Peterson Institute for International Economics

Policy Brief

NUMBER PB11-5 MAY 2011

Estimates of Fundamental Equilibrium Exchange Rates, May 2011

William R. Cline and John Williamson

William R. Cline, *senior fellow, has been associated with the Peterson Institute for International Economics since its inception in 1981. His numerous publications include* Financial Globalization, Economic Growth, and the Crisis of 2007–09 *(2010), and* The United States as a Debtor Nation *(2005). He contributed to* The Long-Term International Economic Position of the United States *(2009).* **John Williamson**, *senior fellow, has also been associated with the Institute since 1981. His numerous publications include* Reference Rates and the International Monetary System *(2007) and* Dollar Adjustment: How Far? Against What? *(2004).* *The authors thank Yimei Zou for research assistance.*

This policy brief updates our estimates of fundamental equilibrium exchange rates (FEERs) to the latest available data, which for exchange rates are the average rates of April 2011, and for the IMF's balance of payments forecasts, those published in the April 2011 issue of *World Economic Outlook* (WEO; see IMF 2011a). It is the central study in what has now become a regular annual cycle, in which we draw out what we believe to be the implications of the IMF's forecasts for the pattern that exchange rates need to take if the world is to approach a reasonably satisfactory medium-run position. This past year we also published an interim policy brief (Cline and Williamson 2010b) in which we updated our calculations to the average exchange rates of October 2010, as well as commented on Brazilian Finance Minister Guido Mantega's description of international monetary events as constituting "currency wars." As in the previous year, however, the November 2010 policy brief updated our estimates only for intervening changes in market exchange rates. We did not make use of the IMF's revised autumn WEO forecasts to update our estimates of FEERs; on the contrary, we assumed the FEERs estimated in May 2010 were correct. In contrast, this policy brief presents totally new estimates of FEERs.

The world economy is still recovering from the Great Recession of 2008–09, but the recovery is proceeding at very different paces in advanced countries versus the main emerging-market economies. Most advanced countries are still suffering from considerable excess supply and substantial fiscal stress, which is the main reason for easy monetary policies. Most emerging-market economies are, in contrast, booming. They have long surpassed their previous peak levels of output, growth is rapid, debts are lowish, unemployment is small and declining, and the problems that concern them are those of prosperity—notably inflation—rather than continued stagnation. Rapid growth in emerging-market economies is stoking increases in commodity prices, especially of oil, which worsens the problems of the advanced countries, just as the problems of the emerging-market economies are intensified by the capital inflows they are receiving as a consequence of the easy monetary policies of the advanced countries.

In April 2011 most currencies appear to have been reasonably close to their FEERs. The most important exceptions are China, on the weak side, and the United States, on the strong side.

As in previous years (Cline and Williamson 2008, 2009, 2010a), we take as our point of departure recent figures for exchange rates and the projections published by the IMF in the latest WEO. It contains projections for individual country current account positions on the technical assumption of no further changes in real exchange rates, which probably exaggerates the likely size of the Chinese surplus but provides us

with exactly the right framework for calculating the changes in exchange rates that would be needed to establish sustainable positions. The IMF also makes projections about the course of commodity prices, including that of the most important commodity, oil. We checked the oil price assumption against that of the US Energy Information Administration, but since they were not greatly different we stuck with the assumption of the IMF (as we did with commodity prices). The IMF assumes an oil price of $107.16 per barrel in 2011, of $108 per barrel in 2012, and an unchanged real oil price thereafter.

In Cline (2011b) one of us has updated his model of the US balance of payments. This model projects a figure for the US current account deficit in 2016 of 4.3 percent of GDP, which is 0.9 percent larger than the IMF projection. We have therefore modified the IMF projections of current account positions in three ways.

1. Since the exchange rates used as a base for this study are two months more recent than those used by the IMF, we added (or subtracted) the product of each country's impact parameter γ (see appendix B) and its change in the real effective exchange rate (REER) between the IMF's February base and our April base (calculating REERs by the trade weights in Cline's model).
2. We then forced the sum of the changes predicted in 2016 current accounts to sum to zero.[1]
3. Since the IMF forecasts underestimate (in our view) the US current account deficit, it follows that the conversion to our basis requires that we distribute an additional 0.9 percent of US 2016 GNP into current account earnings to the remaining 33 countries in the model, in proportion to country shares in US trade.

In this policy brief, we first review the concept of the FEER. This section can be omitted by those who recall earlier similar discussions. We then discuss the main assumptions made in deriving estimates of FEERs, which again overlap with last year's discussion (Cline and Williamson 2010a). The third section reviews the nature of the model employed, with the main emphasis on Cline's symmetric matrix inversion method (SMIM). Many readers will also feel able to skip this discussion, which is again a repetition, but some may wish for full details of the model, which are available in Cline (2008). The final section contains our new results and explains why in some instances they differ significantly from the earlier ones.

1. The sum of positive changes exceeds the absolute value of the sum of negative changes by 27 percent. All positive changes are multiplied by the factor 0.88 and all negative changes multiplied by the factor 1.12 to eliminate this discrepancy (that is: 0.88 x 1.27 = 1.12 x 1.0).

THE CONCEPT OF THE FEER

A fundamental equilibrium exchange rate is defined as an exchange rate that is expected to be indefinitely sustainable on the basis of existing policies. It should therefore be one that is expected to generate a current account surplus or deficit that matches the country's underlying capital flow over the cycle, assuming that the country is pursuing internal balance as well as it can and that it is not restricting trade for balance-of-payments reasons. In a growing world where the demand to hold reserves is therefore increasing over time, one needs to deduct the desired secular growth of reserve holdings in determining either the amount of capital outflow available from a current account surplus or the amount of foreign capital available to finance a current account deficit.

Few countries now restrict trade for balance-of-payments reasons. Similarly, the dominant view that the pressure of demand drives the *acceleration*, rather than the *level*, of inflation pretty much settles what is meant by internal balance. In contrast, the widespread advent of high capital mobility has made it far more difficult to pin down in any definitive way what is meant by a country's "underlying capital flow." An extreme view would be that an endogenous capital flow can finance *any* level of current account imbalance, making it impossible to define a FEER. We believe that this view goes altogether too far and that one can still identify dangerously large capital inflows (i.e., borrowing) and economically unproductive capital outflows (i.e., lending, including reserve buildups). There is nevertheless a range of indeterminacy: Within some limits, capital flows and therefore current accounts may vary without inducing forces that tend to curtail the flows. In this policy brief we adopt the position that limits lie at the edges of this range of indeterminacy and that it is desirable to work toward a situation in which these limits are respected. Naturally a FEER is defined in *real* (i.e., inflation-adjusted) terms. If a country suffers 10 percent higher inflation than its peers, then its currency will have to depreciate by 10 percent in order to restore the same real position as before. Only then will its producers have their competitive position restored and will its consumers face the same choices as before.

Similarly, the relevant exchange rate concept is an *effective* rate, i.e., one in which foreign currencies are taken into account and weighted by their importance in the foreign trade of the country in question to form a single estimate of the exchange rate. The practice of measuring a currency's value in terms of the currency of a single trading partner and calling this "*the* exchange rate" is quite wrong for any country with reasonably diversified trade. This is a bilateral rate, in contrast to the effective rate, which gives a measure of a country's overall competitive position. None of this is to

deny that competitiveness is also influenced by many other factors, like productivity, which are implicitly being held constant in the analysis of exchange rates. While productivity may be enhanced by a "strong" currency policy, as advocates of such a policy assert (though with little empirical evidence to substantiate their case), we do not believe that productivity is stimulated so much that a country pursuing this policy can hope to emerge with a balance-of-payments position that is strengthened as a result of its policy.

The above discussion assumes that one is seeking the medium-run exchange rate that is in a country's best interest. This seems to us to be *one* of the requirements for an exchange rate that the international community can reasonably require its constituent elements to accept. Another obvious requirement is that the set of exchange rates be mutually consistent. But the indeterminacy in defining a FEER suggests that there is an element of ambiguity in a FEER, which may be exploited to enable the international community to allow its members a degree of autonomy in selecting their objectives and thus their FEERs. In what follows we have tried to ask ourselves what the international community could reasonably ask of its constituent nations and to avoid asking for changes where they could not be justified as necessary in order to achieve mutual consistency.

ASSUMPTIONS

We make two main types of assumptions in estimating FEERs, in addition to those embodied in the models that we use (notably Cline's SMIM). First, there are projections of what would occur if there were no changes in (real) exchange rates, which are based on the IMF's latest WEO (April 2011), updated to take account of exchange rate changes between February and April and also modified to take account of Cline's larger estimate of the US deficit in 2016. Second, there are assumptions about the policy objectives that macroeconomic policy should pursue.

We do not believe that it would be fruitful to attempt to estimate the equilibrium exchange rates of the currencies of the oil-exporting countries, represented in our set of major economies by Saudi Arabia, Norway, Russia, and Venezuela. These rates depend upon the countries' saving strategies and the oil price. Saving strategies vary enormously from one country to another: Norway saves virtually all of an increment in the oil price, while Ecuador spends virtually everything and would face difficulties in the event of a protracted oil price decline. The world has to find a way to accommodate countries like Norway, since such a saving strategy reflects the transformation of natural, exhaustible resource wealth into wealth in the form of foreign assets. If exchange rate targeting came to be viewed as a way to cajole countries like Norway into acting contrary to their enlightened long-run interest and to force them into excessive adjustment, they would naturally be reluctant to participate. Sophisticated estimates of equilibrium exchange rates that avoided this danger would require knowledge and appraisal of the saving strategies of each oil exporter identified in the study. That would, at the least, require detailed knowledge of each country that we do not claim to possess.

So far as the policy objectives that macroeconomic policy should seek are concerned, we have already stated that we assume that all countries pursue internal balance. (Some countries—like Greece, Ireland, and Portugal today—may, however, be constrained by creditworthiness concerns.) The assumption is that they do this by manipulating fiscal-monetary policy appropriately, thus offsetting changes in internal demand that result from the pursuit of the external objective. This is not the same thing as ignoring internal balance and assuming the authorities are only interested in external balance, as is sometimes (wrongly) inferred. We also assume that countries should be pursuing some concept of external balance, but it is much more difficult to interpret what this means. We interpret it as implying a current account target: This target need not be zero; neither should it be so large as to lead a country into trouble in the long run. A customary interpretation of this view—which enjoys some modest statistical support[2]—is that countries should not run a current account deficit in excess of 3 percent of GDP on a sustained basis. A desire to have symmetrical rules on the surplus and deficit sides would then suggest extending this rule to surplus countries.

2. For emerging-market economies, Reinhart, Rogoff, and Savastano (2003) identify 40 percent as a critical threshold for external debt relative to GDP, beyond which countries have tended to be vulnerable to default. External debt stabilizes at a debt-to-GDP ratio that equals the ratio of the current account deficit as a percent of GDP to the nominal growth rate of GDP in foreign currency. With emerging-market growth rates typically in the range of 4 to 5 percent and world inflation at 2½ percent in dollars or euros, nominal GDP growth in foreign currency is typically on the order of 7 percent. Forty percent of this growth rate is about 3 percent, so the critical debt-to-GDP ratio translates into a current account deficit of about 3 percent of GDP. For industrial countries, Freund (2000) found that reversals of deficits tend to begin at a threshold of 5 percent of GDP and involve a slowdown in growth in the adjustment period. Mann (1999, 156) has identified 17 episodes in the 1980s and 1990s when a widening of the current account deficit of industrial countries was reversed; the average ratio of the current account deficit to GDP was 4.5 percent when the reversal began (although she emphasized that the turning points were not necessarily the threshold of unsustainability). For the important case of the United States, Cline (2005, 172–74) argued that 3 percent of GDP is a prudent long-term ceiling for the current account deficit despite the national advantage in the past of earning a higher return on foreign assets than it paid on liabilities, plus favorable valuation effects from exchange rate changes.

We follow last year's practice of limiting all countries to imbalances of at most 3 percent of GDP and eliminating the latitude that we previously gave to certain countries to run larger imbalances.[3] The reasons for this change are twofold. First, the events in peripheral Europe have demonstrated the high price that countries may ultimately pay for running large and protracted deficits. Second, the current and prospectively protracted state of excess capacity in the advanced countries means that large current account surpluses impose a negative externality on others. We have not adopted the proposal, advanced inter alia by Edwin Truman (2010), of basing adjustment obligations on the prospective size of the current account imbalance as a percentage of "world GDP" (for which a better acronym is GWP, since there is no distinction between GDP and GNP at the world level). Only fairly large countries are included in our group of 34, accounting for a combined 92 percent of 2016 world product at market exchange rates. We seek parity of treatment among them, rather than imposing an additional penalty on the largest among them through an additional layer of targets dependent on size.

The IMF estimate of Singapore's current account surplus of 14.9 percent of GDP in 2016 is the largest of all the economies considered, although it is down from an even higher 20.4 percent projected for 2011. Last year we questioned whether the official current account figures had been exaggerated because cumulative reported surpluses exceeded the buildup in net foreign assets (NFA). However, new official data eliminate this paradox and show a discrepancy in the opposite direction, so the high current account seems more likely to be accurate and perhaps even understated.[4] We have retained the IMF projection of the 2016 current account, which is in turn based on the official figures for the current account surplus, and thus identify the need for a large revaluation of the Singapore dollar.

Conversely, the largest current account deficit in the WEO forecast is that of Turkey, at 8.4 percent of GDP in 2016, about the same as the outcome in 2010. Last year the April WEO instead projected Turkey's deficit at only 4 percent of GDP for 2010 and at a plateau of 4½ percent for 2011–15. This year essentially the plateau has shifted downward by 4 percentage points of GDP, even though the real effective exchange rate has depreciated by 8 percent. Although growth in 2010 was unexpectedly strong (at 8.2 percent instead of 5.2 percent as the April 2010 WEO had projected), for 2011 and after the new projected growth path is not much different from last year's projection. We suspect that, with little change in the medium-term growth path and some exchange rate correction already in the pipeline, this year's WEO may be exaggerating Turkey's medium-term current account deficit even though last year it underestimated it.

Table 1 (page 10) calculates the current account targets. The first column (shown purely for reference) shows the IMF's (2011a) estimate of this year's current account balance. Column 2 shows the Fund's forecast of 2016 GDP in dollars at market exchange rates. Column 3 shows the IMF projection of the 2016 current account balance as a percentage of that year's GDP. Column 4 shows our adjusted projection of the 2016 current account balance after taking account of changes in exchange rates from the IMF's February base to our April base and Cline's larger estimate of the US current account deficit (see appendix A) and the overstatement of the Swiss current account. Column 5 then shows the target current account imbalance. It is equal to a surplus or deficit of 3 percent of GDP or the actual projected imbalance where it is less in absolute value than 3 percent of GDP. Fourteen of our 30 non-oil economies have projected 2016 imbalances under 3 percent of GDP and are therefore not called on to adjust their effective exchange rates.

As last time, the adding-up discrepancy caused by the world current account not summing to zero was automatically resolved by the SMIM model itself, instead of our making an ex ante adjustment. Solving the model in any event tends to generate modest discrepancies from the raw target changes.

Our methodology is most similar to the first of the three methods employed by the IMF's Consultative Group on Exchange Rate Issues to assess equilibrium exchange rates (Lee et al. 2008). Their macroeconomic balance approach differs in two important ways from our approach as described above. First, it uses an econometric rather than a judgmental approach

3. In 2008 we allowed deficits of 6 percent of GDP for commodity exporters Australia and New Zealand and surpluses of 6 percent for high-saving economies Switzerland and Singapore. For developing countries with surpluses below 3 percent of GDP we set targets of zero (Indonesia, Israel, Indonesia, and the Philippines) and symmetrically for advanced countries with deficits below 3 percent of GDP we also set targets of zero (Canada, the euro area, and Korea). In 2009 the only exceptions to the ±3 percent rule were for wider imbalances that would not cause the NFA/GDP ratio to rise (fall) further for net creditors (net debtors). In 2010 following the G-20 commitment to reducing global imbalances, we eliminated all exceptions to the ±3 percent rule. The only exception was Switzerland, which was allowed a larger measured surplus on the ground that accounting conventions result in an exaggeration of the real size of the Swiss surplus by an amount that we last year estimated at 4.1 percent of GDP. We repeat the Swiss exception this year.

4. During 2010 the NFA figures reported by the IMF were increased sharply (for example, boosting the 2007 level from $155 billion to $359 billion). The new series indicate, for example, that whereas the cumulative current account surplus from 2002 through 2009 was $230 billion, the increase in net foreign assets was $374 billion (IMF 2011b). Note also that the negative balance on capital services despite a large NFA suggests that if anything, the current account surplus may be understated. In 2009, income on end-2008 foreign assets of $1.13 trillion was $56 billion, a return of 5 percent, whereas payments on foreign liabilities of $790 billion were $57.5 billion, a return of 7.2 percent (IMF 2011b).

to determine current account targets. It is doubtless inevitable that the staff of an international organization will seek to use a formula rather than judgment when seeking to postulate national objectives, but that does not make it right. The objectives thus postulated seem to make little normative sense (in that study, average current account targets were –1.9 percent of GDP for advanced countries outside Europe versus +1.3 percent of GDP for emerging Asia), as opposed to reflecting what actually happened (which the exercise is supposed to be aimed at preventing in future). Second, it uses estimated country-specific responses of the trade balance to the real exchange rate rather than using a formula for the response as the SMIM model does. This is undoubtedly preferable in principle, although the uncertainties may not in practice give this method a big advantage.

The second of the IMF's approaches amounts to estimating a behavioral equilibrium exchange rate (BEER). We regard this as appropriate only if it is plausible that on average the exchange rate was in equilibrium over the period of estimation.

The third of the IMF's approaches aimed at stabilizing the NFA/GDP ratio at an appropriate level, which it interpreted as the level in 2006. This is not particularly appealing since there is no reason to think that NFA/GDP was in general at an optimal level in 2006, but the method has the virtue of ruling out Ponzi strategies. In 2009 we made use of this insight in our work, but this year we have maintained the decision of 2010 not to allow countries greater scope to run imbalances if they had higher NFA/GDP ratios (negative or positive).

NATURE OF THE MODEL EMPLOYED

Cline (2008) developed a symmetric matrix inversion method model to calculate FEERs for 34 economies. This method is symmetric in that it gives equal weight to each country in arriving at the realignment to FEERs, rather than (as in Cline 2007) requiring exact achievement of the adjustment target for the United States and then solving for partner exchange rate changes that would be both broadly consistent with this requirement and roughly consistent with the other current account targets.

The model is based on two sets of relationships. The first is economic: The current account depends on the real effective exchange rate.[5] The second is essentially algebraic: Any set of effective exchange rates has a direct mapping to a corresponding set of bilateral exchange rates against the dollar, and there must be consistency not only between all of the desired changes in effective exchange rates but also between the resulting changes in all bilateral rates in a realignment to FEERs.

The economic relationship states that the change in the current account as a percent of GDP will be equal to the percentage change in the effective exchange rate, multiplied by a country-specific impact parameter. The impact parameter (γ) equals the export price elasticity multiplied by the share of exports in GDP. As noted above, export elasticities in Lee et al. (2008) are specially tailored to each economy, thus being able in principle to reflect such factors as idiosyncrasies of greater or lesser exchange rate responsiveness (including, for example, influences of product composition as well as exchange rate pass through) of the economy's principal trading partners. In our work, however, the export price elasticity is assumed to follow a standard formula set at unity for a relatively closed economy with exports amounting to 10 percent of GDP, and falling to 0.5 (because of increasing supply constraints) for a highly open economy, with exports equal to 100 percent of GDP or more. Estimates of the impact parameter were updated as noted in appendix table B.1 (page 18) to reflect 2010 ratios of trade/GDP.

The overall effect is that the impact parameter varies from about a 0.15 percent of GDP change in the current account for each percentage point change in the effective exchange rate for a relatively closed economy to a maximum of a 0.5 percent of GDP change per percentage point change in the effective exchange rate for a highly open economy. In the case of China, for example, we estimate an impact parameter of a 0.3 percent of GDP reduction in the current account surplus for a 1 percentage point appreciation in the real effective exchange rate. If the target external adjustment is a reduction in the current account surplus by 6 percent of GDP, the target effective exchange rate appreciation will need to be 6/(0.3) = 20 percent.

The identification of the target change in each country's REER is thus simple. For each country, the change equals the desired change in the current account as a percent of GDP divided by the elasticity-based impact parameter. The problem then becomes more complicated, however, when consistency is imposed on all of the resulting changes in REERs. Changing the REER for any given country necessarily changes those of its trading partners.

This, then, involves a set of algebraic relationships among individual economies' effective exchange rates and between bilateral and multilateral effective exchange rate changes. If a currency appreciates by, say, 10 percent against the dollar in isolation, its effective appreciation against all trading part-

5. This relationship focuses on the relative price or "elasticity" effect in determination of trade. A parallel shadow "absorption" effect must also be consistent, involving the national accounts identity whereby net imports equal investment minus saving (including public). Implicitly the focus on the effective exchange rate in external-sector adjustment assumes that parallel influences on domestic demand, such as a fiscal adjustment, take place to facilitate external adjustment and maintain the economy at full capacity.

ners also equals the bilateral appreciation, or 10 percent. But if other trading partners also appreciate, the home country's appreciation in effective terms will be diminished by an amount that depends on the importance of the other appreciating countries as trading partners. This influence turns out to be particularly important when considering possible corrective changes in exchange rates in East Asia. Bilaterally against the dollar, some of the indicated changes may be quite large, but because several regional trading partners also show sizable bilateral appreciations against the dollar in order to reach adjustment targets, the corresponding effective exchange rate changes are considerably smaller.

The SMIM model solves for a set of bilateral exchange rate changes against the dollar (z_i, for country i) that is consistent with a target set of changes in effective exchange rates (r_i). It turns out that this solution is the answer to a matrix algebra problem, in which the bilateral exchange rate changes (in percent), the effective exchange rate changes (in percent), and a matrix of trade weights enter in the equation.[6] It also turns out that there is not one single solution to this problem. With 35 economies, the number considered in this study (counting the rest of the world as an economy), there are 35 possible alternative solutions. The reason is that there are 35 equations for target effective exchange rate changes (one for each country, in light of its target current account change and impact parameter) but only 34 unknown exchange rate changes against the dollar, because the dollar cannot change against itself (in the jargon of the exchange rate literature, it is the numeraire). Our approach to dealing with this problem of "overdetermination" is simply to average the alternative possible sets of exchange rate changes.[7]

RESULTS

The results of our calculations are shown in table 2 (page 11). The first column shows the target change in the current account balance as a percentage of GDP and is simply the difference between columns 5 and 4 in table 1. The adjacent column shows how close the simulations of the model came to achieving the targets laid out. It can be seen that simulated changes in current account balances are larger (in algebraic value) than the targets, by an average amount of slightly over 0.4 percent (and varying from 0.1 to 1.1 percent). This reflects the fact that the SMIM model was told to resolve a substantial world discrepancy in the summing up of the desired current account changes.

Column 3 shows our estimates of the target changes in effective exchange rates in April 2011, derived from the target changes in the current account in 2016 (column 1) and the impact parameters (table B.1). Column 4 shows the corresponding model estimates of changes in the effective exchange rates, which approximates each country's target as closely as possible while ensuring consistency across countries. A positive number indicates that the currency of the area in question needed to appreciate because it was undervalued, and conversely. The fact that countries that were not named as needing to adjust nevertheless have negative numbers, indicating a need for depreciation, reflects the fact that the model is seeking to impose larger improvements than those called for in column 1 of table 2 in order to obtain adding-up consistency.

The results are largely as one might have expected. The countries that need to seek weaker effective rates are those with large current account deficits: Australia and New Zealand, South Africa, Turkey, (marginally) Poland and Hungary, and the United States and Brazil. These are countries with floating exchange rates that have been pushed to an overvalued level by (in most cases) capital mobility and the carry trade, reinforced in the case of the United States by the dollar's role as the currency to which many other countries peg combined with the decision of some other countries to peg their rates at an undervalued level. The countries that need to revalue their effective rates are primarily Asian: China and countries that make it a priority to avoid losing competitiveness versus China (Hong Kong, Malaysia, Singapore, and Taiwan). Also labeled as undervalued are two countries with floating exchange rates: Sweden and Switzerland.

Column 5 shows the actual average dollar exchange rates over April 2011. Column 6 presents the results of applying Cline's SMIM model to estimate the percentage changes needed in the dollar exchange rates (these changes in the bilateral rate against the dollar also yield the changes in effec-

6. Namely: $Z = B^{-1}R$, where Z is a vector of bilateral exchange rate changes against the dollar (percentages), R is a vector of effective exchange rate changes (percentages), and $B = I - A$ where B is the matrix obtained by subtracting the trade-weights matrix A from the identity matrix I.

7. There is a single exception, for each country. Of the 35 solutions, the average for the currency in question is that of the 34 equations in which the country has been included. The remaining equation omits the direct effective rate equation for the country and only obtains the country's bilateral exchange rate change indirectly as needed to generate the set of effective exchange rate changes sought for the other countries. The average of the 34 results with Own Country Included, or 34OCI, is used as the estimate of the bilateral exchange rate change for the country in question, because the one Own Country Excluded (OCE) result systematically turns out to be unrepresentative. The OCE estimate is always lower than the 34OCI average, in some cases absurdly so. With the 34OCI estimates in hand for each of 35 economies' exchange rate change against the dollar (except for the dollar itself, which is zero), the corresponding set of effective exchange rate changes is then calculated. Because of the overdetermination problem, this estimated consistent set shows divergences from the target set of effective exchange rate changes. These divergences are generally small, however.

tive exchange rates shown in column 4). The results indicate that New Zealand, South Africa, and Turkey are much more overvalued than the dollar and therefore need to depreciate strongly against it, while Australia and Brazil[8] are somewhat overvalued bilaterally against the dollar. Other currencies that are overvalued on an effective basis, like the Polish zloty and the Hungarian forint, do not need to depreciate against the dollar. All of these results are strongly influenced by the fact that the dollar needs a larger depreciation this year than last owing to the less favorable US current account outlook.

The last column in table 2 shows our estimate of the FEER-consistent dollar exchange rate, but for other than the nationals of each country the previous column is probably more significant. This column (6) shows the percentage change in the bilateral exchange rate needed to achieve the position listed in column 7. Most currencies are shown as needing appreciation against the dollar. The appreciation against the dollar is shown as large in Asia, where the renminbi influence is important; about 5 percent in Europe, where the euro is key (but with larger appreciations for Sweden and Switzerland); and negligible in the Western Hemisphere, where the dollar still dominates. The undervaluation of the renminbi is shown as somewhat greater this year than last, while the undervaluation of the euro in terms of the dollar is strictly a result of the appreciation that would be needed to prevent a depreciation of its effective rate in the event of a renminbi appreciation. Of course, the Chinese figure probably exaggerates the size of the surplus to be expected in China in 2016 because of the IMF's (and our) technical assumption that exchange rates will henceforth be unchanged.

All of these results are strongly influenced by the fact that the dollar needs a larger depreciation this year than last owing to the less favorable US current account outlook.

China and the United States remain at the center of the global imbalances problem. Of the total reduction in 2016 surpluses among excess-surplus countries, China accounts for 76 percent (about $540 billion). Taiwan and Singapore are in distant second and third places (at about $40 billion each). The mirror image is a concentration of adjustment magnitudes among excess-deficit countries, with the United States by far the largest correction (45 percent of the total for deficit reductions, or about $340 billion), followed at considerable distance by Turkey, Australia, and Brazil (each in the range of about $45 billion to $65 billion).

In previous years we compared the new results of the FEER-consistent dollar rates (after adjustment for inflation) with those of the previous year. This year we extend those comparisons in two ways. First, we compare the results for the consistency of FEERs (defined in REER terms) over time, as well as those for FEER-consistent dollar rates. Second, we make a comparison over the four years for which we have been undertaking the calculations, rather than just the most recent pair.

Table 3 (page 12) displays the FEERs over the four years, in each case taking the 2008 FEER = 100. A bigger number denotes an appreciation, so that a number greater than 100 means that the FEER estimated in that year was stronger than the 2008 FEER. Using 2008 FEER = 100 as base, the range of our estimates averages 15.1 and reaches a maximum of 28.1 in the case of South Africa.

Table 4 (page 13) displays the FEER-consistent dollar rates over the same four years, using the 2008 FEER-consistent rate as 100. It can be seen that New Zealand shows the most variation, of no less than 46.3. In general the variation in the FEER-consistent dollar rates is greater than that of the corresponding FEERs, averaging 20.9, but this is not universally true (e.g., Argentina and China). The obvious explanation is that FEER-consistent dollar rates depend also on the variation of the dollar's FEER as well as on that of the country's FEER.

In view of the decision of the G-20 to conduct a mutual assessment program (MAP) with the objective of curtailing global imbalances, particular interest attaches to our results for the G-20 countries. These are shown in table 5 (page 14).[9] Looking first at the FEERs, it can be seen that 9 of the 15 currencies are shown as within 3 percent of equilibrium. Only one (the renminbi) is shown as undervalued. The Turkish lira is by far the most overvalued currency, followed by the South African rand, the Australian dollar, the Brazilian real, and the US dollar. Interestingly, only two of those countries, namely China and the United States, are among the seven that have been selected by the G-20 for intensive investigation because

8. We continue to believe that the IMF is underestimating the long-run damage to Brazil's trading position from the strong real, but we are seeking to draw out the implications of the IMF's forecasts and not to second-guess them.

9. Table 5 expresses the first three columns as index numbers with the FEER for February 2008 as the base, 100. Thus, for example, using this base the actual REER for Argentina stood at 103.9 in February 2008, but had fallen to 92.3 by April 2011. Nevertheless, the REER remained slightly overvalued against the April 2011 FEER of 89.9 (again on an index with the 2008 FEER at 100.) Note further that specifying the misalignment in table 5 as percent overvaluation yields a slightly different figure from the corresponding "percentage change"' in the next to last column of table 2. For example, for China the 28.5 percent appreciation shown in table 2 corresponds to the misalignment of –22.2 percent reported in table 5.

of the size of the spillovers from their national actions onto other countries. The actions of the other five selected (France, Germany, India, Japan, and the United Kingdom) may impact other countries, but the conduct of their exchange rate policy gives no obvious ground for complaint.

Let us next consider the FEER-consistent dollar rates, shown in the right-hand three columns of table 5. This shows a radically different picture. It is true that China is still the only radically undervalued currency and the Turkish lira is still by far the most overvalued with the South African rand next, but even the Australian dollar and the Brazilian real are close to equilibrium against the US dollar. Meanwhile the table emphasizes that if there is to be a realignment of exchange rates adequate to accomplish global rebalancing, then a whole slew of currencies—the euro, the Indian rupee, the Indonesian rupiah, the Japanese yen, the Korean won, the Mexican peso, and the pound sterling—which are in overall equilibrium, will have to accept revaluations against the dollar.

Our calculations show the need for a slightly larger effective revaluation of the renminbi this year (17.6 percent) than last (15.3 percent) and a larger appreciation of the renminbi in terms of the dollar....

China connoisseurs will doubtless note that our calculations show the need for a slightly larger effective revaluation of the renminbi this year (17.6 percent) than last (15.3 percent) and a larger appreciation of the renminbi in terms of the dollar (28.5 percent rather than 24.2 percent), despite the intervening appreciation of the renminbi. We would make two observations. First, the renminbi has not appreciated in effective terms between the two periods: Almost all other countries have appreciated more against the dollar than China has. Deflating by consumer prices and applying the SMIM model trade weights, the real effective exchange rate of the renminbi was virtually unchanged from May 2010 to April 2011.[10] Second, the change in the objective in terms of the dollar (a target rate of 5.09 renminbi per dollar rather than 5.50) reflects primarily the reduction in the FEER of the dollar (by 10 percent) rather than an increase in that of the renminbi (by 2.6 percent; see table 3).

10. With 2007 = 100, the REER index for the renminbi was at 113.2 in May 2010 and 113.6 in April 2011. The BIS real effective exchange rate index actually shows a depreciation rather than appreciation for the renminbi, from an index of 119.96 in May 2010 to 116.92 in April 2011 (BIS 2011).

One of the purposes of estimating FEERs was to gauge the feasibility of a program of limited exchange rate flexibility. If estimated FEERs display constancy over time, that would suggest the feasibility of specifying a central rate and defending it against market skepticism. If the estimates jump around capriciously from one year to another, that tends to make one doubtful of the feasibility of this program. The results displayed in table 3 are not particularly encouraging. Had one used the FEERs estimated in 2008 as base, only 10 of the 30 currencies remained within the traditional +/–10 percent limit for each of the following three years. By enlarging the permitted range to +/–15 percent, one captures 20 of the 30 currencies, with a further four only marginally outside. But that leaves six currencies—those of Australia, Korea, Mexico, New Zealand, South Africa, and Turkey—in which the variations of the estimated FEERs have been embarrassingly large. It is possible that some of the changes in FEERs resulted from real changes that would have been recognized and incorporated (since the FEER is not supposed to be a constant), but there is no obvious way of testing this conjecture. In the case of one of the most extreme changes in the FEER, the 25 percent drop for Turkey from 2008 to 2011, as noted above, it may be that the IMF's new baseline projection exaggerates the prospective current account deficit, resulting in an exaggerated reduction in our calculated FEER.

Despite these exceptions, the most important economies generally do show FEER variation that remains within a ±15 percent band. The world's six largest economies all do so (the United States, euro area, China, Japan, Brazil, and the United Kingdom). For the 34 economies combined, 93 percent of 2016 GDP is in economies whose currencies stay within (or almost within) a 15 percent band (table 3).

CONCLUSION

In April 2011 most currencies appear to have been reasonably close to their FEERs. The most important exceptions are China, on the weak side, and the United States, on the strong side. The two are likely to be closely related: China pegs its exchange rate at an undervalued level and then feeds a substantial share of the resulting proceeds into the United States, thus pushing up the dollar for portfolio reasons in terms of other floating currencies. This suggests the really important change remains, as we have argued ever since the first of our annual publication of FEERs, to persuade the Chinese authorities that they too would benefit from a more realistic value of the renminbi. (Our analysis has demonstrated yet again that a revaluation by China should be accompanied by similar moves by a number of East Asian currencies.)

Note that there is no contradiction between this view and the widely accepted view that elimination of the global imbalances requires an expansion in Chinese demand and an increase in the American saving rate. In the absence of complementary moves focusing on changing demand, one would have to expect that moves of exchange rates to their FEERs would be reversed by relative inflation. The two changes are

Now would thus be a favorable time for renminbi appreciation for both China, helping in its fight against inflation, and the United States, helping in its fight against unemployment.

complements, not substitutes. It is of course possible that China will instead adjust by pushing up nominal wages, but the Chinese share a strong aversion to inflation, which gives them an interest in making the adjustment in real prices largely through an exchange rate appreciation. Now would thus be a favorable time for renminbi appreciation for both China, helping in its fight against inflation, and the United States, helping in its fight against unemployment.

We have also found that several currencies are significantly stronger than their FEERs (Turkey, South Africa, Australia, and New Zealand). While no one can know the exact time when they will face a crisis, and it is possible that they still have unused latitude to add to their debt, it is to be hoped that they will resist the temptation to argue that "this time it is different." By now we know what that is a prelude to.

REFERENCES

Blue Chip. 2011. *Blue Chip Economic Indicators* (April). New York: Aspen Publishers.

BIS (Bank for International Settlements). 2011. BIS effective exchange rate indices. Basel. Available at www.bis.org/statistics/eer/broad1105.xls.

CBO (Congressional Budget Office). 2011. *The Budget and Economic Outlook: Fiscal Years 2011 to 2021*. Washington.

Cline, William R. 2005. *The United States as a Debtor Nation*. Washington: Institute for International Economics.

Cline, William R. 2007. Estimating Reference Exchange Rates. Paper prepared for the workshop on Policies to Reduce Global Imbalances, sponsored by Bruegel, the Korea Institute for International Economic Policy, and the Peterson Institute for International Economics, Washington, February 8–9.

Cline, William R. 2008. *Estimating Consistent Fundamental Equilibrium Exchange Rates.* Working Paper 08-6 (July). Washington: Peterson Institute for International Economics.

Cline, William R. 2010. *Renminbi Undervaluation, China's Surplus, and the US Trade Deficit.* Policy Briefs in International Economics 10-20 (August). Washington: Peterson Institute for International Economics.

Cline, William R. 2011a. Updated Parameters for a Current Account Projection Model. Processed (January). Peterson Institute for International Economics, Washington.

Cline, William R. 2011b. Baseline US Current Account Projections, 2011–16. Processed (May). Peterson Institute for International Economics, Washington.

Cline, William R., and John Williamson. 2008. *New Estimates of Fundamental Equilibrium Exchange Rates.* Policy Briefs in International Economics 08-7 (July). Washington: Peterson Institute for International Economics.

Cline, William R., and John Williamson. 2009. *2009 Estimates of Fundamental Equilibrium Exchange Rates.* Policy Briefs in International Economics 09-10 (June). Washington: Peterson Institute for International Economics.

Cline, William R., and John Williamson. 2010a. *Estimates of Fundamental Equilibrium Exchange Rates, May 2010.* Policy Briefs in International Economics 10-15 (June). Washington: Peterson Institute for International Economics.

Cline, William R., and John Williamson. 2010b. *Currency Wars?* Policy Briefs in International Economics 10-26 (November). Washington: Peterson Institute for International Economics.

Consensus Economics. 2011. *Consensus Forecasts* (April).London.

Federal Reserve Board. 2011. *Price Adjusted Broad Dollar Index*. Washington. Available at www.federalreserve.gov.

Freund, Caroline L. 2000. *Current Account Adjustment in Industrialized Countries.* International Finance Discussion Papers no. 692 (December). Washington: Federal Reserve Board.

Goldstein, Morris, and Nicholas R. Lardy. 2008. China's Exchange Rate: An Overview of Some Key Issues. In *Debating China's Exchange Rate Policy,* ed. Nicholas Lardy and Morris Goldstein. Washington: Peterson Institute for International Economics.

IMF (International Monetary Fund). 2011a. *World Economic Outlook* (April). Washington.

IMF (International Monetary Fund). 2011b. *International Financial Statistics*. CD ROM, Monthly. Washington.

Lee, Jaewoo, Gian Maria Milesi-Ferreti, Jonathan David Ostry, Alessandro Prati, and Luca Antonio Ricci. 2008. *Exchange Rate Assessments: CGER Methodologies*. IMF Occasional Papers no. 261 (April). Washington: International Monetary Fund.

Macroeconomic Advisers. 2011. *Forecast Details* (April). Washington.

Mann, Catherine L. 1999. *Is the US Trade Deficit Sustainable*? Washington: Institute for International Economics.

Reinhart, Carmen M., Kenneth S. Rogoff, and Miguel A. Savastano. 2003. Debt Intolerance. *Brookings Papers on Economic Activity* 1 (Spring): 1-74. Washington: Brookings Institution.

Truman, Edwin. 2010. *Strengthening IMF Surveillance: A Comprehensive Proposal.* Policy Briefs in International Economics 10-29 (December). Washington: Peterson Institute for International Economics.

Table 1 Target current accounts for 2016

Country	IMF projection of 2011 current account (percent of GDP)	IMF 2016 GDP forecast (billions of US dollars)	IMF 2016 current account forecast (percent of GDP)	Adjusted 2016 current account (percent of GDP)	Target current account (percent of GDP)
Pacific					
Australia	–0.4	1,697	–6.2	–5.6	–3.0
New Zealand	–0.2	181	–7.0	–7.4	–3.0
Asia					
China	5.7	11,220	7.8	8.3	3.0
Hong Kong	5.2	342	7.9	9.8	3.0
India	–3.7	2,777	–1.6	–1.6	–1.6
Indonesia	0.9	1,337	–1.0	–1.0	–1.0
Japan	2.3	6,540	2.0	2.8	2.8
Korea	1.1	1,586	0.6	0.1	0.1
Malaysia	11.4	362	8.6	10.1	3.0
Philippines	2.9	289	0.9	1.6	1.6
Singapore	20.4	319	14.9	16.1	3.0
Taiwan	11.6	751	8.0	9.3	3.0
Thailand	2.7	498	2.0	2.2	2.2
Middle East/Africa					
Israel	3.3	308	3.4	3.1	3.0
Saudi Arabia	19.8	772	6.2	7.4	7.4
South Africa	–4.4	501	–6.0	–6.7	–3.0
Europe					
Czech Republic	–1.8	336	–0.7	–0.4	–0.4
Euro area	0.0	14,804	0.1	–0.5	–0.5
Hungary	1.5	172	–3.7	–5.4	–3.0
Norway	16.3	544	14.8	14.6	14.6
Poland	–3.9	688	–4.3	–4.2	–3.0
Russia	5.6	3,237	0.3	0.5	0.5
Sweden	6.1	721	5.6	6.2	3.0
Switzerland	13.2	635	12.0	8.1	3.0
Turkey	–8.0	1,159	–8.4	–8.5	–3.0
United Kingdom	–2.4	3,220	–1.0	–0.0	–0.0
Western Hemisphere					
Argentina	0.1	709	–0.9	–0.3	–0.3
Brazil	–2.6	3,303	–3.6	–4.0	–3.0
Canada	–2.8	2,063	–1.3	0.4	0.4
Chile	0.5	298	–2.5	–1.6	–1.6
Colombia	–2.1	409	–1.8	–1.8	–1.8
Mexico	–0.9	1,495	–1.5	–0.0	–0.0
United States	–3.2	18,808	–3.4	–4.3	–3.0
Venezuela	7.0	327	2.0	2.8	2.8

Source: IMF (2011a); authors' calculations.

Table 2 Results of the simulation

Country	Changes in current account as percent of GDP		Change in REER (percent)		Dollar exchange rate		FEER-consistent dollar rate
	Target change	Change in simulation	Target change	Change in simulation	Actual April 2011	Percent change	
Pacific							
Australia[a]	2.6	3.1	–12.4	–14.9	1.05	–3.2	1.02
New Zealand[a]	4.4	4.9	–16.3	–18.2	0.78	–10.7	0.70
Asia							
China	–5.3	–4.8	17.6	16.0	6.54	28.5	5.09
Hong Kong	–6.8	–6.3	13.7	12.5	7.77	31.4	5.92
India	0.0	0.4	0.0	–1.7	44.4	8.2	41.0
Indonesia	0.0	0.4	0.0	–1.8	8,660	14.6	7,554
Japan	0.0	0.3	0.0	–1.8	84	10.4	76
Korea	0.0	0.7	0.0	–1.6	1,087	11.0	979
Malaysia	–7.1	–6.2	14.2	12.4	3.02	28.7	2.35
Philippines	0.0	0.5	0.0	–1.5	43.2	13.1	38.2
Singapore	–13.1	–12.0	26.2	24.1	1.25	38.5	0.90
Taiwan	–6.3	–5.7	14.1	12.7	29.0	27.5	22.8
Thailand	0.0	0.8	0.0	–1.8	30.1	11.7	27.0
Middle East/Africa							
Israel	–0.1	0.3	0.4	–0.9	3.44	4.5	3.29
Saudi Arabia	0.0	0.6	0.0	–1.4	3.75	7.8	3.48
South Africa	3.7	4.1	–14.8	–16.2	6.75	–8.7	7.38
Europe							
Czech Republic	0.0	0.5	0.0	–1.0	16.9	3.9	16.3
Euro area[a]	0.0	0.5	0.0	–2.3	1.44	4.5	1.50
Hungary	2.4	2.9	–4.9	–5.9	185	–0.3	185
Norway	0.0	0.4	0.0	–1.1	5.43	4.9	5.18
Poland	1.2	1.6	–3.6	–4.8	2.77	0.3	2.76
Russia	0.0	0.3	0.0	–1.2	28.2	4.5	27.0
Sweden	–3.2	–2.7	8.5	7.2	6.24	12.2	5.56
Switzerland	–5.1	–4.7	11.4	10.5	0.90	15.4	0.78
Turkey	5.5	5.7	–28.0	–29.1	1.52	–23.1	1.98
United Kingdom[a]	0.0	0.3	0.0	–1.3	1.63	4.5	1.71
Western Hemisphere							
Argentina	0.0	0.5	0.0	–2.7	4.06	1.4	4.00
Brazil	1.0	1.4	–7.5	–10.1	1.59	–3.9	1.65
Canada	0.0	0.1	0.0	–0.6	0.96	1.9	0.94
Chile	0.0	0.7	0.0	–2.1	472	4.0	454
Colombia	0.0	0.3	0.0	–2.1	1,815	1.7	1,784
Mexico	0.0	0.2	0.0	–0.7	11.8	1.5	11.6
United States	1.3	1.8	–6.2	–8.5	1.00	0.0	1.00
Venezuela	0.0	0.4	0.0	–1.6	4.29	1.9	4.21

FEER = fundamental equilibrium exchange rate
REER = real effective exchange rate

a. The currencies of these countries are expressed as dollars per currency. All other currencies are expressed as currency per dollar.

Source: Authors' calculations.

Table 3 FEER estimated over the last four years (2008 = 100)

Country	February 2008	March 2009	May 2010	April 2011	Range
Pacific					
Australia	100	73.7	85.6	97.0	26.3
New Zealand	100	83.2	73.2	82.5	26.8
Asia					
China	100	114.5	101.4	104.0	14.5
Hong Kong	100	98.1	100.5	99.9	2.4
India	100	93.1	115.0	115.6	22.5
Indonesia	100	88.1	104.8	105.7	17.6
Japan	100	112.6	106.8	106.7	12.6
Korea	100	73.6	86.6	87.8	26.4
Malaysia	100	102.6	102.1	101.6	2.6
Philippines	100	93.3	95.0	94.8	6.7
Singapore	100	91.7	111.3	109.3	19.6
Taiwan	100	99.9	97.0	101.2	4.1
Thailand	100	95.3	98.4	97.9	4.7
Middle East/Africa					
Israel	100	93.6	100.0	104.5	10.9
South Africa	100	95.8	119.8	123.9	28.1
Europe					
Czech Republic	100	97.3	96.9	101.4	4.5
Euro area	100	112.7	98.5	101.6	14.2
Hungary	100	94.4	103.4	104.3	9.8
Poland	100	86.8	97.5	97.6	13.2
Sweden	100	89.8	93.6	101.6	11.8
Switzerland	100	98.4	98.7	106.6	8.2
Turkey	100	99.2	101.5	74.8	26.7
United Kingdom	100	88.5	91.3	91.7	11.5
Western Hemisphere					
Argentina	100	110.5	98.4	89.9	20.7
Brazil	100	86.9	105.9	110.1	23.2
Canada	100	88.0	101.6	108.1	20.1
Chile	100	86.6	92.9	97.3	13.4
Colombia	100	94.8	113.9	116.1	21.2
Mexico	100	80.6	92.5	99.4	19.4
United States	100	104.3	106.0	95.5	10.5

Source: Authors' calculations.

Table 4 FEER-consistent dollar rates estimated over the last four years
(2008 prices, 2008=100)

Country	February 2008	March 2009	May 2010	April 2011	Range
Pacific					
Australia[a]	100	137.5	120.8	96.3	41.3
New Zealand[a]	100	133.9	146.3	117.5	46.3
Asia					
China	100	88.9	100.5	91.2	11.6
Hong Kong	100	99.5	103.8	95.9	7.9
India	100	110.6	92.9	81.8	28.8
Indonesia	100	119.6	97.3	88.5	31.2
Japan	100	91.4	97.4	89.3	10.7
Korea	100	135.0	119.7	108.3	35.0
Malaysia	100	103.3	100.1	92.9	10.4
Philippines	100	108.9	108.7	99.6	9.3
Singapore	100	113.0	94.5	87.7	25.3
Taiwan	100	102.0	106.8	93.4	13.5
Thailand	100	106.5	104.1	94.4	12.1
Middle East/Africa					
Israel	100	108.0	105.2	93.8	14.3
South Africa	100	105.4	90.5	77.8	27.6
Europe					
Czech Republic	100	103.4	115.3	95.7	19.6
Euro area[a]	100	95.1	111.5	97.3	16.4
Hungary	100	106.3	108.0	92.2	15.8
Poland	100	115.3	114.6	100.2	15.3
Sweden	100	114.6	119.1	97.2	21.8
Switzerland	100	102.4	111.4	90.8	20.6
Turkey	100	102.0	107.6	122.2	22.2
United Kingdom[a]	100	116.6	121.6	107.2	21.6
Western Hemisphere					
Argentina	100	96.9	107.8	103.9	10.9
Brazil	100	115.8	100.5	88.4	27.4
Canada	100	114.0	99.9	91.7	22.2
Chile	100	119.7	114.4	100.0	19.7
Colombia	100	107.1	93.1	84.1	23.0
Mexico	100	124.5	110.2	99.2	25.3

a. The currencies of these countries are expressed as dollars per currency. All other currencies are expressed as currency per dollar.

Source: Authors' calculations.

Table 5 Two measures of disequilibrium of the G-20 currencies (February 2008 FEER = 100)

Country	REER		FEER, April 2011	Overvaluation in April 2011[b]	Market dollar rate, April 2011	FEER-consistent dollar rate, April 2011	Overvaluation relative to dollar in April 2011[c]
	February 2008	April 2011					
Argentina	103.9	92.3	89.9	2.7	4.06	4.00	–1.5
Australia[a]	101.3	114.0	97.0	17.5	1.05	1.02	2.9
Brazil	101.4	122.6	110.1	11.4	1.59	1.65	3.8
Canada	104.3	108.7	108.1	0.6	0.960	0.942	–1.9
China	84.5	89.7	104.0	–13.8	6.54	5.09	–22.2
Euro area[a]	107.8	104.0	101.6	2.4	1.44	1.50	–4.0
India	103.8	117.5	115.6	1.6	44.4	41.0	–7.7
Indonesia	96.6	107.6	105.7	1.8	8,660	7554	–12.8
Japan	94.6	108.7	106.7	1.9	83.6	75.8	–9.3
Korea	103.6	89.2	87.8	1.6	1,087	979	–9.9
Mexico	100.4	100.1	99.4	0.7	11.8	11.6	–1.7
South Africa	117.1	147.9	123.9	19.4	6.75	7.38	9.3
Turkey	114.9	105.5	74.8	41.0	1.52	1.98	30.3
United Kingdom[a]	107.1	92.9	91.7	1.3	1.63	1.71	–4.7
United States	109.4	104.5	95.5	9.4	1.00	1.00	

FEER = fundamental equilibrium exchange rate
REER = real effective exchange rate

a. The currencies of these countries are expressed as dollars per currency. All other currencies are expressed as currency per dollar.
b. Percentage by which REER exceeds FEER in April 2011
c. Percentage by which market rate exceeds FEER-consistent rate in April 2011

Source: Authors' calculations.

APPENDIX A BASELINE PROJECTIONS FOR THE UNITED STATES AND CHINA

UNITED STATES

In successive annual issues of our estimates of FEERs, on some occasions we have adopted the IMF's WEO baseline projection of the US current account, and other times we have replaced it with projections from the US-specific models maintained by Cline (2005 and subsequent revisions), depending on the size of the difference from the WEO projection. Cline (2011a) updates the parameters of the KGS (Krugman-Gagnon-symmetrical) model. When the updated model is applied to the April 2011 WEO projections of country growth rates and oil prices, and using the April 2011 level of the Federal Reserve's broad real exchange rate (Federal Reserve 2011), the result is a moderately larger medium-term deficit than projected by the IMF. By 2016, the US current account deficit stands at 4.3 percent of GDP (Cline 2011b) rather than the 3.4 percent projected by the IMF. The difference would be even wider, by about 0.4 percent of GDP, using the IMF's April 2011 WEO base period of February 8–March 8 for exchange rates rather than April exchange rates, given the decline of the dollar by about 2½ percent from February to April.

Private-sector forecasts tend to support a somewhat larger current account deficit than projected by the IMF. Thus, Macroeconomic Advisers (2011) projects the 2011 deficit at 3.8 percent of GDP, the same as Cline (2011b), and Consensus Economics (2011), 3.6 percent of GDP, whereas the WEO estimate for this year is only 3.2 percent. Although it is unclear what divergences might cause the IMF baseline to show a substantially smaller deficit by 2016 than that in the KGSR model baseline (with R for "revised"), it warrants mention that an important influence in the latter is the sizable reduction in the capital services surplus (from 1.2 percent of GDP in both 2010 and 2011 to only 0.3 percent by 2016). This erosion reflects the return of interest rates toward more normal levels (from 3.2 percent in 2010 to 5.3 percent by 2016, based on Congressional Budget Office [CBO 2011] projections).

An important question is why the US medium-term external deficit has returned to being meaningfully in excess of our 3 percent ceiling for fundamental equilibrium whereas our previous estimate in November 2010 judged the dollar approximately at equilibrium, despite the fact that the dollar has declined further in the interim. Thus, in June 2010 we estimated that the dollar needed to decline from its May base by 7.8 percent in effective terms to bring the medium-term current account deficit down to a target of 3 percent of GDP; by October the effective rate had fallen by 5.3 percent, leaving so small a remaining gap (2.5 percent) that we interpreted the dollar to have reached approximate equilibrium (Cline and Williamson 2010b, table 1). From October to April the real effective exchange rate of the dollar fell an additional 3.4 percent (Federal Reserve 2011). The dollar would thus now be slightly below its FEER if the economic environment had not changed.

Instead, two main changes have occurred since last year that have eroded the medium-term US current account baseline. First, oil prices have increased. Last year our projection placed the average for Brent and West Texas Intermediate at $84 per barrel in 2011 and $106 in 2015; the new projection (Cline 2011b) applies the 2011 April WEO forecast of $107 in 2011 and $113 in 2015. The extra cost of oil imports amounts to 1 percent of GDP in 2011 and 0.5 percent by 2015. Second, the foreign growth outlook and hence the market for US exports has weakened. Weighting by US exports, the IMF's WEO has reduced projected foreign growth from the April 2010 edition to the April 2011 edition by an average of 0.2 percent annually for 2011–15. In addition to these two economic factors, the addition of one year to the horizon of the baseline (2016 rather than 2015) is not favorable to the US outlook because of the rising influence of interest payable on external debt as the US interest rate returns to more normal levels. Thus, in the most recent US baseline the current account deficit widens from 4.0 percent of GDP in 2015 to 4.3 percent in 2016, and two-thirds of the 0.3 percentage point erosion is attributable to a decline in the balance on capital services income. Unlike most other major countries, the United States is already beyond the 3 percent of GDP allowable limit for the current account deficit and therefore has to adjust its exchange rate in response to these influences.

Finally, an important question about the US baseline is how it should be seen in relationship to the problem of high fiscal deficits. In general, the FEERs analysis assumes that countries manage their fiscal affairs so as to maintain internal balance, namely, a balanced combination of modest inflation and moderately low unemployment. When a need for an effective depreciation (or appreciation) is calculated in order to reach the FEER, the implicit assumption is that the depreciating (appreciating) country will accompany the movement in the exchange rate with appropriate fiscal tightening (loosening) so as to maintain internal balance. Indeed, the fiscal adjustment is a classic proximate mechanism to implement the exchange rate adjustment, because tighter fiscal policy should reduce the interest rate and hence tend to lower the exchange rate, whereas fiscal loosening should do the reverse.

The analysis is complicated, however, by the fact that the United States starts from a point of internal imbalance: Unemployment is too high. If there were no concern about excessive public debt, there would be little case for fiscal

tightening until relatively full employment had returned and conceivably a case for further fiscal expansion to reduce unemployment. The normal full-employment relationship between a larger fiscal deficit and a larger current account deficit would not obtain, because the larger fiscal deficit would not impose a withdrawal of resources from exports for use in providing the supply for increased domestic consumption. Rather, the extra resources needed would be obtained from additional production provided by increased utilization of the stock of unemployed workers and idle plant capacity.

The baseline projection by the CBO (2011) shows US unemployment falling from 9.6 percent in 2010 to 9.4 percent in 2011, 8.4 percent in 2012, 7.6 percent in 2013, 6.8 percent in 2014, 5.9 percent in 2015, and 5.3 percent in 2016, where it plateaus for subsequent years. Through almost all of the five-year horizon, then, the economy is expected to be operating below full capacity. The WEO projects a gradual decline of the "output gap" from its 2009 peak at 6 percent of GDP and a level of 4.8 percent in 2010 and 3.7 percent in 2011 to a gap of 2.0 percent by 2013, 0.9 percent by 2015, and 0.4 percent by 2016. As for the fiscal deficit, if current legislation is not changed and the Bush era tax cuts expire the deficit should decline from 9.8 percent of GDP in 2011 to 3.1 percent by 2014, but if the tax cuts are made permanent and the usual annual "fixes" for the alternative minimum tax and Medicare physician reimbursement are pursued the deficit would remain as high as 6 percent of GDP in 2013–15 and 6.8 percent by 2016 (CBO 2011). Overall, there is little prospect of a *further* widening of the fiscal deficit, and there is excess capacity through most of the period, so it seems unlikely that the already sizable current account deficit projected in Cline (2011b), or 4.3 percent of GDP by 2016, is understated because of the general influence of a still high fiscal deficit.

CHINA

In contrast to the United States, for China independent alternative projections might arguably show a narrower rather than wider current account imbalance than projected by the IMF. Nonetheless, we have adopted the IMF projections, for two main reasons. First, as shown in Cline (2010), after taking account of the exchange rate and domestic growth relative to foreign growth, there is a secular upward trend in China's current account surplus that amounts to about 0.8 percent of GDP per year. Such a trend is consistent with Nicholas Lardy's diagnosis of rapid relative productivity gains (Goldstein and Lardy 2008, 24). So even if the IMF's projection of China's surplus is overstated for 2011, as seems likely, it probably would not be overstated for the likely outcome in 2016 at an unchanged exchange rate combined with the secular trend.

The WEO estimates that China's current account surplus will rebound from 5.2 percent of GDP in 2010 to 5.7 percent in 2011, 6.3 percent in 2012, and 7.8 percent by 2016. In contrast, one set of consensus private forecasts places the surplus at only 4.3 percent of GDP in 2011 and 4.0 percent in 2012 (Blue Chip 2011). The discrepancy has not gone unnoticed: The *Economist* has pointed out that in April 2009 the IMF projected a current account surplus of 9.3 percent of GDP for 2010 at a time when five investment banks were forecasting a surplus of only 6 percent of GDP for 2010.[1] But suppose the private-sector forecast of 4.3 percent in 2011 is correct. If the secular trend of 0.8 percent addition to the surplus annually continues, and if there is no further correction in the renminbi, the result would be a surplus of 8.3 percent, about the same as the Fund's projection.

The second reason for adopting the IMF's projection for China rather than using alternative private forecasts is that for our purposes, the Fund's WEO assumption of unchanged exchange rates is precisely the concept we seek. In contrast, private forecasters are likely incorporating into their projections the influence of further renminbi appreciation in the future.[2] Without the availability of a robust country-specific current account projection model for China parallel to the KGSR model for the United States, we see no compelling reason to depart from the IMF's baseline projection for China's current account at unchanged exchange rates.

1. "China's Current-Account Surplus: Incredibly Misleading Forecasts?" *Economist*, April 28, 2011.

2. Note, however, that with exchange rate lags, the difference attributable to this source would be expected to show up substantially only by 2012 and after.

APPENDIX B UPDATING THE CURRENT ACCOUNT IMPACT PARAMETERS

In the symmetric matrix inversion model (SMIM) used to calculate FEERs (Cline 2008), an important parameter is the change in current account balance as percent of GDP for a 1 percent change in the real effective exchange rate, or "γ". This parameter takes account of the importance of exports in GDP, on the one hand, and the price elasticity of exports, on the other. Imposing an export price elasticity of unity for an economy with exports at 10 percent of GDP and 0.5 for an economy with exports as high as 100 percent of GDP, a simple formula relates the impact parameter to the size of exports relative to GDP.[1]

In previous rounds of our FEERs estimates, the primary source of the impact parameters was Cline (2005), which had applied 2003 data for exports of goods and services relative to GDP. By now these trade ratios have changed considerably in some important cases. This round of our estimates thus applies a new set of estimates for γ, based on the exports/GDP ratio in 2010 (or, where not yet available, 2008).

In the important case of the United States, the impact parameter was obtained from simulation of the KGS (Krugman-Gagnon-symmetrical) current account model, thus taking account of the additional influence of induced capital services effects from the accumulation of net external debt. In Cline (2005, 96) and the previous rounds of FEERs estimates, this parameter was γ = –0.16, meaning that a 10 percent effective depreciation would reduce the current account deficit by 1.6 percent of GDP (by year 5, with 90 percent of the adjustment occurring by year 3). In the 2011 revised version of the current account model (Cline 2011a, 2011b) the same simulation results in a parameter of γ = –0.21. This increase in the impact of the exchange rate on the current account as a percent of GDP by almost one-third reflects the sharp rise in exports of goods and services relative to US GDP, from 9.2 percent of GDP to 12.5 percent (IMF 2011b), a slightly higher proportionate increase. The effect of updating this parameter is to reduce the size of the dollar adjustment needed for any given target change in the current account as a percent of GDP.

Major increases in the ratio of exports to GDP also took place in the euro area, India, Japan, Korea, Saudi Arabia, and Switzerland. However, there were notable reductions in the export ratio for Indonesia, the Philippines, South Africa, Turkey, Canada, Colombia, and Venezuela. There was a slight decline in the median ratio of exports to GDP, from 0.37 to 0.33.

1. $\gamma = -1.056\ x + 0.56\ x^2$, where x is the ratio of exports of goods and services to GDP (Cline 2005, 252). The parameter is constrained to a maximum absolute value of 0.5.

Table B.1 Export/GDP ratio and current account impact parameter

	Exports of goods and services/GDP		Current account impact parameter γ	
Country	**2003**	**2010**	**Previous**	**Updated**
Pacific				
Australia	0.181	0.221[b]	–0.173	–0.206
New Zealand	0.280[a]	0.308[b]	–0.252	–0.272
Asia				
China	0.344	0.350[b]	–0.297	–0.301
Hong Kong	1.722	2.124[b]	–0.500	–0.500
India	0.146	0.241[b]	–0.142	–0.222
Indonesia	0.312	0.248	–0.275	–0.227
Japan	0.118	0.160	–0.117	–0.154
Korea	0.382	0.543	–0.322	–0.408
Malaysia	1.149	1.035[b]	–0.500	–0.500
Philippines	0.491	0.348[b]	–0.383	–0.300
Singapore	1.580	2.343[b]	–0.500	–0.500
Taiwan	0.584	0.638	–0.426	–0.446
Thailand	0.656	0.714	–0.452	–0.468
Middle East/Africa				
Israel	0.384	0.378	–0.323	–0.319
Saudi Arabia	0.470	0.677[b]	–0.373	–0.458
South Africa	0.440[a]	0.279	–0.356	–0.251
Europe				
Czech Republic	0.758[a]	0.777[b]	–0.479	–0.482
Euro area	0.147	0.225	–0.143	–0.209
Hungary	0.776[a]	0.814[b]	–0.482	–0.488
Norway	0.460[a]	0.417	–0.367	–0.343
Poland	0.405[a]	0.416	–0.336	–0.342
Russia	0.350	0.303	–0.301	–0.269
Sweden	0.439	0.490	–0.356	–0.383
Switzerland	0.437	0.645	–0.355	–0.448
Turkey	0.302[a]	0.209	–0.268	–0.196
United Kingdom	0.251	0.288	–0.230	–0.258
Western Hemisphere				
Argentina	0.250	0.220	–0.229	–0.205
Brazil	0.169	0.138[b]	–0.162	–0.135
Canada	0.378	0.293	–0.319	–0.261
Chile	0.364	0.402	–0.310	–0.334
Colombia	0.214	0.158	–0.200	–0.153
Mexico	0.284	0.302	–0.255	–0.268
United States[c]	0.092	0.125	–0.157	–0.210
Venezuela	0.370	0.232	–0.314	–0.215

a. 2006
b. 2008
c. Special calculation; see text.

Source: Authors' calculations.