcome under total default in the model of the first section of this chapter, that is, repudiation of the entire debt by the borrower. The maximand W is given by

$$W=[u(y^1(\theta)-x)-u(y^1(\theta)-z)]^{\alpha}x^{1-\alpha} \tag{9.15}$$

where $0<\alpha<1$. The first-order condition for a maximum of W with respect to x is

$$x=\left(\frac{1-\alpha}{\alpha}\right)\frac{u(y^1(\theta)-x)-u(y^1(\theta)-z)}{u_c(y^1(\theta)-x)} \tag{9.16}$$

If the weights α and (1-α) are equal, this solution is identical to Nash's (1953) proposed solution to the one-shot bargaining game. Alternatively, using the method of Shaked and Sutton (1984) and Sutton (1986), this solution can be derived as the perfect equilibrium of a sequential bargaining game (Rubinstein (1982)).

Given that the lender receives $x(\theta, R)$ in the event of a bargained partial default, the level of the contract interest rate which yields an expected rate of return of r is given by

$$1+r=(1+i)(1-\pi)+\int_0^{\theta^*} f(\theta)x(\theta, R)d\theta \tag{9.4'}$$

where π now denotes the probability of bargained partial default, i.e. the probability that $\theta<\theta^*$.

The first-order condition for a social optimum with respect to the amount borrowed is

$$u_c(c^0) = \delta\left(\int_0^{\theta^*}(f(\theta)u_c(c^d)x_R(\theta, R))d\theta + (1-\pi)\bar{u}_c(c^r)\right)\partial R/\partial D \qquad (9.9')$$

where

$$\partial R/\partial D=1+i[1+1/\varepsilon] \qquad (9.17)$$

The corresponding first-order condition for private utility maximisation by an individual borrower is

$$u_c(c^0) = \delta\left(\int_0^{\theta^*}(f(\theta)u_c(c^d)\beta)d\theta + (1-\pi)\bar{u}_c(c^r)(1+i[1+\tau])\right) \qquad (9.12')$$

where ß is the total private cost for private domestic borrowers, per unit borrowed, following a bargained partial default. The total private cost is defined to include not only the bargained repayments to foreign lenders, but also taxes on foreign borrowing paid to the domestic government. Comparison of equations (9.9') and (9.12') shows that the optimum can be achieved by setting τ equal to the reciprocal of the elasticity of supply of debt with respect to the contract interest rate, as in the model of all-or-nothing default, and setting ß equal to the marginal repayment to foreign lenders per unit amount borrowed in the event of bargained partial default $x_R(\theta, R)\partial R/\partial D$.

Two polar cases help to clarify how ß should be set. First, suppose that the equation for x in terms of θ and R, which is obtained by using equation (9.1') to eliminate z from equation (9.16), makes x directly proportional to R for any given value of θ:

$$x(\theta, R)=\mu(\theta)R \qquad (9.18)$$

Equation (9.18) will be approximately true if z is itself directly proportional to R for any given value of θ, and if the utility function is almost linear.[7] In this first polar case, the government's optimal policy is to announce in period 0 that, in the event of a bargained partial default in period 1, it will set ß= $\mu(1+i[1+\tau])$, where μ is the ratio of the aggregate value for the whole country of the actual repayments to the contracted repayments. In aggregate, all individuals therefore pay $\mu D(1+i[1+\tau])$, of which foreign lenders receive $\mu D(1+i)$ and the government receives $\mu Di\tau$ in tax revenue. This rule satisfies the optimality condition $ß=x_R(\theta, R)\partial R/\partial D$, and since $\mu D(1+i)=x$, it also satisfies the requirement that foreign lenders receive x, the bargained actual repayment. Therefore, in the first polar case, only the above minor amendment is needed to convert the optimal tax rule from the model of all-or-nothing default to the optimal tax rule for the model of bargained partial default.

The second polar case is that in which the default penalty is independent of the amount owed. In the case of bargained partial default, this assumption, which was needed to derive equation (9.13), and which is made in most of the literature on sovereign debt, leads to the conclusion that $x_R(\theta, R)=0$. In this case a social optimum would be achieved if the government set τ to satisfy equation (9.13), and set ß at zero by promising that, in the event of a bargained partial default, it would take over all the rescheduled private sector obligations to foreign lenders at no charge to the private borrowers! This paradoxical result arises because the bargaining model predicts that, in the event of bargained partial default, the amount actually repaid depends only on the amount of the default penalty. Therefore, if the default penalty is independent of the amount owed, the *ex post* marginal social cost of foreign debt is non-zero only in the event of full repayment without bargaining, i.e. only if $\theta>\theta^*$.

Given the assumptions made in the first section, each borrowing country's risk premium i-r is approximately equal to the net negative externality associated with foreign borrowing.[8] This approximation is also true under the assumptions of this section if either of the following two assumptions is valid: (a) the first polar case is approximately realistic; or (b) the probability of full repayment, without bargained partial default, is high, so that setting τ according to equation (9.13) will ensure approximate coincidence between the social and private conditions for utility maximisation (equations (9.9') and (9.12')), whatever the relationship between ß and $x_R(\theta, R)$. Since international rescheduling agreements provide pressures for similar treatment of countries in similar circumstances, it is clear that in practice the predictions of the first polar case are more realistic than those of the second.

III. SUMMARY

We have analysed the optimal taxes needed to internalise the externalities associated with foreign borrowing in a sovereign country which can default on its foreign debts, subject to stochastic default penalties. In the model of all-or-nothing default analysed in this chapter's first section, the formula for the optimal tax needed to internalise these externalities turns out to have exactly the same form as the optimal tax on foreign borrowing in a capital importing country which is large enough to have monopsony power in the world capital market. This similarity is somewhat surprising. First, the model of the first section allows for the possibility of default, whereas the monopsony model is based on the assumption of certain repayments. Secondly, by definition, the monopsony model assumes that the capital importing country can affect the world interest rate, whereas the model of the first section assumes that the debtor country is too small to have any monopsony power. As explained in that section, the equivalence arises because the decision to default is assumed to be made optimally from the

selfish perspective of the debtor. To the extent that increased borrowing by one domestic resident increases the probability of default it therefore gives rise to two exactly offsetting externalities: there is an increase in the probability that all domestic borrowers will avoid having to make contracted repayments, but there is an equal increase in the probability that all domestic residents will suffer the penalties for national default. The only net external effect of borrowing in that section's model is therefore the increased interest cost to all other domestic borrowers in the event that default does not occur. This is also the external cost of foreign borrowing in the monopsony model without default.

In the second section, we analysed a model in which bargained partial default is possible. This assumption changes the form of the optimal tax. However, if the probability of bargained default is small, and/or if, for any given value of the stochastic variable θ, the actual repayments which result from bargained partial default turn out to be directly proportional to contracted repayments, then the first section's formula for the optimal tax carries over with only minor modifications to the model of the second section. We argued that the assumption that actual repayments turn out to be proportional to contracted repayments may not be a bad approximation to the stylised facts.

Chapter 10

Overview of policy issues

Mercantilist views, dating from the sixteenth to nineteenth centuries, held that governments should intervene to encourage a surplus on the trade balance because the state could profit from the resulting accumulation of precious metals. Although it is improbable that such views are at all influential today, there are still many who believe that government intervention should be used to affect trade and current account balances and the resulting net foreign indebtedness. Proposals for intervention can range from full scale macroeconomic measures to achieve external and internal balance targets, through public intervention to raise the national saving rate, to tailored remedies for specific externalities.

This chapter is divided into two parts. The first draws on the analyses of earlier chapters to assess when and why policies to affect the current account and foreign debt would seem justified. The second part attempts to assess several further arguments that have been made for policy action in relation to the current account balance and foreign indebtedness.[1] While these do not fit readily into the framework of the first part, any investigation of policy towards the current account and foreign debt would be incomplete if it did not deal with the questions thereby raised.

I. POLICIES TO AFFECT THE CURRENT ACCOUNT AND FOREIGN DEBT

The appropriateness of particular policies depends in part on the exchange rate regime. An economy that has chosen a pegged rate system may well have little alternative to using macroeconomic policies to target the current account or exchange rate if it experiences persistent balance of payments difficulties, particularly if it has devalued without solving its balance of payments problem. On the other hand, whatever the exchange rate system, externalities in saving, investment and borrowing processes need to be treated at their source, where it can be clearly identified that benefits will follow. Finally, actions of government, including regulations and government borrowing, can have significant effects on the size of a country's current

account balance and foreign indebtedness. These issues also need to be examined in their own right.

1. Exchange rate management

There is little doubt that the post World War II Bretton Woods era of pegged exchange rates gave rise to the view that policy should target the current account. As has been noted, under this system an economy with pegged exchange rates and a limited financial capital inflow could come under pressure to devalue in circumstances where there was a difference between official and market perceptions of the need to do so. Action to reduce the current account deficit could be taken as a substitute for, or complementary to, devaluation.

In theory, an absolutely fixed exchange rate where the money supply fluctuates, and a market determined exchange rate with a given money supply should give the same real results, provided there is flexibility in nominal prices, wages and contracts.[2] In practice, such flexibility would often seem to be lacking, implying that the control over the domestic money supply and nominal domestic variables that a floating rate provides would seem preferable to a fixed rate, particularly with an inflexible wage system. On the other hand, the potential in a pegged rate system to vary the exchange rate and, in particular, to devalue, seems to involve its own special problems in the form of currency crises. In such a regime it is theoretically possible to use restrictive fiscal and expansionary monetary policy to hold income at any given level while reducing the current account deficit.[3] In practice, these policies may take months or years to work and so are hardly likely to be alternatives to devaluation. Further, as Chapter 8 made clear, such an approach means that the main purposes of the fiscal stance must be sacrificed to allow fiscal policy to affect the current account outcome.[4] These policies are forced on the authorities not by fundamental problems, but by the nature of the exchange rate system. Much faster acting, easier to implement and certain in their effects were import tariffs and quotas and export subsidies. Of course they carried their own distortions. As before, the need to use them to control the current account arises out of the nature of the exchange rate mechanism.

It is often argued that the current account outcome should be controlled in the interest of exchange rate management. However, it is interesting that the view that the current account and balance of payments determine the exchange rate is not a particularly useful way of thinking about the way exchange rates are set.[5] Hence, an alternative and perhaps preferable approach to exchange rate management is for macroeconomic policy to be directed specifically at exchange rate outcomes, rather than at the current account balance. An example of where the two approaches may be in conflict is provided by fiscal policy. Fiscal contraction will reduce the current

account deficit, but in the normal cases considered in Chapter 4 it will tend to depreciate the real and nominal exchange rate. This can conflict with the objective of the exercise where it seeks to prevent devaluation.

The above discussion does not mean that pegged exchange rate systems need not work reasonably well in certain situations. Surplus countries rarely feel pressure to adjust their currencies to the same extent as deficit countries. Further if there are adequate capital inflows, countries with deficits on their current account can and do maintain their exchange rates without the pressure of currency crises. In these circumstances a given exchange rate can be sustained without any need to implement policies that target the current account.

Market determined exchange rates would seem to obviate the need for economic policies to target the current account from the point of view of exchange rate management.[6] Macroeconomic policies can be directed solely towards internal balance, and tariffs and quotas become part of commercial, rather than balance of payments, policy. However, the authorities may still hold views about what the exchange rate should be when it floats. This is inappropriate unless there is doubt about the efficiency of foreign exchange markets stemming, for instance, from fears that 'bubbles' rather than fundamentals might be driving the rate.[7] If there are grounds for believing this, such problems require investigation and treatment at their source. The experience of floating rates in the 1970s and 1980s has not revealed convincing evidence that exchange rates normally respond to factors other than fundamental determinants, such as domestic and foreign monetary policies, the real exchange rate and the terms of trade.[8]

Hence, the question should be not whether countries with floating rates should use macroeconomic policy to control current account outcomes, but why those with pegged rates should choose to do so, rather than float their exchange rate when they find themselves in persistent balance of payments difficulties. Pegging and then using macro policies to reduce aggregate demand below that appropriate to internal balance would seem an expensive method of managing the exchange rate.

2. Externalities

Two types of externalities closely associated with the current account and foreign borrowing have been investigated in earlier chapters. They and others will be examined here and still others are implied by the analysis in section II.

One source of externalities, treated in Chapter 6, involved the possibility that, with a rising supply curve of foreign lending, additional borrowing would raise the interest rate for all borrowers. Whereas the private agent would equate the marginal product of capital to the interest rate, a social optimum would require that it be equated to the marginal cost of borrowing.

This would differ from the interest rate in taking account of the extent to which additional borrowing raised the interest rate on existing loans. However, for several reasons there might well be difficulties in trying to correct this externality. Thus it was argued in Chapter 6 that foreign borrowing might also confer positive externalities, for instance in the form of new technology that raised the productivity of the labour. This could be hard for the borrowing firm to internalise because of the mobility of labour. A subsidy would be needed to correct this. Kemp (1966) showed that in the presence of further distortions such as tariffs, it was also possible that a subsidy would be needed to correct the original distortion. Finally, imposition of a tax on the earnings of foreign investment might well provoke the lending country to retaliate by also taxing these earnings. The outcome could leave both countries worse off than if no tax had been imposed in the first place. These examples illustrate how difficult it can be to correct externalities in a distorted world. A country attempting to correct the original borrowing externality would need to be very sure that it had achieved an improvement.

In Chapter 9, Fane and Applegate exposited an externality arising from the possibility that governments might find it pays to default on foreign borrowing and force a corresponding default on the private sector. This leads to a risk premium that rises with the amount of borrowing, so that the social optimum requires the imposition of a tax on interest paid abroad. In fact the formula for the optimal tax has the same form as that for the previous externality. In their first model, due to Aizenman (1989), default is all-or-nothing. They extend this analysis to the case of bargained partial default where they find a result closely related to that for the all-or-nothing default case.

Another instance of government actions distorting private sector decisions can occur when there are implicit or explicit government guarantees of private sector debt. For example, the procedure of government guarantees of loans to exporters from their foreign customers is common. Perhaps this practice can be justified as offsetting the externality created by the difficulties foreign creditors might experience in getting redress in domestic courts. Another widespread practice involves government support for firms in financial difficulties. Governments, particularly, state or provincial ones, often encourage large firms to establish in their areas with a view to benefiting from the employment and growth they may generate. When financial difficulties arise for these firms, governments are often motivated to help prevent them closing down in their area or defaulting. Such guarantees are often implicit, but they can still distort the risk of default and hence may lead to excessive foreign borrowing.

If increased borrowing by one agent raises the risk factor facing another agent there may be an externality which Corden (1991) calls ‘the contamination effect’. This concept requires careful consideration. First, note what Corden has said:

> The real issue is whether changes in the risk factor resulting from increased borrowing are wholly internalised for the various agents, private and public, or whether there is some externality or 'contamination effect'. If they are wholly internalised—so that increased borrowing by one agent does not raise the risk factor facing another agent—there seems to be no public policy issue resulting from current account deficits.
>
> (Corden 1991:14)

Consider firm A that supplies components that firm B uses to manufacture its product. An expansion of capacity by firm B, financed by borrowing, leads to a consequent expansion by firm A. Lenders will rightly see these prospects as correlated and any additional risk premium extracted from firm B will have a counterpart in firm A's borrowing. Thus related risk premia reflecting correlation between the outcomes of interrelated prospects are entirely appropriate. The situation Corden appears to envisage is entirely different. Assume the prospects of firms A and B are entirely uncorrelated, but suppose both firms are domiciled in country X and firm B has been managed by a prominent country X entrepreneur who has become bankrupt. If firm A is thereby charged an additional risk premium just because it is domiciled in country X, there would be an externality. Firm B's failure has 'contaminated' firm A. The missing market would be in the provision of information about the degree of connection between the two firms. If lenders regard the correlation between borrowers' risks as higher than their objective level, an externality will arise. It would be difficult to identify and deal with this effect. If it were thought to be important, perhaps it could be tackled by increased prudential and accounting controls so that high risk prospects and their correlation with other projects were better identified.

These are just a sample of the many types of distortions that have been suggested as possible externalities in the saving-investment-borrowing-lending process. Additional cases will be considered in section II.

3. Distortions due to governments

Sovereign risk

This potential externality was analysed in Chapter 9 and has been discussed earlier in this chapter. Fane and Applegate treat the case in which the penalty that is imposed on defaulting governments is a stochastic variable because it depends on uncertain terms of trade. Alternatively, the source of risk could arise from a variable contract interest rate. This was a significant part of the problem for third world debtors in the 1980s. The low, even negative, real interest rates of the 1970s encouraged many developing countries to borrow. However, nominal and real interest rates rose substantially in the 1980s so

that many of these borrowers faced financial difficulties. Writing about the third world debt problem, Sjaatad (1983) remarks:

> short-term real interest rates on that debt rose abruptly to the 15 to 20 per cent range at the end of 1980.... While it is difficult to have 'too much' debt (in the short run) when real interest rates on that debt are negative, a debt service 'problem' can quickly arise when real interest rates rise as they did.
>
> (Sjaatad 1983:9)

Another reason for governments to default in poorer countries arises from the possibility that poor production or price outcomes mean that domestic resources are inadequate to service the debt. Thus tax rates might need to be so high in order to avoid default that attempts to service debt might cause revolution or impose poverty and starvation on the citizens.

While no country is immune under all circumstances from disasters that might induce it to default, the probability that they might do so is likely to be greater for those with low wealth and per capita real income. Penalties that might well reach beyond disruption of trade, to loss of political influence and complications in defence relationships, are likely to deter default by wealthier countries that have adequate resources to service debt and a continuing interest in foreign borrowing.

Government institutions

Leaving aside the question of the fiscal stance and fiscal deficits for the next section, government institutions and regulations are a significant source of influences on private saving, investment and trade and hence on the current account. Some of the many areas of potentially important effects are through tax arrangements; pension schemes; health systems; tariffs, subsidies and quantitative restraints on imports; promotions of import competing products; export subsidies and promotion schemes; public business enterprises; government procurement practices; and regulations on financial markets and international capital flows. There is little doubt that these factors will have a distorting effect on private saving, investment and trade. The question at issue is what, if anything, should be done to offset the effects of these government measures on the economy and the current account, when they create considerable distortions? It will be argued that the action taken should depend on the nature of the effects and on the value of the regulations.

Some government institutions and regulations may be judged to be providing a worthwhile service to society, even though their effects on saving and investment may not be neutral. Again, some of the effects that worthwhile institutions may have on the factors immediately affecting the current account balance may be relatively easily avoided, while other effects

are essentially jointly supplied with the service provided. Then again, other government institutions may be thought of as in need of significant change or even abolition. Some examples will illustrate these classifications and the issues they raise for policy which affects the current account outcome.

First, consider cases of government institutions that have adverse effects that can readily be avoided. Tax systems that tax nominal income can be shown to lack neutrality with respect to inflation. The survey of the costs of inflation by Fischer and Modigliani (1978) stressed that such tax distortions could be a major cause of the costs of inflation. For instance, the failure for tax purposes to inflation-proof interest as both income and cost would appear to allow inflation to distort saving downwards and investment upwards. These nominal features in a tax system may thus have the effect of increasing the size of the current account deficit. While there are always practical difficulties in devising tax reforms and political difficulties in implementing them, it would seem possible to find a feasible way of inflation-proofing interest as a receipt and a cost as well as other nominal aspects of tax systems. This would appear to be an appropriate remedy where inflation has not been eliminated.

Non-contributory state pension schemes, such as that operated in Australia, are liable to have a disincentive effect on saving. If this is an unintended consequence, the appropriate response is to rethink the social and economic purposes of the programme. It may be preferable to make it contributory at least by some of its beneficiaries, either directly or through higher taxes. Alternatively, incentives to increase saving might be appropriate.

Secondly, some government institutions will have unavoidable consequences. For instance, tax systems are often made progressive in the interest of a policy of greater equality of income. The effects this would have on consumption and saving are surely intended effects and at least in this sense are unavoidable. However, as it is likely that a redistribution from higher to lower income earners reduces private saving, the current account deficit is liable to rise. Should there be action to offset this effect? It would not seem appropriate because the egalitarian policy has been made part of the structure of society. The saving, investment and current account outcomes arise from private sector choices which take into account the effects of the redistribution.

Finally, it is clear that public institutions that have come to be considered irrelevant or inappropriate should be changed. Government ownership and operation of many types of business is currently thought to be less efficient than private ownership. This does not by any means imply that privatisation inevitably leads to a reduction in the current account deficit. Indeed, it may often be the case that moving public businesses to the private sector may cause them to expand and so invest more, so other things being equal, this will raise the current account deficit. Should this lead to action to offset the current account effect? Assuming that the economy remains in internal

balance, this private sector investment will be aimed at taking advantage of profit opportunities so should not be restrained. If a programme of privatisation produces such an increase in investment that excess demand develops, naturally policies to restore internal balance are appropriate.

Another development in recent years has been the widespread move to financial liberalisation in which restrictions on the operation of financial markets have been eased in many countries. To the extent that this raises the international mobility of financial capital it is liable to increase both international borrowing and lending and so have an impact on current account deficits and surpluses. The way it affects current account balances will depend on the types of restrictions that were previously in place. It is not certain that current account deficits and surpluses would rise. Presumably, the move to freer capital markets has been intended to make the transfer of funds between lenders and borrowers more efficient and if this works it could raise both saving and investment by lowering transactions costs to both groups. With both saving and investment rising in a particular country or in the world as a whole, the outcome for the current account in any particular country is uncertain. On the other hand, if regulations had made access to finance difficult for consumers, saving could fall and the current account deficit rise. If it did, it would be a direct result of the move to improve the efficiency of financial markets. The consequential changes in private decisions should not invite intervention unless excess demand were to develop, or it were found that the measures reduced rather than increased market efficiency.

What about the situation in which there are undesirable regulations that may affect current account outcomes, but because of political inertia these regulations are unlikely to be changed, at least in the near future? It has been argued that the existence of such problems justifies macro intervention to affect current account outcomes.[9] Again, consider the example of avoidable tax distortions (which nevertheless are not likely to be changed) that lead to reduced saving and a higher current account deficit. First, if the distortions arise from inflation this can be an additional argument for action to reduce the inflation rate, but any effects on the current account balance are consequential. Again, the remedy is to seek internal balance. But what if the pursuit of internal balance would not remove the distortion? The relevant question is what is the best policy given the immovable problem? Contractionary macro policy aimed directly at the current account will work through restraining demand for imports and import-competing products and through reducing the level of investment. It will almost certainly also reduce output and have other undesirable consequences, for instance on unemployment and bankruptcy rates. It would be necessary to decide whether these costs justify the reduction in the current account deficit. Alternatively, the macroeconomic formula of reducing government spending and offsetting the impact on activity by expansionary monetary policy might be tried. Aside from the practical difficulties of implementation, the

objection to this is the use of fiscal settings for a purpose that may conflict with fiscal objectives. These additional effects of macro restraint may well lead to reduced welfare. It is most unlikely that macro policies that mimic the results of microeconomic reform exist. A further problem of such substitute policies is that they can prolong the possibility of basic reform.

Fiscal policy and the fiscal deficit

Because of the strong political aspects of government fiscal activities it is likely that there will be debate over the principles which should determine optimal government borrowing and lending. However, for present purposes, it is only necessary to assume that some fairly general principles exist. Thus, it is not inevitably true that the optimal fiscal deficit is zero, even in the longer run. Questions of intergenerational equity should be important in determining the structure of tax collections over time and for government investment, borrowing and lending, issues similar to those affecting private firms will often be relevant. Further, if fiscal policy is regarded as one of the instruments of short run macro policy, the fiscal deficit may be required to vary over the cycle and with exogenous shocks.[10]

Auerbach, Gokhale and Kotlikoff (1991, 1992) have suggested a method of accounting for government obligations that would replace the conventional notion of the government deficit in favour of an approach based on considerations of the net contribution of each generation to government obligations. Using the government's intertemporal budget constraint, that the present value of all its current and future spending cannot exceed its net wealth plus the present value of net payments to it by current and future generations, they calculate the present value of net payments that must on average be made by future generations as a residual. Their notion of equity of the average net payment burden for any generation is that each should contribute the same share of national income. If these intergenerational equity criteria were accepted, budgets based on them could not be said to cause current account 'problems'.

If the public and the private deficit were unrelated, a change in the fiscal deficit would be fully reflected in a change in the current account balance. This would be an extreme case of the 'twin deficits' approach to the current account. The Ricardian Equivalence proposition casts doubts on the connection between changes in fiscal and current account deficits. Suppose the fiscal deficit were reduced by increasing taxes. If the private sector saw this move as a reduction in its future tax liabilities it could reduce saving, thus offsetting the reduction in the current account deficit. In the extreme case this offset could be complete. It is not necessary to subscribe to Ricardian Equivalence to see possibilities for connections between the two deficits that constitute the current account. Thus, both private and public deficits have considerable endogenous elements which will mean that their

observed movements may be related through third variables. Targeting the current account through the fiscal deficit may not have the expected result.

Because of the political problems associated with increasing taxes, budget balances will frequently be at levels that are thought inappropriate to economic needs. The problem can be dealt with directly through budgetary measures, but what if for political reasons fiscal deficits remain at such levels? Presumably, they then become part of the economic environment, albeit an undesirable one, justified temporarily by the political constraints and the private sector must adapt to this. As argued later in relation to a proposal by Williamson (1983, 1989), to try to guess what the real exchange rate and current account balance would be in the absence of the fiscal deficit and to set a target accordingly, would seem to be fraught with error and not necessarily the best response possible.

It has sometimes been suggested that in certain circumstances the fiscal balance should be set at a surplus in order to run down private and/or public debt. For instance, there may be a stock of public debt which is the legacy of past government investment in assets with low yields. Subject to other requirements of fiscal policy at the time, this would seem an entirely reasonable policy. However, it has also been claimed that when the private sector has accumulated foreign obligations, fiscal surpluses should be used in an attempt to run down total foreign indebtedness. The implication of a budget surplus in this context is both that the private sector has made mistakes in its past saving and investment and is incapable of making correct decisions about, and appropriate adjustments to, its current and future saving and investment. This must be established and attempting to do so must involve the types of arguments about the failure of the private sector which are dealt with in the section below on general market efficiency. When there is internal balance, it is not self evident that the authorities should force the private sector to save more than they otherwise would choose.

II. FURTHER POLICY ISSUES

The previous section argued that intervention to influence privately generated current account deficits and foreign indebtedness should be used only in special circumstances. However, this is not the end of the matter because the case for a more active intervention policy is often argued on a variety of other grounds. This section attempts to state and assess the arguments that have been made to justify this approach. Consideration of these issues does not change the main conclusions of the previous section. Thus the argument for macroeconomic policy to restrain the size of deficits can usually be rationalised as relating to internal rather than external balance. In the case of microeconomic policy, the principal conclusion remains that each problem should be evaluated and, if necessary, treated at its source rather than attempting to infer from aggregate current account and foreign debt levels that action is necessary.

The questions discussed below are grouped under a number of headings that are convenient but do not necessarily exclude overlap.

1. General market efficiency

As section II.2 deals with excess demand and business cycles, these major reasons for economic intervention are here assumed away. This makes it possible to concentrate on those market failures that might affect the current account fairly directly.

If markets do not work efficiently to allocate resources involved in trade, or if they produce distortions in investment and saving patterns, it is sometimes suggested that there is scope for micro or even macro intervention to change the current account outcome. However, there must be doubts that intervention will necessarily achieve a result superior to that of inefficient markets. In approaching this question it should first be recognised that the subject of macroeconomics exists essentially because there are thought to be impediments to the free working of markets. One of the major issues in economics is the distinction between how markets are conventionally supposed to work in macro- and microeconomic analysis. On the one hand there has been a view of microeconomics that, aside from inappropriate government regulations and in the absence of externalities, markets operate efficiently to achieve an optimal allocation of resources. On the other hand, many macro theories explicitly or implicitly assume that markets do not bring about appropriate solutions or responses to shocks. At an extreme end of this view is the aggregative Keynesian model without relative prices to do any adjusting. More realistic are the analyses of constrained equilibrium of markets which may not clear because of inadequate price flexibility.[11]

There would be broad agreement that if for any reason the economy departs from some notion of internal balance that is both desirable and feasible, macroeconomic policies are necessary to restore it. Can the same be said for some concept of current account balance? That is, are the workings of the markets which deal with international trade, finance and exchange rates (or alternatively, investment and saving) liable to be so inefficient that macroeconomic intervention to correct current account outcomes is required? Consider some of the various suggestions that have appeared in the literature about this question. To start with, the extreme Keynesian model presents a view of the economy reacting in a mechanistic fashion with little in the way of optimising decisions. If this were a good description of reality, private sector current account outcomes could lead to accumulation of debt or assets that could be disastrous. Few these days would feel that private sector decisions were so innocent of economic considerations. In particular, the decision to borrow must be made jointly with decisions in relation to the spending which that borrowing is to finance. However, many of the macro models of economic management involving targets (in particular the current

account) and instruments also pay scant or no attention to these intertemporal decision making processes. The internal/external balance model is a notable example.

Another case is the issue of 'elasticity pessimism' with which some have viewed the current account question. If trade elasticities are low, a devaluation may have little effect in reducing a current account deficit or may even increase it. By some this is taken as evidence of failure of the price mechanism and hence of the need to control the current account outcome.[12] Yet if these responses are regarded as arising from decisions about the best way to react to price changes, they are part of a process of optimal adjustment. When economies do not respond the way economists' models predict, there is scope for asking what is wrong with the models as well as what is wrong with the economy.

Still another area where fears have been expressed about market outcomes is that of the workings of financial and foreign exchange markets. It has been argued that foreign exchange markets may not deliver solutions that reflect 'fundamentals', with the consequence that the resulting current account and foreign debt outcomes may not be socially desirable. A closely related set of arguments can be made with respect to financial markets generally. If these deliver interest rates, lending policies and attitudes to risk that are thought to be non-optimal, again the resulting current account and foreign debt are also non-optimal.

There are two main ways in which it has been claimed that foreign exchange markets fail. The first is that they produce nominal rates which are 'too volatile' and the other is that they set rates at the 'wrong' level. One view on this has been put by Williamson (1983, 1989). While he refers to the volatility of exchange rates he does not regard this as the major problem. Rather, he argues that real exchange rates can be 'misaligned', departing from some long run 'fundamental equilibrium' values. Given internal balance, this fundamental equilibrium real exchange rate (FEER) is that which would be determined by private saving and investment relationships, that is the net capital importing needs of the economy. He has suggested targeting this real exchange rate, hence targeting the longer run equilibrium current account balance. Judging from the examples he gives about misalignments and their costs, market exchange rates differ from FEER for two main reasons, namely because of short run disturbances and also as a result of policy decisions such as those involving the size of the US budget deficit or the pegging of nominal exchange rates at levels that are overvalued. The idea of targeting the real exchange rate gets close to suggesting that the current account is being targeted. However, the proposition that the real exchange rate would be targeted so as to make it vary with 'fundamentals' implies that this need not be the type of policy which judges that current account deficits should be reduced in all circumstances.

The scheme would depend critically on being able to identify the FEER:

> At best, estimates of the FEER require judgments that in practice contain subjective elements regarding cyclical adjustment, the underlying capital flow, and trade elasticities. At worst, sceptics deny any hope of identifying the fundamental equilibrium rate.
>
> (Williamson 1983)

This list of determinants of the FEER is incomplete, because it does not refer to those elements of policy which are supposed to cause misalignments. I would certainly be among the sceptics on this issue, particularly with respect to being able to predict the extent and nature of the factors that affect capital importing in a changing world. Real exchange rates are relative prices that depend on many price and income variables, private saving and investment decisions, trade flows, terms of trade movements and budget decisions. Not only would it be necessary to foresee the correct 'fundamental' values of the relevant exogenous variables, but to achieve desired results a reliable knowledge of how they interact with requisite endogenous variables would be necessary.

Aside from the difficulties involved in the task of knowing better than the market how the economy should behave, Williamson also wishes to set targets which in some way are supposed to compensate for what are seen as faulty economic policies. Take the US budget deficit for example. Economists rightly point to the potential this has had for imposing costs on present and future generations. Williamson would attempt to engineer an outcome for the real fundamental equilibrium exchange rate and hence the current account that disregarded the move into fiscal deficit. He would not accommodate the budget deficit in his plans, so the rate is to be set as if the deficit did not exist. Is this the best way to operate in the circumstances? Would it not be preferable to ask what is the best setting for available policy instruments, given the fact that the deficit exists? Surely the answer is unlikely to be one which ignored the deficit. And who is to be the arbiter of such decisions? Williamson's own approach to targeting the real exchange rate illustrates one of its main dangers, namely that such an exercise can enshrine objectives that may not necessarily be socially desirable. To summarise, Williamson's proposed targeting of the real exchange rate and so the current account would seem to be reasonably flexible and without the prejudgement that current imbalances are necessarily bad. However, the practical difficulties of knowing what the real exchange rate and current account balance 'should be' and the implicit, rather than explicit agenda of reshaping outcomes would seem to argue against it.

The volatility, or as he would describe it, instability, of foreign exchange markets has been emphasised by Krugman (1989).

> Over the past few years, and especially since the dollar began declining, we have imperceptibly become accustomed to living in a world in which

> exchange rates move by large amounts but the changes have only small effects on anything else.
>
> (Krugman 1989:39)

This delinking of exchange rates from real variables occurs, he argues, because firms adjust pricing policy to suit that of the importing countries' markets. Because exporting firms sink costs into entering foreign markets he argues that they must set prices that do not reflect exchange rate fluctuations and even, for a time, exchange rate trends. The foreign exchange market he claims 'fails to recognise short-term trends, so that its forecast errors are serially correlated, and it loses sight of long-run equilibrium, so that it runs away in temporary speculative bubbles' (Krugman 1989:95). Because of these problems he advocates 'an eventual return to a system of more or less fixed rates subject to discretionary adjustment' (ibid.: 99).

Several of his judgements are open to dispute. For instance, exporters pricing on the basis of conditions in foreign markets would seem to be making a rational adjustment to the market structure of their customers. On the other hand, for some commodities relative demands and supplies ensure that many importing countries face prices determined abroad. The supposed delinking of the real economy would seem to be an optimal adjustment to the reality of market conditions and perhaps also to nominal exchange rate variability. Further, while pegging rates disposes of short term volatility, this would not necessarily deal with the forces that produce it. Do they then emerge as fluctuations in interest rates or the money supply? Whether or not one agrees with his analysis and its conclusions, the nature of his suggested solution, namely searching for the best institutional arrangement to cope with the presumed problems, appears to be a preferable procedure to those that would require the imposition of target values of economic variables.

Weale *et al.* (1989) argue for targeting national wealth in addition to short run macro targets.

> we have confined our analysis to a single form of wealth target, namely a suitably defined path for the total real stock of the country's wealth.
>
> (Weale *et al.* 1989:16)

> Otherwise it becomes all too easy…to combine full employment with uninflated prices by means of a lax fiscal policy…. The resources for an excessively high level of consumption are offset by the deficient expenditure on capital projects.
>
> (ibid.: 14)

In as much as this requires a particular level of private investment, given private saving, it comes close to implying a current account target. Such a target would seem to be subject to the same objection which can be made to

the Williamson proposal, namely that setting such targets requires the solution of the most fundamental problems which the private sector faces. Mistakes would be made and could be disastrous. Surely it would be preferable to tackle the lax fiscal policy at its source.

In two papers written with co-authors, Gruen is concerned about the possible inefficiency of the Australian foreign exchange market which he feels had not delivered the large devaluation that he believed was necessary over the medium term to stabilise the ratio of net external assets to GDP.[13] 'Since late 1985, all our evidence is that the risk premium has been much too small to explain the short-term real interest differential between Australia and the US' (Gruen and Smith 1994:2). The exchange risk referred to is calculated on the basis of experienced variability in the exchange rate and survey material of market expectations.

In a subsequent paper Gruen (1991) claims that the distorting effects of the tax treatment of interest in Australia have accounted for the claimed overvaluation of the exchange rate. He estimates that short term pre-tax real interest rates in Australia over a six year period in the late 1980s averaged 2.5 percentage points above comparable rates abroad. As he believes the Australian dollar risk premium has been small, the market must have been continually expecting a large depreciation of the Australian dollar. With an inherited high domestic inflation rate, he argues that the monetary authorities found it necessary to maintain high domestic short term real pre-tax interest rates to keep the inflation rate from increasing as a consequence of domestic excess demand. Helping to force up the nominal rate is the practice (common to most countries) of not allowing the deduction of the inflation component from interest receipts and not requiring its deduction from interest costs for tax purposes. Domestic lenders will receive a nominal interest return high enough to compensate them for being taxed on their full nominal receipts. Similarly, domestic borrowers will be willing to pay these rates because they can deduct the full nominal value of their interest costs when calculating their taxable income. On the other hand, foreigners will find these high nominal rates attractive even with the risk of substantial depreciation. The capital inflow this induces will appreciate the exchange rate and raise the size of the current account deficit. However, his solution would certainly not be to target the current account with monetary or fiscal policy, but to reduce the inflation rate and/or reform the nominal tax system.

In summary, if, in respect of an economy which is in internal balance and without major market distortions, there is faith that businesses and households are capable of making optimal saving and investment decisions on the basis of available information, there would seem to be no grounds for intervening to affect current account outcomes, though there may be grounds for improving the efficiency of markets.[14] For those without this faith, the alternative is to intervene at a macro and/or micro level because of the view that markets cannot work efficiently so households and firms cannot make sound decisions

about the future. In the extreme case, this would mean macro or micro policy to substantially modify private sector investment and saving plans.[15] In all of this it should not be forgotten that markets work in an institutional environment set by the laws and regulations of society. Even after 'deregulation' money and financial markets are still liable to be substantially regulated, particularly where there are public guarantees of bank deposits. For such markets there is always a question of the optimal degree of regulation.

2. Excess demand and the trade cycle

The term 'excess demand' will be used as a generic description of states of disequilibrium in product and factor markets that include 'low' unemployment, 'high' inflation, cyclical upswings, and so forth. Whatever the causes, economies do appear to depart significantly and frequently from 'full employment' of labour and other resources. Macroeconomic management is largely about attempting to reduce or eliminate those departures. It was shown in Chapter 4 that the connection between aggregate demand and trade and current account deficits need not be simple.[16] Thus increases in aggregate demand induced by monetary expansion need not produce an increased trade deficit. Nevertheless, it is frequently argued that excess demand can result in higher than equilibrium deficits and lower surpluses. For purposes of discussion, assume that there is a positively signed relationship between the size of excess demand for domestic output and the size of the current account deficit.

Given this assumption, fluctuations in current account deficits and surpluses will be lower the more successful is policy in offsetting excess demand and supply. As internal balance is an important objective of macroeconomic policy, an incidental result of pursuing that aim is to reduce the consequential swings in the current account deficit. Notice that this association works in both phases of the cycle. Hence, in a recession, policy that revives demand will raise deficits and reduce surpluses. When a boom is brought under control so that excess demand is zero and the inflation rate is at an acceptable level, there may remain a deficit on the current account. Further macro policy action to reduce the current account deficit could be defended only if it was justified by factors other than excess demand. One example is that of a pegged rate system where the choice is made to take macro action to reduce selling pressure arising from a current account deficit, rather than float the currency. Aside from such considerations, it is the presence of excess demand or supply that justifies macro policy action, not whether the trade balance and the current account achieve particular levels.

3. Wage policies

Can it be argued that 'excessive' wage claims increase current account deficits so that they may be decreased by labour market reform? Wage

systems, industrial relations, the strength and behaviour of unions and the nature of wage policies can affect labour markets in a large variety of ways. It is not inevitable that reform of labour market practices will produce a tendency for real wages to fall. For instance, it could be that the removal of distortions which results in a better allocation of labour could require some wages to rise. Despite this it will be assumed that a successful labour market reform is one that lowers real wage costs. Thus countries with strong unions and ineffective wage policies are taken to have higher real wages than if their unions were weaker or their wage policies more adequate. The issue then is whether lower real wages will result in reduced current account deficits.

The short run effects of an exogenous fall in real wages has been examined using standard macroeconomic analysis in Chapter 4. Assume the exchange rate is flexible and capital is perfectly mobile. In a Mundell/Fleming model extended to incorporate partial or full indexation, a fall in real wages will raise employment and output and depreciate the real exchange rate defined as the relative price of imported to domestic goods. Assuming the Marshall/Lerner condition is satisfied, the real depreciation will reduce any current account deficit. However, the demand effect of the rise in output will, of itself, result in an increased deficit. It was shown in Chapter 4 that the net effect on the current account deficit is ambiguous. It can only be determined if it is known whether the marginal propensity to spend exceeds or is less than unity. It was there argued (section II.1) that standard macroeconomic analysis gives no basis for determining what sign this effect might take. To decide this it is necessary to look at the type of intertemporal optimising responses analysed in Chapter 5. When this is done it is found that the size of the marginal propensity to spend is ambiguous without further information. Hence, it cannot be concluded that labour market reform will reduce a current account deficit. In any case this question provides another example of where the influence affecting the current account must be treated as a problem in its own right. The effects on the current account are incidental.

III. SUMMARY

This discussion has established principles on which economic policy might be directed at the current account balance and foreign debt.[17] If a country has adopted a pegged exchange rate system, there could be times when it will feel the need to institute macroeconomic and commercial policies to prevent the rate from coming under pressure to depreciate. While these actions are often interpreted as affecting the current account, it is not clear that this is the best way to characterise them. More correctly the policies involved would be directed at achieving a particular exchange rate outcome and this need not always coincide with a reduction in the current account deficit. Rather than use macroeconomic policy in circumstances where it might conflict with

internal balance or fiscal objectives, it would seem preferable for economies with persistent balance of payments crises to float their exchange rate. When countries choose to float there seems to be no basis for macroeconomic intervention other than to achieve some form of internal balance.

Externalities related to the process of foreign borrowing or other aspects of the balance of payments can give rise to the need for correction by taxes and subsidies or other measures targeted specifically at the problem in hand. In practice, the problem here will be to identify that these measures will result in clear gains to the economy concerned. The same is true of distortions due to government regulations and institutions. Fiscal deficits also need to be appraised in their own right. Economic management may well require deficits that fluctuate over the cycle, but in the long run government budgets need to be judged with respect to their impact on intergenerational equity and their contribution to short run economic performance.

Notes

1 EXTERNAL BALANCE

1 Definitions of the main terms used in this chapter are given in Chapter 2. Readers unfamiliar with the major concepts used here would benefit from reading the first part of Chapter 2.
2 One practical rule of thumb related desired reserves to imports, which implied a target reserves/import ratio. This means that the required level of reserves would be growing in an expanding economy.
3 See Hume (1752).
4 These conditions may not be sufficient to raise the current account balance. The 'Marshall/Lerner condition is a necessary and sufficient condition in an appropriate context. See Chapter 3, section II.3.
5 Such adjustment of exchange rates constitutes a 'nominal' devaluation. This would not of itself reduce a deficit. Somehow the nominal devaluation had to be translated into a 'real' devaluation, which was necessary, but not always sufficient to achieve the reduction.
6 This brief review can deal only with some of the many possible causes.
7 The protection lobby must have been very happy with this view of the world. On another plane, an econometric industry estimating trade elasticities also thrived because of these doubts.
8 Such capital movements were often based on the evidence of falling reserves, reflecting market fundamentals. It would have been more accurate to call them 'inconvenient' rather than speculative.
9 There was, and in some circles still is, a view that exchange rate depreciation means a loss of welfare. As Chapter 4 demonstrates, it is quite possible for depreciation to be associated with a gain in welfare. There is no simple one-way relation between welfare and exchange rate movements.
10 Incidentally, this would probably not work. The definitions of national income magnitudes show that a rise in foreign demand for exports will not reduce a trade deficit unless saving, investment, government expenditure or taxes change. If none of them change, the effect will be an appreciation of the exchange rate to maintain the trade balance at the old level.
11 Even self financed entrepreneurs borrow from themselves at an interest rate determined by the alternative earning rate of the funds.
12 There are several cases where it can be shown that an externality exists in that additional private borrowing raises the cost of borrowing for existing debtors. See Chapters 6 and 9.
13 The term 'debt' is usually confined to interest bearing obligations, while 'indebtedness' and 'liabilities' include obligations which yield dividends and profits. However, for convenience, 'debt' will often be used as a generic term.

14 Many of the same points could be made with respect to surpluses, but given the standpoint taken and to fix ideas the approach is to work through deficit issues.
15 The current account deficit differs from the trade balance mainly by the addition of net income received from foreigners.
16 In addition to current account balances being said to 'deteriorate', exchange rate depreciation is frequently treated as 'adverse'. Terms of trade improvement and deterioration, on the other hand, refer to clearly identifiable welfare gains and losses.
17 For instance, in the traded/non-traded goods model, devaluation can be shown to reduce some measures of the trade deficit without qualification. See Chapter 2, section II.5.

2 THE EVOLUTION OF APPROACHES TO THE CURRENT ACCOUNT BALANCE

1 Other uses of foreign exchange such as for transfers of funds by migrants are neglected here because they are often not significantly related to the usual macroeconomic variables.
2 In practice the institutional arrangements may be much more complex, but in essence they approximate closely to the agreement to buy and sell foreign exchange at a fixed price.
3 National income can be found by deducting depreciation and indirect taxes less subsidies from net national product.
4 Alexander (1952) pointed out the importance of the identity relating the income-expenditure gap to the current account balance, thereby highlighting the importance of what he called the 'absorption' (expenditure) approach to analysis of the current account.
5 Here public debt is taken to include private sector debt whose default can be controlled by the public sector.
6 The entries in the *New Palgrave Dictionary of Economics* by Allen (1987) on mercantilism and Bauer (1987) on the doctrine of the balance of trade give a fascinating account of the history of these views.
7 Financial capital flows between countries were not given great prominence.
8 The Marshall/Lerner condition on the elasticities of demand for these goods (see section II.3 and Chapter 3) must be satisfied for the trade balance to fall.
9 The effect of exchange rate changes on the net income item (net receipts of interest and dividends) in the current account balance must also be considered, but was neglected in many analyses. The reasons can be seen from the analysis of Chapter 3.
10 Limited capital mobility and pegged exchange rates did characterise many economies in the late forties and early fifties. In any case, the question of the effect of real devaluation is of interest in itself.
11 See Caves and Jones (1973) and Takayama (1972). It is shown in Chapter 3 that this is also the case in a system which allows foreign borrowing and lending.
12 It is shown that (2.16) is net exports in section II.5.
13 See Alexander (1952).
14 To derive (2.20) differentiate $NX \equiv X(\pi) - \pi Im(\pi, \xi)$ and $NX \equiv Z \equiv y(\pi) - \xi$ totally with respect to π and eliminate $d\xi/d\pi$. The advantage is that the NX locus will not shift with changes in ξ.
15 See Dornbusch (1975) for an exposition of this model and its concepts. One of the originators of this model was Swan (1963).
16 The current account feedback/portfolio balance literature was developed by

Branson (1971, 1979), Kouri (1976), Dornbusch and Fischer (1980). It is reviewed in Branson and Henderson (1985). Kouri used a currency substitution model where residents held foreign currencies, but not bonds.

17 Also domestic residents do not hold foreign money and foreigners do not hold domestic currency.

18 This result follows from the fact that domestic residents' demand for these bonds is specified in domestic currency so that it appears as eF in (2.27) to (2.30) and solves for eF=k, constant.

19 See Masson (1979). Note also that introduction of uncovered interest parity and the use of rational expectations to determine the exchange rate expectations contained therein can be shown to ensure 'saddle point stability' in some cases.

20 See MacDougall (1960), Kemp (1962,1966), Bardhan (1967), Pitchford (1970).

21 See Obstfeld (1981), Svensson and Razin (1983), Pitchford (1989a, 1990c).

22 Income inflows and outflows would also need to be added to the supplies and demands.

23 Though this needs further examination, it will not be pursued here because this approach is not central in the analysis.

24 One such is mentioned in Chapter 10, section I.

25 Two such countries are Australia and Japan.

26 See Pitchford (1993).

3 DEVALUATION AND THE TRADE BALANCE

1 As was seen in the previous chapter, this is not so in the traded/non-traded goods system.

2 Even where the rate is floated the question has interest because its answer can contribute to our knowledge of structural relationships in the economy.

3 Strictly, it is the 'trade balance' or 'net exports', defined as the balance of goods and services exports over imports that is at issue. The effect of devaluation on the net interest and dividend component of the current account is a further question. It turns out not to be relevant to stability.

4 See Caves and Jones (1973), Takayama (1972).

5 Of course there are many uses for estimates of trade elasticities other than to determine the sign of the M/L condition. Houthakker and Magee (1969), for instance, were also concerned to investigate the possible consequences for growth and trade of high or low income elasticities.

6 See, for instance, Branson (1977) and Chapter 2, section II.7.

7 Not only does this simplify the analysis, but it avoids the possibility of multiple equilibria which may be generated by the cross partial effects of w. The essence of the exercise is to elucidate the consequences of multiple equilibria arising in relation to the M/L effect, so that it is preferable to avoid other sources of multiple equilibria.

8 It is neater for the purposes of this chapter, to work with a slightly different set of symbols than that used in Chapter 2, section II.3, and Chapters 4 and 8. In particular, imports here are m, rather than Im, and exports are x rather than X.

9 Provided that the integral of discounted utilities converges, these conditions are also sufficient for a unique solution if also the maximised value of H is concave in the state variable D. This can be seen to follow for given r. Solution methods for optimal control problems are given in Arrow and Kurz (1970), Pontryagin (1962b) and Leonard and Long (1992).

10 See, for instance Blanchard and Fischer (1989), Chapter 2.

11 The interest bill is increasing in debt from (3.7).

12 This follows from (3.1).
13 See Pontryagin (1962a), Chapter 5, section 30.
14 Now the stable paths are not unique for all values of D. If the choice of which path is optimal is made on the basis of which is best the lower paths will be chosen, as they involve better terms of trade.

4 MACROECONOMIC THEORY

1 These capital flows are often called 'incipient' because net capital inflow or outflow cannot occur without a corresponding deficit or surplus on the current account.
2 Bruce and Purvis (1985) and Marston (1985) survey this literature in the North Holland *Handbook of International Economics*.
3 To see this, suppose a price index I=aeP*+(1-a)P, where eP* is the price of foreign goods and P the price of domestic goods. With a nominal wage W the real wage cost of domestic output is W/P=a(eP*/P)+(1-a), and is reduced by a rise in P/eP*.
4 This section is partly based on Pitchford (1990a).
5 It has been conventional to analyse fiscal policy in a way which ignores the effect of consequent interest receipts and payments and this approach is followed here. See Marston (1985:868) and Allen and Kenen (1980:40–2) for details of a justification, but the practice is reasonable provided the effects of net interest are small in relation to other changes studied. If this is not so the assumption of neutral tax changes which offset the effects of net interest changes is adopted.
6 Total expenditure is assumed to depend on income (and in the long run on wealth) and the interest rate, and its allocation between home and foreign goods on the relative price of home goods. The determination of expenditure and in particular the decision to spend more or less than income is really a dynamic issue to be decided simultaneously with the optimal choice of net debt. These questions are examined in Chapter 5.
7 For simplicity, it is assumed that decisions about G_m are made with respect to its value in terms of home goods.
8 See section II.1 for a dynamic model with non-static exchange rate expectations.
9 It is sometimes argued that demand elasticities might be low in the short run and higher in the long run as agents adjust their behaviour slowly in the face of significant changes. This type of behaviour may give rise to J-curve effects. Some of the implications of this are examined in Pitchford (1990a).
10 Another way to rationalise this is that the approach regards the intertemporal budget constraint (discounted sum of current account balances summing to zero) as being collapsed to a single period.
11 The system involved has been called the 'insular model' by McKinnon (1981), because its results are analogous to those of a closed economy.
12 In practice, measures of the current account do not allow for changes in the value of the stock of foreign indebtedness which result from various valuation changes, such as movements in exchange rates.
13 Some part of A will represent net obligations of foreigners to domestic residents. To see the effect of this, assume all assets represented by A are such foreign obligations, then the full expression for current account balance includes the term r*A which will work in the opposite direction to the conventional expenditure effects of asset changes on net exports. However, it is assumed that the expenditure effects dominate this interest effect, because otherwise the system may be unstable.
14 Notice that the symbol S is used both for the supply function and for saving. It

should be clear from the context which usage is intended and should not cause confusion as the two uses of the symbol do not appear together in any formulae.

15 See Johnson (1958), Krugman (1991).

16 Essentially the same stability conditions are obtained if spending is made a function of contemporaneous prices.

17 See Corden (1993) and Krugman and Taylor (1978) for discussion of devaluation in a pegged rate context. The macro policies which accompanied devaluation were clearly critical to its effects on demand.

18 Notice also that the income measure used is defined net of interest on foreign liabilities so that changes in exchange rates which affect the domestic currency value of interest obligations do not affect income.

19 For instance, imports could be available only with a lag, so that there could be disequilibrium and a deviation from world prices for the duration of this period.

20 With the labels changed appropriately, the diagram is the same as Figure 4.4.

5 OPTIMAL RESPONSES OF EXPENDITURE AND DEBT

1 For further discussion of this see Harberger (1950), Laursen and Metzler (1950), Obstfeld (1981), Svensson and Razin (1983) and Pitchford (1989a).

2 In general, income consists of net interest receipts and income from other sources. For convenience, 'income' will often be used here to mean the non-interest component.

3 There is a considerable literature on this subject. One of the original papers in this area was by Gregory (1976). For a contribution that deals with some of the dynamic issues see, for instance, Neary (1985).

4 The cases involving a variable discount rate are treated in Pitchford (1989a).

5 This part of the chapter is condensed from a more detailed paper (available from the author) which treats the case where both the interest rate and the discount rate are endogenous.

6 This analysis is based on Pitchford (1991).

7 To fix ideas, suppose A>0. Let debt be D=-A, and define debt positively so that positive debt is measured by A. The marginal cost of lending and borrowing then coincide. To see this explicitly, note that the marginal cost of lending is r(A) +r'(A)A. The cost of borrowing, measured positively is r(-D).(-D). Differentiating with respect to -D, the marginal cost of borrowing is r(-D)+ r'(-D).(-D)=r(A)+r'(A)A=R'(A).

8 Agents would either continue to increase their borrowing or lending indefinitely, or, in the unlikely case in which the interest and discount rates coincide by chance, would be indifferent about the level of their net borrowing.

9 The steady state represented by (5.7) and (5.8) could arise from a system such as

$$\dot{A} = y+R(A)-c$$

$$\dot{c} = f(R'(A)-\rho),\ f'>0$$

Linearising this system in the neighbourhood of the steady state, the necessary and sufficient condition for the steady state to be a saddle point is seen to be 5.10).

10 See Pitchford (1989a) for details of the solution.

11 In the text it is assumed that this rise in income is exactly equal to the initial income fall. The analysis can also deal with the cases where the change *g* is greater or less than the initial income change.

12 See, for instance, Cox and Miller (1965) for a discussion of Poisson processes, Merton (1971) for an example of an economic application, and Malliaris and Brock (1982) for necessary conditions for optimal control with a Poisson process.
13 For large values of λ an intersection between $\dot{C}=0$ and $\dot{A}=0$ may not exist, in which case there may be no solution which avoids the chance of bankruptcy or zero consumption.

6 FOREIGN INVESTMENT

1 In particular, the high degree of mobility of financial capital internationally means that interest parity might be expected to hold in terms of nominal interest rates. Physical capital is normally much less mobile, so that a simple parity condition for profit rates is unlikely where rates of capital importing and exporting are high.
2 It does not judge the issue considered in Chapters 9 and 10 of whether intervention might be suggested by analysis based on different assumptions.
3 In this case $R(K_f)<0$ and it is assumed that $R'=r(K_f)+r'(K_f)K_f>0$.
4 See Leonard and Long (1964), for solution methods. A transversality condition $\lim_{t\to\infty} e^{-\rho t}\psi(t)K_d(t) = 0$ is needed to justify the choice of the stable branch.
5 Note that the state variable b must jump at the initial point to satisfy (6.28).
6 This point is important when considering desirable fiscal policy at full employment in Chapter 8.
7 In Chapter 5 it was allowed only for the purpose of consumption.
8 In an approach based on that of Hayashi (1982), Blanchard and Fischer (1989), Chapter 2, use a more complex adjustment cost function. That complexity is not needed to establish the points made here. The present approach is similar to that used by Pindyck (1982).
9 A consequence of their assumption is that consumption must be constant, from (6.44). The results of the system will then be generated by this requirement of constant consumption.
10 See Bardhan (1967), Kemp (1962).
11 This case is similar to that of perfect competition where the demand curve for the product is negatively sloped, but that for an individual producer has an infinite elasticity.

7 SUSTAINABILITY OF PRIVATE SECTOR FOREIGN INDEBTEDNESS

1 See Cohen (1985) and Horne (1988, 1991) for further discussion of this literature.
2 The distinction between public and private debt is blurred when governments explicitly or implicitly guarantee private borrowing, hence distorting the risks involved. Where this occurs it is necessary to note that an inefficiency is involved and that borrowing may be higher than otherwise. However, this does not mean the economy will be on an unsustainable path of private debt.
3 This chapter is based on Pitchford (1992b).
4 The model of Chapter 3 is a good example.
5 That is not to say that the regulations which control consumer finance are not of considerable interest.

6 An alternative way of doing this exercise involves holding r constant while making the discount rate variable. See Chapter 5.
7 Uzawa (1968) studies a problem similar to the above, but differing in that the discount rate rather than the interest rate is variable. His choice of the stable branch as the optimal path appears to be based on the assumption that net assets should not be negative.
8 The consumer must go to different lenders to conceal the extent of his borrowing. This would probably mean that the average interest rate would rise with the size of the debt.
9 Of course, penalties may take other forms such as the requirement and forfeiture of collateral. Provided penalties are neutral in their effect on c_v, different institutional arrangements will give the same result.
10 See equation (6.2').
11 While there may be no logical inconsistency about the assumption that agents on the one hand only know their part of the market, and on the other know the workings of the whole economy, this does suggest the possibility that systematic errors in forecasts could occur if agents use the wrong model of the economy.

8 MACROECONOMIC POLICY IN AN OPEN ECONOMY

1 In some countries it may still be seen as standard procedure.
2 The 1990s tensions of the United States with respect to the Japanese current account surplus are an exception to this. However, perhaps these pressures may be interpreted as relating to Japanese trade restrictions rather than the surplus.
3 See for instance, Corden (1991), Pitchford (1990b), Makin (1989).
4 For example, it was shown in Chapter 4 that changing the monetary/fiscal mix of macro policy could produce a range of current account outcomes for given levels of real income.
5 Taxes and subsidies on particular goods or sectors rather than the whole economy are taken to constitute a part of microeconomic policy.
6 In a similar vein Auerbach, Gokhale and Kotlikoff (1991, 1992) suggest that fiscal policy should take account of intergenerational equity considerations.
7 There are many reasons why this might not be the most satisfactory way to move to full employment. First, it may take an unacceptably long time, so that other policies, such as microeconomic labour market measures might be regarded as more satisfactory. Secondly, some unemployment might well not respond to the macro measures considered here and so might again call for specific micro policies.
8 See Chapter 4, section II.1. This condition ensures convergence to equilibrium when prices are inflexible.
9 However, this conclusion depended on the assumption that the marginal propensity to spend is less than unity.
10 Assuming that the wage resulting from indexation was a maximum as well as a minimum wage. If this were not so the wage policy would probably be ineffective.
11 Chapters 9 and 10 investigate the conditions under which such microeconomic measures might be justified.
12 See Corden (1985) for a discussion of this literature.
13 Two independent instruments, for instance exchange rate and fiscal policy, would be needed to achieve this.
14 Dornbusch (1974) analyses such a system.

15 It would make no difference in principle to add some form of hoarding motive to the model.
16 That is, $pD_{Np}+D_{Tp}=0$ and $pX_{Np}+X_{Tp}=0$.

9 SOVEREIGN DEFAULT RISK AND THE SOCIAL COST OF FOREIGN DEBT

1 In 1970 the proportion of private non-guaranteed debt in total long term debt for all developing countries (i.e., all low-income and all middle-income countries) was 25 per cent, according to the data and definitions in World Bank (1991). This proportion had fallen to 16 per cent in 1980 and to 6 per cent in 1991 (projected). For all severely and moderately indebted LDCs the proportions at these three dates were 25 per cent, 15 per cent and 5 per cent, respectively. For all other LDCs the corresponding proportions were 25 per cent, 22 per cent and 10 per cent, respectively.
2 In the case of bank loans, our simplifying assumption can be defended on the ground that the importance of asymmetric information is reduced by the formation of consortia, which can share the costs of collecting information among all the individual banks. In the case of bond issues, the rating agencies play a similar role in the provision of information to individual lenders.
3 For a model which allows for the complications introduced by asymmetric information see Kletzer (1984). Evidence from the 1930s is given by Eichengreen and Portes (1986:619), who describe how, in 1934, the US District Court in New York ruled that German exchange controls were 'of no legal significance' in excusing a German shipping company for defaulting on a loan contract made in New York. Eichengreen and Portes then note that: 'In practice, creditors could use a legal decision to obtain satisfaction only if the defendant had attachable assets abroad. Not surprisingly, the notable instances where arrears were paid in full or an acceptable readjustment plan was offered involved shipping companies, like those cited above, with attachable assets anchored in American ports.'
4 If the schedule relating i to D is backward bending, there may be more than one possible equilibrium corresponding to any one rate of tax on foreign borrowing. To ensure that the actual equilibrium is the best, the government may need to impose an additional constraint, such as a ceiling on the allowable contract interest rate.
5 See Kemp (1964:205–6) and Hanson (1974:628). This and related externalities are also discussed in Chapter 6, sections I.1, I.2 and III. The same expression for the optimal tax was also obtained by Harberger (1985) using a model in which the borrowing country has 'quasi-monopsony power…generated by differing perceptions of risk by borrowers and lenders, the lenders' perception being always greater than that of the borrowers.'
6 It is straightforward to confirm that equation (9.16) below makes x a monotonically increasing function of θ for a given value of R, provided that the marginal utility of consumption is positive, but diminishing with consumption. The critical value θ^* is defined to be infinite if $x(\theta, R)<R$ for all values of θ; and θ^* is defined to be zero if $x(\theta, R)>R$ for all values of θ.
7 Provided the utility function is almost linear, the amount to be repaid x will be approximately equal to a constant fraction $(1-\alpha)$, of the potential default penalty z. If the utility function were exactly linear there would not generally be an interior solution to the first-order condition (9.12").
8 This approximation was noted by Harberger (1985).

10 OVERVIEW OF POLICY ISSUES

1 These and other arguments for intervention are reviewed in Pitchford (1990b) and (1992a).
2 This fixed rate system is the one that rules between regions of a country.
3 See Chapter 4, section I.5.
4 It was noted that at full employment, the fiscal stance has implications for welfare and growth that may not coincide with the current account motive.
5 This was pointed out in Chapter 2, sections III.4 and 5.
6 Monetary authorities may still use sterilised or unsterilised intervention to smooth exchange rate fluctuations, but this is another issue.
7 See Chapter 7, section III for a discussion of these issues.
8 See the discussion of exchange rate determination in Chapter 2, section III.
9 See Moore (1989) and for a contrary view, Pitchford (1989c).
10 Although it would be possible to conduct fiscal policy with a balanced budget, this would reduce the effects of automatic stabilisers and could be cumbersome.
11 See, for example, Barro and Grossman (1971).
12 See, for example, the discussion in Kindleberger (1963:595).
13 See Gruen and Smith (1994) and Alesina, Gruen and Jones (1991).
14 Before the financial deregulation of the 1980s, it could be said that a lack of ready access to financial markets was a problem for some economic agents. However, the remedy chosen was not to intervene to affect current account outcomes, but to reform financial markets.
15 One argument that has been made for this is based on policymakers' supposed superior knowledge of the behaviour and working of the economy. However, if it is only a question of knowledge, this can always be made available to the public so that again markets can be left to work out solutions.
16 See section II.1.
17 Previous analyses of the arguments behind the view of policy given in this section include Corden (1974, 1985, 1991), Makin (1989, 1994), Pitchford (1989b, 1990b), and Sinn (1990). Official statements of a similar position are contained in the May 1990 edition the IMF *World Economic Outlook* and in the OECD, December 1989, *Economic Outlook*.

References

Aizenman, J. (1989) 'Country Risk, Incomplete Information and Taxes on International Borrowing', *Economic Journal*.

Alesina, A., Gruen, D.W.R. and Jones, M.T. (1991) 'Fiscal Adjustment, the RealExchange Rate and Australia's External Imbalance', *Australian Economic Review*.

Alexander, S.S. (1952) 'Effects of devaluation on a trade balance', *International Monetary Fund Staff Papers*.

Allen, P.R. and Kenen, P.B. (1980) *Assets Markets, Exchange Rates and Economic Integration,* Cambridge University Press, Cambridge.

Allen, W.R. (1987) 'Mercantilism', in Eatwell, J., Milgate, M. and Newman, P., (eds), *The New Palgrave: A Dictionary of Economics,* MacMillan, London.

Arrow, K.J. and Kurz, M.K. (1970) *Public Investment, the Rate of Return and Optimal Fiscal Policy,* Johns Hopkins, Baltimore.

Auerbach, A.J., Gokhale, J. and Kotlikoff, L.J. (1991) 'Generational Accounts: A Meaningful Alternative to Deficit Accounting', in D.Bradford, (ed.), *Tax Policy and the Economy, National Bureau of Economic Research,* vol. 5.

Auerbach, A.J., Gokhale, J. and Kotlikoff, L.J. (1992) 'Generational Accounting: A New Approach to Understanding the Effects of Fiscal Policy on Saving', *Scandinavian Journal of Economics*.

Bardhan, P.K. (1967) 'Optimum Foreign Borrowing', in Shell, K., (ed.), *Essays on the Theory of Optimal Economic Growth,* MIT Press, Cambridge, Massachusetts and London.

Barro, R. and Grossman, H. (1971) 'A General Disequilibrium Model of Income and Employment', *American Economic Review*.

Bauer, S. (1987) 'Balance of trade, history of the theory', in Eatwell, J., Milgate, M. and Newman, P., (eds), *The New Palgrave: A Dictionary of Economics,* MacMillan, London.

Blanchard, O.J. and Watson, M.W. (1982) 'Bubbles, Rational Expectations and Financial Markets', in Wachtel, P., (ed.), *Crises in Economic and Financial Structure,* Heath and Co., Lexington.

Blanchard, O.J. and Fischer, S. (1989) *Lectures on Macroeconomics,* MIT Press, Cambridge, Massachusetts.

Branson, W.H. (1977) 'Asset Markets and Relative Prices in Exchange Rate Determination', *Socialwissenschaftliche Annalen,* Band 1.

——(1979) 'Exchange Rate Dynamics and Monetary Policy', in Lindbeck, A., (ed.), *Inflation and Employment in Open Economics,* North Holland, Amsterdam.

Branson, W.H. and Henderson, D.W. (1985) 'The Specification and Influence of Asset Markets', in Jones, R.W. and Kenen, P.B., (eds), *Handbook of International Economics,* Vol. II, North Holland.

Bruce, N. and Purvis, D.D. (1985) 'The Specification and Influence of Goods and

Factor Markets in Open-Economy Macroeconomic Models', in Jones, R.W. and Kenen, P.B., (eds), *Handbook of International Economics,* Vol. II, North Holland.
Bulow, J. and Rogoff, K. (1989) 'A Constant Recontracting Model of Sovereign Debt', *Journal of Political Economy*.
Caves, R.E. and Jones, R.W. (1973) *World Trade and Payments,* Little, Brown, Boston.
Cohen, D. (1985) 'How to Evaluate the Solvency of an Indebted Nation', *Economic Policy,* November.
Corden, W.M. (1985) (1st ed., 1974) *Inflation Exchange Rates and the World Economy,* 3rd ed., Oxford Clarendon Press, Oxford.
——(1991) 'Does the Current Account Matter? The Old View and the New', *Economic Papers*.
——(1993) 'Absorption, the Budget and Debt: The Wonderland of Possibilities', in Herberg, H. and Long, N.V., (eds), *Trade, Welfare and Economic Policies,* University of Michigan Press, Michigan.
Cox, D.R. and Miller, H.D. (1965) *The Theory of Stochastic Processes,* Methuen, London.
Dornbusch, R. (1976) 'Expectations and Exchange Rate Dynamics', *Journal of Political Economy*.
——(1974) 'Real and Monetary Aspects of Exchange Rate Changes', in Aliber, R.Z., (ed.), *National Monetary Policies and the International Financial System,* UCP.
Dornbusch, R. and Fischer, S. (1980) 'Exchange Rates and the Current Account', *American Economic Review*.
Eichengreen, B. and Portes, R. (1986) 'Debt and Default in the 1930s: Causes and Consequences', *European Economic Review*.
Epstein, L.G. and Hynes, J.A. (1983) 'The Rate of Time Preference and Dynamic Economic Analysis', *Journal of Political Economy*.
Fane, G. (1982) 'A Geometric Analysis of Exchange Rate Adjustment Under Static and Rational Expectations', *Economic Record*.
——(1994) 'Foreign debt: Externalities and optimal taxes in an intertemporal model', Discussion Paper No. 315, *Working Papers in Economics and Econometrics,* Australian National University, August.
Fischer, S. and Modigliani, F. (1978) 'Towards an Understanding of the Real Effects and Costs of Inflation', *Weltwirtschaftliches Archiv*.
Flood, R.P. and Hodrick, R.J. (1990) 'On Testing for Speculative Bubbles', *Economic Perspectives,* Spring.
Folkerts-Landau, D.F.L. (1985) 'The Changing Role of International Bank Lending in Development Finance', *IMF Staff Papers*.
Gaber, P. (1990) 'Famous First Bubbles', *Economic Perspectives,* Spring.
Gregory, R.G. (1976) 'Some Implications of the Growth of the Mineral Sector', *The Australian Journal of Agricultural Economics*.
Gruen, D.W.R. (1991) 'The Effects of Steady Inflation on Interest Rates and the Real Exchange Rate in a World with Free Capital Flows', *Discussion Paper 9101,* Reserve Bank of Australia, Sydney.
Gruen, D.W.R. and Smith, J. (1994) 'Excess Returns in a Small Open Economy', *Economic Record*.
Hanson, J.A. (1974) 'Optimal International Borrowing and Lending', *American Economic Review*.
Harberger, A.C. (1950) 'Currency Depreciation, Income, and the Balance of Trade', *Journal of Political Economy*.
——(1985) 'Lessons for Debtor Countries and Policy Makers', in Smith, G.W. and

Cuddington, J.T., (eds), *International Debt and the Developing Countries,* The World Bank, Washington, DC.
Hayashi, F. (1982) 'Tobin's Marginal q and Average q,: A Neoclassical Interpretation', *Econometrica*.
Hillman, A.L. and Long, N.V. (1983) 'Pricing and Depletion of an Exhaustible Resource when there is Anticipation of Trade Disruption', *Quarterly Journal of Economics*.
Horne, J. (1988) 'Criteria of External Sustainability', *IMF Working Paper,* WP/88/60, Washington, DC.
——(1991) 'Indicators of Fiscal Sustainability', *IMF Working Paper,* WP/91/5, International Monetary Fund, Washington, DC.
Houthakker, H.S. and Magee, S.P. (1969) 'Income and Price, Elasticities in World Trade', *Review of Economics and Statistics*.
Hume, D. (1752) *Political Discourses,* Fleming, Edinburgh.
IMF (1990) *World Economic Outlook,* May, International Monetary Fund, Washington, DC.
Johnson, H. (1958) 'Towards a General Theory of the Balance of Payments', in Johnson, H., *International Trade and Economic Growth,* Allen & Unwin, New York.
Jones, R.W. and Kenen, P.B. (eds) (1985) *Handbook of International Economics,* Vol. II, North Holland, Amsterdam.
Kemp, M.C. (1962) 'Foreign Investment and the National Advantage', *Economic Record*.
——(1966) 'The Gain from International Trade and Investment: A Neo-Heckscher-Ohlin Approach', *American Economic Review*.
——(1964) *The Pure Theory of International Trade,* Prentice-Hall, Englewood Cliffs, NJ.
——(1985) *The Pure Theory of International Trade and Investment,* Prentice-Hall, Englewood Cliffs, NJ.
Kindleberger, C.P. (1963) *International Economics,* Irwin, Homewood, Illinois.
Kletzer, K.M. (1984) 'Asymetries of Information and LDC Borrowing with Sovereign Risk', *Economic Journal*.
Kouri, P.J.K. (1976) 'The Exchange Rate and The Balance of Payments in the Short Run and the Long Run', *Scandinavian Journal of Economics*.
Krugman, P.R. (1989) *Exchange Rate Instability,* MIT Press, Cambridge, Massachusetts.
——(1991) *Has the Adjustment Process Worked?,* Institute for International Economics, Washington, DC.
Krugman, P.R. and Taylor, L. (1978) 'Contractionary Effects of Devaluation', *Journal of International Economics*.
Laursen, S. and Metzler, L.A. (1950) 'Flexible Exchange Rates and the Theory of Employment', *Review of Economics and Statistics*.
Leonard, D. and Long, N.V. (1992) *Optimal Control Theory and Static Optimisation in Economics,* Cambridge University Press, Cambridge.
Long, N.V. (1991) 'Cyclical International Capital Flows', in Takayama, A., (ed.), *Trade Policy and International Adjustments,* Academic Press.
MacDougall, G.D.A. (1960) 'The Benefits and Costs of Private Investment from Abroad: a Theoretical Approach', *Economic Record*.
McKinnon, R.I. (1981) 'The Exchange Rate and Macroeconomic Policy: Changing Postwar Perception', *Journal of Economic Literature*.
Makin, A.J. (1989) 'The External Imbalance: Burden or Blessing', *Australian Quarterly*.
——(1994) 'Financial Deregulation and Foreign Debt: Taking Stock', in White, G.,

Walsh, M., Makin, T. and Hopkins, S., (eds), *Why Worry About Foreign Debt?,* Centre for Independent Studies, Sydney.
Malliaris, A.G. and Brock, W.A. (1982) *Stochastic Methods in Economics and Finance,* North Holland, Amsterdam.
Marston, R.C. (1985) 'Stabilisation Policies in Open Economies', in Jones, R.W. and Kenen, P.B., (eds), *Handbook of International Economics,* Vol. II, North Holland, Amsterdam.
Masson, P.V. (1979) 'Dynamic Stability of Portfolio Balance Models of the Exchange Rate', *Journal of International Economics.*
——(1985) 'The Sustainability of Fiscal Deficits', *IMF Staff Papers,* International Monetary Fund, Washington, DC.
Merton, R.C. (1971) 'Optimal Consumption and Portfolio Rules in a Continuous Time Model', *Journal of Economic Theory.*
Moore,D. (1989) 'Why Australia has a Current Account Problem', *Policy,* Spring.
Nash, J.F. (1953) 'Two-Person Cooperative Games', *Econometrica.*
Neary, P.J. (1985) 'Real and Monetary Aspects of the Dutch Disease', in Jungenfelt, K. and Hague, D., (eds), *Structural Adjustment in Developed Open Economies,* Macmillan, London.
Obstfeld, M. (1981) 'Macroeconomic Policy, Exchange Rate Dynamics and Optimal Asset Accumulation', *Journal of Political Economy.*
OECD, *Economic Outlook,* Paris, 43: June 1988; 44: December 1989; 45: June 1989.
Pindyck, R.S. (1982) 'Adjustment Cost Uncertainty and the Behaviour of the Firm', *American Economic Review.*
Pitchford, J.D. (1970) 'Foreign Investment and the National Advantage in a Dynamic Context', in McDougall, I.A. and Snape, R.H., (eds), *Studies in International Economics,* North Holland, Amsterdam.
——(1989a) 'Optimum Borrowing and the Current Account when there are Fluctuations in Income', *Journal of International Economics.*
——(1989b) 'Does Australia Really Have a Current Account Problem?', *Policy,* Winter.
——(1989c) 'The Current Account: Still a Secondary Issue', *Policy,* Spring.
——(1990a) 'Macroeconomic Policy and the Current Account in an Open Economy with Partial Wage Indexation', *Economic Record.*
——(1990b) *Australia's Foreign Debt: Myths and Realities,* Allen & Unwin, Sydney.
——(1991) 'Optimum Responses of the Current Account when Income is Uncertain', *Journal of Economic Dynamics and Control.*
——(1992a) 'Current Account Deficits, External Liabilities and Economic Policy', *IMF Working Paper,* WP/92/54, International Monetary Fund, Washington, DC, July.
——(1992b) 'Sustainability and Private Sector Foreign Debt', in Hargreaves, C., (ed.), *Macroeconomic Modelling of the Long Run,* Edward Elgar, London.
——(1993) 'The Exchange Rate and Macroeconomic Policy in Australia', in Blundell-Wignall, A., (ed.), *The Exchange Rate, International Trade and the Balance of Payments,* Reserve Bank of Australia, Sydney.
Pitchford, J.D. and Turnovsky, S.J. (eds) (1977) *Applications of Control Theory to Economic Analysis,* North Holland, Amsterdam.
Pontryagin, L.S. (1962a) *Ordinary Differential Equations,* Addison-Wesley, Reading, Mass.
Pontryagin, L.S., Boltyanskü, V.G., Gamkrelidze, R.V. and Mishchenko, E.F. (1962b) *The Mathematical Theory of Optimal Processes,* Interscience, New York.
Reserve Bank of Australia (1988) *Report and Financial Statements 30 June 1988,* Sydney.

Rubinstein, A. (1982) 'Perfect Equilibrium in a Bargaining Model', *Econometrica*.
Sachs, J.D. (1982) 'The Current Account in the Macroeconomic Process', *Scandinavian Journal of Economics*.
——(1984) 'Theoretical Issues in International Borrowing', *Princeton Studies in International Finance*.
Salop, J. and Spitaller, E. (1980) 'Why Does the Current Account Matter?', *IMF Staff Papers*.
Shaked, A. and Sutton, J. (1984) 'Involuntary Unemployment as a Perfect Equilibrium in a Bargaining Model', *Econometrica*.
Sinn, S. (1990) *Net External Asset Position of 145 Countries, Estimation and Interpretation,* Kieler Studien 234, Institute für Weltwirtschaft an der Universität Kiel.
Sjaatad, L.A. (1983) 'The International Debt Quagmire, To Whom Do We Owe It?', University of Chicago, mimeo.
Sutton, J. (1986) 'Non-cooperative Bargaining Theory: an Introduction', *Review of Economic Studies*.
Svensson, L.E.O. and Razin, A. (1983) 'The Terms of Trade, Spending and the Current Account; The Harberger-Laursen-Metzler Effect', *Journal of Political Economy*.
Swan, T.W. (1963) 'Longer-run Problems of the Balance of Payments', in Arndt, H.W. and Corden, W.M., (eds), *The Australian Economy: A Volume of Readings,* Cheshire Press, Melbourne.
Takayama, A. (1972) *International Trade,* Holt, Rinehart & Winston, New York.
Uzawa, H. (1968) 'Time Preference, the Consumption Function, and Optimum Asset Holdings', in Wolfe, J.N., (ed.), *Value, Capital and Growth, Papers in Honour of Sir John Hicks,* Edinburgh University Press, Edinburgh.
Weale, M., Blake, A., Christodoulakis, N., Meade, J. and Vines, D. (1989) *Macroeconomic Policy, Inflation, Wealth and the Exchange Rate,* Unwin Hyman, London.
White, E.N. (1990) 'The Stock Market Boom and Crash of 1929 Revisited', *Economic Perspectives,* Spring.
Williamson, J. (1983) *The Exchange Rate System,* Institute for International Economics, Washington, DC.
——(1989) 'Equilibrium Exchange Rates: an Update', Institute for International Economics, Washington, DC.
World Bank (1991) *World Debt Tables 1991–92, External Debt of Developing Countries,* vol. 1, Washington, DC.

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