III Macroeconomic Balance Approach

Overview

The macroeconomic balance approach furnishes a useful framework for calculating equilibrium exchange rates at positions of internal and external equilibrium. Accordingly, it employs a number of other macroeconomic indicators in addition to competitiveness. The analytical basis of the macroeconomic balance approach, initially outlined in Swan (1963), was refined by IMF staff during the 1970s and has been used more recently by John Williamson and others in their work on "fundamental equilibrium exchange rates." It defines the equilibrium real exchange rate as the value that is consistent with internal and external balance over the medium term. Internal balance is normally defined as achieving the underlying level of potential output, while external balance is defined as achieving an equilibrium position in the current and capital accounts.

A diagram highlights the key relationships involved. In Chart 4, the real exchange rate is measured on the vertical axis and real domestic demand on the horizontal axis. Internal balance is represented by the upward sloping $Y^*$ line, which represents those combinations of the real exchange rate and real domestic demand at which the economy is at its full employment level, $Y^*$. It slopes upward because as the exchange rate appreciates, more domestic demand is diverted from domestic to imported goods and foreign demand for exports lessens; hence, more domestic demand is required to achieve the same level of output. Points to the right of $Y^*$ indicate that output is above potential, with higher domestic demand being satisfied either by domestic output (lower quadrant) or by imports (right quadrant), while points to the left of $Y^*$ (upper and left quadrants) indicate that output is below potential. External balance is defined by the $CA^*$ line, which shows the combinations of the exchange rate and domestic demand at which the current account is equal to its equilibrium level, $CA^*$. It is downward sloping because higher domestic demand, which worsens the current account, needs to be offset by a depreciation in the real exchange rate to keep the external position unchanged. Points to the right of $CA^*$ indicate that the real exchange rate is above (more appreciated than) the level required to achieve external balance, and hence that the current account is less than the equilibrium level, while points to the left of $CA^*$ indicate that the current account is above its equilibrium value.

The intersection of the two lines at point $E$ determines the real exchange rate, $R^*$, that is simultaneously consistent with both internal ($Y^*$) and external ($CA^*$) balance, and hence with appropriate underlying macroeconomic policies that achieve these desired macroeconomic positions.

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The regions around $E$ represent four types of disequilibrium. A point such as $E'$ in the right quadrant of the diagram corresponds to a position where output is above potential and the current account is above its equilibrium, as $E'$ is to the right of $Y^*$ and above $CA^*$. This combination of inflationary pressure and current account deficit (relative to equilibrium) could reflect a rise in domestic demand caused, for example, by an expansionary fiscal policy. An illustration of this situation occurred in the United States in 1985, when output was above potential, the current account deficit was not in an equilibrium position, and the real exchange rate was overvalued. The left quadrant shows the opposite combination: depressed output and current account surplus above the equilibrium level. This would be the typical position of a country in recession, such as Japan in 1993.

Points in the upper quadrant also indicate a condition of depressed output, but in this case it is combined with a current account below its equilibrium level because of an appreciated exchange rate. This combination of depressed output and an overvalued exchange rate characterized the macroeconomic positions of the United Kingdom, Sweden, Italy, and Spain from 1987 to September 1992. Chart 5 shows that the real effective exchange rates of these countries, on average, appreciated considerably from 1987 to September 1982, a situation that contributed to a deterioration in their current account positions, though that was masked by weak domestic demand in 1991–93. The cyclical increase in unemployment from 1990 to 1993 in these countries was exacerbated by the need to raise interest rates in order to maintain their parities in the ERM (or peg to the ECU in the case of Sweden). Market participants focused on these developments, and exchange market tensions emerged that ultimately led these countries to give up their parities or peg in the summer and fall of 1993.

This episode illustrates that important policy issues arise when considerations of macroeconomic balance suggest there is a misalignment of exchange rates. As noted in Section I, it is beyond the scope of this paper to discuss appropriate policy responses to cases in which the real exchange rate appears to be outside a range of values judged consistent with economic fundamentals. Nonetheless, a few brief observations are warranted. First, a more careful analysis of the underlying situation could reveal that a misalignment does not exist and that no policy actions are called for. Second, if indeed the exchange rate is deemed out of line with fundamentals, the appropriate policy response will depend in part on whether the exchange regime is pegged or floating. Third, under either regime two main courses of action need to be considered: (i) adjustments in macroeconomic policies may well be needed in order to correct the misalignment; and (ii) in the case of a pegged rate regime, an inconsistency between the real exchange rate and positions of internal and external balance may warrant an adjustment in the nominal peg.

Because the equilibrium exchange rate, $R^*$, depends on the position of internal and external balance of the economy, it will change in response to shocks that alter these balances. Consider the case of a rise in the price of oil for an oil exporting country, such as Norway. The boost to nominal exports implies an improvement in the current account balance. If the increase in oil prices raises the equilibrium surplus on the current account—on the grounds that some of the economic windfall is used to build up net foreign assets to provide income in the future—the $CA^*$ line will shift upward. Hence, an increase in the price of oil will lead to a rise in the equilibrium exchange rate of oil exporting countries and an increase in domestic demand. This framework can be used to analyze other disturbances, such as those connected with other natural resources, political events, or technological innovations. For example, German unification led to a large transfer of resources from west Germany to rebuild the economy of the eastern half of the country, and thus a redirection of German saving from abroad to the domestic economy. This reduction in the equilibrium current account implies an upward movement in the $CA^*$ line, and hence an appreciation in the equilibrium real exchange rate.

Implementing the macroeconomic balance approach requires two pieces of information. The first is a definition of internal and external balance, a subject that will be explored in the next section. The second is a set of estimates of the parameters that define the relationships among the current account, output, real demand, and the real exchange rate.

### Defining Internal and External Balance

Calculation of the exchange rate corresponding to macroeconomic balance involves estimating the levels of output and the current account associated with internal and external balance. Internal balance is defined as the level of output consistent with both full employment and a low, sustainable rate of inflation. External balance is less easily

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28For an empirical analysis of the economic effects of German unification, including estimates of the implied real appreciation of the deutsche mark, see Masson and Meredith (1990).
specified. A broad definition would be the net flow of international capital that corresponds to equilibrium levels of national saving and investment over the medium term.

Internal balance is closely connected with the concept of macroeconomic stability, and in particular with the level of unemployment consistent with a nonaccelerating rate of inflation (NAIRU). The NAIRU is the level of unemployment consistent with nominal stability, since at this rate there is no pressure for inflation to rise or fall. In this framework, potential output can be defined as the level
of real output consistent with the NAIRU.\textsuperscript{29} Empirical estimates of potential output in different countries have been made for some time within the IMF.\textsuperscript{30}

As noted above, external balance is more difficult to define. Since the counterpart to the current account on external transactions is the capital account, external balance can be approached in terms of the desired net flow of assets between economies in the absence of significant institutional or government distortions. Seen in this light, the equilibrium current account represents the desired intertemporal reallocation of resources between countries, and identifying the preferred path for the current account means identifying the preferred path for international debt. As with any intertemporal analysis, this path depends on current assessments of the future values of variables.\textsuperscript{31}

Several alternative methods for identifying this path are discussed below.

One approach is to identify external balance with a zero current account, and hence with an unchanged level of nominal net claims on the rest of the world. While having the virtue of simplicity, such an assumption is without any firm analytical or empirical basis. Net flows of capital between countries can provide the same benefits for the international economy that domestic financial markets provide within an economy; namely, they can act as an efficient mechanism for moving capital between savers and investors. Identifying a zero current account balance as the equilibrium external position would fail to recognize these gains from allocating international resources. There have been numerous historical examples of persistent non-zero current accounts. The gold standard period provides a useful case in point. Between 1880 and 1913, the United Kingdom and Germany ran average current account surpluses of 4.5 percent and 1.8 percent of output, respectively, while Australia, Sweden, Denmark, and Norway all ran average current account deficits of between 2.5 and 3.7 percent of output. The persistent external deficits of many developing countries in the postwar period are another example.

An alternative approach, discussed in IMF (1984), is to use data on international capital flows to differentiate between persistent transfers of long-term capital and more reversible short-term funds. The long-term flows are taken to represent the “normal balance” and are assumed to be sustainable over time, while the short-term capital transactions are taken as volatile flows that are transitory and reversible. In practice, however, it is extremely difficult to differentiate between these flows. The reason is that this distinction lies in the motives of the investor, which are very imperfectly correlated with any objective characteristics that can be measured using capital account data.

Given these problems with identifying the equilibrium level of the current account directly from data on the external accounts, calculations of the exchange rate associated with macroeconomic balance have approached the issue in a less direct fashion. Rather than looking at the current account per se, the desired current account has been derived from theoretical considerations regarding economic behavior in the rest of the economy. For example, Williamson (1994) discusses the saving and investment position of the major industrial countries using the debt cycle theory of investment, in which less developed countries borrow capital from more developed countries in order to industrialize, and the lifecycle theory of savings, which predicts that demographic differences across countries will systematically affect private saving.

Although Williamson uses a relatively informal approach to these calculations, it is possible to formalize such computations using empirical estimates of the impact of various factors on saving and investment. Bosworth (1993) surveys the empirical literature on saving and investment, as well as several new results on the determinants of saving and investment using data across a number of industrial countries. These results confirm, among other things, the importance of demographic differences across countries will systematically affect private saving.

An alternative to the regression analysis used by Bosworth is to use macroeconomic simulations to estimate the effect of underlying disturbances on the world economy. Masson and Tryon (1990) use a modified version of the MULTIMOD macroeconomic model to estimate the impact of an aging population; as the population ages, the private saving rate will tend to decline. Hence,

\textsuperscript{29}Deviations from internal balance justify using a cyclically adjusted current account balance as an indicator to identify underlying current account positions.

\textsuperscript{30}Table 22 in Annex 1 of the October 1993 World Economic Outlook (IMF, 1993d) reports estimates of potential output for the major industrial countries.

\textsuperscript{31}Approaches of this type date back to Sachs (1981). Mendoza (1992) provides a more recent framework, while Razin (1993) and Obstfeld and Rogoff (forthcoming) supply an overview of the literature. Ghosh (1990) provides some empirical results for the intertemporal approach to the current account using a highly stylized model.

\textsuperscript{32}For an analysis that explains movements in the current account in terms of the determinants of private saving and investment, see Knight and Masson (1989).
cross-country differences in demographic trends imply movements in the equilibrium value of the current account. Similarly, Masson and Meredith (1990) use MULTIMOD to analyze the consequences of German unification on the world economy. Yet another alternative is to employ small theoretical models, using empirical estimates of underlying parameters, to provide estimates of the relationship between macroeconomic disturbances, the current account, and the real exchange rate (Ostry (1988)).

One related issue is the impact of the government balance on the current account. At one extreme, the Ricardian model (Barro (1979)) predicts that changes in taxation will be associated with offsetting changes in private saving and hence that there will be no net impact on the current account. Alternatively, if private sector behavior is unaffected by the actions of the government, then changes in the government balance would feed into the external accounts on a one-for-one basis. The empirical evidence points somewhere between these extremes, showing a partial private sector offset of changes in the government balance and hence implying that the current account does depend, among other things, on the fiscal policy of the government. The calculation of the equilibrium level of the current account, then, requires a projection of future fiscal balances. Other aspects of fiscal policy can also affect the saving-investment balance. This is most obvious in the case of policies that directly affect private saving or investment decisions, such as the introduction of Individual Retirement Accounts in the United States or a reduction in the retirement age. In general, fiscal policies pose a significant practical problem for the macroeconomic balance methodology, since implementation requires both estimates of the effect of these policies on actual saving and investment, as well as some conclusion about the change in the underlying equilibrium levels of these variables.

Because the current account equals the change in net foreign assets (excluding the impact of valuation effects), it is necessary to ensure that the saving-investment approach to the current account is consistent with the equilibrium path of net foreign assets. While the saving-investment approach focuses on flow equilibrium, the net foreign asset approach involves identifying the underlying stock equilibrium of the economy. Here, the key is to determine the underlying demand for net foreign assets and the speed of adjustment toward this equilibrium. Masson, Kremers, and Horne (1993) provide some empirical work along these lines. Looking at the underlying stock of net foreign assets focuses attention on the need to ensure that the level of international debt is kept within values that markets are willing to accept, and in particular that debt does not explode in future years. Explicit consideration of the net stock of foreign assets is thus needed to ensure that the equilibrium current account position is consistent with the determinants of international financial capital flows, such as interest rate differentials.

## Calculating the Macroeconomic Balance Exchange Rate

Once positions of internal and external equilibrium have been identified, the next step is to calculate the underlying exchange rate consistent with these values. Because this means the computation of a real exchange rate, changes in domestic and foreign prices feed through directly into the equilibrium nominal exchange rate; thus, different inflation rates across countries are taken into account in the same manner as in the assessment of exchange rates based on international competitiveness considerations. The macroeconomic balance approach therefore encompasses the indicators approach but is more comprehensive, since other economic fundamentals enter the calculation via their effects on the levels of internal and external balance.

Two methods for making this calculation have been adopted in the literature: comparative static calculations and simulations using large macroeconomic models. Because comparative static calculations often involve explicit consideration of many of the assumptions underlying both approaches, they are discussed below in some detail. This discussion is followed by an examination of how macroeconomic model simulations can be used to carry out the same calculations, together with an assessment of the comparative advantages of the approaches. Clearly, in practice neither method will produce an unambiguously unique value for the equilibrium exchange rate. Rather, these calculations will produce a range within which the underlying equilibrium exchange rate is likely to lie.

The macroeconomic balance exchange rate depends on the underlying relationship between

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33Note, however, that even in the Ricardian model changes in real government spending will affect the economy and hence the current account.

34Bernheim (1987) provides an overview of the issues and the empirical evidence.
the current account and its determinants, namely, domestic output, foreign output, and the real exchange rate. This functional relationship can be derived from estimated equations for trade volumes and prices. The volumes of exports and imports depend mainly on the levels of economic activity at home and abroad and on the real exchange rate. This relationship is the empirical counterpart to the $CA^*$ line in Chart 4, with foreign output included since it affects the current account through the demand for exports. It is then straightforward to calculate the level of the real exchange rate that is consistent with estimated equilibrium values of the current account, domestic output, and foreign output.

While this calculation provides an estimate of the deviation of the current real exchange rate from its equilibrium value, it does not explain the reasons for such a misalignment. For example, an exchange rate appreciated relative to its calculated equilibrium value could reflect an unsustainable fiscal policy, a monetary policy oriented toward dissaving, divergent cyclical positions, speculative movements in the market exchange rate, or any number of other causes. Clearly, the appropriate policy response will depend on the underlying causes of the misalignment, an analysis of which requires a detailed judgment of the particular circumstances of the country in question. This paper is concerned only with the crucial first step in this process, namely, how to identify whether an exchange rate misalignment exists.

The chief complications in implementing the comparative static approach include parameter uncertainty, time lags in the estimated equations, trends in the real exchange rate, the relationship between the real and nominal exchange rate, and the impact of the adjustment path on the final result. These will be discussed in turn.

The accuracy of any estimated equilibrium exchange rate depends on the correctness of the empirical specification and on the precision of the underlying trade elasticities. Estimates of the elasticities associated with both activity and relative prices vary significantly across empirical trade models. This range of estimates needs to be taken into account in assessing the precision of equilibrium exchange rate calculations. Most estimated trade equations also show that there are time lags before changes in output and changes in the real exchange rate exert their influence on the current account. This means that the current account relationship must take into consideration the impact of past changes in output and in the real exchange rate, as well as any trend in the level of the real exchange rate caused by underlying factors, such as differential rates of productivity growth. In addition, the calculated real exchange rate will not translate into a one-for-one change in the nominal rate, because the change in the nominal exchange rate required to achieve this real value will depend on the sensitivity of domestic prices and wages to exchange rate changes. In particular, if the economy is very open to international trade, changes in import prices will significantly affect prices of consumer goods, real incomes, and wages. The nominal exchange rate component of the equilibrium exchange rate needs to reflect these domestic price responses. Finally, the equilibrium exchange rate may also depend on the speed at which the economy moves back to equilibrium, due to the impact of the adjustment path on the external net assets of the country. An economy that has a current account below its desired level also has net foreign assets that are falling below their desired path. This implies higher interest rate payments to foreign creditors, an even lower current account, and hence a larger eventual real exchange rate adjustment.

Several papers have applied the comparative static approach to estimate underlying equilibrium exchange rates. Barrell and Wren-Lewis (1989) use the approach to estimate equilibrium rates for the major industrial countries. Assuming an equilibrium current account deficit of 1 percent of GDP for the United States and a desired surplus of 2 percent of GDP for Japan and Germany, they conclude that in 1989 the U.S. dollar was above its equilibrium value by 5–15 percent, while the yen and deutsche mark were below theirs by 5–17 percent. Bayoumi and others (1994) carry out a similar exercise for the major industrial countries during the breakup of the Bretton Woods fixed exchange rate system; however, the primary focus is on methodological issues rather than producing estimates of equilibrium exchange rates. Church (1992) and Wren-Lewis and others (1991) use the approach to evaluate the parity chosen by the United Kingdom when it entered the...
exchange rate mechanism of the European Monetary System.\textsuperscript{39}

In principle, an approach similar to that suggested here could be used to analyze the equilibrium exchange rates of developing countries.\textsuperscript{40}

This approach would be particularly useful for the middle-income developing countries with relatively diversified, open economies and low tariffs, such as Korea, Thailand, Malaysia, and (more recently) Mexico. For other developing countries, the analysis is still relevant, but account needs to be taken of several factors that are more important for these economies than for industrial countries. In particular, the effects of changes in the terms of trade, tariff policy reforms, capital market constraints, and high and variable levels of inflation need to be considered in detail in calculating the equilibrium exchange rate.\textsuperscript{41}

Thus far, we have outlined the comparative static approach to calculating the exchange rate consistent with macroeconomic balance. An alternative approach, taken by Williamson (1985 and 1994), is to employ macroeconomic model simulations to calculate the exchange rate associated with internal and external equilibrium. Williamson (1994) explores this approach comprehensively. Several large macroeconomic models are used to estimate equilibrium exchange rates for the major industrial countries in early 1990. His preferred estimates indicate significant deviations between actual real exchange rates and their underlying equilibrium values, particularly for the three largest industrial countries.\textsuperscript{42}

An advantage of the macroeconomic approach is that it provides a consistent framework that automatically takes into account the interactions discussed above, such as the interactions between the level of net foreign assets and the current account, and the interaction between changes in the nominal exchange rate and domestic prices. Moreover,

to the extent that the model is intertemporal, it can incorporate the forward-looking behavior of economic agents. Large macroeconomic models can also take better account of the way in which the economy moves back toward equilibrium. Potential output depends on the capital stock and the NAIRU, which in turn depend on many other factors, including government consumption, taxation, and structural policies. Because internal equilibrium is contingent on achieving full employment output, any endogenous movements in the level of potential output will influence the equilibrium exchange rate. Bayoumi and others (1994) find that even when the size of the exchange rate adjustment is similar, the effect of the exchange rate change on key economic variables such as output and absorption can vary significantly depending on how the adjustment is brought about.

On the negative side, large macroeconomic models are complex. Because the exchange rate depends on all of the interactions within the model, it reflects the degree to which these interactions have been properly specified. The size and complexity of these models often make it difficult to check the appropriateness of such specifications. In addition, sensitivity analysis of the results can be time-consuming.

Nonetheless, such sensitivity analysis is valuable, as demonstrated by results reported in Bayoumi and others (1994). Illustrative equilibrium exchange rates for the major industrial countries were calculated for 1971 (the period of the breakup of the Bretton Woods fixed exchange rate system) under a number of different assumptions about the underlying elasticities, lags, and equilibrium current accounts. Depending on the country, the estimated range in the calculated equilibrium exchange rates varied between 10 and 30 percent.\textsuperscript{43}

This uncertainty, however, has to be compared with the size of real exchange rate movements over the floating rate period. For example, the real effective exchange rate for the U.S. dollar fell roughly a third between 1985 and 1988 (see Chart 3). While this case is extreme, it does illustrate the size of the movements in the real exchange rate during the floating rate period. In the context of such large changes in competitiveness, calculations of the estimated equilibrium exchange rate furnish some guidance in assessing the extent to which actual exchange rates are in line with the economic fundamentals.

\textsuperscript{39}Both papers concluded that the exchange rate at the time of entry into the ERM was overvalued compared with its equilibrium value.

\textsuperscript{40}See Edwards (1989) for a discussion of this approach. Ostry and Reinhart (1992) provide useful estimates of some important underlying parameters. See Ghosh and Ostry (1993) for an application to developing countries of the intertemporal approach to the current account.

\textsuperscript{41}See Khan and Ostry (1991) for an analysis of some of these disturbances on the equilibrium exchange rate.

\textsuperscript{42}Williamson's figures suggest that in 1990 the United States had a real exchange rate some 11 percent above its equilibrium value, while the real exchange rates for Japan and Germany were 13 and 15 percent, respectively, below their equilibrium values; the estimates were based on current account targets of a deficit of 1 percent of GDP for the United States and surpluses of 1.5 percent of GDP for Japan and Germany.

\textsuperscript{43}Using a somewhat different methodology, Williamson (1994) finds a similar range in the estimates derived from different macroeconomic models. These findings indicate a significant degree of uncertainty in such estimates.
The approach adopted here is similar to that outlined in earlier work on industrial country exchange rates in IMF (1984). There are some important differences in emphasis, however. One concerns the equilibrium current account. This paper has suggested that the equilibrium current account should be derived in the context of a more general macroeconomic approach to the balance of payments. The 1984 analysis compared underlying current account balances (which were actual current account balances adjusted for the effects of temporary disturbances, recent relative price changes, and cyclical positions) to the normal levels of capital flows, which were based on extrapolations from past trends in international capital flows. The study concluded that it was extremely difficult to arrive at a view of the normal pattern of capital flows for the industrial countries. Another difference concerns the impact of the adjustment path on the results. Finally, the earlier work contained little discussion of the effects of changes in levels of net international debt or of potential output.

The above discussion has focused on calculating the level of the real exchange rate that is consistent with internal and external balance. It is worth noting that there have been some empirical studies of both industrial and developing economies that estimate relationships between real exchange rates and a given set of fundamental determinants. Although the selection of explanatory variables has differed across these studies, the investigations share a general framework wherein the real exchange rate—affected by speculative and cyclical factors in the shorter term—eventually tends toward a path determined by underlying structural factors over the longer term. Emphasizing the role of variables such as trade and productivity disturbances, and the equilibrium stock of net foreign assets, these studies can in principle provide estimates of a sustainable equilibrium path for the real exchange rate based on estimated relationships between the real exchange rate and its fundamental determinants.

The key issue in implementing the macroeconomic balance approach remains the degree of confidence with which the equilibrium level of the current account can be identified. If the equilibrium current account can be specified within a relatively narrow range, then the approach would appear to offer concrete guidance in identifying disequilibria in the international economy. On the other hand, if the plausible range for underlying external positions is very wide, then this approach will be capable of catching only quite large misalignments. This section has suggested an approach to equilibrium current accounts based on the fundamental determinants of national saving and investment across countries. This in turn requires a judgment about the particular fiscal policy considered appropriate for achieving macroeconomic balance over the medium term.

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44 Stein (1994) studies the case of the United States and links the real exchange rate to productivity and thrift proxies. Preliminary estimates by Faruqee (1994) support the finding of a long-run empirical relationship between the U.S. dollar real exchange rate and the economic fundamentals that underlie stock flow equilibrium. Edwards (1989) and Elbadawi (1994) estimate equilibrium exchange rates for a number of developing countries.