16-6 Estimates of Fundamental Equilibrium Exchange Rates, May 2016

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May 2016

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The US dollar is overvalued by about 7 percent, approximately the same amount as estimated in the two previous issues in this semiannual series (Cline 2015a, 2015b).[1] After rising about 5 percent from October 2015 (the base of the previous assessment) to January 2016, the real effective exchange rate (REER) of the dollar fell slightly below its October level by April 2016 (the base of the new estimates). The new estimates find the yen slightly undervalued (by 3 percent) despite its recent strength-

ening, but no misalignment of the other two leading currencies, the euro and Chinese renminbi.

INTEREST RATE DIVERGENCE AND DOLLAR STRENGTH

In recent months the divergence in monetary policy between the United States, on the one hand, and the euro area and Japan, on the other, has widened further. Paradoxically, however, the dollar has weakened against both currencies rather than gaining further strength. In December the European Central Bank (ECB) moved its already negative deposit rate from –0.2 to –0.3 percent and in March 2016 to –0.4 percent (ECB 2016). Japan entered the realm of negative interest rate policy at the end of January, when it announced a rate of –0.1 percent on excess reserves.[2] In contrast, in mid-December the Federal Reserve boosted the federal funds rate to a range of 0.25 to 0.5 percent from the floor of 0 to 0.25 percent, where it had stood for the past seven years (Federal Reserve 2016b). Instead of rising, however, the dollar has fallen from an average of 1.073 per euro in November 2015 to 1.134 in April 2016, and from 122.6 yen per dollar to 109.6 over the same period.[3]

The divergence in monetary policy phases had contributed to a rise in the dollar against the euro and yen through most of 2015. As shown in figure 1, from mid-2014 through November 2015 the dollar had risen about 25 percent against the euro and 20 percent against the yen. Significant increases occurred after announcements of expansion of quantitative easing in Japan (October 2014) and adoption of quantitative easing in the euro area (January 2015). By November 2015 there was much talk about the euro falling to (or through) parity with the dollar.[4] Since then, however, changing expectations about the strength and pace of divergence in monetary policy appear to have reversed this path, at least temporarily. Despite the Federal Reserve's increase in the policy interest rate in December 2015, by April 2016 the dollar had fallen from its November peak by about 5 percent against the euro and 11 percent against the yen.

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1. First introduced in Cline and Williamson (2008), the semiannual calculations of fundamental equilibrium exchange rates (FEERs) examine the extent to which exchange rates need to change in order to curb any prospectively excessive current account imbalances back to a limit of ±3 percent of GDP. This target range is intended to be consistent with sustainability for deficit countries and global adding-up for surplus countries. The estimates apply the Symmetric Matrix Inversion Method (SMIM) model (Cline 2008). For a summary of the methodology, see Cline and Williamson (2012, appendix A), available at www.piie.com/publications/pb/pb12-14.pdf.

2. Leika Kihara, "BOJ stuns markets with surprise move to negative interest rates," Reuters, January 29, 2016.

3. Calculated from Bloomberg.

4. For example, Ivana Kotasova, "Coming soon: one dollar = one euro," CNN, November 20, 2015, http://money.cnn.com/201/11/20/news/economy/dollar-euro-parity-ecb/.

Figure 1   Strength of the dollar against the euro and yen

index (June 2014 = 100)
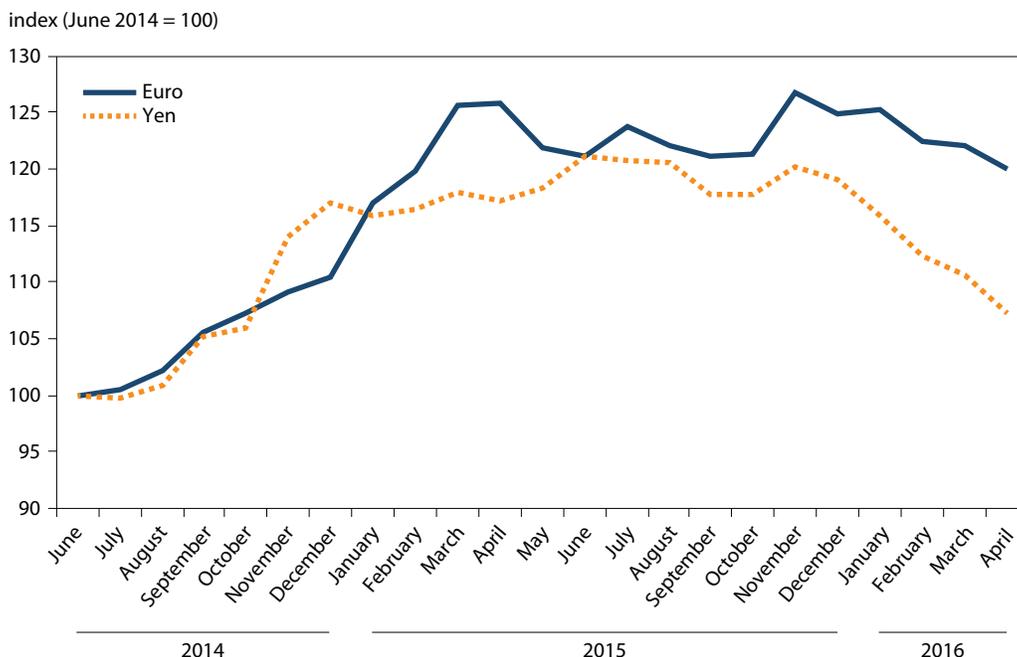
Source: Calculated from Bloomberg.

In part the failure of the dollar to rise further likely reflects the decision of the Federal Reserve to delay the phasing of subsequent increases in interest rates. This decision in turn has been influenced by prospective worsening of the trade deficit as a consequence of both slower than expected foreign growth and appreciation of the dollar.[5] Markets may also have concluded that the scope for monetary ease in the euro area and Japan has largely been exhausted and that for Japan in particular the move to a negative rate reflected desperation.[6] Because the dollar had already risen so much against the euro and yen by late 2015 as a consequence of the divergent monetary policies, markets may well have already overdiscounted the prospective effects on exchange rates. The recent weakening of the dollar could reflect recognition of earlier overshooting.

Figure 2 shows the interest rate on five-year government notes for the United States, Germany, and Japan since January 2007. It is evident that there has been a shift from a long period in which US rates were about the same as those in Germany,

with both higher than in Japan, to a convergence of all three rates at a low level in 2012, followed by the opening of a sizable gap between the United States and both Germany and Japan. From March 2013, when the United States announced the tapering off of quantitative easing, to December 2015, the US interest rate gap widened from 45 basis points against Germany and 63 basis points against Japan to 153 and 139 basis points, respectively. But if one thinks that going forward the scope for this gap is not much more than a maximum of say 200 basis points and that such a gap would not persist more than say another five years, then in principle a fully front-loaded rise in the dollar in 2013 would have warranted an increase of 16 percent (200 basis points for eight years). As it turns out, this amount is at the bottom of the range of the actual increase in the dollar from March 2013 to November 2015 (17 percent against the euro, 23 percent against the yen). The decline of the dollar from November 2015 to April 2016 (5 percent against the euro, 11 percent against the yen) is broadly consistent with a rollback of overshooting. Even so, the ranges just suggested are purely illustrative, and there is no guarantee that the dollar will avoid a new phase of strengthening when the Federal Reserve adopts the next few rounds of interest rate increases.

OIL PRICES AND FINANCIAL MARKETS

Further declines in the already low price of oil appear to have been a source of uncertainty in early 2016 before a price rebound. As shown in figure 3, from the beginning of November 2015 through April 2016 there was a notable correlation between the

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5. Thus, in her press conference announcing results of the March meeting of the Federal Open Market Committee, Federal Reserve Chair Janet Yellen stated that the decision to keep the federal funds rate unchanged reflected the fact that "global economic and financial developments continue to pose risks" and that "net exports also remain soft as a consequence of subdued foreign growth and the earlier appreciation of the dollar," press release, March 16, 2016, www.federalreserve.gov/mediacenter/files/FOMCpresconf20160316.pdf.

6. Nonetheless, my colleague Joseph Gagnon emphasizes that, especially in the euro area, there is much more scope for quantitative easing, considering the size of central bank balance sheets in relationship to domestic asset markets including equities (Gagnon 2016).

Figure 2   Five-year government bond rate: United States, Germany, and Japan

percent
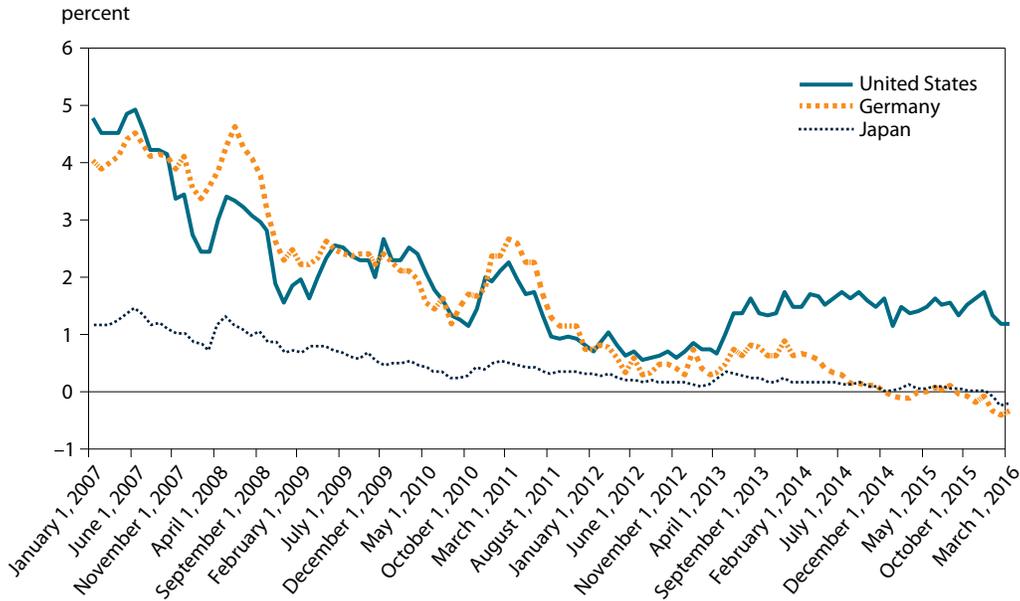
Source: Bloomberg.

Figure 3   S&P 500 Index and price of Brent crude oil per barrel
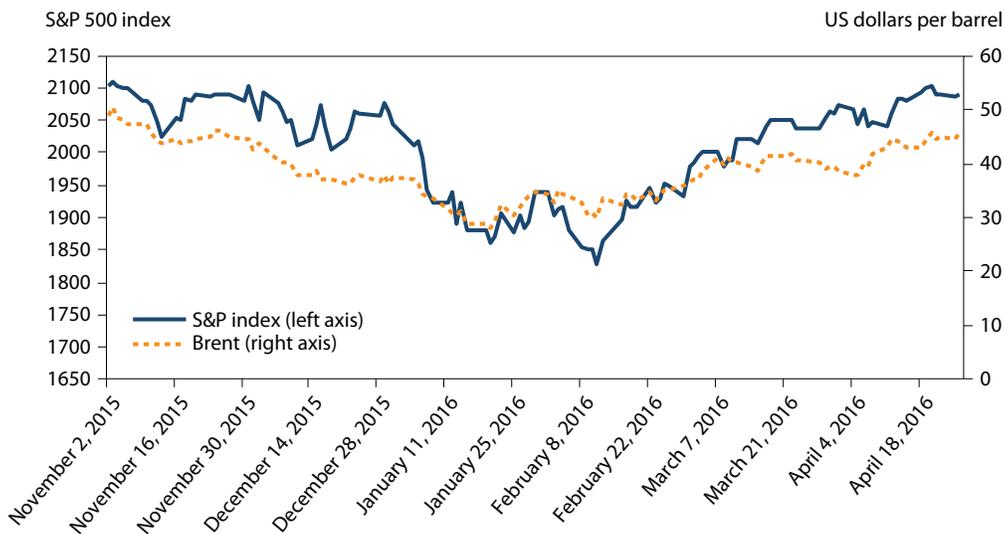
Source: Bloomberg.

price of oil and the strength of equity markets as measured by the S&P 500 index. Thus, a simple statistical test finds that in this period, a change of $1 per barrel in the price of Brent crude oil (2.6 percent of the period average of $38.8 per barrel) was associated with a change in the same direction by 13.1 points on the S&P 500 index (0.65 percent of the index average in this period).[7]

Arguments for this relationship have included the ideas that the oil price is acting as a signal of future weakness of major economies; that low oil prices force oil-exporting nations to sell off financial asset holdings; that the direct impact of low oil prices on US shale oil activity is being reflected; and that oil underpins substantial amounts of debt, creating vulnerability for creditor institutions.[8] The more usual expectation

7. The regression yields: P_S = 1500.6 (61) + 13.1 (21) P_B; adj. R^2 = 0.79, with t-statistics in parentheses.

8. Dani Burger and Oliver Renick, "Tracing Oil's Hypnosis of Stocks from Wealth Funds to Junk," Bloomberg, February 1, 2016.

has been that for most advanced economies (including the United States), the expansionary effects of lower oil prices on general consumption considerably outweigh costs, boosting the economy in the same manner as a tax cut.[9] Even so, at their trough oil prices seem likely to have overshot their medium-term equilibrium, and such volatility imposes near-term uncertainty without bringing longer-term consumption gains.

MEDIUM-TERM CURRENT ACCOUNT OUTLOOK

The medium-term projections of current account balances in the International Monetary Fund's most recent *World Economic Outlook* (WEO) (IMF 2016a) provide the principal basis for the estimates of fundamental equilibrium exchange rates (FEERs) in this study. Table 1 shows the Fund's projected current account outcomes for 2016 (first column) and 2021 (third column). Because the projections use an earlier base month (February) than the present study (April), changes in exchange rates between the two are taken into account as follows. The percent change in the real effective exchange rate (REER) between the two base months is applied to the current account impact parameter for each country (γ, percent of GDP change in current account for 1 percent appreciation of the REER). As in recent issues in this series, one-half of the resulting difference from the IMF projection is then incorporated to arrive at the "adjusted" current account (fourth column). In most cases the adjusted projections are relatively close to the IMF's projection.[10]

In the FEERs calculations, a country is considered to be in proper exchange rate alignment if its prospective current account balance is within ±3 percent of GDP. Accordingly, the final column of table 1 sets the "target" current account at no lower than −3 percent of GDP, no higher than +3 percent, and otherwise simply the same as the (adjusted) projected outcome. The four oil economies (Norway, Russia, Saudi Arabia, and Venezuela) are exceptions, as larger current account surpluses are permitted in view of the need to convert natural resource wealth to financial assets.

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9. Blanchard (2016) reviews the positive and negative effects of the sharp drop in oil prices for the US economy. He too finds a close correlation between the oil price and US stock prices from December through early March. He notes that the decline in energy investment in the second half of 2014 and in 2015 cut investment by 0.27 percent of GDP at an annual rate. He also worries that the negative effect on inflation expectations could boost real interest rates given the zero bound. He nonetheless expects the positive consumption effect from lower oil prices, at about 0.6 percent of GDP if the price stays lower by $70 per barrel, will dominate and provide a net boost to the US economy.

10. Venezuela is an exception. In March the government devalued the official rate from 6.3 to 9.99 bolivars per US dollar (Bloomberg). However, the estimated impact on the current account should be taken with a grain of salt, considering that much of the trade does not occur at the official rate.

Countries with projected current account surpluses substantially in excess of the 3 percent ceiling include the familiar cases of Singapore and Taiwan (with medium-term surpluses at 18.0 and 14.1 percent of GDP, respectively), Sweden and Switzerland (4.8 and 5.8 percent), and Hong Kong (4.6 percent). Korea again joins the excess surplus list, with a baseline current account surplus of 5.1 percent of GDP. After several years of not being placed in the category of excessive surpluses (2008–13), Korea has shown prospective medium-term surpluses in the range of 4 to 5 percent of GDP since late 2014 (Cline 2014b, 2015a, 2015b). Finally, Japan also shows a relatively small excess in its current account surplus in table 1 (at 3.6 percent of GDP).

Familiar members of the excess deficit category include South Africa (−4.8 percent of GDP), Turkey (−4.5 percent), the United States (−4.1 percent), and Australia (−3.5 percent). Low commodity prices have added Chile (−3.4 percent) and Colombia (−4.4 percent) to this list. As in recent estimates (Cline 2015a, 2015b), the present study uses a separate model-based projection of the US current account deficit. It shows the US current account deficit widening from an actual 2.7 percent of GDP in 2015 to 4.1 percent of GDP by 2021.

PROSPECTIVE WIDENING OF THE US CURRENT ACCOUNT DEFICIT

Even if the US dollar does not rise further as US monetary policy pursues normalization while monetary ease persists in the euro area and Japan, the US current account deficit is on track to rise, albeit not yet to the peak levels of 2006–07. Appendix A sets forth new projections using the model for the US current account originally developed in Cline (2005) and updated in Cline (2015a). In April 2015, the REER for the dollar stood 15.2 percent higher than the average in 2013–14. There is a two-year lag from the exchange rate signal to the trade outcome. After taking account of this lag, the current account deficit is on track to rise from 2.7 percent of GDP in 2015 to about 3.9 percent of GDP in 2017–19 and 4.1 percent by 2021. This level would be below the peak of 5.8 percent reached in 2006 and also below the average in 2004–08 (5.4 percent). But it would substantially exceed the 1980–2000 average deficit of 1.7 percent and would be larger than the average deficit of about 3 percent of GDP in 1985–87, which reflected extreme appreciation of the dollar resulting from Reaganomics and prompted collective intervention in the Plaza Accord of September 1985.

For its part, the IMF has now increased its projected US current account deficit to a range nearly as high. Thus, whereas the Fund had projected the medium-term deficit (for 2020) at 2.6 percent of GDP in its spring 2015 WEO (IMF 2015a), and at 3.4 percent in its fall WEO (IMF 2015b), it now places the deficit at 3.7 percent in 2020 and 3.9 percent in 2021 (IMF 2016a).

Table 1   Target current accounts for 2021

Country	IMF projection of 2016 current account (percent of GDP)	IMF 2021 GDP forecast (billions of US dollars)	IMF 2021 current account forecast (percent of GDP)	Adjusted 2021 current account (percent of GDP)	Target current account (percent of GDP)
Pacific					
Australia	–3.6	1,536	–3.2	–3.5	–3.0
New Zealand	–3.7	216	–2.9	–2.9	–2.9
Asia					
China	2.6	17,762	0.5	0.8	0.8
Hong Kong	3.1	410	3.6	4.6	3.0
India	–1.5	3,660	–2.6	–2.5	–2.5
Indonesia	–2.6	1,428	–3.0	–3.0	–3.0
Japan	3.8	4,895	3.7	3.6	3.0
Korea	8.2	1,629	5.6	5.1	3.0
Malaysia	2.3	531	1.6	0.5	0.5
Philippines	2.6	528	1.6	1.7	1.7
Singapore	21.2	347	18.0	18.0	3.0
Taiwan	15.0	610	14.0	14.1	3.0
Thailand	8.0	510	1.4	1.7	1.7
Middle East/Africa					
Israel	4.0	373	2.4	2.4	2.4
Saudi Arabia	–10.2	813	–1.3	–0.8	–0.8
South Africa	–4.4	323	–4.0	–4.8	–3.0
Europe					
Czech Republic	0.6	196	–1.0	–0.6	–0.6
Euro area	3.5	13,945	2.6	2.7	2.7
Hungary	5.4	141	1.9	2.4	2.4
Norway	6.5	435	8.3	7.9	7.9
Poland	–1.8	629	–3.0	–2.9	–2.9
Russia	4.2	1,608	6.5	4.7	4.7
Sweden	5.8	593	5.0	4.8	3.0
Switzerland	9.3	722	8.8	5.8	3.0
Turkey	–3.6	986	–4.6	–4.5	–3.0
United Kingdom	–4.3	3,374	–3.5	–3.1	–3.0
Western Hemisphere					
Argentina	–1.7	551	–3.0	–3.3	–3.0
Brazil	–2.0	1,829	0.1	–0.3	–0.3
Canada	–3.5	1,804	–2.3	–3.2	–3.0
Chile	–2.1	297	–3.2	–3.4	–3.0
Colombia	–6.0	441	–3.6	–4.4	–3.0
Mexico	–2.6	1,467	–2.4	–3.0	–3.0
United States	–2.9	22,766	–3.9	–4.1	–3.0
Venezuela	–6.6	104	1.3	4.5	4.5

IMF = International Monetary Fund

Source: IMF (2016a) and author's calculations.

Figure 4   China: IMF forecast of medium-term current account and REER at time of forecast
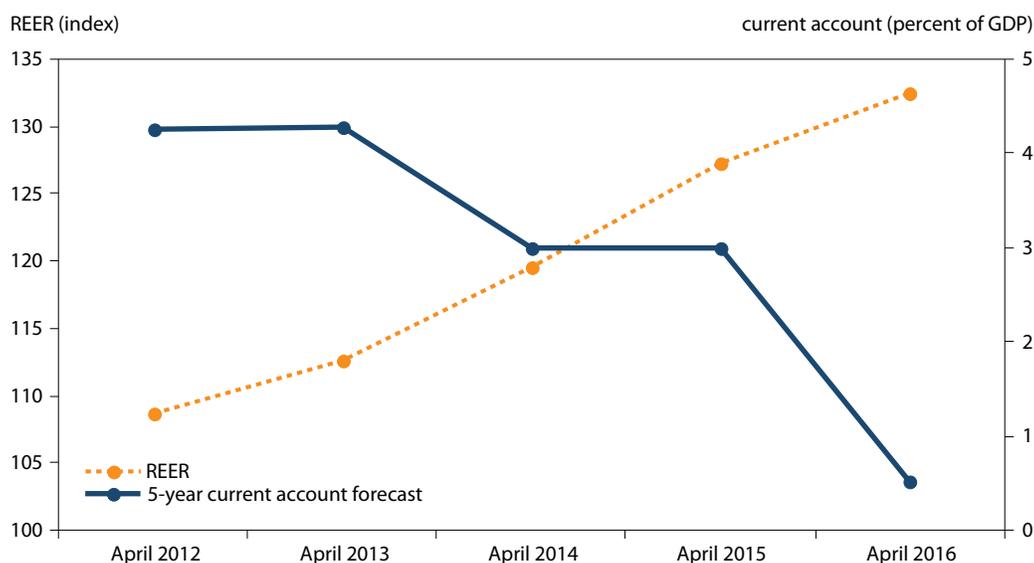
REER = real effective exchange rate; IMF = International Monetary Fund
Sources: IMF (2016a, 2015a, and earlier issues) and author's calculations.

Simulation of the model developed in appendix A provides a slightly revised estimate of the impact parameter for the influence of the REER on the current account, at $\gamma = -0.178$. Thus, after taking account of induced effects on cumulative net liabilities and capital services, a depreciation by 10 percent would reduce the current account deficit by 1.78 percent of GDP.[11] With the medium-term deficit projected at –4.13 percent of GDP (2021) and the FEERs target ceiling at 3 percent of GDP, the excess deficit is 1.13 percent of GDP. Applying the impact parameter, by implication the needed depreciation amounts to 6.3 percent.[12]

CHINA'S FALLING CURRENT ACCOUNT SURPLUS

For China, the outlook is instead for further narrowing of its current account surplus. The Fund has now cut its medium-term surplus estimate to only 0.5 percent of GDP for 2021. In contrast, the surplus had peaked at 10 percent of GDP in 2007, and in dollar terms, at $421 billion in 2008. The average surplus fell to 2 percent of GDP ($167 billion) in 2011–13 and is projected at only $93 billion by 2021 (IMF 2016a).

A major factor behind the downward trend in the surplus is the upward trend in the real effective exchange rate of the renminbi. As shown in figure 4, the REER has increased approximately 18 percent from February 2012 to February

2016 (the base months of the April 2012 and April 2016 WEOs). China's current account impact parameter in the SMIM model is $\gamma = -0.239$. So the medium-term surplus could have been expected to decline by 4.2 percent of GDP in the absence of any secular upward drift from increasing competitiveness.[13] The Fund's medium-term forecast surplus has fallen by 3.7 percent of GDP.

Appendix B further analyzes China's current account trends. The analysis suggests that the upward time drift of China's current account surplus (attributable to the "Balassa-Samuelson" effect of rising relative productivity in tradable goods) may have declined from about two-thirds of one percent to one-quarter of one percent per year.[14] The discussion also suggests that trade conflict could persist more than might be expected with a vanishing current account surplus, because trade in services (including tourism) was at near balance in 2007 but is headed to a deficit of 2.7 percent of GDP by 2020. The offsetting surplus in goods, combined with the rising size of the Chinese economy, could contribute to ongoing trade conflicts.

The appendix then examines China's swing over the past year from intervening to prevent currency appreciation

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11. The corresponding parameter in last year's issues in this series was $\gamma = -0.165$.

12. That is: 1.13/0.178 = 6.3.

13. That is: 17.7 percent real appreciation times –0.239, yielding –4.2 percent of GDP.

14. My colleague Nicholas Lardy suggests that this deceleration could have come in part from the transition from dominance of exports by state-owned firms in the early 1990s to dominance by private indigenous and foreign firms by the 2010s. The scope for further productivity gains from this shift would have moderated as this transition became more complete.

to intervening to prevent depreciation in the face of capital outflows. Reserves fell from $4.01 trillion in June 2014 to $3.22 trillion in February 2016. Currency valuation effects can explain about one-third of the decline. Credit flows have swung from net inflows of 0.8 percent of GDP in 2013 to net outflows of about 3 percent of GDP in 2014–15, apparently reflecting the reversal of the previous one-way bet on a rise in the renminbi and hence corporate incentives to borrow abroad. However, errors and omissions have widened from outflows of 0.7 percent of GDP in 2013 to 2 percent in the first three quarters of 2015, suggesting some role for household capital flight as well.

OTHER COUNTRIES

Medium-term current account projections for other countries that warrant special comment include those for Switzerland, Korea, and Brazil. The surplus for **Switzerland** in 2015 turned out to be far larger than expected. Thus, in its October 2015 WEO, the IMF (2015b) had projected the 2015 surplus at 7.2 percent of GDP. Instead, the actual outcome was a surplus of 11.4 percent (IMF 2016a). The much higher base helps explain the escalation of the IMF's medium-term forecast (to a 2021 surplus at 8.8 percent of GDP [IMF 2016a], in contrast to the 7.0 percent previously projected for 2020 [IMF 2015b]). A decline of the surplus from an average of 11 percent of GDP in 2010–13 to 8.8 percent in 2014 turns out to have been exceptional rather than indicative of a trend toward a more moderate surplus.

Switzerland intervened heavily from September 2011 to December 2014 to enforce a floor of 1.2 francs per euro. At the height of the euro area debt crisis, the franc had surged from 1.3 per euro to nearly parity in the space of eight months. In September 2011 the central bank announced it would intervene to prevent the currency from strengthening above 1.2 per euro. It held that peg until January 2015. Although the franc surged that month, on average its real effective exchange rate from then until April 2016 has been only about 7 percent stronger than during the period of the 1.2 per euro peg.[15] Moreover, the 2015 trade outcome would have reflected 2013–14 real exchange rates, given lags. The Fund's new medium-term projection indicates a surplus far above the 3 percent FEER ceiling, even after the lagged effects of the stronger currency following the end of the peg.

In its 2015 Article IV review of Switzerland, the IMF (2015d) suggested that the current account of Switzerland is overstated by "merchanting profits, net exports of financial/insurance services, and a statistical bias due to the treatment of retained earnings of multinationals" (p. 37). It noted that the

first two factors alone represented 7 percent of GDP. On this basis, the report argues that the Swiss REER was overvalued rather than undervalued in 2015. However, if Switzerland has a comparative advantage in merchanting (the buying and reselling of foreign products that never enter the country) and financial/insurance services, it is unclear why these export earnings should be excluded any more than, say, Australian exports of raw materials in assessing the underlying external account position.

With respect to earnings of multinational corporations (MNCs), all retained earnings of Swiss-based MNCs are treated as income of Swiss residents, even though relatively large portions accrue to foreign shareholders. The IMF (2015d) estimates that in 2014 the much greater incidence of this effect than of its mirror image (for Swiss shareholders in MNCs headquartered elsewhere) amounted to 3 percent of GDP. The estimates of this study thus deduct 3 percent of GDP from the projected current account, and after taking account of the change stemming from a different base month, arrive at an adjusted estimate of 5.8 percent of GDP.[16]

For **Korea,** whereas the October 2015 WEO had projected a 2015 surplus of 7.1 percent of GDP, falling to 6.7 percent in 2016 and 4.7 percent by 2020 (IMF 2015b), the April 2016 WEO placed the 2015 outcome at 7.7 percent, the 2016 balance at 8.2 percent, and the 2021 balance at 5.6 percent of GDP (IMF 2016a). Without going into the forces underlying this prospective widening of the surplus, it warrants mention that as a consequence Korea is now more clearly in the category of undervaluation, whereas as recently as May 2014 the currency was at its FEER (Cline 2014a).

For **Brazil**, the October 2015 WEO had projected a medium-term deficit of 3.8 percent of GDP (IMF 2015b) even though the REER had fallen sharply as part of the downswing in commodity-sensitive currencies. Cline (2015b, 6) applied an alternative estimate of 2.8 percent of GDP. The Fund's April 2016 WEO in contrast sets the medium-term balance for 2021 at +0.1 percent, reflecting the depreciation (but perhaps also the more severe than anticipated recession). A complication is that with the prospective impeachment of the unpopular president, financial markets have bid up the Brazilian *real* substan-

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15. Author's calculations using SMIM trade weights and consumer price index (CPI) deflators.

16. Note that prior to 2015 the estimates in this series had used a corresponding downward statistical adjustment of 4.1 percent; see Cline and Williamson (2010, 4). In the 2015 estimates (Cline 2015a, 2015b), I omitted any special adjustment, under the impression that Swiss statistical revisions (SNB 2016) had removed this bias and contributed to the 6 percent of GDP drop in the 2014 surplus from that projected in the October 2014 WEO (12.96 percent of GDP; IMF 2014) to the actual outcome as estimated in early 2015 (6.96 percent; IMF 2015a). However, the Fund's statistics were already presented on a basis consistent with current international practice (revision 6 of the IMF's balance of payments manual, BPM6), so the sharp change in the estimated 2014 surplus reflected forecast error rather than a change in statistical methodology. The bias from attribution of retained MNC earnings remains present and is inherent in the (IMF) international balance of payments accounting conventions.

tially. The real effective exchange rate of the currency rose by 17.8 percent from October 2015 to April 2016, and the April level stood 8.6 percent higher than the February average used as the base in the most recent IMF forecasts.[17] Although the latter increase is taken account of in the general base-month adjustment in table 1, resulting in a slight deficit by 2021, a caveat is perhaps in order that political developments could be particularly significant for the outlook for Brazil, and possible future strengthening of the currency could widen the prospective deficit.

FEERs ESTIMATES

Table 2 reports the results of applying the SMIM model to solve for consistent changes in real effective exchange rates that come as close as possible to the target set of changes. The first column shows the target change in the current account as a percent of GDP. The third column shows the percent change in the REER that would be required to achieve the target current account change. This REER change equals the change in the current account as a percent of GDP divided by the impact parameter γ. For example, for Korea the target current account change is a reduction by 2.1 percent of GDP. Korea's "γ" parameter is –0.4 percent of GDP current account change for 1 percent REER appreciation. So the target change in the REER for Korea is –2.1/–0.4 = 5.2 percent appreciation.

Column 2 of table 2 reports the simulation result for change in the current account, and column 4 shows the corresponding simulation result for the change in the REER. The final three columns refer to the bilateral exchange rate against the dollar: its actual level in April 2016; the percent change that would be needed if all countries simultaneously were to realign to their FEERs; and the FEER-consistent bilateral rate against the dollar if that general realignment were to occur.

As shown in table 2, the SMIM model simulation arrives at a depreciation of 7.3 percent needed in the REER of the dollar. The Japanese yen would appreciate by 2.9 percent in real effective terms. Although there is no target change in the REER for either the euro or the renminbi, both would depreciate by about 0.8 percent in the model solution for international consistency. The simulations show the largest REER appreciations for Singapore (29 percent) and Taiwan (about 25 percent), with more moderate REER appreciations identified for Switzerland (6 percent), Korea (4.6 percent), Sweden (4.5 percent), and Hong Kong (2.7 percent).

In addition to the United States, countries found to need real effective depreciations to reach FEERs include Colombia (by almost 10 percent), South Africa and Turkey (about 7 percent each), Australia (3.5 percent), Argentina (3 percent), Chile (2 percent), and Canada (about 1 percent). The small

depreciations reported in column 4 for many other countries are an artifact of the remaining divergence of model-consistent changes in current accounts from the individual country target changes.[18]

Because of the sizable depreciation of the dollar in the realignment to FEERs, bilateral rates against the US dollar would tend to rise by about 7 percent even in the absence of special country circumstances. Given the REER appreciations called for in Asia (Singapore, Taiwan, Korea, Japan, and Hong Kong), the bilateral appreciations to reach FEERs tend to be higher in that region (for example, by about 12 percent for Malaysia and the Philippines even though neither one has a targeted REER appreciation). In the case of Japan, the FEER-consistent bilateral rate reaches 98 yen per dollar. It is important to recognize, however, that if Japan were to appreciate in isolation (with no other country moving to its FEER), its needed move of about 3 percent would boost the yen to only about 107 per dollar. The same phenomenon is the reason that the renminbi strengthens from 6.48 to 5.95 yuan per dollar in a general realignment but would not need to appreciate at all if other economies did not realign. General realignment also means that Colombia's REER depreciation of about 10 percent would translate to a depreciation of only 4 percent bilaterally against the dollar. Figure 5 shows the country exchange rate changes that would be called for to move to FEERs, both for the changes in real effective rates and in FEER-consistent bilateral rates against the dollar.

TRENDS OVER TIME

For the four largest economies—the United States, euro area, China, and Japan—the main patterns that developed in 2015 have persisted. All four economies had been at their FEER levels in 2014 (Cline 2014a, 2014b). However, in 2015 the dollar appreciated sharply, because of the move toward normalization of monetary policy even as the euro area and Japan moved toward greater monetary stimulus, and because of falling currencies of commodity-based economies. As a result, the dollar became overvalued by about 8 percent (Cline 2015a, 2015b). It remains overvalued by about this amount. In contrast, throughout 2014, 2015, and in the new estimates, China and the euro area have remained at their FEER levels, neither under- nor overvalued. Japan was also at its FEER level in 2014 and only slightly undervalued in 2015, but its undervaluation has now reached about 3 percent (despite the recent rise against the dollar) in view of the rising medium-term current account surplus.

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17. The REER calculations use the SMIM trade weights and CPI deflators.

18. As can be seen by inspection of the difference between the first and second columns of table 2, current account changes in the model simulation are typically about 0.2 percent of GDP larger than the target current account changes, resulting in overachievement of deficit reductions and underachievement of surplus reductions.

Table 2   Results of the simulation: FEERs estimates

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	April 2016	Percent change	
Pacific							
Australia*	0.5	0.7	–2.8	–3.5	0.77	6.9	0.82
New Zealand*	0.0	0.2	0.0	–0.6	0.69	8.4	0.75
Asia							
China	0.0	0.2	0.0	–0.8	6.48	8.8	5.95
Hong Kong	–1.6	–1.4	3.1	2.7	7.76	13.5	6.83
India	0.0	0.2	0.0	–0.7	66.5	7.6	61.8
Indonesia	0.0	0.1	0.0	–0.7	13173	12.3	11728
Japan	–0.6	–0.5	3.6	2.9	110	12.2	98
Korea	–2.1	–1.8	5.2	4.6	1147	13.9	1007
Malaysia	0.0	0.3	0.0	–0.7	3.90	12.9	3.45
Philippines	0.0	0.2	0.0	–0.6	46.3	11.7	41.5
Singapore	–15.0	–14.6	29.9	29.1	1.35	39.7	0.97
Taiwan	–11.1	–10.8	25.6	25.0	32.3	34.5	24.0
Thailand	0.0	0.3	0.0	–0.7	35.1	9.7	32.0
Middle East/Africa							
Israel	0.0	0.1	0.0	–0.5	3.77	6.5	3.54
Saudi Arabia	0.0	0.2	0.0	–0.5	3.75	8.8	3.45
South Africa	1.8	2.0	–6.7	–7.2	14.59	1.0	14.45
Europe							
Czech Republic	0.0	0.2	0.0	–0.4	23.8	6.6	22.4
Euro area*	0.0	0.2	0.0	–0.9	1.13	6.6	1.21
Hungary	0.0	0.2	0.0	–0.4	275	6.6	258
Norway	0.0	0.1	0.0	–0.5	8.22	6.9	7.69
Poland	0.0	0.2	0.0	–0.5	3.80	6.5	3.57
Russia	0.0	0.1	0.0	–0.5	66.5	7.2	62.0
Sweden	–1.8	–1.6	5.0	4.5	8.12	11.3	7.29
Switzerland	–2.8	–2.7	6.4	6.0	0.96	13.0	0.85
Turkey	1.5	1.6	–6.1	–6.6	2.83	0.8	2.81
United Kingdom*	0.1	0.2	–0.4	–0.9	1.43	6.3	1.52
Western Hemisphere							
Argentina	0.3	0.5	–2.2	–3.0	14.39	3.7	13.88
Brazil	0.0	0.1	0.0	–0.9	3.55	6.2	3.35
Canada	0.2	0.3	–0.7	–0.9	1.28	2.0	1.26
Chile	0.4	0.6	–1.4	–2.0	669	5.0	637
Colombia	1.4	1.5	–8.9	–9.5	2989	–4.0	3115
Mexico	0.0	0.1	0.0	–0.3	17.5	2.9	17.0
United States	1.1	1.3	–6.3	–7.3	1.00	0.0	1.00
Venezuela	0.0	0.1	0.0	–0.6	9.99	5.9	9.43

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

Source: Author's calculations.

Figure 5　Changes needed to reach FEERs

percent

◆ Change in REER
■ Change in dollar rate

SGP　TAI　SWZ　KOR　SWE　JPN　HK　MEX　HUN　CZH　POL　ISR　NZ　PHL　THA　IDN　IND　MLS　CHN　BRZ　UK　EUR　CAN　CHL　ARG　AUS　TUR　SAF　US　COL

ARG = Argentina, AUS = Australia, BRZ = Brazil, CAN = Canada, CHL = Chile, CHN = China, COL = Colombia, CZH = Czech Republic, EUR = Euro area, HK = Hong Kong, HUN = Hungary, IND = India, IDN = Indonesia, ISR = Israel, JPN = Japan, KOR = Korea, MLS = Malaysia, MEX = Mexico, NZ = New Zealand, PHL = Philippines, POL = Poland, SGP = Singapore, SAF = South Africa, SWE = Sweden, SWZ = Switzerland, TAI = Taiwan, THA = Thailand, TUR = Turkey, UK = United Kingdom, US = United States

REER = real effective exchange rate

Source: Author's calculations.

Figure 6   Successive estimates of REER changes needed to reach FEERs: United States, euro area, China, and Japan

percent
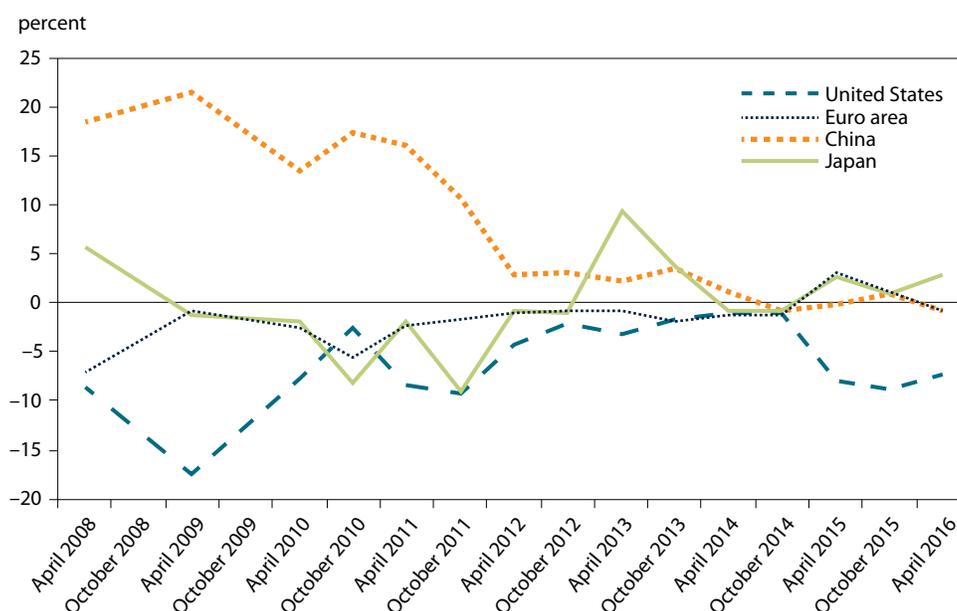
Source: Author's calculations.

Nonetheless, for the four key economies the degrees of exchange rate misalignment remain far smaller than in 2008–11. Figure 6 shows the estimates of needed REER changes to reach FEERs in the full series of this analysis.[19] The principal correction has been in the elimination of the severe undervaluation of the renminbi, which had been in the range of 15 to 20 percent but fell to less than 5 percent by 2012 and disappeared by late 2014. There was also a large correction in the overvaluation of the US dollar from more than 15 percent in 2009 (when the safe-haven effect had caused a large appreciation) to less than 5 percent by late 2012 through 2014, but this overvaluation has returned to a plateau of about 7 to 8 percent since early 2015. The euro was modestly overvalued in 2008–10 but moved to equilibrium by 2014 and was briefly modestly undervalued in early 2016 before returning to its FEER level. The yen was somewhat overvalued in 2010–11 but then swung to undervaluation by early 2013 following sharp depreciation under Abenomics. The resulting dominant pattern is that whereas the other three key economies have largely eliminated misalignment, an overvaluation of the dollar has reemerged and persists.

In contrast, as shown in figure 7, certain high-imbalance economies have consistently shown a need for major real appreciation (Singapore, Taiwan, Sweden, and Switzerland) or real depreciation (Australia, South Africa, and Turkey) to reach

their FEERs. The findings of the present set of estimates tend to replicate this familiar pattern. Although these economies tend to be relatively small, in some cases their imbalances are proportionately so large that collectively they are of meaningful scale in comparison to global imbalances. Thus, the five economies with the largest needed REER appreciations in table 2 (Singapore, Taiwan, Switzerland, Korea, and Sweden) have a combined target reduction in current account surpluses of $185 billion in 2021, in comparison with the targeted increase in the US current account by $257 billion and a collective target increase of $36 billion for Turkey, South Africa, Colombia, and Australia (see tables 1 and 2).

CONCLUSION

In 2015 the US dollar returned to a relatively large overvaluation that persists, on the order of 7 to 8 percent. Divergent phases of monetary policy in the United States, on one hand, and the euro area and Japan, on the other, and a collapse in commodity prices drove the stronger dollar. Although the commodity cycle may have begun to turn (with the sizable rise in oil prices in recent months), monetary policies will likely continue to diverge for some time. A benign interpretation would be that financial markets front-loaded exchange rate expectations stemming from this divergence and that little further appreciation of the dollar should be expected. A pessimistic interpretation would be that the dollar could rise much further. Yet the two-year lag from the exchange rate to trade performance means that the bulk of the prospective widening

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19. The base month of each issue is indicated on the horizontal axis. This data series is available at https://piie.com/interactive-map-fundamental-equilibrium-exchange-rates-feers.

Figure 7   Successive estimates of REER changes needed to reach FEERs for chronic high-surplus and high-deficit economies
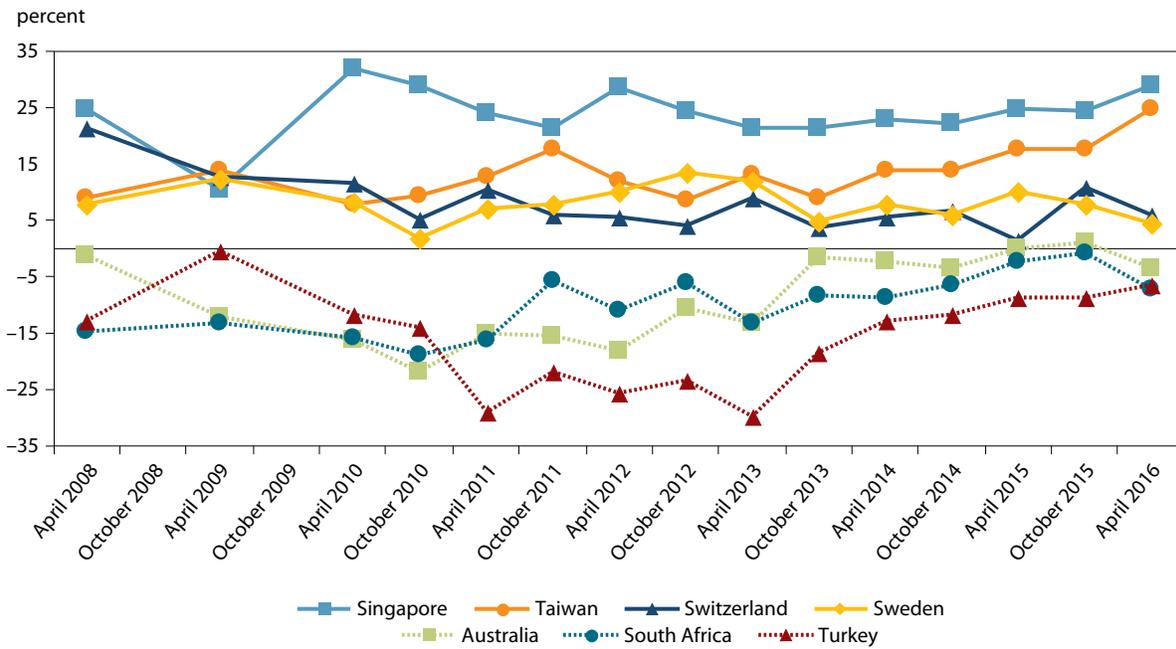
REER = real effective exchange rate
Source: Author's calculations.

of the US current account deficit is still in the pipeline, even if the dollar does not rise further.

Faster growth abroad would help narrow the prospective US deficit, but fiscal space for stimulus is limited in Japan and the periphery of the euro area. Although the baseline imbalances projected do not yet represent an acute problem, going forward the problem could escalate if the dollar resumes

climbing. If that were to occur, at some point some form of coordinated intervention could become desirable. Even under current baseline prospects, it will be important to resist misguided politicization of a rising US trade deficit, such as outdated calls for retaliation against imports from China even though the phase of severe undervaluation of the renminbi is now well in the past.

APPENDIX A CURRENT ACCOUNT PROJECTIONS FOR THE UNITED STATES

Cline (2015a) set forth projections for the US current account based on a simple reduced-form relationship of nonoil trade in goods and services to the lagged real exchange rate and the differential between US and foreign growth. The projections separately examined prospects for oil trade and then applied the capital services block of the model developed in Cline (2005) to arrive at projections for the full current account.

An update of the nonoil trade equation yields the following, for the period 1990–2015:

$$(A.1)\ z_t = 10.42 - 0.115\ R^*_{t-2} - 0.332 gdif_{t-1} - 0.112 T;\ R^2 adj = 0.90$$
$$\quad\quad\quad (11.3)\ (-11.9)\quad\quad (-4.7)\quad\quad\quad (-10.7)$$

where z is the balance on trade in nonoil goods and services as a percent of GDP, R^*_{t-2} is the real effective exchange rate two years earlier, $gdif_{t-1}$ is the excess of US real growth over world real growth (percent) at market exchange rates in the previous year, and T is a time trend (with $T = 1$ in 1990 and 26 by 2015). The exchange rate is the broad real index of the Federal Reserve (2016a); US and global growth are from IMF (2016a).

Oil trade is projected as follows. In 2015, US imports of petroleum and petroleum products amounted to $182 billion; exports were $99.5 billion (US Census Bureau 2016). The 2015 base of $82.5 billion for net oil imports is then projected for changes in volume and price. The US Energy Information Administration (EIA 2016) projects a decline of US oil production from 9.43 million barrels per day (mbpd) in 2015 to 8.6 mbpd in 2016 and 8.04 mbpd in 2017, but an increase in US consumption of liquid fuels from 19.4 mbpd in 2015 to 19.52 mbpd in 2016 and 19.71 mbpd in 2017. The difference represents the volume of imports, which would rise by 9.5 percent in 2016 and an additional 6.9 percent in 2017. I assume the import volume rises 3 percent annually thereafter. For prices, Brent crude averaged $52.32 per barrel in 2015 (EIA 2016) and $37.3 in the first quarter of 2016.[20] Corresponding oil futures on the New York Mercantile exchange provide the basis for future prices.[21]

Based on market forecasts (Blue Chip 2016), US interest rates are projected at 2.1 percent in 2016 and 2.8 percent in 2017 for 10-year treasury bonds, and correspondingly 0.5 and 1.3 percent for 3-month treasury bills. Thereafter the 10-year bond rate is set at GDP deflator inflation plus 1 percent in 2018, 1.5 percent in 2019, and 2 percent thereafter.[22] These interest rates are applied to debt securities except for a 50 basis point reduction imposed on US liabilities in 2016 and 2017 to reflect exceptionally low rates in Europe and Japan. Returns on direct investment and portfolio equity are set at their 2006–15 average rates.[23] New flows of direct investment and portfolio equity capital are calculated at past average ratios to GDP. The current account deficit cumulates to an increase in debt securities owed abroad.

The resulting current account baseline is as shown in table A.1. The current account deficit rises from 2.7 percent of GDP in 2015 to 4.13 percent by 2021. The driving force in this widening is the lagged increase in the real exchange rate. The Federal Reserve's broad real index stood at 84.4 in 2013 (the rate affecting trade in 2015), but rose to 86.2 in 2014, 95.4 in 2015, and 96.0

Table A.1   US current account baseline projections (percent of GDP)

	2015	2016	2017	2018	2019	2020	2021
Nonoil goods and services	−2.55	−2.50	−3.62	−3.81	−3.75	−3.76	−3.81
Petroleum	−0.46	−0.39	−0.45	−0.45	−0.45	−0.49	−0.50
Capital services	1.12	0.83	1.00	1.27	1.21	1.01	1.03
Transfers[a]	−0.81	−0.84	−0.84	−0.84	−0.84	−0.84	−0.84
Current account	−2.70	−2.90	−3.91	−3.84	−3.82	−4.09	−4.13
Memorandum:							
Net international investment position	−41.30	−40.50	−42.70	−44.60	−46.30	−48.40	−50.40

a. Includes net employee income.

Sources: BEA (2016a, 2016b); author's calculations.

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20. See, e.g., http://finance.yahoo.com.

21. On April 20, 2016, these showed a rising path from $43.3 per barrel of UK Brent in June 2016 (CLM16) to $48 by June 2019 (CLM19) and $54.5 by June 2021 (CLM21). See http://finance.yahoo.com.

22. The treasury bill rate is set 164 basis points lower.

23. These are 8.1 percent for US direct investment assets, 3 percent for direct investment liabilities, 3.1 percent for portfolio equity assets, and 2.2 percent for portfolio equity liabilities. However, the return on US foreign direct investment is cut to 6 percent for 2016 to reflect recent weakness, rising to the average benchmark by 2019.

by April 2016 (Federal Reserve 2016a). There has thus been an increase of about 14 percent in the real effective exchange rate for the dollar from its 2013 base.

It warrants emphasis that the US trade deficit in oil appears to have fallen to a relatively low plateau of about one-half percent of GDP. In contrast, this deficit was an average of 2 percent in 2006–12. The table also shows somewhat surprisingly that the US capital services account manages to sustain a surplus of about 1 percent of GDP, even though the net international investment position continues its decline to reach about –50 percent by 2020–21. This paradox stems from the much higher return on US direct investment abroad (about 8 percent) than on foreign direct investment (FDI) in the United States (about 3 percent), as well as the concentration of liabilities in even lower-return debt (averaging 2.2 percent interest).

It should also be noted that the deficit for 2020 is slightly smaller in this projection than in that a year earlier (Cline 2015a), at 4.13 percent of GDP instead of 4.3 percent, despite the stronger dollar.[24] Although the balance projected for nonoil goods and services moved in the expected direction (from −3.37 percent of GDP to −3.81 percent), there was a more than fully offsetting increase in the projected balance on capital income (from +0.33 percent of GDP to +1.03 percent). A lower path for projected interest rates (at 2.44 percent for 6-month treasury bills and 4.08 percent for 10-year bonds, versus 3.4 and 4.6 percent, respectively) reduced payments on the large amount of bank and bond debt owed abroad (about $20 trillion at the beginning of 2020) by more than corresponding reductions in interest on US debt claims abroad (about $7 trillion). A greater reduction in returns on FDI in the United States than on US direct investment abroad further improved the projected capital income balance.[25]

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24. From April 2015 to April 2016 the real effective exchange rate of the dollar rose by 2.4 percent.

25. Using 2006–15 average returns instead of 2006–14, the rate fell from 3.9 to 3.0 percent for FDI liabilities but only from 8.3 to 8.1 percent for FDI assets.

APPENDIX B CHINA: MEDIUM-TERM DECLINE IN CURRENT ACCOUNT SURPLUS AND RECENT CAPITAL ACCOUNT PRESSURES

A striking change in the medium-term international outlook is the IMF's projection that China's current account surplus will largely disappear by 2021. In its 2015 Article IV review (IMF 2015e), the Fund cited reforms planned in the Third Plenum as a reason to expect the move toward external balance. Changes in social security and the financial sector are expected to reduce household saving, and reforms of state-owned enterprises are expected to curb corporate saving. Reforms would also reduce investment but by less, so the external position would move toward a range the Fund considers consistent with fundamentals and desirable policies for China: a surplus of less than 1 percent of GDP (p. 11).

An interesting technical question in this regard is how the prospect of a falling surplus relates to the Balassa-Samuelson effect of rising relative productivity in tradable goods as an emerging-market economy grows. In Cline (2012) I estimated that in 2000–11 China's current account had an upward drift of 0.62 percent per year, associated with this effect. That study also estimated that each additional percentage point of world growth (at market exchange rates) boosted China's current account by 0.27 percent of GDP. From its April 2012 WEO (IMF 2012) to the April 2016 WEO (IMF 2016a) the Fund reduced its five-year average world growth rate (at market exchange rates) from 3.5 to 2.9 percent. This influence would have cut the medium-term surplus by 0.16 percent of GDP annually, or 0.8 percent of GDP over five years.[26] Adding the influence of slower world growth to the exchange rate impact would bring the total reduction in the medium-term surplus to 5 percent of GDP if there were no Balassa-Samuelson drift. The Fund's estimated 3.7 percent of GDP reduction in the surplus would imply that this drift has moderated to only 0.26 percent of GDP per year.[27] The decline may have been larger, because this illustration does not include any influence of the sizable slowdown in China's own expected growth on slower import growth. Thus, from its early 2012 WEO to the corresponding 2016 issue, the Fund reduced expected 5-year growth for China from 8.65 percent annually to 6.0 percent.

Even though China's current account is on a broadly declining path relative to GDP, two considerations suggest that international trade conflicts could persist. The first is that a rising deficit in services (especially Chinese tourism abroad) is contributing substantially to the decline in the surplus, so a more sizable surplus will remain in goods trade than might be inferred from the overall current account.[28] Second, the scale of the Chinese economy in dollars is rising so fast that absolute magnitudes remain high even as percentages of GDP decline. Thus, with GDP rising from $3.5 trillion in 2007 to $11.0 trillion in 2015 (IMF 2016a), the surplus in goods was larger in dollar terms in 2015 than in 2007 ($567 billion versus $312 billion; SAFE 2016) even though relative to GDP it was considerably smaller (5.2 percent in 2015 versus 8.8 percent in 2007).

In addition to the trajectory of China's current account surplus, a key question in recent months has been whether China has entered a period of capital flight that could cause a sharp drop in the currency and cause a shock to the world economy. Lardy (2016) argues that fears of this scenario are greatly exaggerated. He emphasizes that although China's reserves have declined, most of the reduction can be explained by two market influences that do not constitute capital flight. First, valuation effects resulting from the decline of the euro, yen, and other nondollar reserve currencies against the dollar would have reduced the dollar magnitude of reserves. Second, there have been normal business decisions to retire dollar debt owed abroad once firms began to perceive that there was no longer a one-way bet that the renminbi would strengthen against the dollar (and thus no longer assured erosion of dollar debts owed).

Figure B.1 shows that China's reserves have indeed fallen significantly, from a peak of $4,010.8 billion in June 2014 to a trough of $3,223.3 billion in February 2016, an average decline of $39 billion per month. The international pattern of reserve currencies places the share of US dollars at 64 percent and the shares of other major currencies at: euro, 20.6 percent; yen, 4.2 percent; pounds, 3.9 percent; Australian dollars, 1.7 percent; Canadian dollars, 1.8 percent; and Swiss francs, 0.3 percent.[29] If one assumes that China's reserve composition is the same as the international pattern, then considering the change in these currencies against the dollar from the end of June 2014 to December 15, 2015, the expected weighted average valuation effect would have amounted to a decline of 6.18 percent.[30] Applying this impact to the initial stock of $4.0 trillion, currency valuation effects can explain a decline of $248 billion in China's reserves.

As for the influence of decisions to unwind dollar debt abroad, the most recent available data show that from the end of

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26. That is: $0.27 \times (2.9 - 3.5) = -0.16$.

27. That is: $(5 - 3.7)/5$.

28. In goods, the trade surplus fell from 9.9 percent of GDP in 2007 to 6.2 percent in 2015 (IMF 2016a; SAFE 2016) and is projected still at 3.2 percent in 2020 (IMF 2015c, p. 62, adjusted for 2015 difference from actual). Services showed a deficit of only 0.1 percent of GDP in 2007, rising to 2.0 percent in 2015, and projected at 2.7 percent in 2020. Note further that there was a swing from a surplus on income and transfers of 1.3 percent of GDP in 2007 to a deficit of 0.83 percent by 2015, further widening the difference between the decline in the current account surplus and that in the goods trade surplus.

29. Calculated from IMF (2016c).

30. I choose December 15, 2015 because that is when the dollar peaked against the yen—and also when the Federal Reserve increased the federal funds rate.

Figure B.1   China's external reserves excluding gold

millions of dollars
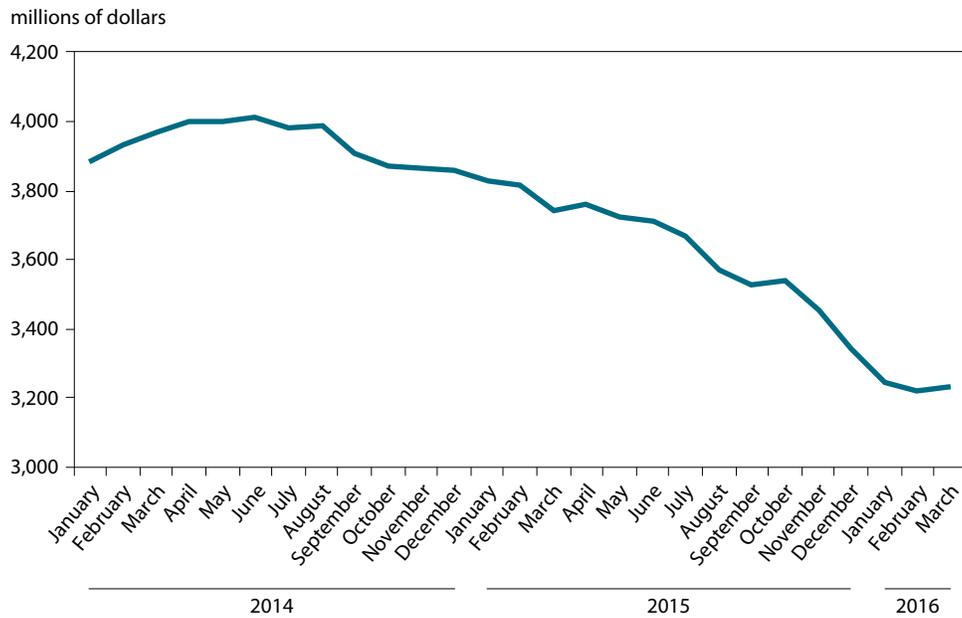
Source: IMF (2016b).

Figure B.2   China: Net capital flows

percent of GDP
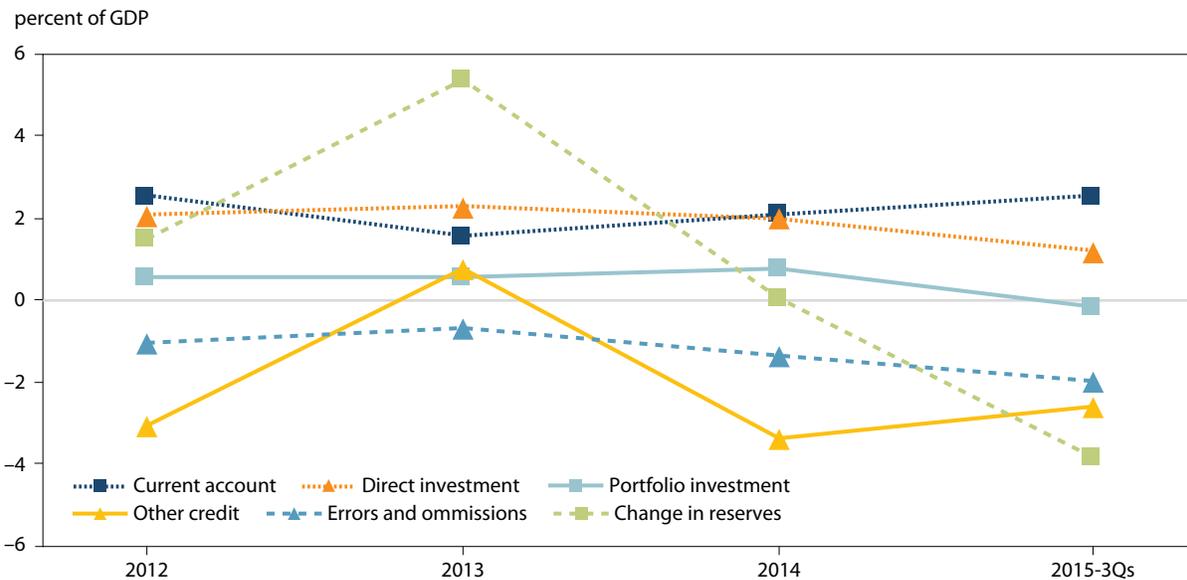
3Qs = three quarters
Source: IMF (2016b).

September 2014 to the end of September 2015, China's "debt instruments" (nonportfolio debt, and hence mainly business loans) declined from $1.42 trillion to $1.39 trillion on the side of assets abroad, but from $1.49 trillion to $1.09 trillion on the side of liabilities to foreigners (IMF 2016c). So net debt instruments owed abroad showed a decline of $369 billion. The sum of reduced net debt abroad and reserves valuation effects thus amounted to $617 billion, or 78 percent of the decline in reserves from June 2014 to February 2016. A reasonable interpretation, then, is that the declining reserves do not represent massive capital flight by households. (Even so, at about $200 billion in 2015, net outflows in the category of errors and omissions suggest that at least some classic household capital flight is present.) Moreover, reserves have stabilized in the past two months, as shown in figure B.1. This change partly reflects the new trend in the dollar (see figure B.1), but it may also signal that much of the volume of debt retirement has already been exhausted.

Figure B.2 shows net capital flows as a percent of GDP (with the 2015 data at annual rates for the first three quarters). Direct

investment averaged about 2 percent of GDP in 2012–14 but eased to about 1.2 percent in the first three quarters of 2015. "Other credit" showed a downswing from net inflows of +0.8 percent of GDP in 2013 to net outflows of about 3 percent of GDP in 2014–15. Net portfolio flows swung from +0.8 percent of GDP in 2014 to –0.2 percent in the first three quarters of 2015. For their part, net flows on errors and omissions—the classic locale of capital flight—widened from −0.7 percent of GDP in 2013 to −2 percent in the first three quarters of 2015. Overall, by 2015 the net surplus flow on direct investment and the current account (+3.7 percent of GDP combined) was insufficient to cover the net outflow on portfolio investment, other credit, and errors and omissions (−4.7 percent of GDP), leaving pressure on reserves of about 1 percent of GDP in the first three quarters. Measured reserve declines were even larger given valuation effects.

Overall, if the medium-term outlook has shifted to falling current account surpluses, it would not be surprising that a consequence would be falling expectations of real appreciation of the currency over time, and correspondingly a shift toward greater holding of assets abroad and lesser exposure to liabilities abroad. Capital account pressures could thus continue. At some point, Chinese authorities might decide to stop intervening to support the currency. Any significant resulting decline in the renminbi in turn could renew foreign critiques of beggar-thy-neighbor trade policy, albeit without justification.[31]

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31. The classic case for such a charge is the presence of a large current account surplus, such as that in 2006, combined with massive intervention, buying (rather than selling) foreign exchange reserves, to offset market pressures for appreciation.

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