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To: Members of the Executive Board

From: The Secretary

Subject: **Methodology for Current Account and Exchange Rate Assessments**

Attached for consideration by the Executive Directors is a paper on the methodology for current account and exchange rate assessments, which will be discussed in an informal seminar in June on a date to be announced shortly. Concluding remarks and issues for discussion appear on pages 37 and 38.

Questions may be referred to Mr. Isard (ext. 36640), Mr. Fetherston (ext. 38761), Mr. Kincaid (ext. 37356), and Mr. Faruquee (ext. 37332).

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INTERNATIONAL MONETARY FUND

**Methodology for Current Account and Exchange Rate Assessments**

Prepared by the Research Department and the  
Policy Development and Review Department

(in consultation with other departments)

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May 23, 2001

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## EXECUTIVE SUMMARY

Surveillance over the exchange rate policies of members lies at the core of the Fund's mandate. In recent years, the staff has strengthened its analytical work on exchange rate issues, seeking to improve its ability to identify possible tensions among currencies. An inter-departmental working group, the Coordinating Group on Exchange Rate Issues (CGER), acts as the technical secretariat to prepare exchange rate analysis for staff and management discussion. Since the Executive Board last discussed the framework for exchange rate assessments in October 1997, CGER has strengthened its methodology for the major-currency countries, extended the application to all industrial countries, and begun work on a methodology for emerging market economies.

The primary motivation for the assessment exercises is to identify cases in which exchange rates appear to be substantially out of line with macroeconomic fundamentals. It is recognized that such situations can have different interpretations, depending on the circumstances. Whether policymakers should take actions or make pronouncements when the methodology identifies possible misalignments is left as an open question, to be addressed on a case-by-case basis and in the context of considering the extent to which monetary, fiscal, and other policies are appropriate from a broader perspective.

CGER's analysis has helped to form the basis for views expressed to national authorities and in international fora such as the Group of Seven. In keeping with guidance from the Executive Board, CGER's work has not been aimed at providing regular public assessments of currency alignments. On a number of occasions, however, the assessments have provided support for the staff and management to express qualitative judgments about exchange rates among the major currencies, including in the World Economic Outlook, and in some cases the assessments have appeared in published Staff Reports.

The assessments of exchange rates among industrial country currencies rely primarily on an application of a macroeconomic balance framework, which focuses on the extent to which the current account positions associated with prevailing exchange rates are consistent with medium-run fundamentals. CGER's assessments also take account of purchasing power parity considerations, which provide perspectives on how much exchange rates deviate from historical trends in real terms (i.e., after adjusting for inflation). The formal analysis provides a starting point for a more judgmental assessment of the appropriateness of prevailing exchange rates in the context of a wider range of considerations, including the cyclical positions of national economies.

The macroeconomic balance methodology is based on comparisons of underlying current account positions with estimates of medium-run "equilibrium" saving-investment balances. The underlying positions are the external balances that would emerge at prevailing exchange rates if all countries were operating at potential output and the lagged effects of past exchange rate changes had been fully realized. The assessments rely on the WEO projections as measures of these underlying positions. The measures of equilibrium saving-investment balances are derived from an estimated equation, with judgmental adjustments, in

some cases, for factors not captured by the equation. Given the estimates of underlying current account positions and equilibrium saving-investment balances, a globally consistent framework is used to calculate the amounts that multilateral and bilateral exchange rates would have to change, other things equal, to adjust the underlying current account balances to their medium-run equilibrium positions.

CGER's estimates of equilibrium exchange rates are not very precise. Imprecision emerges both from the limitations of the conceptual models and empirical techniques used to generate estimates of underlying current account positions and equilibrium saving-investment balances, and from the need to adjust for global current account discrepancies. Nevertheless, for cases in which the assessments point to substantial deviations of exchange rates from their medium-run equilibrium levels, the qualitative findings are noteworthy. As indicated in the 1997 paper, retrospective applications of the CGER methodology to episodes that are widely regarded as extreme misalignments of the major currencies during 1980-1995 would generally have delivered correct signals at the time.

Substantial discrepancies between exchange rates and their medium-run equilibrium levels, when they emerge, raise two different but related issues for the Fund to address in its exercise of bilateral and multilateral surveillance. One issue is whether such discrepancies imply that policy adjustments are warranted in the near term. A second question is how macroeconomic performance would be affected in the event of a sudden and sharp exchange rate correction.

The analytic framework that CGER uses to assess the current account and exchange rate positions of industrial countries rests on capital mobility assumptions that are not entirely appropriate for most emerging market economies. Accordingly, CGER has been developing an alternative methodology for these economies, focusing first on criteria for assessing when the size of their underlying current account deficits or surpluses may be unsustainable. Several applications of the methodology, to test and improve it, are likely to be required before CGER can provide adequately-considered assessments of current account sustainability. When this work is completed, CGER's analysis of the sustainability of current accounts from a medium-run perspective will contribute to assessing vulnerability to currency crises in the short run and will complement ongoing work to develop and implement an early warning system based on a broader set of indicators.

## I. INTRODUCTION

1. In late 1994, the staff took a step toward making surveillance more effective by initiating more extensive and systematic assessments of the current account positions and exchange rates of the major industrial countries, incorporating both the perspectives of area department desks and calculations derived from a multilateral framework implemented by the Research Department. In 1995, an interdepartmental working group, the Coordinating Group on Exchange Rate Issues (CGER), was established by management to strengthen and extend this work, and to provide a greater degree of discipline and consistency in the staff's judgments about exchange rates.<sup>1</sup> CGER's methodology for assessing the current accounts and exchange rates of the major industrial countries was discussed by the Executive Board in October 1997 and subsequently published in an Occasional Paper.<sup>2</sup>

2. This paper provides an updated description of the CGER methodology. Such a review seems useful in light both of developments in the methodology itself and of turnover on the Executive Board. Since the 1997 Board seminar, CGER has enhanced its methodology for assessing the current accounts and exchange rates of industrial countries, has extended the application to all industrial countries, and has made progress in developing a methodology for assessing the current account positions of emerging market economies. The latter, when completed, will complement the results of ongoing staff work to develop and implement an early warning system based on a broader set of indicators.

3. CGER's work on industrial countries is motivated by the wide fluctuations that have occurred in exchange rates among major currencies during recent decades. As illustrated by Figure 1, both the nominal and real effective (weighted-average) exchange rates of major currencies have frequently exhibited prolonged movements in one direction followed by pronounced reversals. One case in point is the dramatic rise of the U.S. dollar during the first half of the 1980s, followed by an equally large drop between early 1985 and early 1987. The yen and the pound have also been pushed sharply up and down a number of times over the past two decades, and similar wide variation is evident for weighted-average exchange rates of the deutschemark against the currencies of countries outside the Euro Area.

4. Economists have achieved reasonable success in developing an understanding of the relationships between exchange rates and macroeconomic fundamentals over the *medium run* and, hence, of the trends in exchange rates over time. In particular, trends in nominal

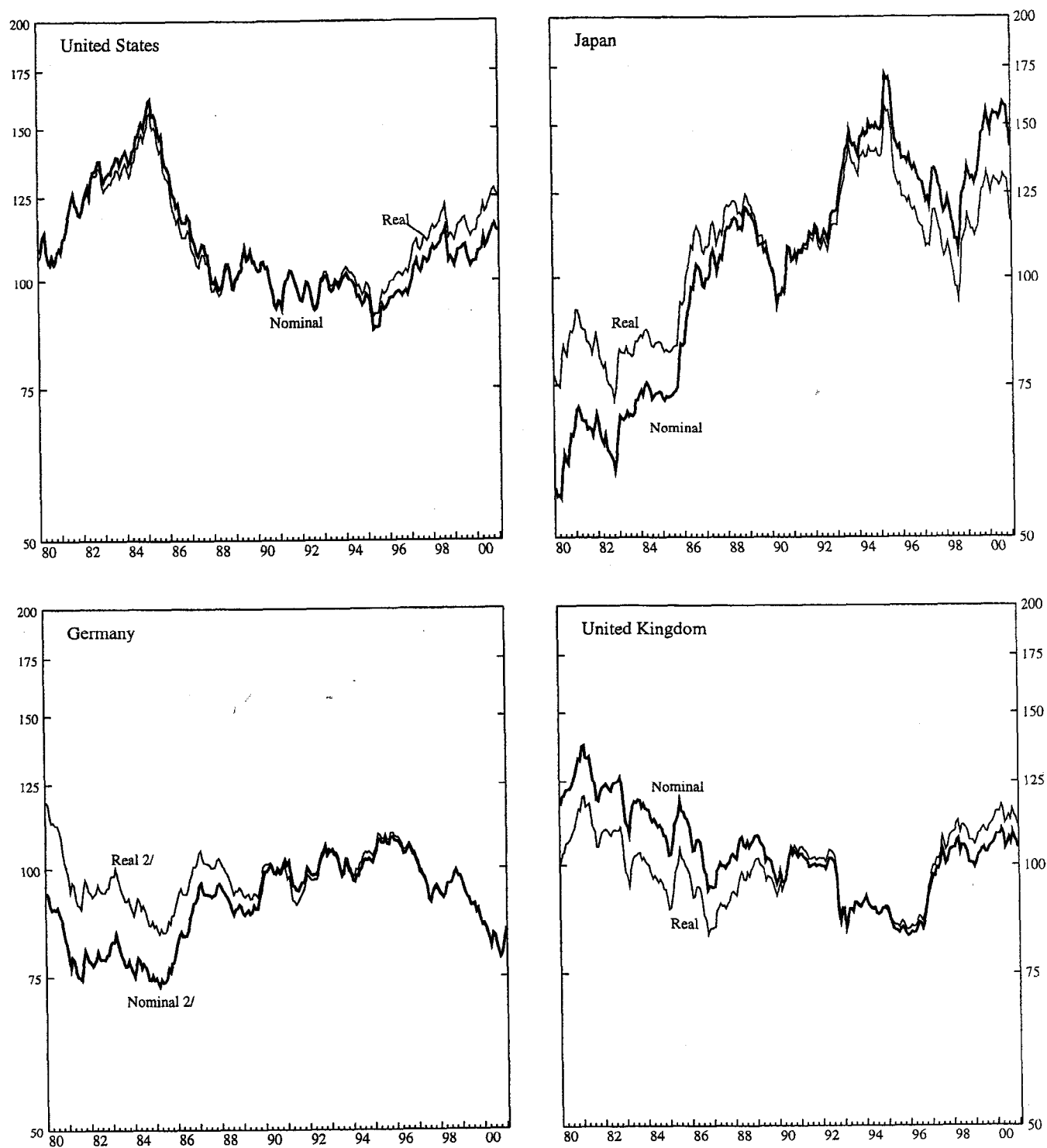
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<sup>1</sup> CGER is co-chaired by the Policy Development and Review Department and the Research Department, with active participation by area departments.

<sup>2</sup> "A Methodology for Exchange Rate Assessments and its Application in Fund Surveillance over Major Industrial Countries" (SM/97/252, October 6, 1997); and Isard and Faruquee, eds. (1998).

Figure 1. Selected Industrial Countries: Nominal and Real Effective Exchange Rates,  
January 1980 to January 2001 1/

(1990=100; logarithmic scale)



1/ Real effective exchange rates are based on consumer price indices. Increases correspond to appreciations.

2/ Weighted averages against trading partners outside the Euro area.



exchange rates tend to reflect inflation differentials over the medium run and real exchange rates to gravitate toward levels at which the associated current account imbalances are fairly moderate in size and consistent with factors that influence the relative saving and investment positions of different countries over the medium run. It has also been demonstrated formally that the *short-run* behavior of exchange rates includes a large unpredictable component. Although a consensus has emerged on partial explanations for some of the large deviations of currency values from their medium-run trends, such as the impact of the shift in the U.S. policy mix in pushing the dollar higher in 1980-82, for the most part changes in macroeconomic fundamentals have not provided convincing and generally accepted explanations for the wide swings in exchange rates. This has contributed to the view that market exchange rates sometimes become substantially misaligned with medium-run macroeconomic fundamentals.

5. Wide swings in real exchange rates have major effects on countries' competitiveness and can have significant implications for the growth and composition of economic activity and employment. Moreover, the potential for substantial nominal and real effects of large exchange rate changes complicates the task of monetary policy, sometimes adding significantly to the difficulties of keeping economies expanding at close to full potential and with low inflation. Accordingly, the behavior of exchange rates is a relevant concern for policymakers. In making policy decisions, it can be important to assess by how much prevailing exchange rates deviate from the levels that are consistent with medium-run fundamentals—or, equivalently, the levels toward which exchange rates seem likely to gravitate over time.

6. The staff's efforts to assess exchange rates have received encouragement from the Executive Board. During a discussion in 1994, Directors generally agreed that the Fund needed to monitor closely and assess carefully actual or emerging exchange rate misalignments.<sup>3</sup> They emphasized the considerable difficulties in estimating equilibrium exchange rates and indicated that Fund views on possible misalignments should be communicated in a timely and confidential manner to the authorities concerned. At the same time, most Directors were opposed to the Fund taking a more public posture on exchange rate misalignments. These views were echoed during the October 1997 discussion of the CGER methodology.<sup>4</sup>

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<sup>3</sup> "Summing Up By the Chairman — Future Orientation of the Fund – Making Multilateral Surveillance More Effective, and Observations and Issues Concerning International Policy Coordination" (SUR/94/115, September 22, 1994).

<sup>4</sup> "Concluding Remarks by the Acting Chairman—A Methodology for Exchange Rate Assessments and its Application in Fund Surveillance over Major Industrial Countries" (SUR/97/122, October 30, 1997).

7. In keeping with the guidance of the Board, CGER's work has been aimed at informing staff judgments about currency alignments, and the circulation of CGER's assessments has been limited. On a number of occasions, however, these assessments have provided a basis for the staff and management to express qualitative judgments about exchange rates among the major currencies, both in the context of the World Economic Outlook (WEO) and in meetings of the Group of Seven and other international fora. The assessments have also been employed by area departments in their dialogs with national authorities during Article IV consultations with industrial countries, and in some cases the assessments for individual countries have appeared in published Staff Reports. CGER revisits its assessments semi-annually in association with the updating of the WEO projections. Executive Directors have been kept informed through World Economic and Market Developments (WEMD) sessions and, beginning in August 2000 and again in March, written summaries of the semi-annual assessments have been distributed to Directors.

8. This paper describes the methodologies that CGER has developed for its assessments of the current accounts and exchange rates of industrial countries (Section II) and the current accounts of emerging market economies (Section III). It is not intended to focus on numerical assessments per se, which have been presented to the Board in other contexts. The paper concludes with a list of issues for discussion (Section IV).

## **II. METHODOLOGY FOR CGER'S ASSESSMENTS OF INDUSTRIAL COUNTRIES**

### **A. Background and Caveats**

9. The quantification of equilibrium exchange rates is a somewhat murky area of economics. Conceptual frameworks typically rely on strong simplifying assumptions, and the empirical support for different approaches is mixed. From a policymaking perspective, however, such exercises are important: the IMF cannot effectively exercise its surveillance responsibilities without forming views about possible misalignments of exchange rates and considering the risks of sudden and sharp corrections of currency misalignments.

10. Success in explaining the behavior of exchange rates—and, hence, in providing meaningful empirical support for methodologies of assessing equilibrium exchange rates in terms of economic fundamentals—depends importantly on time horizons. Based largely on research that flourished during the 1970s and early 1980s, economists have concluded that models of the links between currency values and economic fundamentals perform little if any better than random walks in predicting the behavior of exchange rates in the short run.<sup>5</sup> Furthermore, from surveys of commercial banks and other private financial institutions that

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<sup>5</sup> Meese and Rogoff (1983a, 1983b, 1988). Numerous attempts to overturn the Meese-Rogoff results have failed; see Rogoff (1999) and the survey by Frankel and Rose (1995). Moreover, as emphasized by Flood and Rose (1999), the short-run volatility of exchange rates far exceeds the volatility of macroeconomic fundamentals.

actively participate in exchange markets, policymakers have learned that market participants condition their short-run trading strategies to a large extent on “technical analysis” of very recent trends or other patterns in the observed behavior of exchange rates, although they regard fundamentals as much more important than technical analysis in their long-term decision making.<sup>6</sup> These perspectives discredit the notion that exchange rates should be expected to adjust, in the short run, to fundamentals-based equilibrium levels.<sup>7</sup> Partly for that reason, most methodologies for defining equilibrium exchange rates have relied on models of behavior over a medium-run or long-run horizon.<sup>8</sup>

11. One traditional methodology for defining equilibrium exchange rates is the purchasing power parity (PPP) approach, which hypothesizes that the nominal exchange rate between any two currencies should closely reflect the relative purchasing powers of the two monetary units, as indicated by national price levels.<sup>9</sup> It is commonly expressed as a hypothesis that, over a given period of time, the percentage change in the nominal exchange rate between any two currencies will equal the difference between the percentage changes in the price levels of the two corresponding countries—or, equivalently, that the real exchange rate between the two currencies remains constant.

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<sup>6</sup> Group of Ten Deputies (1993).

<sup>7</sup> Economists have also had limited success in finding fundamentals-based explanations for the short-run behavior of the prices of assets other than foreign exchange—for example, equity prices.

<sup>8</sup> The distinction between the short run and the medium run is also relevant for reconciling the influence of capital flows on exchange rates with the role of the current account. The dramatic changes that have occurred in the size of financial asset holdings, and in the amounts of these holdings that can be moved between countries and currencies in the short run, have led some to argue that capital flows drive exchange rates while current account flows have a relatively minor influence. This view can be misleading in two senses. First, although exchange rate movements and capital flows may be closely associated in the short run, capital flows are not exogenous; hence, it would be misleading to regard capital flows as more than a proximate cause of exchange rate movements. Second, in assessing the influence of the current account on exchange rates, it would be misleading to draw inferences simply from the perception that movements of exchange rates in the short run are much more closely associated with capital flows than with current account flows. The macroeconomic balance methodology described below views exchange rates as having systematic influences on current account balances and as adjusting to levels consistent with current account equilibrium over the medium run.

<sup>9</sup> The term purchasing-power-parity was coined in the early twentieth century by Cassel (1918, 1922).

12. Although PPP has been discredited as a hypothesis about the relationship between exchange rates and national price levels in the short run,<sup>10</sup> the econometric evidence is much more favorable to PPP as a hypothesis about medium-run or long-run behavior.<sup>11</sup> This is illustrated by Figure 2. Changes in nominal exchange rates are measured along the horizontal axis, inflation differentials are measured along the vertical axis, and the diagonal 45 degree line represents the set of points that are consistent with the PPP hypothesis. The figure shows that PPP becomes a much more respectable hypothesis as the time horizon is lengthened, and that—at least over the past quarter century—the long-run PPP hypothesis fits the data for industrial countries remarkably well.<sup>12</sup>

13. Policymakers have relied on the PPP formula on various occasions to help them decide whether, and by how much, to adjust *nominal* exchange rates. Such use of the PPP formula to calculate an appropriate or “equilibrium” level for the nominal exchange rate requires a decision about the type of price (or cost) index on which the calculations are to be based, as well as an assumption about the equilibrium level of the *real* exchange rate. The latter is generally taken to be the observed level of the real exchange rate during some selected base year, or the average level of the real exchange rate over an extended period of time.

14. Sensitivity to the price (or cost) measure and base period that are chosen limits the usefulness of PPP as a normative approach. Figure 3 plots five measures of the real exchange rate between the pound and the deutschemark from 1970 through 2000. Each of the measures suggests that the pound was stronger than its equilibrium rate (proxied by long-term averages) against the deutschemark (hence, the euro) in 2000; but the magnitude of the estimated deviation from equilibrium ranges from 10 to 40 percent, depending on the type of price or cost index used and the averaging period chosen. This suggests that if the United Kingdom should decide to join the Euro Area, the PPP methodology would provide only limited guidance on the appropriate level of the exchange rate at which to lock the pound to the euro.

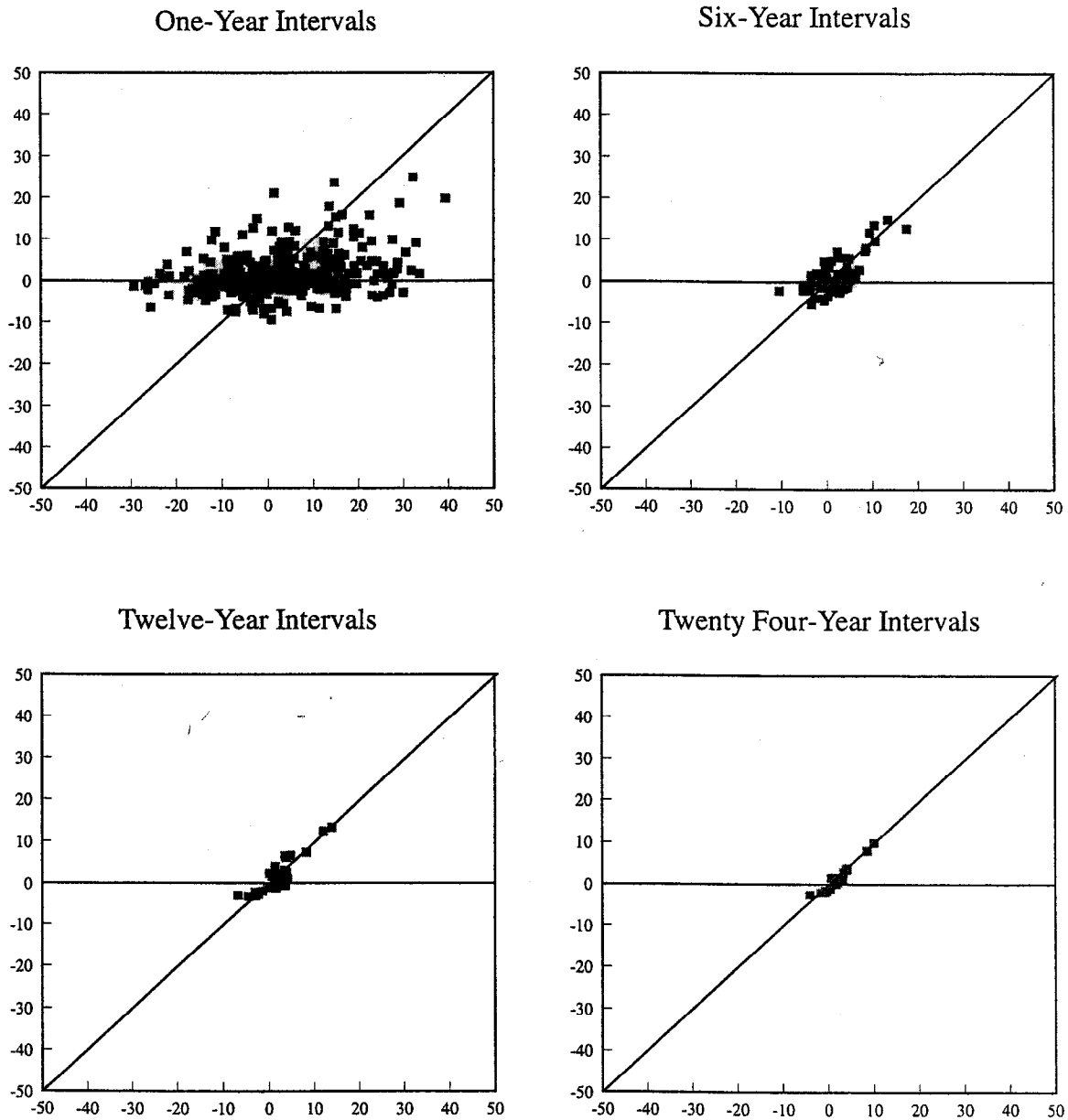
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<sup>10</sup> Whether one looks at consumer price indices, GDP deflators, wholesale price indices, unit labor costs, or export price indices, there is considerable month-to-month and quarter-to-quarter variation in the associated measures of real exchange rates. Hyperinflations provide exceptional circumstances in which PPP has not been discredited as a description of short-run behavior.

<sup>11</sup> See Breuer (1994), Isard (1995), Froot and Rogoff (1995), and Rogoff (1996) for summary discussions.

<sup>12</sup> The fit is not as close for the developing countries, or for the industrial countries over the previous quarter century. Indeed, as elaborated in the discussion of the Balassa-Samuelson hypothesis in Annex I, there is empirical evidence of systematic deviations from PPP.

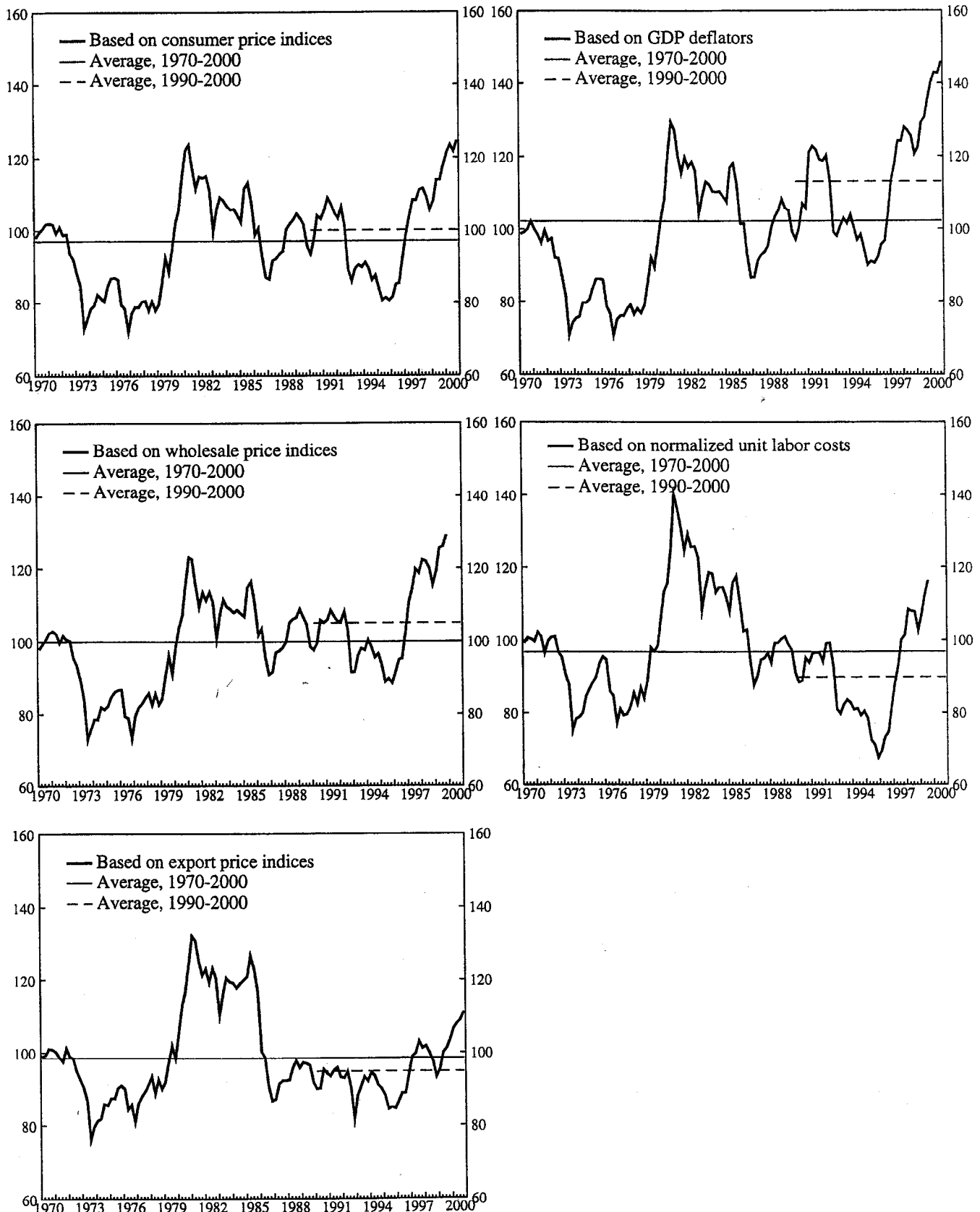
Figure 2. Scatter Plots of Exchange Rate Changes Versus Inflation Differentials Over Different Time Intervals 1/



1/ Based on Flood and Taylor (1996). The plots reflect annual-average data on the nominal exchange rates of 20 industrial-country currencies versus the US dollar, along with corresponding CPIs, for the period from 1976 to 2000. The first panel plots 480 one-year changes (24 for each country); the second plots 80 non-overlapping six-year changes (at annual rates) corresponding to the periods 1976-82, 1982-88, 1988-94, and 1994-2000; and so forth.

Figure 3. Real Exchange Rates Between the United Kingdom and Germany, 1970-2000

(1970=100)



15. Given the limitations of the PPP hypothesis as a normative approach, economists have been attracted to other methodologies for assessing exchange rates. CGER relies heavily on the macroeconomic balance approach, which makes quantitative assessments of exchange rates that are consistent with “appropriate” current account positions (external balance) when economies are operating at potential output (internal balance). Other approaches include an extended purchasing power parity approach that takes account of Balassa-Samuelson effects, methodologies that rely on estimated single-equation reduced-form models of exchange rate behavior, and the approach of relying on general equilibrium frameworks. Annex I outlines these alternative approaches and why CGER has chosen not to rely on them.

16. Key features of the macroeconomic balance approach have been prominent in calculations by the IMF staff since at least as far back as 1967, when views were developed about the appropriate size of the prospective devaluation of sterling.<sup>13</sup> As refined by the IMF staff during the 1970s and early 1980s,<sup>14</sup> and also used by Williamson (1985) and others in their early work on “fundamental equilibrium exchange rates” (FEERs), the macroeconomic balance approach was rooted in the balance of payments identity. In particular, these applications tended to define external balance in terms of “balanced” or “normal” or “target” or “underlying” capital flows, and then estimated the levels of real exchange rates that would equate current account balances—at positions of internal balance—to these notions of equilibrium capital flows. By contrast, applications at the IMF today, as elaborated below, are rooted in the national income accounting identity that links the current account to the saving-investment balance. While the two identities are closely related, the shift in emphasis has been in the direction of relying less on ad hoc judgments about equilibrium capital flows, which are difficult to make in an environment of high and rising capital mobility, and more on models of the behavior of the saving-investment balance over the medium run.<sup>15</sup>

17. It is important to recognize at the outset that CGER’s analysis is subject to considerable limitations in generating definitive estimates and to various caveats in interpreting the assessments. A key limitation is that the quantitative assessments are inherently imprecise. In general, economists do not have the conceptual basis or empirical methodology for generating exact estimates of the exchange rate levels that are consistent with medium-run macroeconomic fundamentals. As will become evident below, imprecision

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<sup>13</sup> See Polak (1995), who emphasizes the focus on external balance and the use of elasticity calculations but does not mention any focus on internal balance. The approach apparently began to take shape in the writings of Nurkse (1945) and Metzler (1951) and benefited from pathbreaking contributions by Meade (1951) and Swan (1963).

<sup>14</sup> Artus (1978) and Artus and Knight (1984).

<sup>15</sup> See, for example, Knight and Masson (1988), Williamson, ed. (1994), Clark and others (1994), Debelles and Faruquee (1996), Isard and Faruquee, eds. (1998), and Faruquee, Isard, and Masson (1999).

enters CGER's quantitative analysis in several different places. Such imprecision provides the rationale for generating assessments with both the macroeconomic balance framework and a purchasing-power-parity approach, and for characterizing CGER's summary assessments as approximations or ranges that involve a significant element of judgment.

18. A further important caveat is that large deviations of exchange rates from their medium-run equilibrium levels (even if these could be estimated precisely) do not necessarily represent currency misalignments. In some cases, such deviations may reflect short-term cyclical factors rather than medium-run disequilibria. Moreover, regardless of their cause, deviations of exchange rates from medium-run equilibrium can sometimes be helpful from a short-run perspective; in particular, an appreciated currency can help cool an overheated economy, just as a depreciated currency can help reinvigorate a weak one. Furthermore, quite apart from cyclical considerations, deviations of exchange rates from medium-run equilibrium sometimes reflect a need for policy adjustment rather than an indication that markets are wrong.

19. Two related points should be kept in mind when interpreting CGER's assessments. First, the assessment that a currency is substantially stronger or weaker than its medium-run equilibrium level does not necessarily imply a high probability of a sudden and sharp correction. Consequently, it is difficult to evaluate the assessments on the basis of their track record in anticipating exchange rate movements. The failure of the U.S. dollar to weaken significantly since early 1997, when CGER began to assess it as substantially stronger than its medium-run equilibrium level, can be interpreted as either a persistent error in CGER's analysis or an implication of the possibility that misalignments can be persistent. Second, there is no general answer to the question of whether policy actions should be taken when exchange rates appear to deviate substantially from their medium-run equilibrium values. The staff's analysis leaves the latter issue to be addressed on a case-by-case basis in the context of a broader assessment of macroeconomic circumstances. Whether anything should be said publicly in such a situation is also left as an open question.

## **B. Macroeconomic Balance Assessments**

20. As noted earlier, the macroeconomic balance framework is based on the accounting identity that links a country's current account balance (CUR) to the excess of domestic saving (S) over domestic investment (I).<sup>16</sup>

$$CUR = S - I \quad (1)$$

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<sup>16</sup> There are some definitional distinctions between national accounts concepts and balance of payments concepts that need to be taken into account when applying the macroeconomic balance framework, especially with respect to the treatment of net factor income payments and transfers.



The current account balance is explicitly recognized to depend on the real exchange rate, which influences the volumes and prices of exports and imports. A complicating feature is that the effects of changes in the exchange rate on CUR usually take some time to materialize fully. CUR also depends on the levels of domestic and foreign aggregate demand (or other measures of economic activity) and on various other factors that may shift the current account balance over time.

21. The broad outline of CGER's approach remains unchanged from the overview presented in the 1997 paper and is recapitulated here for convenience. The first step in applying the framework is to estimate each country's *underlying current account position*, which is the relevant measure of CUR for assessing exchange rates from a medium-run perspective. The underlying current account is defined as the value of CUR that would emerge at prevailing exchange rates if all countries were producing at their potential output levels and the lagged effects of past exchange rate changes had been fully realized. Under normal assumptions, a country's underlying current account position will be inversely related to the prevailing level of its real exchange rate, as depicted by the negatively sloped line labeled UCUR in Figure 4; that is, a decline (or depreciation) in the real exchange rate will normally improve the underlying current account. If the real exchange rate was  $R_1$ , the first step in the macroeconomic balance approach would identify the underlying current account position as  $UCUR_1$ .

22. The second step is to derive an estimate of each country's *equilibrium saving-investment position*, which is interpreted as a balance that can be regarded as "normal" from a medium-run perspective. Such estimates focus on the right-hand-side of equation (1) and also assume that countries are operating at potential output. In Figure 4, the equilibrium saving-investment balance is assumed to be independent of the real exchange rate,<sup>17</sup> as depicted by the vertical S-I line.

23. The third step is to calculate how much real exchange rates would have to change, other things equal, to be consistent with medium-run fundamentals—that is, to equilibrate, for each country simultaneously, the underlying current account position with the medium-run equilibrium saving-investment balance. Although this calculation is made in a multilateral framework, it is broadly similar to estimating the difference between  $R_1$  and  $R^*$ , where  $R^*$

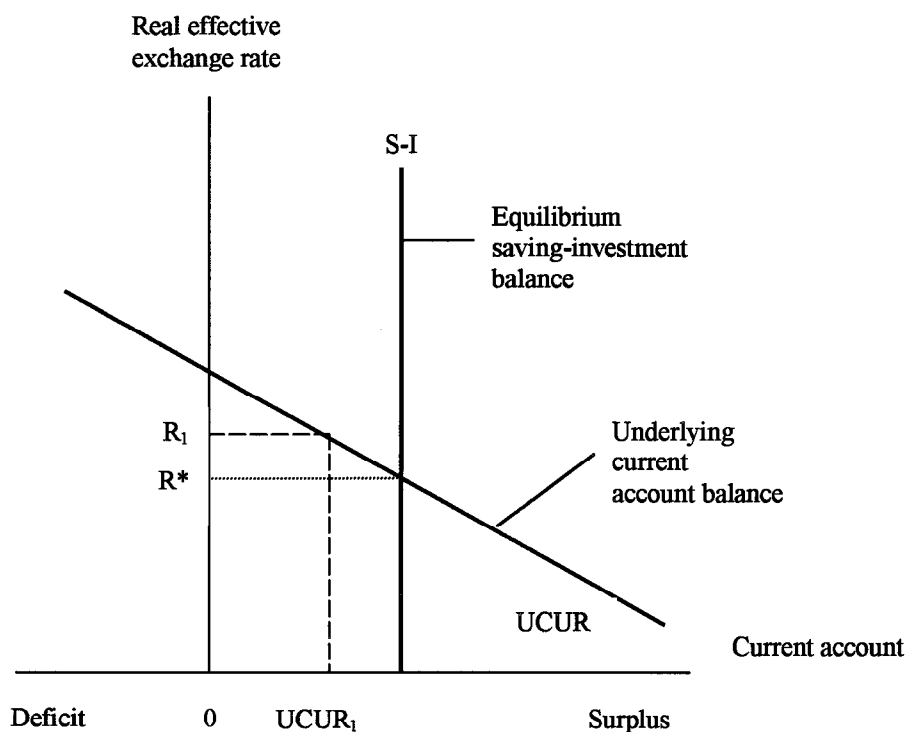
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<sup>17</sup> This simplifying assumption is consistent with the fact that most empirically-estimated reduced-form models of industrial-country saving and investment behavior do not include the exchange rate among the main determinants. As elaborated below, it is also associated with an assumption that the industrial countries have perfect access to international capital markets (apart from any time-invariant interest rate premia). A more complete macroeconomic framework could recognize that exchange rates may influence saving and investment through their effects on the terms of trade, the profitability of the traded-goods sector (or subsectors susceptible to "Dutch disease"), the level of potential output, and the distribution of income.

corresponds to the medium-run equilibrium exchange rate at which the UCUR and S-I lines intersect.

24. The methodology also involves applications of judgment, both in implementing each of the steps in the macroeconomic balance approach and in considering whether and how much to adjust the resulting macroeconomic balance assessments in light of purchasing-power-parity perspectives and other information that may be relevant. Additional judgment is required in deciding whether the final quantitative assessments imply a need for policy adjustment in the near term or point to significant risks for the macroeconomic outlook.

Figure 4. Medium-Run Fundamentals



### Underlying current account positions

25. CGER has focused on two approaches to generating estimates of underlying current account positions. One approach, developed by the Research Department (RES), is based on a standard trade model that has a relatively simple structure and employs common equation

specifications and parameter values across countries.<sup>18</sup> The RES model-based estimates of underlying current accounts have the positive attributes of global consistency and transparency, but the aggregation of non-oil trade, oil trade, and other current account items (investment income flows and transfers) and the lack of country-specific detail are disadvantages.

26. A second approach is based on the current account projections generated by the Fund's country experts in connection with the World Economic Outlook exercise. For industrial countries (and most other countries), the WEO projections are conditional on unchanged real exchange rates. Moreover, the projections for the final year in the 5-year WEO horizon assume that economies are operating at potential output and, in that sense, can be interpreted as estimates of underlying current account positions. This set of estimates has the advantage of incorporating the country-specific knowledge (including that of the models and projections of national authorities) and judgments of the Fund's area department staff. A disadvantage is that the separate projections for individual countries may lack global consistency;<sup>19</sup> indeed, as of mid-March (the time of CGER's last semi-annual assessment exercise) the staff's WEO projections summed to a global current account deficit of one percent of projected 2006 world GDP, compared with a global deficit in 2000 of about 0.6 percent of GDP. This global inconsistency, which the WEO forecasts appear to share with most other forecasts, presents a problem for the CGER exercise, as discussed in more detail below.

27. CGER has chosen to rely primarily on the WEO projections as estimates of underlying current account positions. To avoid relying uncritically on the WEO projections, however, it has disciplined its assessments by generating alternative estimates of underlying current account positions from the globally-consistent RES model and taking those estimates into account when shaping its summary judgments on exchange rates. It has also continued to use the RES model in the third step of the CGER process (see below) for calculating the changes in real exchange rates that would be needed to make the underlying current account balances consistent with medium-run equilibrium levels of saving-investment balances.

28. To strengthen the assessment process, RES has recently begun to develop benchmarks that can be used as comparators for the individual components of the WEO projections

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<sup>18</sup> The RES trade model is described in Bayoumi and Faruquee (1998). It implicitly treats all current account outflows (inflows) as merchandise exports (imports); assumes that export (import) volumes depend on both the level of foreign (domestic) activity and the current and lagged values of the real effective exchange rate; and assumes that exchange rate changes are fully passed through into import prices, with no effect on (domestic-currency-denominated) export prices.

<sup>19</sup> For major industrial countries the WEO projections are generated to a large extent from formal models, but the structures of these models differ across countries.

(Box 1). The development of these benchmarks amounts, in effect, to an effort to construct an improved version of the RES model that disaggregates the current account into different components and employs a globally-consistent and common (across countries) framework for modeling each component.

29. The benchmarks are not intended as an alternative set of projections. The simple analytic models on which they are based, while having the important property of global consistency, do not take account of country-specific factors. Moreover, history reveals considerable variation over time in observed outcomes relative to “benchmark projections” for individual countries. Nevertheless, the benchmarks provide CGER with a consistent and disciplined approach for considering the possible directions of bias in estimates of underlying current account balances based on the WEO projections and, accordingly, in the corresponding assessments of exchange rates. The perspectives provided by the benchmarks may also help focus desks and WEO coordinators on questionable features of the projections and lead to a greater degree of global consistency over time.

### **Saving-investment norms**

30. The basis for CGER’s estimates of equilibrium or normal saving-investment balances, commonly referred to by the staff as *S-I norms*, is an estimated equation generated in the Research Department.<sup>20</sup> This aspect of the present CGER framework can be viewed as a significant advance in terms of global consistency and transparency.<sup>21</sup>

31. The assumptions and derivation of the S-I model are described in Box 2. Updated estimates for the period 1971-1999 yield the following long-run relationship

$$CA = c_i + 0.23 SUR + 0.11 YPCAP \quad (2)$$

where: *CA* is the current account, expressed as a ratio to GDP; *SUR* is the fiscal surplus (as a ratio to GDP) relative to the industrial country average; *YPCAP* is income per capita relative to that of the United States; and the  $c_i$  are the country-specific constant terms. Note that

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<sup>20</sup> The original set of econometric estimates is described in DeBelle and Faruquee (1996) and Faruquee and DeBelle (1998), and the conceptual framework is further elaborated in Masson (1998) and Faruquee, Isard, and Masson (1999).

<sup>21</sup> Polak (1995) points to the lack of agreed analytic procedures for modeling equilibrium current account positions as a major weakness in the IMF’s applications of the macroeconomic balance approach during the 1970s and 1980s. Prior to the estimation of a model of saving-investment behavior over the medium run, CGER’s macroeconomic balance assessments for the major currencies were based on arbitrary assumptions about equilibrium ratios of net foreign assets to GDP and associated equilibrium ratios of current accounts to GDP.

### **Box 1. Benchmark Comparators for the WEO Projections**

The effort to develop benchmark comparators for the industrial-country WEO projections, and to improve upon the aggregated RES model, has concentrated to date on modeling the volumes and prices of non-oil exports and imports. It would be desirable, at a later stage, (a) to model oil trade in a systematic manner that captures the sensitivity of oil import (and export) volumes to changes in the relative price of oil, and (b) to systematically link investment income flows to asset stock positions and the general level of interest rates.

The formulas (equations) used to derive the benchmarks for non-oil trade have been calibrated to provide “good fits” to the history of the past 15 years for the industrial countries *on average*. In particular, non-oil trade volumes are calibrated to grow about twice as fast as economic activity when real exchange rates remain constant at prevailing levels, but with export volumes growing systematically slower (faster) and import volumes systematically faster (slower) for countries with currencies that have recently appreciated (depreciated). The equations focus on real absorption (aggregate demand) as the measure of economic activity, abstracting from supply-side factors that tend to be more important in developing countries. Such supply side factors tend to have stronger effects on developing country exports (industrial country imports) than on developing country imports (industrial country exports). Consistently, the elasticity of industrial-country import volume with respect to domestic real absorption is set at 2.1, while the elasticity of industrial-country export volume with respect to foreign real absorption is calibrated as 1.9. The benchmark calculations for trade volumes are based on the WEO projections for real absorption. The responses of non-oil trade volumes to changes in real exchange rates are calibrated with the same long-run elasticities and distributed lag patterns that are embodied in the aggregated RES model.

In contrast to the aggregated RES model, traded-goods prices are calibrated to take account of lags in the response to past exchange rate changes, a consequence of the tendency for exporters to gradually adjust prices in destination markets (i.e., to “price to market” in the short run). Thus, under the assumption of no future changes in real exchange rates and in light of the adjustment to past exchange rate changes that remains in the pipeline, export prices are calibrated to rise systematically faster (slower) than the global average, other things equal, and import prices systematically slower (faster), in countries with currencies that have recently appreciated (depreciated).<sup>1</sup>

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<sup>1</sup>The benchmark formula relates each country’s export (import) price—measured in a common currency unit, the U.S. dollar—to the global average of the WEO projections for export (import) prices in the common currency unit.

## Box 2. Derivation of the Saving-Investment Equation

The long-run saving-investment equation is derived from a model that relates each country's current account (S-I balance) to four explanatory variables: its stage of development, as represented by its per capita income position; its fiscal position; the gap between its actual and potential output levels; and the level of world interest rates.<sup>1</sup> The model is simplified by imposing the constraint that aggregate saving must equal aggregate investment for the world as a whole, which provides a condition that links the level of the world interest rate to the other variables in the model. This condition can be substituted for the level of the world interest rate to derive an equation that relates each country's S-I balance to *relative levels* of its per capita income, fiscal position, and output gap. Substituting out the world interest rate is not equivalent to treating it as a constant, or as irrelevant to the S-I balances of individual countries, but rather amounts to an implicit assumption that the world interest rate is determined by global variables—including, in particular, global measures of income per capita, the fiscal balance, and the output gap.

Econometric testing of the model focused on both cross-section and panel results, exploring the panel data with both error-correction and partial-adjustment models, taking into consideration a reasonably long list of candidate explanatory variables, and settling in the end on a partial-adjustment equation; see Faruquee and DeBelle (1998). The relative fiscal position and most of the country-specific constant terms were highly significant, as were the lagged dependent variable and the relative output gap (which do not appear in the long-run relationship). The econometric testing found that, for the industrial countries as a group, country-specific interest rates did not have significant effects on S-I balances when the output gap was also included as an explanatory variable. The indirect and limited role that interest rates play in the S-I model is an issue that warrants more attention in future efforts to strengthen CGER's methodology.<sup>2</sup>

The variables in the S-I model are viewed as direct determinants of saving and investment in the medium run, which are different than the explanatory variables of the standard trade-equation models that are used to generate estimates of underlying current account positions. Although one of the variables in the S-I model is the relative output gap, this variable does not appear in the long-run relationship. Its inclusion in the model enables a better overall fit of the historical data and better estimates of the parameters that capture the effects of the medium-run determinants.

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<sup>1</sup> The original version of the S-I model, as reported in the 1997 paper, included the ratio of the dependent-age population to the working-age population as a fifth explanatory variable; the estimates suggested that a higher dependency ratio implied a lower S-I balance, other things equal, although the effect was relatively small. In the updated sample the demographic variable was insignificant and wrong-signed, so it was dropped.

<sup>2</sup> A number of other empirical studies have found strong empirical links between current account flows and country-specific real interest rates; see, for example, Obstfeld and Rogoff (2000).

current account positions would not change if all countries were to reduce their fiscal positions equiproportionately, or to experience the same rates of per-capita income growth. The use of this equation to estimate the medium-run equilibrium levels of saving-investment balances relates the S-I norms to structural fiscal positions, since the calculations are based on projections at the end of the WEO horizon, where output gaps are zero.

32. The long-run relationship is derived from a model that takes account of cyclical variables, but country-specific interest rates play no explicit role. Accordingly, the present version of the S-I model abstracts from various factors that are relevant to capital flows and portfolio allocation decisions in a world in which claims on different countries are subject to different risks.<sup>22</sup> While future efforts to improve the S-I model should attempt to capture the influence of such factors, hopes for major improvements in this area are dimmed by the fact that economists have not yet had much success in empirical efforts to explain how they systematically influence the behavior of country-specific interest rate premia.

33. The framework abstracts from any influence of monetary policy on the medium-run behavior of S-I balances or real exchange rates, in contrast with the treatment of fiscal positions. Note that the structural fiscal positions that enter the S-I norms do not necessarily correspond to “desirable” fiscal balances. Nor should connotations of desirability be attached to the equilibrium or “historically normal” S-I balances.

34. The saving-investment model has been estimated with country-specific constant terms to capture the effects of omitted variables that may influence the relative saving and investment rates of different countries. These constant terms capture, for example, the fact that a relatively low S-I balance has been historically normal for the United States, other things equal, consistent with a relatively low observed saving rate for the United States, and perhaps also reflecting a relatively strong desire of nonresidents to accumulate claims on the United States.

35. The parameter estimates in equation (2) imply that a one percentage point of GDP increase in a country’s *relative* structural fiscal surplus improves its current account by 0.23 percentage points of GDP. Changes in fiscal positions are thus found to have “non-Ricardian” effects; that is, an increase in public saving is not fully offset by a reduction in private saving.<sup>23</sup> An improvement in a country’s relative living standards also leads to a

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<sup>22</sup> An implicit assumption is that each country can borrow or lend any amount of capital internationally (i.e., any shortfall or excess of domestic saving relative to domestic investment) at a fixed premium above the world rate of interest. This assumption of perfect capital mobility may be an acceptable simplification for industrial countries but would be inappropriate for most other economies.

<sup>23</sup> There is a long-standing debate on the economic implications of public deficits; see Barro (1989) and Bernheim (1989) for reviews of the Ricardian and neoclassical perspectives. Whether the effects of an increase in the fiscal surplus on aggregate saving are positive,

(continued)

higher saving-investment balance, suggesting that higher income countries tend to be larger (net) exporters of capital, other things equal.

36. Equation (2) can be regarded as a formula for generating estimates of equilibrium medium-run current account positions by adjusting historical-average saving-investment balances (as captured by the country-specific constant terms) to account for changes over time in two variables for which it seems appealing to adjust—namely, relative fiscal positions and relative incomes per capita. The simple formula leaves considerable scope for improvement through future research efforts, but it has served the important purpose of pinning down a set of judgments on equilibrium saving-investment balances and maintaining consistency in those judgments over time.

37. The implied levels of the S-I norms are shown in Figure 5 for the period from 1990 through 2006. Consistent with the concept of medium-run (cyclically-adjusted) equilibrium positions, the fiscal variables that enter the calculations of the norms are measures of structural fiscal balances and per capita income is measured as potential output per capita.

38. The United States, the United Kingdom, Canada, Australia, and New Zealand are countries in which current accounts have on average been in deficit over the past three decades, which is reflected in the deficit positions of their S-I norms. The other industrial countries are all estimated to have equilibrium S-I surpluses. In the cases of Australia, New Zealand, and Canada, the historically normal deficits in their S-I balances presumably reflect the combined influence of relatively abundant natural-resource-based investment opportunities and relatively sparse populations. The largest surplus norms are associated with Norway and Switzerland, consistent with the effects on S-I balances of substantial oil wealth in the case of Norway and a relatively large net foreign asset position in the case of Switzerland.<sup>24</sup>

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negligible, or even negative is related to prevailing economic conditions, including debt sustainability and capital market imperfections. Further work to relate the effect of fiscal consolidation to various economic determinants would be an interesting direction for enriching the saving-investment model.

<sup>24</sup> The norms reflect adjustments to the country-specific constant terms for Japan, Australia, Denmark, New Zealand, Norway, and Switzerland. In each case, the adjustment has raised the level of the curve shown in Figure 5 without affecting the time profile of the norm; the implicit counterpart of these adjustments is an increase in the size of the deficit norm for the developing countries. For Japan, the norm has been adjusted upward to offset the influence on the estimated country-specific constant term of the abnormal component of investment during the bubble of the 1980s and early 1990s. For Norway, the norm has been judgmentally raised in light of the effects on national wealth and saving of the general rise in oil prices since the historical sample period. For Switzerland, the norm has been judgmentally raised to better capture the implications of a relatively high net foreign asset position. For Australia, Denmark, and New Zealand, the norms were judgmentally raised (to  
(continued)



Figure 5. Saving-Investment Norms, 1990-2006  
(as percent of GDP)

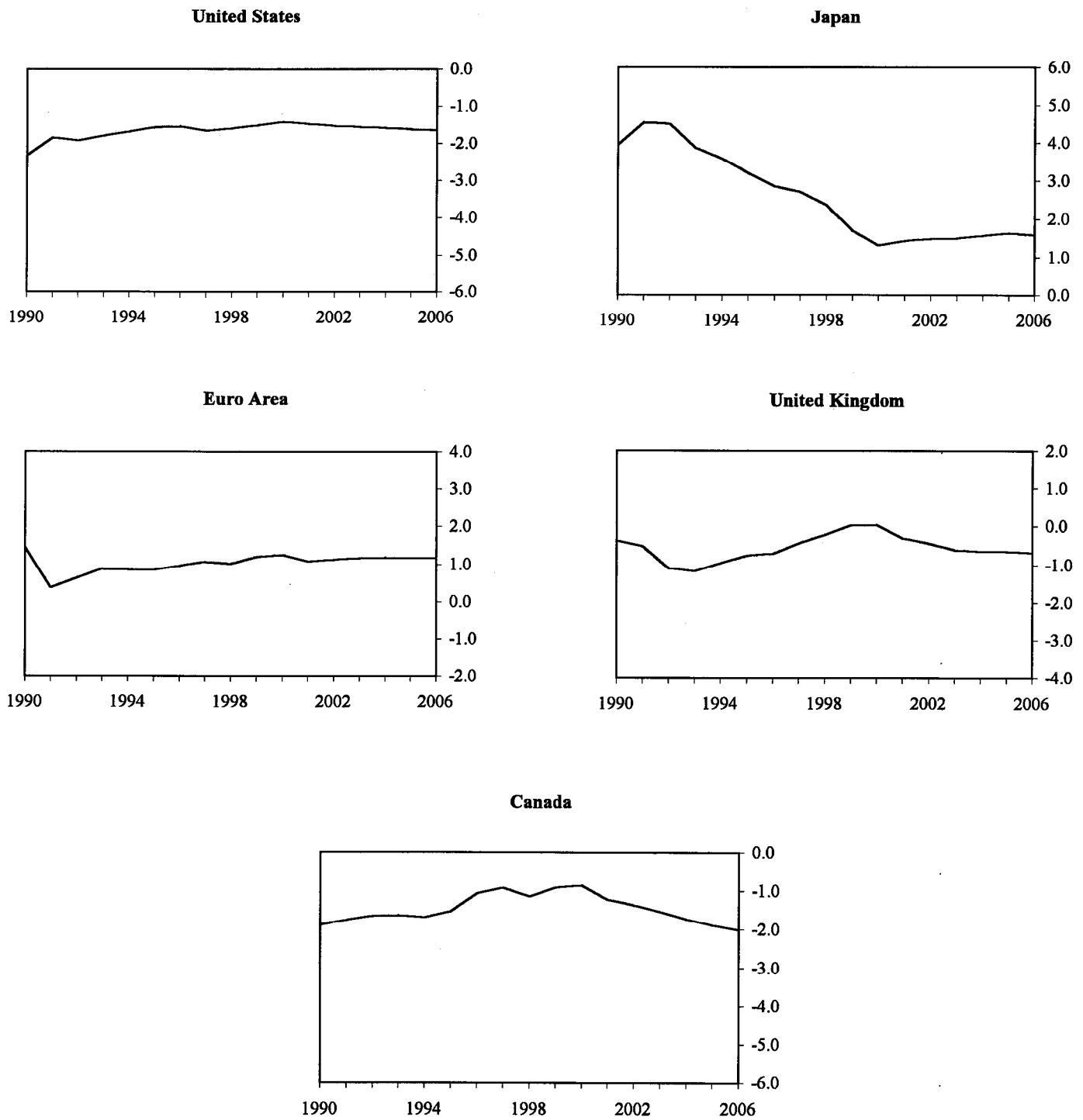
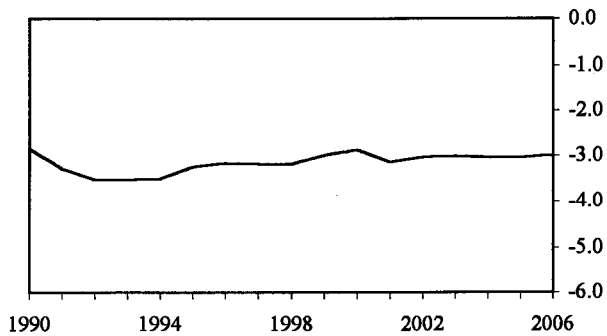
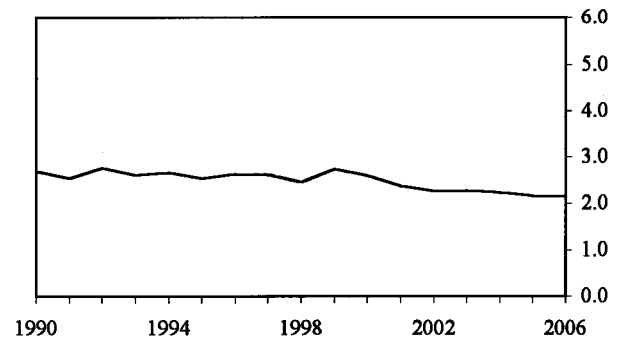


Figure 5 (continued). Saving-Investment Norms, 1990-2006  
(as percent of GDP)

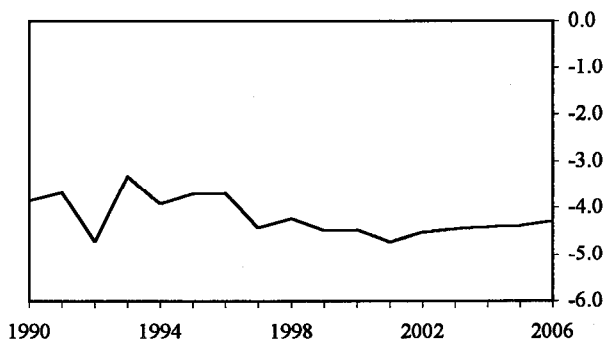
**Australia**



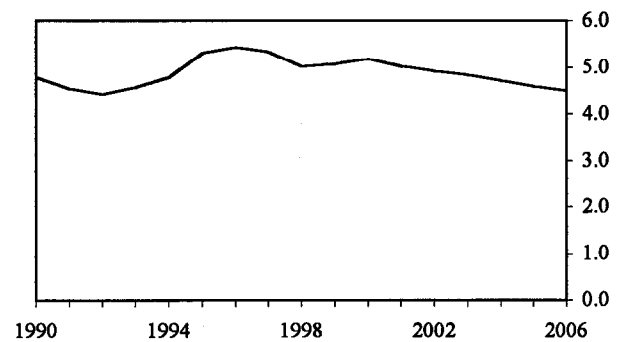
**Denmark**



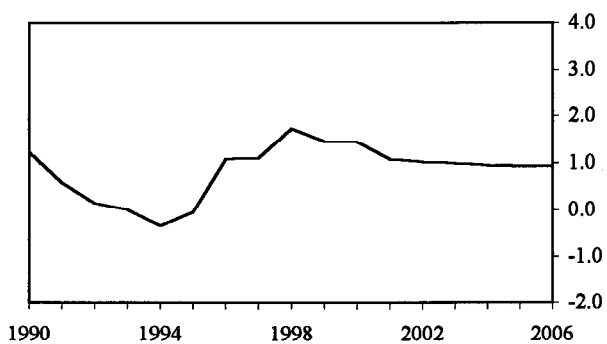
**New Zealand**



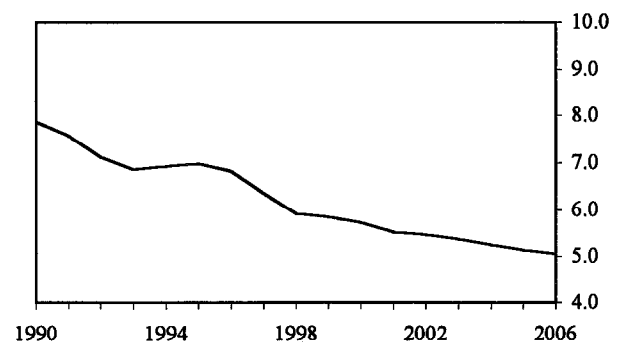
**Norway**



**Sweden**



**Switzerland**



39. The changes in the norms from one year to the next, as derived from equation (2), reflect the changes in actual (or projected) levels of structural fiscal balances and potential output (cyclically-adjusted income) per capita. In the United States the gradual upward trend (decline in the norm deficit) during the 1990s mainly reflects an improvement in the public sector's structural budget position. In Japan the time profile of the norm reflects the widening of structural fiscal deficits and relatively slow growth of potential output during the 1990s, along with the projection for a gradual reduction in the structural fiscal deficit during the five years ahead. For the Euro Area the norm has been constructed by aggregating estimates for the individual member countries, with an adjustment to account for temporary effects of German unification in the early 1990s. For most of the other countries except Switzerland, the variation in the norms primarily reflects changes over time in relative structural fiscal balances. For Switzerland, the downward trend in the norm mainly reflects the relatively slow growth of potential output per capita.

40. The simple structure of the equation used to calculate the S-I norms is one of the reasons that CGER's assessments should be viewed as imprecise.<sup>25</sup> This confronts CGER and area departments with the challenge of continuing their efforts to generate improved econometric estimates of S-I behavior for the industrial countries in general, and to take account of specific factors or structural changes that may have major influences on S-I behavior in individual countries.<sup>26</sup> To a large extent, however, the general levels of the S-I norms reflect the average historical values of the S-I balances and would probably not be much affected by more sophisticated explanations of the observed data. Thus, the main message that emerges from recent CGER assessments—that the U.S. dollar is considerably stronger than its medium-run equilibrium level—would probably not be altered substantially by a more sophisticated explanation of the historical behavior of the S-I balance for the United States.

### **Multilateral exchange rate calculations**

41. Step three of the process calculates the direction and magnitude of the implied exchange rate changes that, assuming no changes in policies or other variables, would bring currency values in line with medium-term fundamentals. This section highlights aspects of the analytical framework that are relevant for the interpretation of these calculations and also describes the treatment of the global discrepancy.

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<sup>25</sup> Such oversimplification limits the usefulness of the macrobalance approach as a normative tool, just as the usefulness of a PPP-based assessment for normative purposes is limited by sensitivity to the type of price index and averaging period chosen.

<sup>26</sup> Krajnyak (2000) has developed a portfolio allocation model of S-I behavior for Switzerland.

42. As noted above, the UCUR line in Figure 4 is negatively sloped to reflect the presumption that a lower real effective exchange rate is associated with an improvement in the current account over the medium term. In the logic of CGER's WEO-based assessments, the position of the UCUR line is assumed to reflect the projected values of economic variables at the end of the 5-year WEO horizon, when output is at potential and the lagged effects of past exchange rate changes have been realized. Thus, *projected* changes in economic fundamentals, including effects of announced policy changes, are already reflected in the position of the UCUR line. By contrast, any *unanticipated* changes in relevant economic variables over the WEO horizon, including changes that arise from unanticipated policy actions, would shift the position of the UCUR line.

43. The vertical S-I line in Figure 4 shows the normal level of the saving-investment balance determined in step two. The line is vertical because the normal level of the S-I balance (at potential output) is assumed not to depend on the exchange rate.<sup>27</sup> Its position, like that of the UCUR line, reflects the projections for relevant economic variables (in this case, per capita income levels and structural fiscal balances) at the end of the medium-run WEO horizon.

44. Given the initial real exchange rate ( $R_1$ ) and underlying current account position (UCUR<sub>1</sub>), the amount of exchange rate adjustment that is needed to equilibrate the underlying current account with the equilibrium S-I balance depends on the slope of the UCUR line. The assumptions on which the calculations are based (see below) imply that the slope of the UCUR line depends on the openness of the economy. Countries with relatively high ratios of exports and imports to GDP have relatively flat UCUR lines and require smaller percentage changes in their real exchange rates, other things equal, to achieve given changes in their trade volumes or underlying current account positions (as shares of GDP).

45. Unexpected changes in economic fundamentals—that is, deviations from the changes projected in the WEO—can shift the position of either the vertical S-I line or the negatively sloped UCUR line and thereby alter the real effective exchange rate that is consistent with medium-run fundamentals. For example, a greater-than-projected increase in (relative) per capita income or the (relative) structural fiscal surplus will shift the S-I line in Figure 4 to the right, implying a lower medium-run equilibrium level of the real effective exchange rate. The size of the implied change in the equilibrium exchange rate will depend on the extent of the shift in the vertical S-I line and on the slope of the UCUR line. Shifts in the position of the UCUR line (due to unexpected changes in medium-run fundamentals that affect the current account through channels other than real exchange rates) also change the equilibrium level of the real effective exchange rate that is consistent with medium-run fundamentals, but they do

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<sup>27</sup> As noted earlier, this simplifying assumption could be relaxed in principle (implying a non-vertical S-I line), for example to recognize the phenomenon of “Dutch disease.” However, the simplifying assumption is consistent with many other empirical models of saving and investment behavior.

not change the medium-run levels of either the saving-investment balance (assuming a fixed and vertical S-I line) or, correspondingly, the current account balance.

46. In moving from the analysis of the equilibrium level of the real effective exchange rate of a single country, as depicted in Figure 4, to conclusions about the equilibrium configuration of exchange rates in a multi-country world, it needs to be recognized that an n-country world has only n-1 independent exchange rates. It is not feasible to apply Figure 4 independently to all countries (or regions) without imposing a mathematical requirement for global consistency. The general procedure for producing such multilaterally-consistent calculations is described elsewhere.<sup>28</sup>

47. The calculations reflect two sets of specific assumptions. For purposes of characterizing the responsiveness of current account flows (and hence the underlying current account) to changes in real exchange rates, CGER relies on the aggregated RES model described earlier. This model treats each country in the same globally-consistent manner, and its parameters have been calibrated to reflect representative estimates from the literature.<sup>29</sup> The elasticities (percentage responsiveness) of export and import volumes to a given percentage change in the real exchange rate are assumed to be identical across countries. Accordingly, in countries with relatively high ratios of exports and imports to GDP, a given percentage change in the real exchange rate generates relatively large changes in trade volumes and current account balances as shares of GDP.

48. The second set of specific assumptions relates to the treatment of the global discrepancy. Although the multilateral calculation procedure itself is globally consistent (to a very close approximation), the WEO current account projections for individual countries add up to a global total that has tended to differ substantially from the sum of the estimated saving-investment norms.

49. To illustrate the multilateral calculations and CGER's treatment of the global consistency issue, Table 1 shows the results of CGER's most recent semi-annual assessment exercise for the United States, the United Kingdom, and the Euro Area. As indicated in column 5, for the United States and the United Kingdom the underlying deficits are nearly 2½ percentage points of GDP larger than the equilibrium saving-investment deficits, while

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<sup>28</sup> See Faruquee (1998). It may be noted that, when the sum of the underlying current account positions is reasonably similar to the sum of the saving-investment norms, the results of calculating equilibrium exchange rates in a multilateral framework generally do not deviate materially from those derived by focusing on countries individually (as in Figure 4).

<sup>29</sup> See Goldstein and Khan (1985). The calibrated long-run (and medium-run) elasticity of export (import) volume with respect to the real effective exchange rate is 0.73 (0.92), and it is assumed that exchange rate changes are fully passed through (over the medium run) into import prices, with no effect on (domestic-currency-denominated) export prices.

Table 1. Current Account and Exchange Rate Assessments 1/

	Nominal Exchange Rate Against U. S. Dollar 2/	Current Accounts (in percent of GDP)				Multilateral Real Exchange Rates (Percentage deviations from estimated medium-run equilibrium levels) 3/	
		WEO Data/ Projections		S-I Norm	Column 3 Minus Column 4	Calculated	Summary Judgment 4/
	(1)	2000	2006	2006	(5)	(6)	(7)
United States	1.00	-4.4	-4.0	-1.6	-2.4	↓ 26	↓ > 20
Euro Area	0.94	-0.1	1.1	1.2	-0.1	↑ 4	↑ about 10
United Kingdom	1.49	-1.4	-3.1	-0.7	-2.4	↓ 7	↓ about 10
Totals (\$billion)							
Industrial Countries		-295	-342	-64	-278		
Developing and Transition Economies		113	-80	-104	24		
Global Discrepancy		-182	-422	-168	-254		

1/ As of mid-March 2001.

2/ Average for December 26, 2000 – January 19, 2001, in U.S. dollars per euro and per pound.

3/ ↓ indicates that currency would need to depreciate to reach its medium-run equilibrium level; ↑ indicates need to appreciate.

4/ Reflects macroeconomic balance calculation in column 6 along with purchasing-power-parity perspectives and other considerations.

for the Euro Area the underlying surplus is practically the same as the norm. For each of the other industrial countries (not shown), the underlying position is either a larger surplus or a smaller deficit than the S-I norm.

50. Column 6 presents the calculated estimates of how much prevailing exchange rates deviate from their medium-run equilibrium levels in multilateral or real effective terms. Two features are noteworthy. First, the assessments of multilateral exchange rates for the dollar and the pound are quite different, despite the similar gaps between underlying current accounts and S-I norms for the United States and the United Kingdom. Second, the euro is assessed as needing to appreciate somewhat to reach its medium-run equilibrium rate, despite the fact that the underlying current account of the Euro Area is estimated to be a slightly smaller surplus than the S-I norm.

51. Part of difference between the assessments for the dollar and the pound is explained by the fact that the calculations reflect not only the discrepancies between underlying current accounts and saving-investment norms, but also the openness of the different countries. Because the United States is a relatively closed economy in comparison with the United Kingdom, each percentage point of GDP adjustment in the current account requires a larger multilateral exchange rate adjustment in the United States. Another part of the explanation, which also explains the assessment for the euro, is associated with the global discrepancy.

52. As shown in the table at the bottom of columns 2 and 3, the mid-March WEO projections for individual countries summed to a global current account deficit of \$422 billion in 2006, or one percent of the projected level of world GDP in 2006, compared with an estimated global discrepancy of -\$182 billion in 2000.<sup>30</sup> The average global discrepancy over the past two decades was a deficit of 0.4 percent of GDP, which CGER uses as a norm for the global S-I balance. This historical discrepancy ratio and the WEO projection for global GDP in 2006 would imply a global discrepancy of -\$168 billion in 2006 (column 4).

53. The large difference between the global discrepancy in the underlying current account positions and the global discrepancy in the S-I norms has a significant effect on the calculations. If the world as a whole was treated as a single country, a depreciation of 4.4 percent (relative to a hypothetical mirror-image country) would be required, other things equal, to reduce its current account deficit from \$422 billion to \$168 billion. Analogously, independent comparisons of the underlying current account positions and S-I norms for individual countries would tend to suggest estimates of equilibrium exchange rates that were biased by about 4.4 percentage points on average. The mechanical calculation procedure is

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<sup>30</sup> Outside forecasts appear to exhibit a broadly similar degree of global export pessimism. In particular, as of April, the Consensus Forecasts, which are based on surveys of more than 200 prominent financial and economic forecasters and extend over a two-year horizon, showed the global current account deficit widening to about -\$300 billion in 2001 and -\$340 billion in 2002, compared with the WEO projections of about -\$260 billion and -\$300 billion.

appropriately constrained to be globally consistent, and it essentially removes the bias in a manner that reduces (increases) by 4.4 percentage points the amount that each currency needs to depreciate (appreciate) in multilateral terms to reach its medium-run equilibrium level, other things equal. This is why column 6 suggests that the euro needs to appreciate by about 4 percent in multilateral terms. It also explains, together with openness considerations, why the pound's estimated deviation from equilibrium is so small in proportion to that of the dollar.

54. Given the need for a significant global discrepancy adjustment, as well as the limitations of the models used to generate the estimates of underlying current account positions and saving-investment norms, the exchange rate assessments that emerge from the application of the macroeconomic balance framework should not be regarded as precise. Retrospective applications to episodes that are widely regarded as extreme misalignments of the major currencies during the past two decades (in particular, exchange rates among the G-3 currencies in February 1985 and April 1995, and among major European currencies in June-July 1992) would generally have delivered correct signals at the time.<sup>31</sup> Nevertheless, the various sources of imprecision point to both the desirability of continuing efforts to improve the inputs to the calculations, including the global consistency of the WEO projections, and the need to also take other considerations into account in making judgments about equilibrium exchange rates.

### **C. Other Relevant Considerations and Summary Judgments**

55. In moving from the macroeconomic balance calculations (Table 1, column 6) to summary judgments about exchange rates, which are expressed as approximations or ranges (column 7), CGER takes account of purchasing-power-parity (PPP) perspectives. The PPP-based perspectives had an influence on the summary assessments shown in Table 1 for the dollar, the euro, and the pound. In particular, the PPP-based perspectives on multilateral exchange rates show broad similarity to the macroeconomic balance assessment for the U.S. dollar while supporting judgments that the pound is somewhat further above its equilibrium level, and the euro somewhat further below its equilibrium, than the amounts suggested by the macroeconomic balance calculations.

56. The benchmark comparators for the WEO projections, described earlier, provide another type of perspective that can be useful in moving from the macroeconomic balance calculations to a set of summary judgments. In CGER's most recent assessment exercise, the benchmarks suggested that the WEO-based macroeconomic balance calculations might be underestimating the disequilibrium in bilateral exchange rates of the U.S. dollar against other

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<sup>31</sup> See "A Methodology for Exchange Rate Assessments and its Application in Fund Surveillance over Major Industrial Countries" (SM/97/252, October 6, 1997). The retrospective applications relied on the RES model to generate estimates of underlying current account positions.



currencies. They thus lend support to the main judgment that emerges from CGER's assessments—namely, that the U.S. dollar is substantially out of line with medium-run fundamentals.<sup>32</sup>

#### **D. Applications in IMF Surveillance**

57. As emphasized earlier, the assessment that a currency is substantially out of line with medium-run fundamentals may have different explanations or interpretations. Accordingly, the implications for the Fund's policy advice in the exercise of its multilateral and bilateral surveillance responsibilities<sup>33</sup> depend on the circumstances. One issue is whether prevailing exchange rates are appropriate or helpful from a short-run perspective. This type of view received prominence during much of the 1997-99 period in considering the implications of the relatively strong U.S. dollar and pound sterling when the U.S. and U.K. economies appeared to be at risk of overheating while Japan and many European economies were relatively weak.

58. A second issue is whether deviations of exchange rates from their medium-run equilibrium levels signal a need for policy adjustment. In considering this possible interpretation, it is relevant to note that even after policy changes have been proposed by national authorities, market participants may harbor strong doubts about the prospect that the authorities will be able to muster adequate political support for the proposed measures. This was the case in Italy during 1995, when a large underlying current account surplus suggested that the lira was undervalued from a medium-run perspective, while large market interest rate premia on lira-denominated assets suggested that the weak lira reflected market concerns that the political process might not deliver the fiscal adjustment that national authorities had recommended. After the fiscal adjustment was legislated and the uncertainty was resolved, the lira appreciated to a level that appeared to be broadly consistent with medium-run fundamentals, and in late 1996 Italy rejoined the European Exchange Rate Mechanism.

59. In some circumstances, adjustment of exchange rates toward medium-run equilibrium levels would appear to be helpful from a cyclical perspective. This was judged to be the case in the spring of 1995, when the U.S. dollar was weak relative to the yen and the deutschmark and the U.S. economy seemed at risk of overheating while the Japanese and European economies were weakening. In those circumstances, the staff and management of the Fund pushed for coordinated interest rate actions by the G-3 countries, reinforced by

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<sup>32</sup> Other information that CGER looks at include private forecasts of exchange rates and market forward exchange rates; but this information has not played a significant role in CGER's assessments to date.

<sup>33</sup> During 1998 and 1999, nearly half of the industrial-country Staff Reports included discussions of CGER (or CGER-type) assessments, compared with 14 percent in 1997. See "Biennial Review of the Implementation of the Fund's Surveillance and of the 1977 Surveillance Decision—Background Paper" (SM/00/40, February 29, 2000), Table 1.

medium-term fiscal adjustment in the United States and Europe and market opening measures in Japan.<sup>34</sup> Such proposals for policy adjustment were aimed primarily at moving the economies toward internal balance and, secondarily, at bringing exchange rates to a better international alignment. In the event, while monetary policy was eased in Germany and Japan in response to weakening cyclical conditions, the case for higher interest rates in the United States was subsequently eroded by signs of a greater-than-expected slowdown in activity (partly reflecting spillovers from the economic crisis in Mexico), setting in motion a lowering of U.S. interest rates from early July.

60. In still other circumstances, deviations of exchange rates from medium-run equilibrium levels may create concerns at a time when prevailing interest rate levels remain appropriate for the needs of the domestic economy. Such circumstances raise the question of whether policy authorities should make an effort to influence perceptions through market intervention or public pronouncements.

61. These examples indicate that the quantitative estimates that emerge from CGER's analysis can only be regarded as the starting point for judgmental assessments of how to interpret cases in which exchange rates appear to deviate substantially from their medium-run equilibrium levels. Such deviations can have a range of different interpretations and policy implications and need to be considered on a case-by-case basis.

62. In addition to considering whether any near-term policy actions might be called for when exchange rates appear to deviate substantially from their medium-run equilibrium levels, it can be important to consider the risks to national economic performances and the global macroeconomic outlook. Although substantial deviations from equilibrium do not necessarily imply a high probability of sudden and sharp corrections, an analysis of what such corrections might imply is an integral part of the exercise of the Fund's multilateral surveillance responsibilities. In that connection, the World Economic Outlook has paid considerable attention in recent years to addressing the possible implications of a sudden and sharp depreciation of the U.S. dollar.

### **III. METHODOLOGY FOR CGER'S ASSESSMENTS OF EMERGING MARKET ECONOMIES**

#### **A. Points of Departure**

63. The experience of the 1990s has demonstrated that currency and financial sector crises in emerging market economies can have devastating implications for these economies and major spillover effects for the global economy. In response, the Fund has been substantially strengthening its efforts to monitor and address financial sector weaknesses and deficiencies in the provision of transparent data. The build-up of unsustainable balance sheet positions

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<sup>34</sup> See Kahn and Nord (1998) and IMF News Brief, April 14, 1995.

can leave countries vulnerable to sudden declines in capital inflows that make it impossible to sustain current accounts and exchange rates at prevailing levels. The staff has also devoted considerable research to developing a system for monitoring early warning signals of crises.<sup>35</sup>

64. In an attempt to strengthen Fund surveillance, CGER has been making an effort to extend its assessment exercises to emerging market economies. This effort is intended both to reflect on the sustainability of pegged exchange rates and, more broadly (including under floating regimes), to assess the sustainability of current account positions and the likelihood of exchange market pressures. Analysis of the sustainability of current account positions and exchange rates from a medium-run perspective can contribute to assessing vulnerability to currency crises in the short run. Indeed, the empirical work on early warning systems has found that crisis probabilities are positively related to variables such as current account deficits as a percent of GDP and measures of real exchange rate overvaluation relative to trend. However, while CGER's analysis may suggest refinements for identifying crisis probabilities, CGER's focus is limited to the assessment of medium-run current account sustainability issues, as distinct from efforts to develop and implement an early warning system for currency and financial sector crises based on a broader set of indicators.

65. CGER's methodology for assessing the current account positions and exchange rates of industrial countries rests on assumptions and simplifications that are not entirely appropriate for most other countries. One of the simplifications that underpins the model of saving-investment behavior for the industrial countries is the implicit assumption that each country can borrow or lend an unlimited amount of capital internationally at a constant premium above the world rate of interest. This assumption facilitates the estimation of the saving-investment equation and is regarded as an acceptable simplification for the industrial countries, but it is not valid for emerging market economies, which generally confront much more limited and variable access to international capital markets.

66. In addition, the industrial country methodology does not go very far in modeling the linkages between equilibrium saving-investment positions and structural policies. In terms of the earlier discussion of Figure 4, the industrial country methodology pays little attention to the role that structural adjustments can play in shifting the position of the S-I line.<sup>36</sup> As a result, it characterizes the equilibrium levels of exchange rates as largely independent of structural policies and, correspondingly, it largely ignores the potential for trade-offs between exchange rate adjustment and structural reforms.

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<sup>35</sup> For background on the staff's work on early warning systems, see Berg and others (1999).

<sup>36</sup> This reflects the general state of the empirical literature on saving and investment behavior, which has not achieved much success in linking movements in S-I balances to structural changes.

67. Moreover, although the industrial country framework does explicitly recognize that the need for exchange rate adjustment over the medium run depends on the extent to which structural fiscal positions are adjusted, it assumes that the national saving-investment balance is positively and linearly correlated with the structural fiscal position. For countries undertaking relatively large adjustments in structural fiscal positions, this assumption may not be wholly appropriate. In particular, the assumption of a positive correlation ignores the important possibility that a relatively large fiscal contraction (expansion) that improves (worsens) a country's structural fiscal balance may substantially affect market expectations about the sustainability of the country's policies, leading to a significant reduction (increase) in its interest rate premium along with an increase (decrease) in investment relative to saving and, hence, a decline (rise) in the S-I balance. This channel is likely to be more significant in emerging market economies than in industrial countries, although it has also been germane for some industrial countries at times (e.g., Italy).

68. Because of these considerations and other difficulties,<sup>37</sup> CGER has made only modest progress in developing a framework for emerging market economies. To date its focus has been on developing criteria for assessing the sustainability of current account imbalances. No single criterion for assessing sustainability has been found acceptable; therefore, CGER has developed a set of criteria to use collectively for identifying countries in which sustainability issues could arise. In addition, because the assessments rely on the WEO projections as estimates of prospective current account positions, CGER has also been developing a set of benchmarks—analogueous in purpose to those described earlier for the industrial countries—to provide a consistent and disciplined mechanism for considering the possible directions of bias in the WEO projections and, accordingly, in the corresponding assessments of current account sustainability (see Annex II).

## **B. Criteria for Assessing Sustainability**

69. As the first step in the effort to extend its framework to emerging market economies, CGER investigated the historical relationship between current account balances and a set of potentially important determinants of medium-run saving-investment positions. This study, conducted by Chinn and Prasad (2000), built on CGER's earlier analysis of the saving-investment behavior of industrial countries; Annex III summarizes the econometric methodology and results. While the S-I norms derived from the analysis seem reasonable to area department staff in many cases, for a number of countries the calculations are more doubtful as estimates of equilibrium saving-investment balances. Such findings imply that despite the relative sophistication of the Chinn-Prasad (CP) effort, it would not be appropriate to base assessments of current account sustainability solely on the CP norms. It is

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<sup>37</sup> The definition and measurement of internal balance or potential output poses greater difficulties in applications to emerging market economies than in applications to industrial countries, and applications to emerging market economies also call for greater attention to the commodity composition of trade and the role of official financing.

important to recognize not only the general difficulties that can arise in seeking to explain history with econometric models, but also that history may have limited relevance for the future in individual countries that have undertaken major structural reforms and/or experienced major changes in their access to international capital markets.

70. This conclusion has led CGER to consider other criteria that can be used in combination with the CP norms—including criteria that focus on ratios of net foreign liabilities (NFL) to GDP.<sup>38</sup> Different criteria may be appropriate for assessing projected deficits and projected surpluses. The discussion here concentrates on criteria for assessing whether underlying current account deficits may be unsustainably large. For that purpose, three additional criteria have been tentatively adopted. These criteria focus on whether projected current account deficits (as ratios to GDP) either exceed the average experience of the past decade, or would imply an increase in NFL/GDP from its current level, or would be inconsistent with keeping NFL/GDP below some threshold level over the long run. Such criteria are ad hoc and may well be modified over time as CGER reflects on their application and re-evaluates their usefulness. For purposes of considering how the criteria might be collectively applied, CGER has focused on a selected group of 22 emerging market economies.<sup>39</sup> The threshold level of the NFL/GDP ratio was set at 40 percent, corresponding approximately to the 75<sup>th</sup> percentile of the distribution of NFL/GDP ratios for these economies.

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<sup>38</sup> In practice, the measurement of NFL/GDP ratios poses several difficulties—in particular, the difficulty of revaluing asset and liability stocks to account for changes in exchange rates and the question of whether to include capital that has flown offshore in a country's stock of foreign assets. Reported data on international investment positions are not available for many developing countries and do not extend back very far where they are available. In addition, these data are based on national sources that employ a variety of methodologies in calculating the values of foreign asset and liability stocks. The dataset used by CGER has been assembled and analyzed by Lane and Milesi-Ferretti (1999, 2001) and represents the most comprehensive effort to date to construct NFL data based on a uniform methodology. Since that dataset ends in 1998, it was extended by cumulating current accounts for 1999-2000 and adding them to NFL stocks at the end of 1998. Measurement error in official current account data, especially in recent years, remains a potential problem with these estimates.

<sup>39</sup> The 22 selected countries, by region, were: (in Africa) Nigeria and South Africa; (in Asia) China, India, Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand; (in Europe) Israel and Turkey; (in the Middle East) Egypt, Iran, and Pakistan; and (in the Western Hemisphere) Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. The preliminary focus on these countries does not preclude future applications to a longer list of countries, including some of the advanced transition countries. The absence of transition economies from the list reflects the fact that data limitations (short time series) precluded them from the CP regression analysis.

71. Among the 22 selected emerging market economies, 8 countries are projected to have current account (CA) surpluses in 2006. For each of the other 14 cases, the March WEO projection of the CA/GDP ratio for 2006 was compared with four critical values: the CP norm, the average CA/GDP ratio for the country during 1990-2000, and the CA/GDP ratios that would stabilize NFL/GDP at its current level and at 40 percent. These comparisons yielded the following results.

- 2 countries had projected deficits that were smaller (in absolute terms) than the critical values for all four criteria
- 1 country had a projected deficit that exceeded only the CP norm
- 2 countries had projected deficits that exceeded one or two critical values, but only by small amounts
- 6 countries had projected deficits that were larger than one to three critical values and substantially exceeded at least one critical value other than the CP norm
- 3 countries had projected deficits that exceeded all four critical values

72. Based on the above considerations, CGER would tend to regard the nine countries in the last two groups as cases in which sustainability issues might warrant closer attention. It would not be appropriate to draw mechanical conclusions in such cases. In particular, it would be inappropriate to presume that large current account deficits should always be resisted, or to lose sight of the potential for capital inflows to make substantial contributions to economic development. Accordingly, it is important to reflect on the cases identified and to consider relevant information that might have been overlooked or distorted in the application of the criteria.<sup>40</sup> This process should also consider whether there are countries not identified by the criteria that might nevertheless be cases in which sustainability issues warrant concern.

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<sup>40</sup> This step would recognize, for example, that in countries with Fund programs, policy regimes and economic structure generally undergo substantial changes that tend to be reflected in the WEO projections but may be inadequately taken into account by the criteria for assessing current account sustainability. It would also provide scope for CGER to take account of criteria that country desks have developed for assessing sustainability in certain specific cases.

### C. Next Steps

73. CGER plans to begin applying its methodology to emerging market economies at the time of the summer updating of the WEO projections. The initial application will be a learning process, undoubtedly leading to suggestions for modifying the criteria for assessing sustainability and improving the manner in which they are applied. To the extent that CGER's methodology identifies possible concerns for many of the countries with projected current account deficits, it will be important to differentiate between the strength of these possible concerns. It will also be desirable to focus on how much information the CGER exercise adds to the signals provided by the early warning indicators. Given the desirability of avoiding a mechanical application of the criteria, and extrapolating from the experience of shaping the industrial country methodology, it may take several assessment exercises to develop an appropriate process for arriving at considered judgments. Until that point is reached, CGER will want to guard its assessments closely. Accordingly, the staff would plan, for an initial period, to use the WEMD sessions as a mechanism for keeping the Board informed of CGER's assessments.

### IV. CONCLUDING REMARKS AND ISSUES FOR DISCUSSION

74. During recent years, CGER has strengthened its methodology for assessing the current account positions and exchange rates of industrial countries, has extended the application to all industrial countries, and has begun to develop a separate methodology for assessing the current account positions of emerging market economies. The main motivation for the industrial country assessments is to identify cases in which exchange rates appear to be substantially out of line with macroeconomic fundamentals. The methodology relies primarily on the macroeconomic balance framework, with secondary consideration of purchasing power parity perspectives and other information. Application of the methodology involves elements of judgment, and the summary assessments are characterized as approximations or ranges in recognition of their imprecision. CGER's judgments about currency alignments have increasingly been raised by area departments in their dialogs with national authorities during Article IV consultations, and in a number of cases the assessments for individual countries have appeared in published Staff Reports. *Do Directors regard the motivation and methodology of the industrial-country assessment exercises as appropriate? Do they share the view that, despite the imprecision inherent in such exercises, a systematic and transparent framework can impose an important degree of multilateral consistency on the process, as well as consistency over time in the staff's assessments? Do they regard the CGER methodology as reasonably systematic and transparent? Do Directors feel that current practices for disseminating CGER's assessments are appropriate?*

75. The staff holds the view that substantial deviations of market exchange rates from their medium-run equilibrium levels can have different interpretations and policy implications, depending on the circumstances. In some cases such deviations may reflect cyclical factors or be helpful from a short-run perspective. In other cases they may reflect well-founded market perceptions of a need for policy adjustment. In still other circumstances the most plausible

interpretation may be that monetary and fiscal policies are appropriate and market exchange rates are substantially out of line with macroeconomic fundamentals; in the staff's view, such cases raise the issue of whether policymakers should seek to influence exchange rates through market intervention or public pronouncements, but generally do not call, in a context of floating exchange rates, for giving exchange rate objectives prominence over the needs of the domestic economy. *Do Directors agree that substantial deviations of exchange rates from medium-run equilibrium levels need to be interpreted on a case-by-case basis, taking account of cyclical considerations and the extent to which prevailing macroeconomic policies are appropriate from a broader perspective?*

76. CGER has been developing a separate methodology for emerging market economies, based on the perception that its framework for the industrial countries relies on assumptions and simplifications that are not entirely appropriate for most other countries. The methodology for emerging market economies, which has not yet been adequately tested, involves the use of criteria to assess the sustainability of current account positions. No single criterion has been found acceptable, so CGER has developed a set of criteria to use collectively. Four criteria have been adopted: one based on an estimated saving-investment equation, a second based simply on average current account balances over the past decade, and two others focusing on what projected current account positions would imply for ratios of net foreign liabilities to GDP. *Do Directors agree that the methodology that CGER uses to assess the current account positions and exchange rates of industrial countries is not entirely appropriate for emerging market economies? Do Directors agree with staff proposals for further development of the work on emerging market economies, including the criteria to be used in assessing current account sustainability?*



## ANNEX I

### ALTERNATIVE METHODOLOGIES FOR ASSESSING EQUILIBRIUM EXCHANGE RATES

77. As discussed in Section II, CGER's assessments for the industrial countries rely primarily on the macroeconomic balance framework while also taking account of traditional purchasing power parity perspectives. In reflecting on this choice of methodology, it may be useful to briefly consider several approaches on which CGER has chosen not to rely.

#### A. Extended Purchasing Power Parity with Balassa-Samuelson Effects

78. An important modification or refinement of the long-run PPP hypothesis has come from the observation that the prices of nontradable goods and services, relative to the prices of tradables, tend to be higher in high-income countries than in low-income countries. This observation emerged from attempts to make quantitative comparisons of living standards in different countries in a series of projects sponsored by the United Nations and other international organizations, and spearheaded to a large extent by economists from the University of Pennsylvania.<sup>41</sup> These studies have established that the methodology of comparing international standards of living by converting national accounts data at market exchange rates into a common currency unit generally understates the living standards of low-income countries relative to those of high-income countries. Samuelson (1994) has referred to this empirical regularity as "the Penn effect."

79. Balassa (1964) and Samuelson (1964) attempted to explain the empirical regularity, along with an apparent tendency for market exchange rates to deviate systematically from PPP over the long run. They conjectured that the tendency for the relative price of nontradables to be higher in high-income countries reflected a tendency for productivity in the tradable goods sector to rise relative to productivity in the nontradables sector as real incomes expanded.<sup>42</sup> Given competitive pressures within each country for workers with similar skills to receive similar wages in the two sectors, relatively rapid productivity growth in the tradables sector would tend, other things being equal, to push up the relative cost of production in the nontradables sector and, hence, the relative price of nontradables. Under conditions in which the relative price of tradable goods across countries remained constant, such an increase in the relative price of nontradables would in turn give rise to an appreciation of the real exchange rate.<sup>43</sup>

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<sup>41</sup> See, for example, Gilbert and Kravis (1954), Kravis, Heston, and Summers (1982), and Summers and Heston (1991).

<sup>42</sup> Harrod (1939) provided an earlier discussion of some of the key arguments made by Balassa and Samuelson, the seeds of which have been traced back to Ricardo (1821).

<sup>43</sup> See Isard and Symansky (1996) for a formal description of how the PPP formula can be modified to allow for Balassa-Samuelson effects. Like traditional PPP, the extended

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80. For purposes of policy analysis, the extended PPP framework provides a basis for refining the traditional PPP formula to take account of trends in the relative prices of nontradables. CGER has not attempted such a refinement, however, partly because PPP considerations play a secondary role in its assessments, partly because its focus has been primarily on the industrial countries, where the case for such refinement is relatively weak, and partly because the prospective gains from such refinement are limited by difficulties in measuring (or finding suitable proxies for) trends in the relative prices of nontradables.<sup>44</sup>

### **B. Estimated Single-Equation Reduced-Form Models**

81. During the decade that followed the breakdown of the Bretton Woods system in the early 1970s, international economists devoted considerable attention to the formulation and empirical testing of reduced-form exchange rate models. Contributors to this approach typically started by describing macroeconomic behavior in terms of a small number of key behavioral relationships and then combined the relationships to arrive at a single reduced-form equation for the exchange rate. These reduced-form models often fit the historically-observed data fairly well within the sample periods over which they were estimated. As already noted, however, by the early 1980s a careful evaluation of such results had delivered the sobering assessment that a variety of state-of-the-art single-equation reduced-form models, in forecasting beyond the sample periods over which the models were estimated, were unable to out-perform the predictions of a simple random walk model at *short-run* horizons of up to a year or longer.<sup>45</sup> Indeed, this result even obtained when the post-sample model forecasts were based on realized values of the explanatory variables. Among other things, such findings drove home the point that in-sample goodness-of-fit is not a sufficient criterion for evaluating exchange rate models, and that post-sample testing is important.

82. Advances in econometric methodology since the mid-1980s have provided new techniques for seeking to estimate models that capture the *long-run* relationships between exchange rates and other economic fundamentals.<sup>46</sup> This has led to the development of conceptual frameworks that focus simultaneously on long-run equilibrium conditions for

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hypothesis does not provide an empirically valid description of exchange rate behavior in the short run.

<sup>44</sup> Some economists have used GDP per capita as a proxy; see De Broeck and Slok (2000).

<sup>45</sup> Meese and Rogoff (1983a, 1983b).

<sup>46</sup> The key advances were the introduction of the concept of cointegration by Granger (1981) and Engel and Granger (1987) and the subsequent development of time series econometrics.

both asset stocks and current account flows (more generally, national income account flows).<sup>47</sup>

83. At the stage of empirical implementation, this approach also involves the estimation of single-equation reduced-form models.<sup>48</sup> These specifications have several features that limit their attractiveness. One feature is that they do not yield explicit estimates of equilibrium current account positions. This tends to lessen the appeal of the approach, as it is difficult to judge the plausibility of equilibrium exchange rate estimates unless the associated estimates of equilibrium current account positions can be assessed. A second feature of many of these models is that the process of reducing the conceptual framework to an empirically-estimable single equation generally involves simplifying assumptions and precludes the possibility of identifying the parameters of the fully-specified conceptual framework. As a result, the end product typically is significantly less transparent than the conceptual framework.<sup>49</sup>

### **C. General Equilibrium Frameworks**

84. Approaches based on simulations of general equilibrium models lie at the other end of the spectrum from those based on purchasing power parity or estimates of single-equation reduced-form models. The attractive feature of general equilibrium approaches is that the

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<sup>47</sup> Such conceptual frameworks define the equilibrium levels or timepaths of exchange rates as the levels or paths that give rise to current account flows that are consistent with convergence to long-run asset stock equilibrium. An early contribution to the empirical implementation of these models was made by Faruquee (1995), based on a continuous-time version of the stock-flow consistent framework described by Mussa (1984). More recently, Alberola and others (1999) have extended the methodology further. Goldman Sachs (1996, 1997) has relied on the methodology in providing forecasts for its clients. See MacDonald (1999, 2000) and Clark and MacDonald (2000) for perspectives on the literature. See also Edwards (1989, 1994) and Elbadawi (1994) for applications of single-equation reduced-form models to developing countries.

<sup>48</sup> These reduced-form error-correction models contain long-run components that embody the PPP hypothesis; in that sense, they can also be viewed as extensions of the traditional PPP hypothesis. In these reduced-form models, however, PPP is embodied not as a time-invariant level of the long-run real exchange rate, but rather as a steady-state condition in which the equilibrium level of the real exchange rate depends on the steady-state levels of various fundamental determinants.

<sup>49</sup> Another difficulty arises from the fact that the models relate trends in real exchange rates to the observed values of other variables. Accordingly, the derived estimates of equilibrium exchange rates are conditional on assumptions about the equilibrium values of explanatory variables; and for some of these explanatory variables, such as ratios of net foreign liabilities to GDP, economists may not have strong priors about long-run equilibrium values.

analysis is based on more complete models of macroeconomic behavior; by the same token, however, the added complexity and reduced transparency can be a drawback.

85. Obviously, the general equilibrium approach cannot be implemented for a given country until a macroeconomic model has been specified and estimated for that country. In addition, the case for implementing such an approach depends on whether the available models have well-defined and conceptually-appealing long-run properties. Some macroeconomic models that have been designed primarily for purposes of short-term forecasting do not have carefully-specified long-run properties, which limits their appropriateness for analyzing the long-run relationship between the exchange rate and other economic fundamentals. Moreover, even when appropriate models are available, the resource-intensiveness of the general equilibrium approach may be an impediment to its application, particularly when the exercise involves assessing equilibrium exchange rates for a number of different currencies simultaneously.

86. The IMF's global macroeconometric model, MULTIMOD, has carefully-specified long-run properties, but other features limit its attractiveness for generating estimates of equilibrium exchange rates.<sup>50</sup> These features derive from the fact that MULTIMOD was not designed for purposes of generating a baseline forecast, but was rather intended to analyze the implications of various shocks to the global economy, using as its baseline the medium-term World Economic Outlook (WEO) projections, which reflect the detailed knowledge and judgments of the IMF's country economists. The WEO projections are generated for a five-year horizon, and beyond that various assumptions are imposed to extend MULTIMOD's baseline into a model-consistent balanced growth path. As such, MULTIMOD's baseline (or control solution) reflects the assumption that real exchange rates remain constant over the WEO horizon and imposes fairly strong constraints on the paths that exchange rates take beyond the WEO horizon.

87. For most of the "shock minus control" experiments conducted with MULTIMOD, the simulated effects of the shocks—and their plausibility—reflect the dynamic properties of the model, but are largely independent of the baseline. Using MULTIMOD to solve for equilibrium exchange rate paths, however, would be a different type of exercise than simulating the effects of exogenous shocks, and would not be very meaningful in light of the prior restrictions placed on the baseline paths for real exchange rates.<sup>51</sup>

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<sup>50</sup> See Laxton and others (1998) for a description of MULTIMOD.

<sup>51</sup> Meredith (1998) has modified the Japan block of MULTIMOD to develop a framework in which it does appear valid to interpret the solution paths for exchange rates as equilibrium paths. However, adapting the Japan block to allow for fully simultaneous determination of exchange rates, interest rates, and saving-investment balances required strong simplifying assumptions about other aspects of macroeconomic behavior, and an effort to extend the

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## ANNEX II

### BENCHMARK COMPARATORS FOR CURRENT ACCOUNT PROJECTIONS FOR EMERGING MARKET ECONOMIES

88. To avoid relying uncritically on the WEO projections as estimates of prospective current account positions for emerging market economies, CGER has begun to develop a set of benchmarks—analogueous in purpose to those developed for the industrial country assessments—to provide a consistent and disciplined approach for considering the possible directions of bias in the WEO projections and, accordingly, in the corresponding assessments of current account sustainability. The intention is to focus on individual components of the WEO projections, starting with those for the volumes of non-oil exports and imports.<sup>52</sup>

89. The benchmarks for export and import volumes relate to the projected percentage (or logarithmic) changes in trade volumes relative to projected percentage (or logarithmic) changes in real absorption. The ratios of these projected changes are analogueous to elasticities, although the projected changes in trade volumes will generally depend on factors additional to the projected changes in absorption, such as the lagged effects of past changes in real exchange rates. For the selected group of 22 emerging market countries, the ratios implied by the March WEO projections varied widely, as illustrated by Figure 6, which focuses on projected changes between 2000 and 2006. The median ratios were 2.2 for export volumes and 1.6 for import volumes, while for 4 of the 22 countries the export ratios exceeded 3.0 and for 4 countries the import ratios were less than 1.0.

90. CGER has adopted three types of benchmarks for assessing the WEO projections. Different thresholds are relevant for identifying projected imbalances that may be underestimated and projected imbalances that may be overestimated. The discussion here concentrates on countries that are projected to record current account deficits and on benchmarks for assessing the extent to which the projections may be underestimating the size of these deficits by either overestimating the likely expansion of export volumes or underestimating the likely growth of import volumes. For exports, the first benchmark, which is common to all countries, is the 75<sup>th</sup> percentile of the distribution (across the 22 emerging market economies) of the implied “elasticity” of export volume relative to foreign demand.<sup>53</sup>

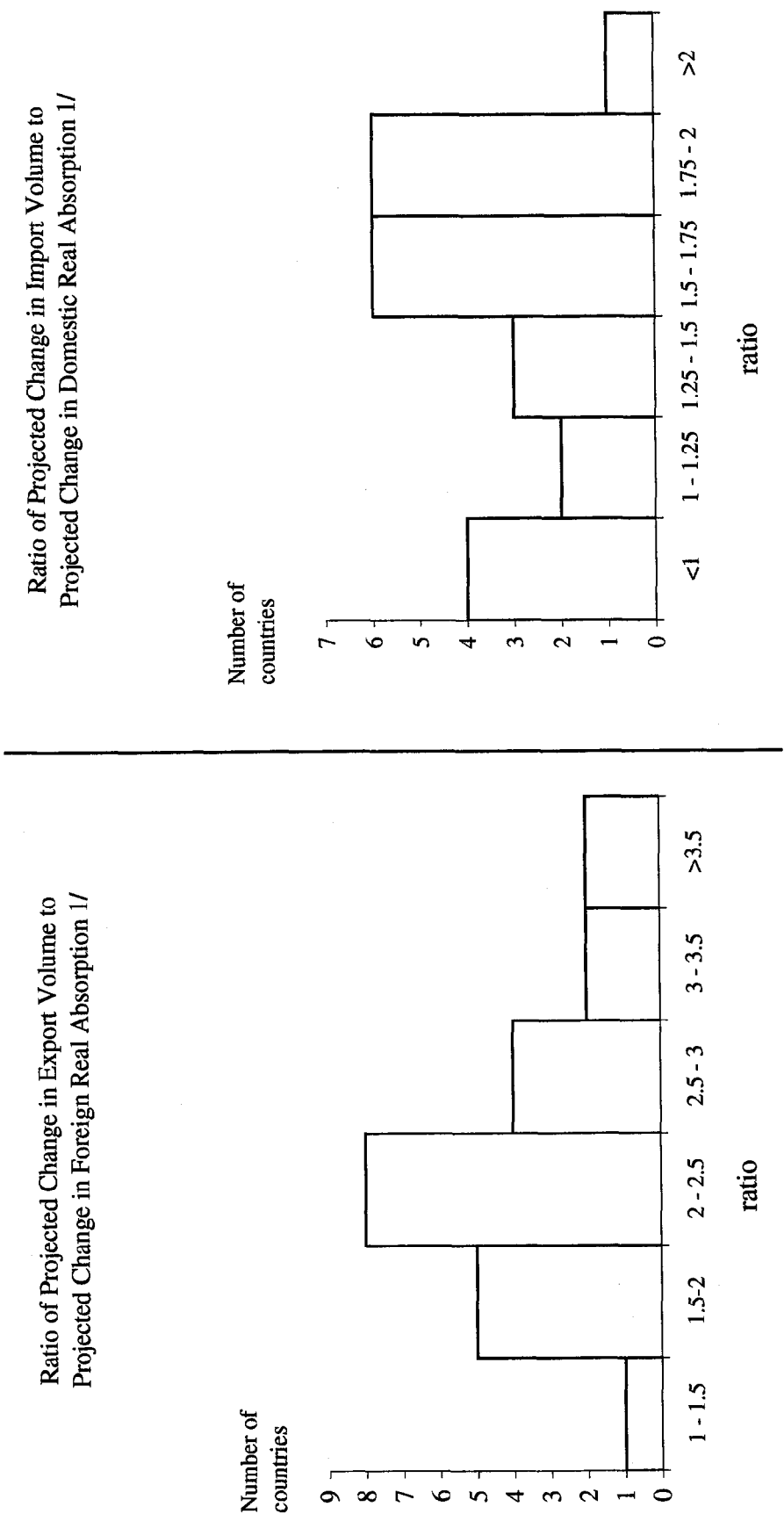
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framework to the other country blocks in MULTIMOD would be a resource-intensive project.

<sup>52</sup> Benchmarks for the prices of non-oil exports and imports present greater difficulties, partly because of the importance of distinguishing between the prices of primary products and the prices of other tradable goods, which need to be modeled in different ways.

<sup>53</sup> More precisely, the benchmark corresponds to the 75<sup>th</sup> percentile of the distribution (across countries) of the ratio of the projected six-year increase in the logarithm of export volume to the projected six-year increase in the logarithm of foreign real absorption.

Figure 6. Distribution of Projected Changes in Export and Import Volumes



1/ Based on projected changes in logarithms of trade volumes and absorption, from 2000 to 2006.

Countries for which the WEO projections paint a rosier outlook for export growth are flagged as outliers by this benchmark. The second two benchmarks are country specific. One is the average ratio (over the past decade) of the observed six-year change in export volume to the corresponding six-year change in foreign real absorption. This benchmark picks out countries for which the projections for export growth are more optimistic than recent performance might suggest. The other benchmark is a ratio calculated from a simple trade model. This picks out countries for which the export volume projections are more optimistic than what representative elasticity parameters would suggest, taking account of both the projections for absorption and the lagged effects of recent changes in real exchange rates.<sup>54</sup> For import volumes, where the issue is whether the WEO projections may be underestimating the prospective rate of import growth, the first benchmark is set at the 25<sup>th</sup> percentile of the ratio of projected increases in import volumes to projected increases in domestic real absorption, while the other two benchmarks are similar to those for exports. The benchmarks are clearly ad hoc and may well be modified over time as CGER reflects on their application and re-evaluates their usefulness.

91. One way to apply the benchmarks collectively would be to identify cases for which the export volume projections either (a) exceed the 75<sup>th</sup> percentile in the distribution of projections and also exceed at least one of the other two benchmarks, or (b) are fairly well centered in the distribution of projections but exceed both of the other two benchmarks. The analogous application on the import side would look for cases in which the import volume projections either (a) fall below the 25<sup>th</sup> percentile in the distribution of projections and also fall below at least one of the other two benchmarks, or (b) are fairly well centered in the distribution of projections but fall below both of the other two benchmarks.

92. Application of these benchmarks to the March WEO projections would suggest that the forecasted imbalances might be understated in 9 of the 14 countries that were projected to have current account deficits in 2006, including most of the countries selected by the current account sustainability criteria as cases that might warrant closer attention. In cases picked out by the benchmarks, an important next step is for country desks to explain and clarify the WEO projections, and for CGER to then reflect on relevant considerations that might have been overlooked or distorted in the application of the benchmarks. For any cases in which it remained CGER's judgment that the WEO projections might well be underestimating the size of prospective current account deficits, further consideration would be given to the issue of whether larger current account deficits for those countries would create (or heighten) concerns about sustainability.

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<sup>54</sup> The benchmarks calculated from the simple trade model assume that real exchange rates remain constant over the projection horizon, which for some emerging market countries may be at variance with the assumptions underlying the WEO projections.

## ANNEX III

### AN ECONOMETRIC STUDY OF SAVING-INVESTMENT BEHAVIOR IN DEVELOPING ECONOMIES

93. The study by Chinn and Prasad (2000) looked for systematic relationships between saving-investment balances and a fairly long list of possible explanatory variables for developing countries, focusing on both cross-section and time series data. In contrast to CGER's econometric analysis of the saving-investment behavior of the industrial countries, the Chinn-Prasad (CP) study gave emphasis to exploring the relevance of countries' abilities to attract capital from abroad. The objective was to try to find an acceptable way to model the size of the S-I surpluses or deficits that have been historically observed for developing countries, taking into account, inter alia, economic factors that might limit their access to international capital markets.

94. Table 2 reports some of the regression findings from the CP study. Column 1 shows results for a sample of 71 developing countries, while columns 2-5 show results obtained after separating the sample into the African countries and the developing countries excluding Africa.<sup>55</sup> The regressions focus on explaining the current account to GDP ratio in terms of the variables listed in the rows of the table. The table reports the magnitudes of all coefficients that were estimated to differ significantly from zero, as well as the signs (+ or -) of coefficients that did not differ significantly from zero. The results reported in columns 3 and 5 include the foreign aid/GDP ratio (row 9) among the explanatory variables; the results in columns 1, 2 and 4 do not. Foreign aid receipts have had a significant negative effect on current account balances in Africa, but have not been a significant explanatory variable for the other developing countries as a group.

95. As was the case in the industrial country regressions reported in the earlier discussion of equation (2), the government budget balance (row 1) has a significant positive effect on the overall saving-investment balance while the dependency ratios (rows 2 and 3) tend to have negative but usually insignificant effects on the saving-investment balance. The regression analysis looked for a nonlinear effect of relative per capita income, based on the hypothesis that, at relatively low stages of development, increases in income would tend to improve a country's access to foreign capital while, at advanced stages of development, the correlation between income and the current account would become positive (or less negative). The latter part of the hypothesis reflects the notion that countries at the highest income levels and most advanced stages of development tend to be capital exporters, an

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<sup>55</sup> Because of data limitations (short time series), transition economies were not included in the sample of countries. Regional dummy variables designed to test the extent to which the developing countries can be treated as a homogeneous group proved insignificant for all regions except Africa. A dummy variable for oil-exporting countries was significantly positive in some specifications, but not in the "final specifications" shown in Table 2.



Table 2. Results of Panel Regressions  
(Dependent Variable—Current Account to GDP Ratio)

	Developing Countries (1)	Developing Countries Excluding Africa (2)	Africa (3)	African Countries (4)	(5)
1. Govt. budget balance (ratio to GDP)	0.39***	0.26***	0.18***	0.60***	0.64***
2. Relative dependency ratio (young)	-	-0.06*	-	-	-0.16**
3. Relative dependency ratio (old)	-	-	+	-	-
4. Relative income	-	-	-	0.33*	-0.45**
5. Relative income squared	0.25**	0.27**	+	-0.49*	+
6. Financial deepening	0.04***	0.04**	0.03*	+	+
7. Openness ratio	-0.03**	-0.02*	-	-	+
8. NFA/GDP ratio	0.04***	0.04***	0.04***	0.04***	0.03*
9. Foreign aid/GDP ratio	...	...	+	...	-0.51***
10. Terms of trade volatility	+	0.03*	+	+	+
11. Average GDP growth	-	-	+	-	-
12. Capital controls (current account)	+	+	+	+	+
13. Capital controls (capital account)	-	-	+	+	+
14. Dummy for oil-exporting Countries	+	+	+	+	-
15. Significant time dummies	1981-85	1981-85	1981-85	None	1976-80 1981-85
Adjusted R-squared	0.44	0.45	0.49	0.49	0.59
Number of observations	223	155	142	68	64

Notes: Ordinary least squares specifications with dummy variables for each time period. The dependent and independent variables are non-overlapping 5-year averages of the corresponding annual variables, except for NFA/GDP, which is the observed value during the initial year of each 5-year period. The symbols \*, \*\*, and \*\*\* indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively; + and - indicate the signs of insignificant coefficients.

implication of the negative relationship between the abundance of existing capital and the marginal returns on additional investments. The hypothesis suggests a positive coefficient on the relative income squared term (row 5) and finds some support from the results in columns 1 and 2.

96. Among the other variables tested in the regression analysis, financial deepening (as measured by a ratio of broad money to GDP), openness (exports plus imports as a share of GDP), and the initial net foreign asset (NFA) position as a ratio to GDP were found to have significant effects on the current account to GDP ratio (rows 6-8). A priori, the latter two variables were viewed as particularly relevant to a country's ability to attract foreign capital. The finding of a negative correlation between the S-I balance and openness is consistent with the view that a country's ability to attract foreign capital is enhanced by a relatively large capacity to generate export revenues or compress imports for purposes of meeting debt service payments.

97. The significant positive correlation between the current account and the initial NFA/GDP ratio does not have a clear interpretation.<sup>56</sup> Several factors may be contributing to it. One factor is the direct contribution to the current account of the (net) income on the net foreign asset position. It may also be the case that whatever factors determined the relative attractiveness of countries to capital inflows in the past—and hence led to their initial net foreign liability (asset) positions—have continued to explain the relative sizes of their current account positions. Another plausible interpretation of the positive sign is that it is capturing the effect of the NFA/GDP ratio adjusting toward some long-run equilibrium level.<sup>57</sup>

98. It would be desirable to be able to separate the different channels through which the current account is affected by the initial net foreign asset position. In principle, this could be done by modeling and estimating simultaneously the equilibrium NFA/GDP ratio and the path of adjustment to long-run equilibrium. Such an undertaking, however, would be a major challenge. Similarly, the introduction of country-specific interest rates (or cost of capital measures) into the analysis would present challenges; even if adequate data were available, one would have to deal with two-way causality between the current account and the cost of capital.<sup>58</sup>

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<sup>56</sup> The CP dataset covered the period 1971-95, which was broken into non-overlapping five-year subperiods, with the panel regression analysis focusing on corresponding five-year averages of annual data as a strategy for trying to see through the shorter-run influences on current account behavior. The initial NFA/GDP ratio was then measured as the ratio existing at the beginning of each subperiod.

<sup>57</sup> However, the correlation between the current account and NFA can be either negative or positive during the transition to long-run equilibrium.

<sup>58</sup> Lane and Milesi-Ferretti (2001) have recently shown that the evolution of NFA positions over the period 1970-98 can be largely explained by shifts in relative output levels, the stock  
(continued)

99. The plausibility of the CP equation depends not only on the signs, magnitudes, and statistical significance of the individual estimated parameters, but also on the implied estimates of historically-normal saving-investment balances or “S-I norms.”<sup>59</sup> For many of the emerging market economies on which CGER has focused, the implied S-I norms seem reasonable to area department staff. For a number of others, however, the calculations seem implausible as estimates of equilibrium saving-investment balances.<sup>60</sup>

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of public debt, and demographic variables, with the latter two factors particularly important for developing countries.

<sup>59</sup> In calculating S-I norms for future years, it is highly desirable to shift to WEO data (and projections) for the explanatory variables in the CP equation. Overall, the WEO data generally move in line with the corresponding series in the CP dataset, but to align the fitted values of the equation (based on WEO data) with the sample period observations it is necessary to introduce country-specific constant terms (or one-time level adjustments) into the calculations. The constant terms have been calibrated to imply mean-zero errors between observed and fitted current account to GDP ratios over the period 1980-95.

<sup>60</sup> A number of factors that seem important in assessing medium-term sustainability—such as political conditions, the role of past defaults, and the climate for and level of foreign direct investment—are precluded from the analysis by the inherent difficulties of quantification or limitations in available data.

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