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Abstract

The authors use the Bank of Canada's version of the Global Economy Model, a multi-country, multi-sector dynamic stochastic general-equilibrium model with an active banking system (the BoC-GEM-FIN), to study the evolution of global current account balances following the recent global financial crisis. More specifically, they use several shocks from the model to generate a simulated baseline scenario that mimics: (i) the initial, pre-crisis state of disequilibrium in global current account balances, and (ii) the effects of the crisis, including those of the policy responses undertaken worldwide. The authors find that a sufficient set of conditions and policies for a sustainable resolution of the global current account imbalances relies on three key elements: (i) a continuous upward adjustment of U.S. private savings, (ii) fiscal consolidation in advanced countries, and (iii) an orderly adjustment of exchange rates. These three criteria facilitate a gradual decline in the U.S. current account deficit going forward. A fourth key element, the implementation of policies aimed at stimulating domestic demand in emerging Asia, is needed to ensure that the counterpart of the decrease in the U.S. current account deficit is mainly a reduction in the surpluses of emerging Asia. Sensitivity analysis based on deviations from these conditions illustrates the factors behind the main results and the costs associated with the alternative scenarios considered.

JEL classification: E21, F01, F32
Bank classification: Balance of payments and components; Business fluctuations and cycles; International topics; Recent economic and financial developments

Résumé

En se servant de la variante du modèle GEM élaborée à la Banque du Canada – BOC-GEM-FIN, un modèle multirégional d'équilibre général dynamique et stochastique qui comporte plusieurs secteurs, dont un secteur bancaire actif –, les auteurs étudient l'évolution des balances courantes à l'échelle internationale dans le contexte de la récente crise financière mondiale. Ils simulent différents chocs au moyen du modèle en vue de générer un scénario de référence qui permet de reproduire : 1) l'état de déséquilibre affiché, avant la crise, par les balances courantes; 2) les effets de la crise, y compris ceux des mesures adoptées de par le monde pour y faire face. Les auteurs concluent que l'ensemble des conditions et des politiques suffisantes à la résolution durable des déséquilibres des balances courantes s'appuie sur trois éléments clés : 1) un relèvement progressif de l'épargne privée aux États-Unis; 2) l'assainissement des finances publiques des pays avancés; 3) un ajustement ordonné des taux de change. Ces trois éléments favoriseraient une baisse graduelle du déficit courant américain. Mais pour que celle-ci se

conjugue à une réduction des excédents courants dans les pays émergents d'Asie, des politiques devront aussi être mises en œuvre dans cette partie du monde afin d'y stimuler la demande intérieure. Une analyse de sensibilité fondée sur le non-respect de ces conditions fait ressortir les facteurs à l'origine des principaux résultats et les coûts associés aux divers scénarios envisagés.

Classification JEL : E21, F01, F32
Classification de la Banque : Balance des paiements et composantes; Cycles et fluctuations économiques; Questions internationales; Évolution économique et financière récente

1 Introduction

Over the previous two years, in the context of the global financial crisis, we have observed important movements in the current account balances of the world's major countries/regions. In particular, the large current account imbalances of the past, characterized by the sizable and growing U.S. current account deficit and the large and increasing current account surpluses in emerging Asia, have been partially resolved over the period of the crisis. Both the current account deficit in the United States and the current account surpluses in emerging Asia have declined as a share of GDP since 2007 (Figure 1). However, the causes and the sustainability of the recent adjustment in these current account positions are not well understood. In this paper, we provide a possible explanation of the key factors behind the latest movements in global current account positions and assess whether the adjustment is sustainable. Moreover, we gauge whether further adjustment is required to return global current account positions to sustainable levels and under what type of policies and conditions the required adjustment can be achieved. These questions are addressed using the Bank of Canada's version of the Global Economy Model (de Resende et al. forthcoming), a multi-country, multi-sector dynamic stochastic general-equilibrium model with an active banking system and financial frictions. The model provides a consistent global framework within which we can study movements in global current account positions.

An orderly resolution of global current account imbalances is a major concern for policy-makers. A disorderly adjustment, or no adjustment at all, could entail, for example, abrupt swings in exchange rates. Of particular concern and interest is whether the resolution of global current account imbalances requires a further depreciation of the U.S. dollar. While the dollar has already depreciated by about 20 per cent since 2002, it will likely have to fall further to induce an additional decline in the U.S. current account deficit.[1] Given the central role that the U.S. dollar plays in the international financial system, a sharp depreciation could disrupt global financial markets.

In this paper, we generate a baseline view of the recent adjustment in global current account positions. We begin our analysis in 2008Q3, when the collapse of Lehman Brothers intensified the global financial crisis. From 2008Q3 until 2009Q4 we capture the initial, pre-crisis state of disequilibrium in current account positions that existed using several structural shocks from our model. Perhaps the most striking evidence of the initial disequilibrium in global current accounts is the fact that the U.S. current account deficit in 2006 reached 6.0 per cent of GDP, well above the 2.0 to 2.5 per cent sustainable range. We also capture the effects of the crisis and the corresponding policy responses on current account positions using several structural shocks from our model. We show that a combination of five factors can largely explain the observed movements in current account balances: (i) the correction of an initial state of disequilibrium in

1. From January 2002 to February 2010.

U.S. consumption and savings, (ii) the tightening of global financial conditions, (iii) expected permanent declines in productivity levels in advanced countries compared with previous forecasts, (iv) the implementation of fiscal stimulus packages worldwide, and (v) the decline in consumer and business confidence.

After using our model to explain the recent dynamics of global current account balances, we extend our baseline scenario into the future. Importantly, this baseline scenario does not provide a forecast of future global current account positions, but instead identifies a set of conditions and policies under which global current account imbalances can be gradually resolved. The baseline scenario is generated by combining our explanation of the recent dynamics in global imbalances with additional assumptions for policy and behaviour going forward, and allowing the model to simulate the implied future path of the global economy. The sustainable resolution of global current account positions in the baseline scenario relies on three key elements: (i) a continuous upward adjustment of U.S. private savings, (ii) fiscal consolidation in advanced countries, and (iii) an orderly adjustment of exchange rates. These three criteria facilitate a gradual decline in the U.S. current account deficit towards a sustainable level (between 2.0 and 2.5 per cent of GDP). A fourth key element, the implementation of policies aimed at stimulating domestic demand in emerging Asia, is needed to ensure that the counterpart of the decrease in the U.S. current account deficit is mainly a reduction in the surpluses of emerging Asia. When these conditions are met, our baseline scenario points to a "benign" outcome in terms of a gradual resolution of global imbalances as global economic activity recovers. The baseline scenario is roughly consistent with the desired outcome of the G-20 framework for strong, sustainable, and balanced growth (Carney 2010; G-20 2009).

Sensitivity analysis based on deviations from these criteria illustrates that a gradual rebalancing of global current account positions towards sustainable levels may not occur if these conditions and policies do not prevail. Moreover, our results suggest that the baseline scenario, in which global imbalances are gradually resolved, would result in higher world output growth going forward relative to two alternative scenarios considered. Finally, we show that all regions of the world, including those without large imbalances in their external positions, would be worse off than in our baseline scenario if global current account imbalances are not resolved in an orderly fashion.

The remainder of this paper proceeds as follows. Section 2 provides a description of the Bank of Canada's Global Economy Model, used to study global current account imbalances. Section 3 describes the baseline scenario for global current account rebalancing, and section 4 completes sensitivity analysis around the baseline scenario. Section 5 offers some conclusions.

2 The Model

2.1 The structure of the model

The Bank of Canada's Global Economy Model is used to explore the conditions under which a sustainable path of global current account balances can be achieved. The model was originally developed by the International Monetary Fund (IMF) and was later adapted by Lalonde and Muir (2007) to include a detailed role for Canada and for endogenous oil and non-energy sectors.[2] More recently, the model has been augmented to include a role for real-financial linkages by incorporating a financial accelerator (based on Bernanke, Gertler, and Gilchrist 1999) and a banking sector (based on Dib forthcoming). This updated version of the model is called the BoC-GEM-FIN (de Resende et al. forthcoming). Given that the model has been documented extensively elsewhere, we will keep its description relatively short and non-technical.

The model is multi-region, encompassing the entire world economy in five regional blocks: Canada, the United States, emerging Asia, the commodity exporters, and the "remaining countries," which consist primarily of the European Union (EU) and Japan.[3] Thus, the model provides a consistent global framework within which the dynamics of global current account balances can be examined. Each of the five regional blocks is modelled symmetrically and consists of a continuum of households, a government sector, and firms that operate in a multi-sector economy, featuring tradable goods, non-tradable goods, oil, and non-energy commodities.

In the model, households/consumers provide labour to produce goods, and consume the final consumption and investment goods they help to produce. There are both forward-looking consumers and liquidity-constrained consumers. The former own all of the firms, the capital stock used by firms for production, and the "bank capital" used within banks to produce loans. On the other hand, liquidity-constrained consumers have no access to capital markets, cannot save or borrow, and depend solely on their labour income to finance their consumption. All households derive utility from consumption and leisure. Forward-looking households also derive utility from the liquidity services originated in their holdings of deposits that they keep in "saving banks." To better capture the sluggishness observed in consumption and the labour supply, there is habit persistence in both variables. Nominal wages are set by households in a monopolistically competitive way and feature rigidities in the form of quadratic adjustment costs.

2. See Pesenti (2008) for a description of the IMF's version of the Global Economy Model.
3. For the purposes of this paper, combining the EU and Japan into one region will affect the regional distribution of the expected rebalancing in global current accounts. While these regions share key structural characteristics, including low productivity growth and highly rigid labour markets, they have exhibited very different behaviour regarding the accumulation of U.S. assets and foreign exchange intervention policy (Faruqee et al. 2007). By combining the EU and Japan together, we cannot differentiate between their roles in the global rebalancing process going forward. Nevertheless, this aggregation should not affect our analysis of the expected path of global current accounts, since the roles of the EU and Japan in the resolution of global imbalances are likely to be smaller than the role played by either emerging Asia or the United States.

Firms combine capital and labour, among other inputs, to produce raw materials, intermediate goods, and final goods. The production structure is as follows: capital, labour, and natural resources are combined to produce oil and non-energy commodities, while capital, labour, oil, and non-energy commodities are combined to produce tradable and non-tradable goods. Tradable goods, non-tradable goods, and gasoline are then combined to produce homogeneous consumption and investment goods. The firms' investment decisions are managed by entrepreneurs who finance the difference between their capital expenditures and their net worth by borrowing from "lending banks." When borrowing, entrepreneurs must pay an external finance premium to compensate lenders for the risk the lenders take on financing the entrepreneurs' investments. This premium depends inversely on entrepreneurial net worth. Since net worth tends to be procyclical, due, for example, to the procyclicality of profits and asset prices, the premium tends to be counter-cyclical and to amplify movements in borrowing, spending, and production. As a result, financial frictions may significantly amplify the magnitude and persistence of business cycles. This is called the financial accelerator effect (Bernanke, Gertler, and Gilchrist 1999). Other frictions at the firm level include adjustment costs for capital, investment, and the share of imported goods.

The banking sector is modelled following Dib (forthcoming), and consists of two types of monopolistically competitive banks: "savings banks" and "lending banks," which interact in an interbank market. These banks supply different banking services. Savings banks set the nominal deposit interest rate and channel household savings into risk-free assets (government bonds) or interbank lending, while lending banks set the nominal lending rate (loan prime rate) and combine funds borrowed from savings banks on the interbank market with bank capital to supply loans to entrepreneurs. In order to lend to entrepreneurs, lending banks must maintain sufficient capital to satisfy the minimal capital-to-loans ratio (i.e., the maximum leverage ratio) required by regulators.[4] Banks that hold capital in excess of the required level receive convex gains, so that variations in banks' capital ratio directly affect the marginal cost of raising bank capital. Finally, the model allows endogenous default on both bank capital and interbank borrowing. Defaulting banks must pay convex penalties in the next period, which generates spreads over the deposit rate.

The government in each region purchases consumption, investment goods, and services. Expenditures in excess of tax revenues are financed by borrowing from the domestic private sector. Moreover, the government's net tax rate adjusts so that government debt eventually conforms to a long-run debt-to-GDP ratio. All domestic debt is held exclusively by domestic (forward-looking) agents, with the exception of U.S. debt, which is traded internationally and is in zero net supply worldwide. The interest rate paid on each type of bond is equal to the policy rate in the country that issued the bond plus an exogenous risky spread. Households face intermediation costs when transacting in the international bond market.

4. The maximum leverage ratio is calibrated to Basel requirements.

Each region includes a monetary authority that provides a nominal anchor for the domestic economy using the short-term nominal interest rate as its instrument. The exception is emerging Asia, which is assumed to follow a nominal exchange rate peg relative to the U.S. dollar. All countries target core inflation. The monetary authority can also engage in quantitative easing by providing liquidity injections to lending banks, and in qualitative easing by allowing lending banks to swap a fraction of their risky loans for risk-free government bonds.

The model features several linkages between the regions of the world economy. Regions trade in oil, non-energy commodities, and tradable consumption and investment goods on a bilateral basis. Moreover, firms obtain financing from both domestic and foreign banks, creating a role for international loan flows. There is also international trade in the international bond (U.S. debt). Positions in this bond determine regions' net foreign asset (NFA) positions, which are maintained through a financial intermediation cost and a risk-adjusted uncovered interest rate parity condition, defined in terms of the bilateral exchange rates with the United States. In particular, the model specifies a long-run NFA-to-GDP target. This target is linked to the target government debt-to-GDP ratio through the presence of financial intermediation costs that depend on the desired holding of NFA and on each region's discount rate relative to that of the United States. Therefore, if the debt-to-GDP target increases in the United States, investors in the rest of the world would require a higher return on U.S. securities, leading to a higher share of U.S. assets in their portfolios or a reduction in net borrowing from the United States.[5]

2.2 Model calibration

In general, the calibration of the model's parameters is based on data, microeconomic studies, and by drawing on other dynamic stochastic general-equilibrium models (see Lalonde and Muir 2007 and de Resende et al. forthcoming for a detailed account of the model's calibration). We restrict discussion of the model's calibration in this section to the details that are pertinent to the results of this study. Specifically, we limit our discussion to the calibration of each region's external sector.

International loan flows are calibrated based on recent movements in loans observed in the International Banking Statistics data maintained by the Bank for International Settlements. The calibration of these international loan flows, shown in Figure 2, is used to derive the regional composition of loans to firms.

Trade linkages in the model are calibrated based on current trends in trading observed in the COMTRADE database of the United Nations. Figure 3 illustrates the calibration of all bilateral trade flows in tradable goods between the regions.[6] Much like the calibrated international loan

5. The response of the NFA position to the change in government debt is calibrated to mimic the properties of the Global Fiscal Model, the overlapping-generations model developed by the IMF (Botman et al. 2006).
6. Trade flows are calculated as the sum of imports and exports.

flows, these calibrated trade flows are used to derive the regional composition of imports as well as the weights of imported consumption and investment goods in each region's production functions.

For this study of global current account imbalances, the calibration of the behaviour of NFAs is also important. In the model, each region is assumed to converge to its desired NFA-to-GDP ratio within 15 to 20 years. Moreover, the model also specifies the share of any increase in a region's net foreign liabilities absorbed by each other region. Important for our study is the calibration of the share of any expansion in U.S. net foreign liabilities accounted for by each region. In particular, the model is calibrated such that Canada, the commodity exporters, emerging Asia, and the EU and Japan absorb 10, 14, 24, and 52 per cent, respectively, of any adjustment in the U.S. NFA position. The calibration of these shares is based on recent trends in flows of global holdings of U.S. government debt held by each region, and on recent trends in flows of global holdings of U.S. government debt. The consequence of this calibration is that the EU, Japan, and emerging Asia will absorb the majority of any movement in U.S. net foreign liabilities. This is consistent with the fact that these regions have recently been the driving force behind flows in U.S. government debt.

3 A Baseline Scenario for Global Current Account Rebalancing

In this section, we construct a plausible baseline scenario of global current account rebalancing that provides an assessment of the key macroeconomic factors underlying recent dynamics in global current account balances. The baseline scenario also identifies a set of conditions and policies under which a sustainable resolution of global current account imbalances can be achieved. Alternative assumptions regarding the causes of the historical buildup of global current account imbalances would have an impact on their expected future evolution, as detailed in our baseline scenario. Importantly, the scenario does not represent a forecast for global current account balances, but instead can be seen as one of many possible paths for current account balances going forward. As such, the baseline scenario can be seen as a benchmark against which alternative views of the evolution of global current account balances can be assessed. We first describe the factors contributing to the recent partial resolution of global current account imbalances and then discuss the outlook for global current account rebalancing under the baseline scenario. Two alternative scenarios, featuring deviations from the main baseline assumptions, will be discussed in section 4.

3.1 Recent dynamics in global current account balances

Recently, global current account imbalances have declined (Figure 1). In particular, following the intensification of the financial crisis when Lehman Brothers collapsed, the U.S. current account deficit decreased from 4.3 per cent of GDP in 2008Q2 to 3.0 per cent in 2009Q3, while the current account surpluses fell in China (from 11.0 to 9.9 per cent), Canada (from 0.7 to

-3.2 per cent), Japan (from 4.1 to 2.8 per cent), and the euro area (from 0.4 to -0.9 per cent). We attribute these developments in current account balances to a combination of five global economic factors:

i. the partial correction of an initial disequilibrium in U.S. consumption and housing expenditures as well as savings,

ii. the tightening of global financial conditions,

iii. an expected permanent decline in productivity levels in advanced countries,

iv. the worldwide implementation of fiscal stimulus packages, and,

v. a decline in consumer and business confidence.

We simulate structural shocks in our model to capture each of these five factors in order to understand their respective roles in recent current account movements and their likely impacts in the future. We consider each of these key shocks and their relevant impacts on the regional and global economies. The first and third factors will permanently affect global current account balances relative to their 2008Q2 levels. In contrast, the second, fourth, and fifth factors are temporary cyclical shocks to the global economy, because they stem from the financial crisis. In our baseline scenario, the structural shocks representing the five global economic factors are introduced sequentially beginning in 2008Q3. Thus, the factors are captured in our baseline scenario as a series of unexpected shocks that hit the global economy during the financial crisis. This approach provides an accurate representation of how the global economy evolved over the 2008Q3–2009Q4 period because these shocks can replicate the dynamic behaviour of the global economy over the financial crisis and recession.

3.1.1 The partial correction of an initial disequilibrium in U.S. consumption and housing expenditures as well as savings

Prior to 2008Q3, global current account positions were in disequilibrium. In particular, the U.S. current account deficit was large, growing, and unsustainable, and was mainly financed by large current account surpluses in emerging Asia (Bernanke 2005). In our explanation of the recent dynamics of global current account balances, we follow Faruqee et al. (2007) and interpret this initial disequilibrium as mainly a reflection of low U.S. savings, rather than of excess investment. In particular, we assume that the pre-crisis imbalances were partially created by disequilibrium in U.S. consumption and savings behaviour as households overconsumed because of the dramatic increases in housing and financial wealth over the early to mid-2000s. These increases in wealth also led households to overinvest in the U.S. housing market. While households perceived these increases to be permanent increases in their wealth, it is clear that the increases were temporary and associated with the rapid increases in U.S. housing and asset prices. Going forward, households will permanently reduce their spending, since their wealth is

permanently lower than they had previously anticipated. As global current account balances have been partially attributed to low U.S. savings, the associated upward adjustment of U.S. savings should help to reduce global current account balances permanently in the future.

The excess consumption and residential investment by U.S. households due to the misperception of permanently higher wealth are captured in our model by simulating positive shocks to U.S. consumption over 2005Q1 to 2008Q2.[7] The size of the shocks to consumption is calibrated to reflect the effect of the increase in housing and financial wealth on the consumption-to-GDP ratio over 2002–08. The Bank's Model of the U.S. Economy (Gosselin and Lalonde 2005) is used to determine the disequilibrium in the consumption-to-GDP ratio induced by the rise in wealth. The model suggests that rising wealth led to about a 2 percentage point increase in the consumption-to-GDP ratio over 2002–08.[8] Thus, we generate the initial disequilibrium by simulating positive shocks to consumption to produce a 2 percentage point increase in the consumption-to-GDP ratio. These shocks produce an initial disequilibrium in global current account balances in 2008Q2. As households and firms react to this disequilibrium by permanently reducing their spending, there is a gradual upward adjustment of U.S. private savings in our baseline scenario beginning in 2008Q3. The upward adjustment of U.S. savings exerts negative pressure on the U.S. current account deficit.

3.1.2 The tightening of global financial conditions

Although disruptions in financial markets began in mid-2007, the collapse of Lehman Brothers in September 2008 sharply increased the perceived risk in financial markets and accelerated the tightening of global financial conditions. We use several financial shocks in the BoC-GEM-FIN to replicate the tightening of financial conditions. In each region, we introduce positive shocks to the probability of default on interbank borrowing and the corporate risk premium to reflect the increase in financial risk.[9] These shocks are calibrated to replicate the dynamic paths of two interest rate spreads over 2008Q3–2009Q4: (i) the spread between the interbank and policy rates, and (ii) the spread between the business borrowing and prime loan rates. In each region, the interbank, prime loan, and business borrowing interest rates are calibrated using the London Interbank Offered Rate, the prime commercial lending, and the BBB business borrowing rates, respectively. In Figures 4 and 5, we compare the mapping of these spreads in our model to the observed path of the interest rate spreads in each region over 2008Q3–2009Q4.[10] As the figures show, our mapping of the interest rate spreads is close to the tightening observed over the crisis. In emerging Asia, the spread between the interbank and policy rate is not mapped as closely as in the other regions, since we do not have good data on interbank borrowing or corporate bond rates

7. In the model, residential investment is included in consumption, rather than investment.
8. It should be noted that there are important uncertainties around this estimate.
9. In the model, there are different corporate risk premiums for the non-tradable and tradable sectors. We calibrate shocks of the same size in each of these premiums to reflect the spread between the business borrowing and prime loan rates.
10. All interest rate data for the EU and Japan are the weighted sum of EU and Japanese interest rates, weighted using the share of their output in the remaining-countries region. In this weighting scheme, the EU and Japan represent 75 and 25 per cent, respectively, of the remaining-countries output.

in emerging Asia. While we use data from Thailand to guide our mapping, we do not attempt to perfectly match the dynamics of the Thai interest rate spreads. Note also that we do not map the observed dynamics of the interest rate spreads in the commodity exporting region, due to a lack of sufficient interest rate data for this region. Thus, the spreads are omitted from Figures 4 and 5.

Negative shocks to the supply of loans and positive shocks to the probability of default on bank capital are also introduced over the same period. These additional structural shocks represent some of the tightening in financial conditions observed over the crisis not captured by the interest rate spreads discussed above. In 2009Q1, a 6 per cent negative shock to the loan supply is introduced in the United States. As was observed in the crisis, the other regions are subsequently affected. In our scenario, we introduce a 6 per cent negative shock to the loan supply in Canada in 2009Q2 and a 7 per cent decline in the loan supply in the EU and Japan in 2009Q3. It is important to note that these figures represent the impact of the negative loan supply shocks introduced into the model. The loan supply is, however, also endogenously affected by the other developments in the global economy, and thus falls by more than the impact of the shocks. Although we do not attempt to map the observed fall in loans at the beginning of the financial crisis, these shocks capture the fall in credit and its persistence over the crisis. The final financial shocks introduced into the baseline scenario are positive 0.5 and 1.0 per cent shocks to the probability of default on bank capital in the United States and emerging Asia. These shocks reduce output by 0.5 and 1.0 per cent in each region, respectively.

In our scenario, the shocks to spreads, loans, and the probability of default on bank capital result in a further tightening in financial conditions that restrains domestic demand in all regions. Moreover, as was observed throughout the crisis, the United States is affected the most by the tightening of financial conditions. Domestic demand in the EU and Japan is also severely restricted by the tightening of financial conditions, while it is less affected in Canada, the commodity exporters, and emerging Asia. In our baseline scenario, we find that these relative developments in financial conditions contributed to the rotation of global demand towards emerging Asia and away from advanced countries, most notably the United States, and to the reduction in global current account imbalances over the crisis.

The slowdown of the world economy associated with the financial crisis in our baseline scenario also temporarily reduces the price of oil, which contributes to the reduction in the U.S. current account deficit. Again, this endogenous fall in the price of oil in our baseline scenario is consistent with the fall in oil prices observed over the financial crisis (Figure 6).[11] The effect of the financial crisis and the corresponding fall in oil prices on global current account balances is, however, largely temporary, given the temporary nature of the financial crisis. This point will be discussed further in section 3.2.

11. Note that, in our model, the response of oil prices is endogenous and is not calibrated to map the path of oil prices observed over the crisis.

The tightening of global financial conditions was also associated with a marked appreciation of the U.S. real effective exchange rate over 2008Q4–2009Q1 that has been linked to a repatriation of U.S. assets and to a portfolio shift towards U.S. assets. Our model does not feature endogenous portfolio choice and thus does not fully capture the portfolio shift towards U.S. assets. Therefore, we introduce a temporary shock to the U.S. dollar, linked to these developments, to represent the appreciation of the U.S. dollar over 2008Q4–2009Q1. We capture the flight to quality by decreasing the relative country-wide U.S. risk premium in the uncovered interest rate parity condition. The size of the shock is calibrated to generate a 13 per cent appreciation in the U.S. real effective exchange rate, which allows us to loosely map the appreciation of the U.S. dollar over 2008Q4–2009Q1.[12] This appreciation partially offset the other forces that were causing the U.S. current account deficit to shrink, because it reversed part of the depreciation of the U.S. dollar that had occurred prior to the onset of the global crisis. However, the effect of the shock was short-lived, since the appreciation was itself reversed over the remainder of 2009.

3.1.3 An expected permanent decline in productivity levels in advanced countries

Over the latter half of the 1990s and the early 2000s, advanced economies, most notably the United States, experienced historically high rates of trend labour productivity growth. As trend productivity growth persisted at high rates, expectations for long-term growth in U.S. labour productivity were gradually revised upwards and anticipated rates of return on U.S. investments rose. These developments led to an increased demand for U.S. investments and to stronger capital inflows into the United States. At the same time, U.S. agents upwardly revised their expectations for their permanent income and responded by increasing their consumption. These developments contributed to the low level of U.S. savings and to the expansion of the U.S. current account deficit in the later 1990s and early 2000s.

More recently, it appears that expectations for a permanent rise in the growth of U.S. labour productivity have been revised downward. This reduction can perhaps be most clearly seen by the downward revisions to the Consensus Economics long-term GDP growth forecasts shown in Table 1. The table depicts the long-run growth forecasts that were made in each subsequent year. Thus, the entry for the long-run growth forecasts for 2001, for example, reflects the long-run growth forecast made by Consensus Economics in 2001. Table 1 shows that the Consensus Economics forecasts for long-run GDP growth have gradually been revised down from a peak of 3.2 per cent in 2004 to 2.6 per cent in 2009. We interpret these downward revisions to potential output growth to be a reflection of expected declines in trend productivity growth. To a lesser degree, we believe that expectations for trend productivity growth in Canada and the EU and Japan have also been revised down recently, most notably since the beginning of the financial

12. The size of the shock is larger than the actual amount of appreciation observed over that period, since our model would suggest that the U.S. dollar should have depreciated over 2008Q4–2009Q1.

crisis. These downward revisions to expectations for trend productivity growth also represent a permanent downward revision to expectations for the level of trend productivity.

Based on the above observations, we incorporate declines in expectations for trend productivity growth in the United States, and to a lesser degree in Canada and the EU and Japan, in our baseline scenario for global current account rebalancing. Specifically, we assume that trend productivity growth in the United States, Canada, and the EU and Japan is temporarily reduced by 0.4, 0.3, and 0.3 percentage points, respectively, beginning in 2008Q2.[13] Trend productivity growth is expected to persist at the lower rates for 40 quarters, permanently reducing the level of labour productivity in the aforementioned regions relative to what it would have been otherwise. The downward revisions to trend productivity growth for 2009–11 are roughly in line with those made in the Bank's *Monetary Policy Report*. We further assume that the downward revisions to trend productivity growth in each of these regions are accompanied by movements in the relative NFA-to-GDP ratios across countries. Because the fall in productivity is larger than that observed in the other regions, it leads to a reduction in demand for investment in U.S. assets.[14] Our model does not feature endogenous portfolio choice; thus, we must capture this loss in demand through a fall in the steady-state NFA-to-GDP ratio in the United States. In particular, we introduce a permanent 7 percentage point negative shock to the U.S. NFA-to-GDP ratio. All regions of the world share in this adjustment, with the NFA-to-GDP ratios increasing by 2.5 percentage points of GDP in Canada, the EU and Japan, and emerging Asia. We further assume that lower trend productivity in these regions would mean a lower marginal return on their assets.[15] The shock that we introduce lowers the marginal return on U.S. assets by 40 basis points. The other regions are slightly less affected, with their marginal returns falling by 20 basis points each.

Finally, we also assume that productivity growth in emerging Asia is unaffected; thus, these supply shocks introduce a permanent rotation of demand away from the United States and, to some extent, from other advanced countries, and towards emerging Asia. We find that this rotation of global demand is one of the factors that contributed to the adjustment in global current account imbalances observed since the beginning of the financial crisis in our baseline scenario.

3.1.4 The simultaneous implementation of fiscal stimulus packages in all regions

In 2009Q1, governments in all regions reacted to the global recession by enacting stimulus packages. We replicate the effects of the fiscal stimulus on aggregate demand by introducing shocks in our model to government spending, transfer payments, and labour income taxes based on the analysis of the global stimulus packages in de Resende, Lalonde, and Snudden (2010).

13. In our dynamic scenario, we assume that trend productivity growth in the United States, Canada, and the EU and Japan was 3.1, 1.9, and 2.0, respectively, prior to the financial crisis. Thus, in our scenario, we assume that trend productivity growth temporarily falls to 2.7, 1.6, and 1.7 per cent, respectively, in each of these regions.
14. Recall that the U.S. bond is the only bond traded internationally.
15. Thus, we introduce a permanent negative shock to the equilibrium interest rate in each region.

Both the positive effect on the level of economic activity associated with the implementation of the fiscal packages, and the negative effect as the stimulus from these policies dissipates, is captured. Table 2 shows the expected size of the fiscal packages and their components enacted in each country/region.

We also map the expected path of government debt in each region. In particular, the baseline scenario includes an increase in government debt as a share of GDP of 35, 20, and 50 percentage points by the end of 2015 in the United States, the EU, and Japan, respectively.[16] After this horizon, government debt gradually returns to pre-crisis levels.[17] These increases in government debt trigger increases in the long-term interest rates on government debt in each of these countries. In our model, the interest rate on government debt does not respond endogenously to movements in government debt, because the interest rate on government debt in our model is the policy interest rate. Therefore, we introduce a spread on the interest rate that the government pays on its debt, and introduce a permanent shock of 40 basis points in the United States and 30 basis points in the EU and Japan to this spread.[18] Given these expected increases in government debt, fiscal consolidation is needed in the medium term. We capture this fiscal consolidation by assuming that, beginning in 2012, the advanced countries increase their labour income tax rates to consolidate their fiscal positions.[19] In the baseline scenario, this fiscal consolidation, particularly in the United States, is an important aspect of the future evolution of global current account imbalances, and will be discussed further in section 3.2.

3.1.5 A persistent decline in consumer and business confidence

Increased economic uncertainty over the crisis also led to large declines in the confidence of consumers and firms in all global regions. For example, consumer confidence surveys across the world indicated record low levels of consumer confidence over late 2008 and 2009. Consider consumer confidence in the United States (Figure 7), which reached a record low in late 2008 and early 2009. To capture the effect of the fall in confidence, we introduce negative shocks to consumption and investment.[20] In general, these confidence effects play a relatively small role in our replication of the dynamic path of the global economy over 2008Q3 to 2009Q4, since the

16. The expected increase in government debt is roughly consistent with the IMF projection in their October 2009 *World Economic Outlook*. In the model, part of the increase in debt is associated with the fiscal stimulus and the economic downturn; however, we use further negative shocks to the labour income tax rate in each region to map the expected debt profiles.
17. This is discussed further in section 4.
18. This is slightly smaller than the relationship between the government debt-to-GDP ratio interest rates on government debt estimated by empirical studies. Laubach (2003) finds that a one percentage point increase in the government debt-to-GDP ratio is typically associated with a 2 to 4 basis point increase in the interest rate on government debt. Given that the expected increase in government debt is temporary, we assume that the effect is the minimum of that estimated by Laubach (2003).
19. This is an endogenous response in our model, since the government must return to its target government debt-to-GDP ratio. Moreover, fiscal consolidation occurs as the fiscal stimulus subsides.
20. These shocks are introduced in a country/region only when disparity exists between the country/region's actual dynamic path of real GDP, consumption, and/or investment and the dynamic path of these variables implied by the results of our simulations after incorporating the shocks previously discussed. At most, these shocks account for a quarter of the cyclical fall in demand in the United States.

aforementioned shocks are able to generate most of the downturn in global economic activity observed over this time period. These confidence effects have the strongest negative effect on the U.S. economy and are also important for the EU and Japan.

All of the aforementioned adverse shocks have implications for monetary policy. In all regions, monetary policy authorities reacted to the financial crisis and recession by cutting policy interest rates. In many countries/regions, interest rates quickly reached the effective nominal lower bound. In the scenario, we thus imperfectly constrain the policy interest rate to not fall below its lower bound.[21] Some regions, most notably the United States, also engaged in quantitative and qualitative easing. Our model replicates these actions by introducing a 3.6 per cent of GDP shock to quantitative easing and a 1.7 per cent of GDP shock to qualitative easing in 2008Q4. These shocks are similar in magnitude to the actions undertaken by U.S. authorities.

In Figure 8, we show that the five shocks capturing the global financial crisis and the assumed monetary and fiscal responses to the crisis are able to replicate closely the broad features of the global economy over 2008Q3 to 2009Q4. In particular, the dynamic path of real GDP in each region is closely matched by the dynamic path of real GDP suggested by the combination of the five shocks included in our baseline scenario.[22] Moreover, the combination of these five shocks is able to explain the movements in global current account balances over this time period. As Table 3 shows, these five shocks would suggest a 2.8 percentage point decline in the current account deficit-to-GDP ratio in the United States over 2008Q2 to 2009Q3, compared to the 2.1 percentage point decline observed. The shocks also do a relatively good job of capturing the observed movements in the current account surpluses in emerging Asia over this time period, suggesting a 1.1 percentage point decline in the current account surpluses as a share of GDP, compared to the 1.5 percentage point decline observed.

3.2 Simulation results: the implied path for global imbalances

After using our model to explain the recent dynamics of global current account balances, we extend our baseline scenario into the future. The baseline scenario is generated by combining the shocks used to represent recent dynamics in global imbalances with additional assumptions for policy and behaviour going forward and allowing the model to simulate the implied future path of the global economy.

The five global economic factors discussed in the previous section will, of course, continue to affect the dynamics of global current account imbalances going forward. These factors include several adjustments in economic policy, and behaviour such as fiscal consolidation. Other than

21. Since the BoC-GEM-FIN is a simulation model, as opposed to a real data projection model, we are able only to imperfectly control for the lower bound on the nominal interest rate and the associated non-linearities.
22. While we do not map the portion of the fall in real GDP in each region attributed to consumption and investment, the shocks that form our baseline scenario and their relative effects on real GDP are roughly consistent with the patterns observed in consumption and investment over the crisis. The 2009Q4 data for emerging Asia are omitted from Figure 8; they were not available when the baseline scenario was completed.

the policies included in the five global economic factors, we make one additional assumption in our baseline scenario regarding the incorporation of economic policies. Starting in 2009Q4, we assume that emerging Asia adjusts its domestic policies in order to encourage domestic demand. These structural reforms could include import liberalization, pension reforms, labour market reforms, and tax reforms, among other possibilities. In the baseline scenario, we do not specify which policies are adopted, and instead capture their effect using a permanent 28.75 percentage point negative shock to the NFA-to-GDP ratio in emerging Asia.[23] This shock occurs gradually, with the NFA-to-GDP ratio taking about 20 years to converge to its new target. The decrease in the NFA-to-GDP ratio increases domestic absorption as a per cent of GDP in that region, as we would expect following structural reforms designed towards stimulating domestic demand. As domestic demand in emerging Asia rises, emerging Asia becomes less willing to finance the U.S. current account deficit, as it has done historically. Thus, structural reform in emerging Asia, which provides a boost to domestic demand, contributes to a rotation of global demand towards emerging Asia and away from the United States, and to the long-run adjustment expected in global current account positions. In our baseline scenario, this assumption is an important component of the expected gradual resolution of global current account balances. Absent this assumption, the EU and Japan would bear a larger share of the expected adjustment in global current account balances, and we would not observe as large a fall in the current account surpluses in emerging Asia. Thus, although the U.S. current account deficit may decline towards a sustainable level, its counterpart would not be reflected in a decline in the large current account surpluses in emerging Asia, and global current account imbalances would not be completely resolved.

The baseline scenario for the global economy and global current account balances is shown in Figures 9 to 16. We report results for the United States, emerging Asia, and the EU and Japan. Although our model also features Canada and the commodity exporters, developments in these regions are not key to the resolution of global imbalances in our baseline scenario.[24] Because the scenario begins in 2009Q4, Figures 9 to 16 report the results of the scenario from that time, and, prior to 2009Q4, they show the observed historical data.

Consider first the evolution of the U.S. economy in the baseline scenario. As noted earlier, the disequilibrium in global current account balances prior to the crisis was partially created by disequilibrium in U.S. consumption and savings behaviour. Although this disequilibrium was partially corrected during the financial crisis, the baseline scenario calls for a further correction in U.S. consumption and savings behaviour. In particular, U.S. consumption is expected to fall as a share of GDP and the household savings rate is expected to rise as households rebuild the wealth that was lost over the crisis (Figures 9 and 10). These results are comparable to Lee,

23. The counterpart of the decrease in the U.S.-dollar-denominated NFA-to-GDP ratio in emerging Asia is a 5.75 percentage point increase in the NFA-to-GDP ratio in the EU and Japan.
24. Results for these regions can be obtained from the authors. In the commodity-exporting region, the current account-to-GDP ratio is expected to rise in the near term, due to the expected increase in the price of oil.

Rabanal, and Sandri (2010) and Mody and Ohnsorge (2010), who also find that the U.S. savings rate should rise going forward, contributing to a fall in the U.S. current account deficit. U.S. government debt continues to rise for a period of time in the baseline scenario, as the effects of the fiscal package persist. Eventually, however, the U.S. government sector begins to consolidate and the debt-to-GDP ratio begins to stabilize. Finally, there is a further gradual 10 per cent depreciation of the U.S. dollar on a real effective basis by the end of 2015 (Figure 12). This depreciation helps to stabilize the U.S. NFA-to-GDP ratio. Overall, the dynamics in the U.S. economy lead to a gradual decline in the U.S. current account deficit (Figure 13).

In the near term, our baseline scenario suggests that the U.S. current account deficit will increase due to temporary, cyclical factors. In particular, given that the U.S. fiscal stimulus is expected to have a larger positive effect than the stimulus enacted in the rest of the world, the U.S. economy is expected to recover faster than the economies in the rest of the world, leading to an increase in the U.S. current account deficit. Moreover, consistent with recent data, oil prices are expected to rise alongside the global recovery and add to the temporary increase in the U.S. current account deficit. This latter effect has the largest effect on the U.S. current account deficit in the near term.

Despite the increase in the U.S. current account deficit in the short run, in the long run our baseline scenario calls for a secular decline in the U.S. current account deficit towards a sustainable level. In our baseline scenario, the U.S. current account deficit-to-GDP ratio stabilizes between 2.0 and 2.5 per cent of GDP, which we interpret as the sustainable level of the U.S. current account deficit.

Several key structural factors contribute to the expected decrease in the U.S. current account deficit towards its sustainable level. The first key factor is the permanent fall in U.S. consumption and the increase in U.S. savings. The second key factor is the global rotation of demand towards faster-growing emerging-market economies, associated with the reduction in potential output growth in the United States, Canada, and the EU and Japan relative to emerging Asia. This global rotation of demand is facilitated by the further depreciation of the U.S. dollar expected over the next few years. These two key structural changes to the global economy have already begun. They have been at work reducing the global current account imbalances, most importantly the U.S. current account deficit, since the onset of the financial crisis, and will continue to act in the same direction going forward.

Two further structural factors are key to the reduction in global current account imbalances going forward. First, fiscal consolidation on the part of advanced countries, most notably the United States, plays an important role in reducing global current account imbalances in our baseline scenario. We expect that this consolidation will begin following the conclusion of the fiscal stimulus packages. The fiscal consolidation expected in our baseline scenario does not merely reflect the winding down of the stimulus packages, but also includes a built-in permanent component as countries increase their labour tax rates to consolidate their fiscal positions. The

final structural factor at work in the secular decline of the U.S. current account deficit is the incorporation of policies to stimulate domestic demand in emerging Asia, which will reduce emerging Asia's willingness to finance the U.S. current account deficit.[25] Thus, these policies will contribute to the rotation of global demand towards emerging Asia and away from the United States, and to the long-run adjustment in global current account positions.

Given these long-run structural factors at work reducing global current account imbalances, every region in the world contributes to the eventual rebalancing of global current account imbalances (Figures 14 and 15). However, the counterpart of the expected permanent adjustment in the U.S. current account deficit is mostly attributed to reductions in the current accounts in emerging Asia and in the EU and Japan. As in the United States, the current account adjustment in emerging Asia overshoots in the near term due to the cyclical increase expected in the price of oil. Emerging Asia's real bilateral exchange rate against the U.S. dollar is expected to appreciate by roughly 7 per cent and thus contribute to the global current account rebalancing (Figure 16). Given that, in our model, emerging Asia has a fixed nominal exchange rate relative to the U.S. dollar, this appreciation is expected to occur mainly through higher domestic inflation as domestic demand rises with the structural reforms. In practice, however, this appreciation could occur either through movements in relative prices or through a revaluation of the fixed exchange rate. Of course, the expected appreciation of the exchange rate in our baseline scenario is contingent on emerging Asia not sterilizing to prevent the appreciation. Overall, we assume that the real appreciation occurs at a pace similar to that of the real exchange rate movements in the other regions.

The EU and Japan also contribute to the expected adjustment in global current account imbalances. In both regions, the current account surpluses fall as a share of GDP. The expected declines in the current account surpluses of these regions are driven mainly by the expected appreciation of their currencies on a real effective basis, rather than by the adjustment in demand. Put another way, the expected appreciation of the currencies of the EU and Japan is larger than that expected for emerging Asia, because part of the adjustment in emerging Asia's current account is due to structural policies. Therefore, its real effective exchange rate does not need to appreciate as much as in the EU and Japan to facilitate the rotation of demand. If emerging Asia does not put in place policies to stimulate domestic demand, its real exchange rate would need to appreciate by more than the 7 per cent in our baseline scenario.

Overall, our baseline scenario for global current accounts calls for a sustainable reduction of global current account imbalances. The medium-term resolution of global current account imbalances observed in our baseline scenario is conditional on changes in behaviour and policy adjustments on several fronts. These include: an upward adjustment of U.S. household savings; a sustained fiscal consolidation in the United States and several other advanced countries;

25. These policies may include, for example, reforms to encourage financial sector development, the introduction of public pensions, and reforms to health and education.

increased domestic demand in emerging-market economies, most notably Asia; and a real exchange rate appreciation in current account surplus countries. Should these conditions fail to materialize, a return to the large global current account balances of the past cannot be discounted. It is also worth noting that the path of the current account-to-GDP ratios in each region depends critically on the speed of introduction of the changes in behaviour and policy adjustment included in the baseline scenario. If these policies were put in place later than assumed in the baseline scenario, the initial worsening of global imbalances would persist for longer, which could increase the size of the required adjustment in global exchange rates.

4 Alternative Scenarios for Global Current Account Positions

In this section we consider two alternative scenarios. First, we examine a scenario in which advanced countries do not make the adjustments in behaviour and policy necessary to achieve the gradual resolution of global imbalances in our baseline scenario. Second, we examine a scenario in which the global recession persists for a prolonged period of time, thus generating global deflation. In both cases, we discuss the implications of these deviations from our baseline scenario for global imbalances.

4.1 The pre-crisis policy scenario

In the pre-crisis policy scenario, countries return to their old patterns of economic behaviour and policies that led to the crisis. This scenario differs from the baseline scenario in two key respects. First, unlike in the baseline scenario, we assume that advanced countries do not make the fiscal adjustments necessary to stabilize their debt dynamics, and that household savings rates do not increase. In the model, this lack of adjustment is captured by an additional permanent 65 percentage point increase in U.S. government debt as a share of GDP (over and above what is included in the baseline scenario), achieved through a permanent increase in the government debt-to-GDP target.[26] Over the 2009–20 horizons, therefore, this alternative scenario assumes a monotonically increasing debt-to-GDP ratio in the United States. In light of the further permanent increase in U.S. debt, we assume that all advanced economies must pay higher interest rates to finance their government debt because there is a permanent increase in the risk premia. We include a permanent positive 300 basis point increase in the interest rate on government debt in the United States.[27] Thus, for every percentage point increase in the U.S. government debt-to-GDP ratio, the interest rate on government debt rises by 4 basis points. This estimated impact is at the top of the band of Laubach's (2003) estimates of the relationship between government debt and interest rates (between 2 and 4 basis points for every percentage point increase in the debt-to-GDP ratio), since we assume that the relationship becomes non-

26. To speed up the adjustment of the debt-to-GDP target towards its new steady-state level, we include some negative shocks to labour income taxes over 2010 that quickly reverse.
27. Given the importance of the U.S. economy in global markets, we assume that the interest rates on government debt in the other regions are affected. In the EU and Japan, the interest rate on government debt permanently rises by 175 basis points.

linear as U.S. debt increases beyond the levels observed in our baseline scenario. We also assume that, in contrast to the baseline scenario, emerging Asian economies continue to finance the U.S. current account deficit through sterilized reserve accumulation, effectively impeding real exchange rate adjustment. This effect is captured by a permanent 70 percentage point shock to the NFA-to-GDP ratio in emerging Asia relative to the baseline scenario, which increases emerging Asia's desire to hold U.S. debt. This shock occurs quite gradually over 20 years.[28] On the other hand, the U.S. NFA-to-GDP ratio falls by 80 percentage points relative to the baseline scenario. All additional shocks in this scenario are implemented beginning in 2010Q1.

In this scenario, the conditions and policies under which global imbalances are gradually resolved in the baseline scenario no longer hold. First, since there is no fiscal consolidation in the United States, its debt-to-GDP ratio increases substantially relative to the level observed in the baseline scenario (Figure 17). Second, the upward adjustment of the U.S. savings rate necessary to rebalance global demand does not occur (Figure 18). In fact, the savings rate declines below pre-crisis levels. Finally, there is no adjustment in global exchange rates. Rather than the depreciation needed to ensure the resolution of global imbalances in the baseline scenario, the U.S. real effective exchange rate appreciates slightly relative to its 2009Q3 level (Figure 19). The lack of a rebalancing in global exchange rates is also reflected in the bilateral exchange rates of emerging Asia and the EU and Japan with the U.S. dollar, which depreciate, in contrast to the appreciation observed in the baseline scenario (Figure 20). In particular, emerging Asia's bilateral exchange rate with the U.S. dollar depreciates by about 6 per cent by the end of 2015, in contrast to the roughly 7 per cent appreciation observed in the baseline scenario. There is also a substantial difference in the movement of the EU and Japan's bilateral exchange rate with the U.S. dollar between the two scenarios: it appreciates by about 13 per cent by the end of 2015 in the baseline scenario, and depreciates by about 3 per cent in the alternative scenario. Moreover, emerging Asia does not adopt policies to stimulate domestic demand, but rather continues to finance the U.S. current account deficit, which further limits the global rotation of demand observed in the baseline scenario.

Given these developments in the global economy, global imbalances increase, reversing the partial resolution observed over the crisis. Under this scenario, the U.S. current account deficit-to-GDP ratio increases from 2.8 per cent in 2009Q2 to a peak of about 6.0 per cent at the end of 2015, instead of converging towards a sustainable level as in the baseline scenario (Figure 21). The current account surplus-to-GDP ratio in emerging Asia reaches a peak of close to 10 per cent in 2013 (Figure 22). Thus, this scenario would imply a return to the large current account imbalances of the past.

28. There are also permanent 45 and 20 percentage point increases in the NFA-to-GDP ratios in Canada and in the EU and Japan, respectively, relative to the baseline scenario. However, these shocks – particularly the Canadian shock, given the small share of Canadian output in world GDP – play a smaller role than the shock to emerging Asia in continuing to finance the U.S. current account deficit.

As countries fail to make the necessary adjustments to resolve global imbalances, global growth suffers, remaining well below what could be achieved under the policies and conditions outlined in our baseline scenario (Table 4). In particular, the rising public debt burden, and the associated rise in global interest rates, crowd out private investment, ultimately lowering potential output growth. Global growth falls steadily to 2.7 per cent in 2013, much less than the average rate of 4 per cent over 2000–07.[29] This is much weaker than the 3.8 per cent growth in 2013 observed in the baseline scenario. Over 2010–20, the fall in global growth relative to the baseline scenario is also reflected in a loss of per capita U.S.-dollar income in all regions relative to the baseline scenario (Table 5).[30] This result suggests that all regions of the world economy will suffer if global current account positions are not rebalanced, and not just those regions in which the disequilibrium is concentrated.

4.2 The global deflation scenario

One could also envision an alternative scenario in which domestic demand growth in advanced countries falls by more than in the baseline scenario, and is not offset by stronger demand growth in emerging Asia, thereby generating global deflation.[31] This unlikely event provides a useful illustration of a worst-case scenario, differing from our baseline scenario in four key respects. First, the fall in private domestic demand in advanced countries is exacerbated by further reductions in the loan supply as lenders become more cautious due to increased uncertainty. In the United States, the loan supply falls by an average of 1 per cent more than in the baseline scenario over the next five years. In the EU and Japan, the additional decline in the loan supply is assumed to be slightly smaller, averaging 0.3 per cent over the next five years. Second, we incorporate additional negative shocks to consumption into advanced economies to capture more adverse confidence effects. These further declines in consumption are comparable in magnitude to the additional declines in loans. Third, we assume that, in light of these additional shocks to domestic demand, expectations for trend productivity growth are further revised down, such that productivity growth falls by a further 0.7 and 0.3 per cent per year in the United States and in the EU and Japan, respectively. Fourth, as opposed to the baseline scenario, we assume that emerging Asia does not put into place policies to promote domestic demand. Therefore, stronger domestic demand in emerging Asia does not compensate for the additional weakness in demand in the advanced countries. Since we continue to assume that fiscal consolidation takes place as in the baseline scenario, the main difference between this scenario and the baseline scenario is that private demand does not increase to offset the fall in public demand.

The decline in economic activity results in global deflation, with deflation peaking at 6 per cent in advanced economies for an extended period. With policy interest rates in many countries at

29. Figure 23 shows the effect on the level of real GDP in each region.
30. Using purchasing-power parity (PPP) exchange rates.
31. Then-Governor Dodge (2005) discusses a similar global scenario. Moreover, as part of the Bank's participation in the IMF's 2007 Financial Sector Assessment Program, Coletti et al. (2008) depict a similar scenario for the United States.

the zero lower bound, real interest rates rise and further depress demand. Consider as an example the U.S. economy. Consumption as a per cent of GDP deteriorates gradually by 5 percentage points, reaching 66 per cent by 2015. This is accompanied by an increase in the U.S. household savings rate to 10.5 per cent, at its peak, in 2012. Similar developments occur in other advanced economies. Moreover, despite the fiscal consolidation, the deterioration of the global economy worsens the debt-to-GDP ratio relative to the baseline scenario in all countries. For the United States, the debt-to-GDP ratio increases by 33 percentage points, relative to the baseline scenario, to a peak of 114 per cent of GDP in 2015. The debt-to-GDP ratio in the EU and Japan increases to 108 per cent, 18 percentage points higher than in the baseline scenario. Finally, this scenario still implies an adjustment in global exchange rates, with the U.S. dollar depreciating by about 5 per cent less than in the baseline scenario.

Give these developments, global imbalances are reversed for some time as the additional weakness in the global economy mainly affects advanced countries, particularly the United States (Figures 24 and 25). The U.S. current account increases, moving quickly from its deficit position to a large surplus. However, this increase is transitory, due to the global recession. The U.S. current account eventually stabilizes at a 4 per cent of GDP deficit. Since the U.S. economy is the most affected by the prolonged global recession, the current account balances in all other regions fall in the medium term. In the long run, the adjustment is similar to what is observed in the baseline scenario. Thus, as in the baseline scenario, this scenario implies a long-run reduction in global current account imbalances; however, the adjustment is not orderly and occurs at the expense of a prolonged global recession (see Tables 4 and 5).

5 Conclusion

Under the baseline scenario, global imbalances are gradually resolved and the U.S. current account deficit will return to a sustainable level (between 2.0 and 2.5 per cent of GDP) by the end of 2015. This rebalancing is contingent on three key elements: (i) a continuous upward adjustment of U.S. private savings, (ii) a gradual fiscal consolidation in advanced countries beginning in 2012, and (iii) an orderly adjustment of real exchange rates across countries. These three criteria facilitate a gradual decline in the U.S. current account deficit going forward. A fourth key element, the implementation of policies designed to stimulate domestic demand in emerging Asian economies, is needed to ensure that the counterpart of the decline in the U.S. current account deficit is mainly a reduction in the surpluses of emerging Asia. If emerging Asia does not put in place policies to stimulate domestic demand, their currency would need to appreciate by more than suggested in our baseline scenario.

The orderly resolution of global imbalances in this paper is consistent with the desired outcome of the G-20 framework for strong, sustainable, and balanced growth. Given these adjustments, we show that world growth will be much stronger than in an alternative scenario in which countries return to their pre-crisis patterns of economic behaviour and policies. As the pre-crisis

policy scenario suggests, should the conditions necessary to achieve a rebalancing of global current account balances fail to materialize, a return to the large global current account balances of the past is likely.

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Table 1: Consensus Economics Long-Run U.S. Growth Forecasts

Forecast Period	Long-Run Growth (%)
2001	3.2
2002	3.1
2003	3.2
2004	3.2
2005	3.1
2006	3.0
2007	2.7
2008	2.8
2009	2.6

Source: Consensus Economics United States Economic Forecasts

Table 2: Estimate of the Impact of the G-20 Initiatives (% of GDP)

2009

	GOVCONS	GOVINV	TRANS_TARG	TRANSFER	TAU_L	TAU_K	*TOTAL*
Canada	0.00	0.91	0.23	0.45	0.23	0.05	1.88
Emerging Asia	0.29	1.44	0.24	0.11	0.08	0.06	2.22
Commodity exporter	0.34	0.25	0.61	0.23	0.16	0.34	1.93
Japan	0.33	0.32	0.95	0.66	0.05	0.05	2.36
Remaining countries	0.01	0.13	0.08	0.06	0.22	0.02	0.52
United States	0.00	0.34	1.12	0.13	0.19	0.40	2.19

2010

	GOVCONS	GOVINV	TRANS_TARG	TRANSFER	TAU_L	TAU_K	*TOTAL*
Canada	0.00	0.68	0.28	0.24	0.35	0.06	1.61
Emerging Asia	0.18	1.42	0.00	0.04	0.07	0.07	1.79
Commodity exporter	0.22	0.04	0.16	0.07	0.08	0.36	0.92
Japan	0.00	0.58	0.21	0.89	0.04	0.04	1.76
Remaining countries	0.01	0.04	0.03	-0.01	0.15	0.08	0.31
United States	0.00	0.56	0.62	0.69	0.40	0.21	2.49

2011

	GOVCONS	GOVINV	TRANS_TARG	TRANSFER	TAU_L	TAU_K	*TOTAL*
Canada	0.00	0.34	0.00	0.00	0.00	0.00	0.34
Emerging Asia	0.00	0.71	0.00	0.00	0.00	0.00	0.71
Commodity exporter	0.00	0.02	0.00	0.00	0.00	0.00	0.02
Japan	0.00	0.29	0.00	0.00	0.00	0.00	0.29
Remaining countries	0.00	0.02	0.00	0.00	0.00	0.00	0.02
United States	0.00	0.44	0.13	0.10	0.18	0.05	0.90

Note: GOVCONS, GOVINV, TRANS_TARG, TRANSFER, TAU_L, and TAU_K are government consumption, government investment, targeted transfer payments, transfers, the labour tax rate and the capital tax rate, respectively.

Source: de Resende, Lalonde, and Snudden (2010). Note that the version of the BoC-GEM in de Resende, Lalonde, and Snudden (2010) includes a separate block for Japan. Therefore, the remaining countries are composed mainly of the EU.

Table 3: Current Account Dynamics in the Baseline Scenario

Current Account (relative to 2008Q2, as % of GDP)	Quarter	Data	Model
United States	2009Q3	+2.1	+2.8
Emerging Asia	2009Q4	-1.5	-1.1
EU and Japan	2009Q3	+1.2	+0.9

Table 4: World GDP Growth

	2010	2011	2012	2013	2014	2015
Baseline	3.7	4.5	4.1	3.8	3.2	3.1
Pre-crisis Policy	3.9	2.7	3.1	2.7	2.5	2.4
Global Deflation	-0.3	0.7	0.9	0.8	2.8	2.9

Table 5: Cumulative Loss in Per Capita US$ PPP Income Relative to the Baseline Scenario

The Pre-crisis Policy Scenario	United States	Euro area	Japan	Emerging Asia	Canada
2010 to 2015	-391	-5,919	-6,613	-2,410	-2,983
2010 to 2020	-8,043	-15,810	-18,303	-6,255	-11,740
The Global Deflation Scenario					
2010 to 2015	-36,989	-16,501	-18,348	-2,172	-17.05
2010 to 2020	-70,984	-28,869	-32,910	-5,762	-35,999

Figure 1: Current Account-to-GDP Ratio
(Level, in per cent)

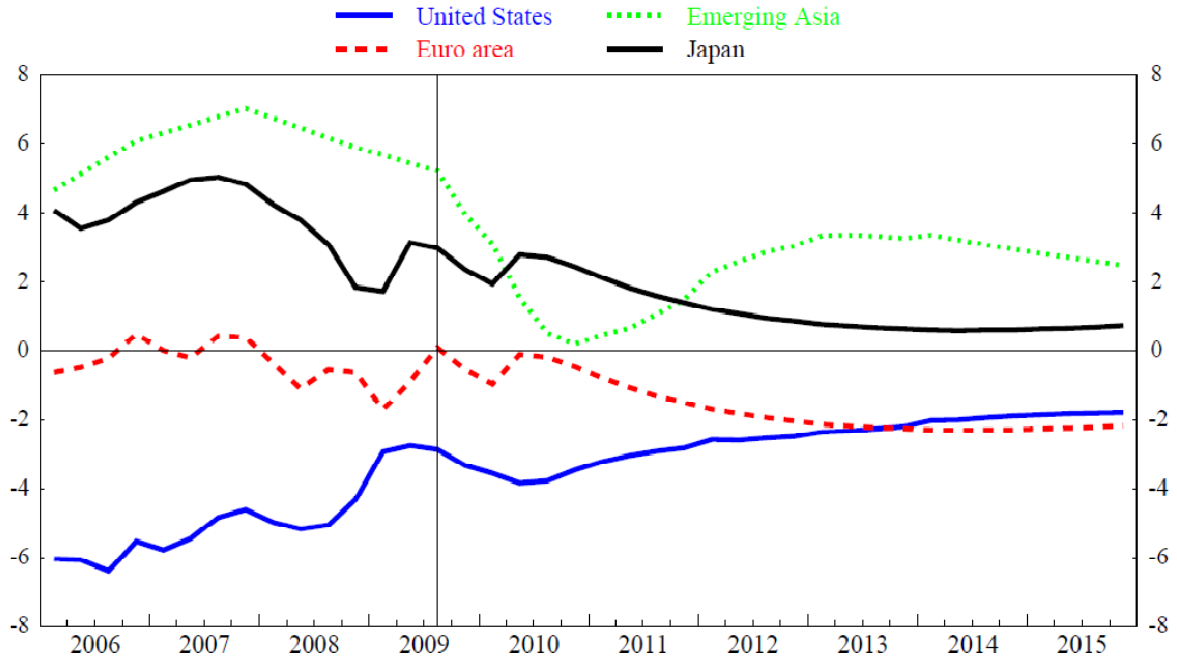
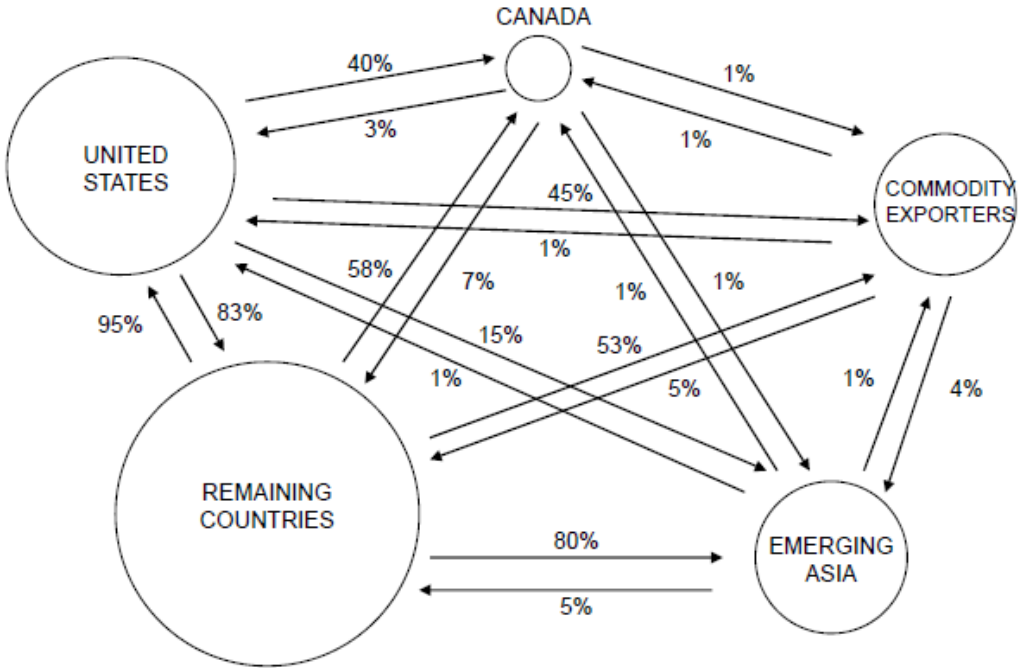
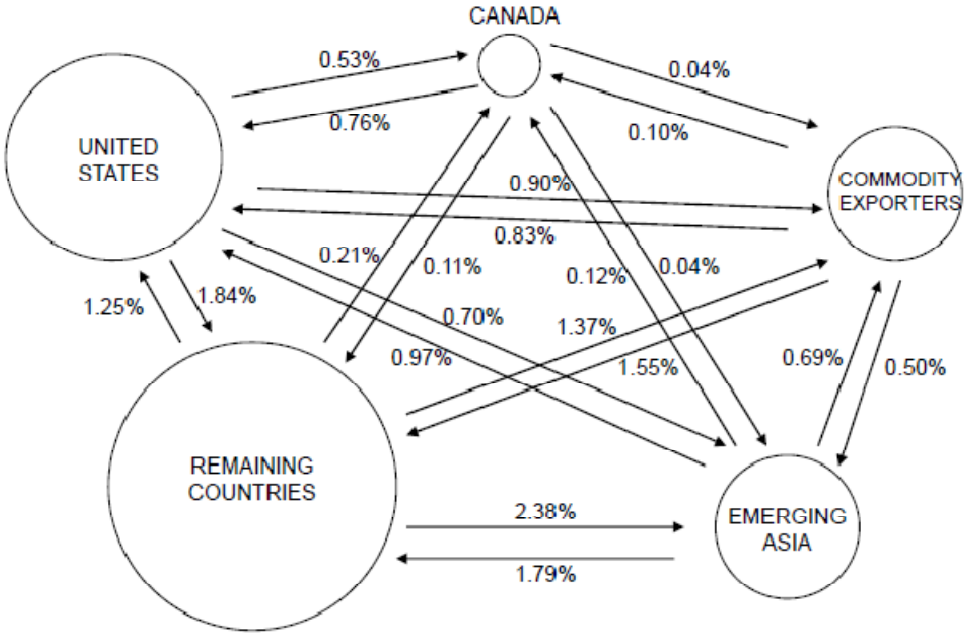


Figure 2: Global Loan Flows in the BoC-GEM-FIN



Note: Circle sizes represent the share of global GDP that is held by each region. Loan flows are expressed as the per cent of total foreign loans in the domestic economy from each foreign source.

Figure 3: Global Trade Linkages in the BoC-GEM (All Goods – Per Cent of World GDP)



Note: Circle sizes represent the share of global GDP that is held by each region.

Figure 4: Spread Between the Interbank and Policy Rates
(Relative to 2008Q2)

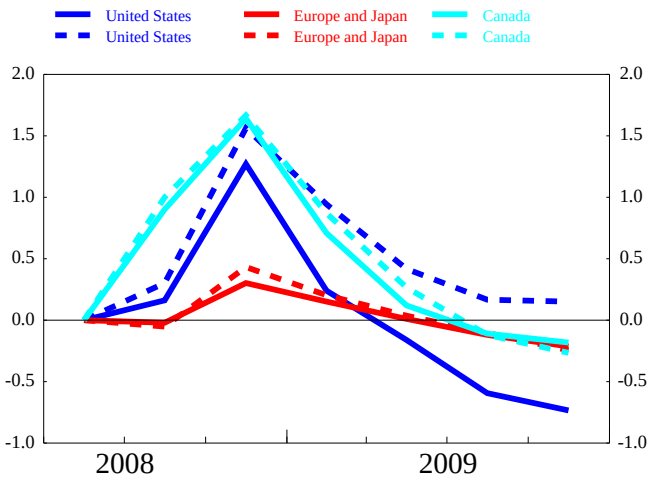


Figure 5: Corporate Risk Premium
(Relative to 2008Q2)

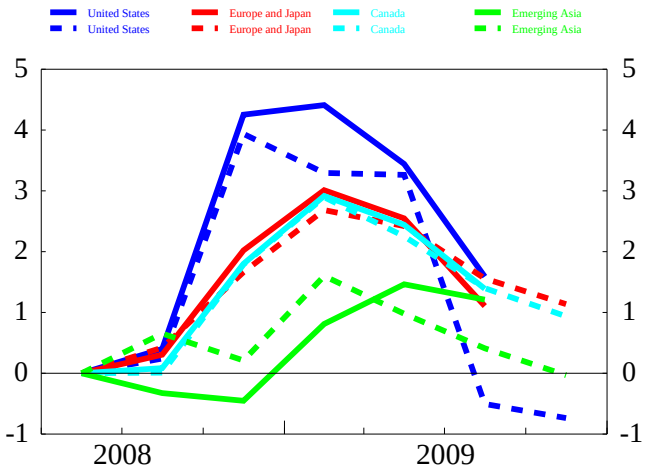


Figure 6: Price of Oil
Relative to 2008Q2

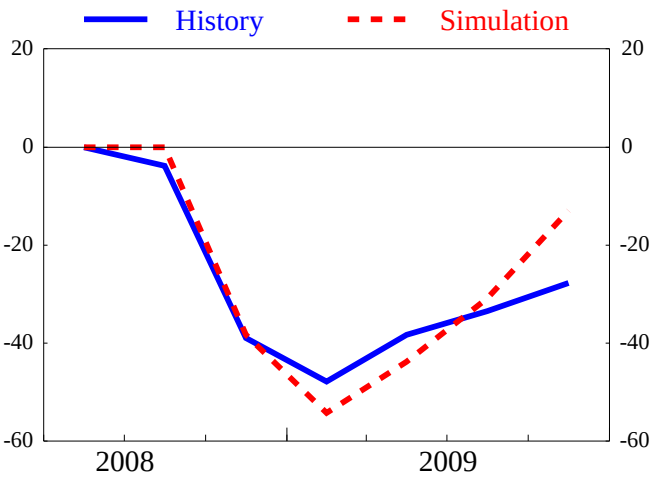


Figure 7: The Conference Board Consumer Confidence Index
Benchmarked to 1985=100

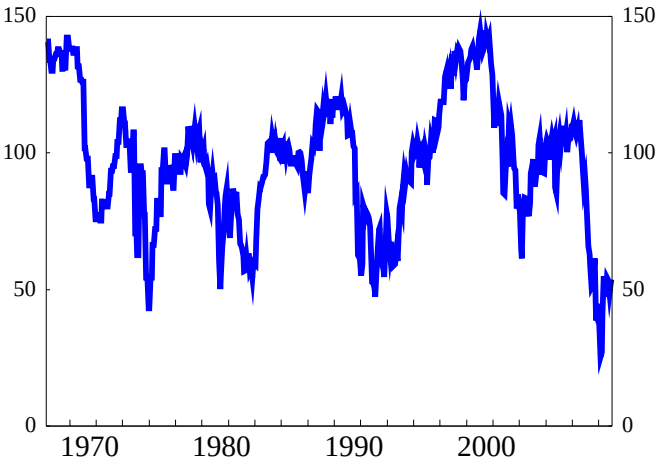
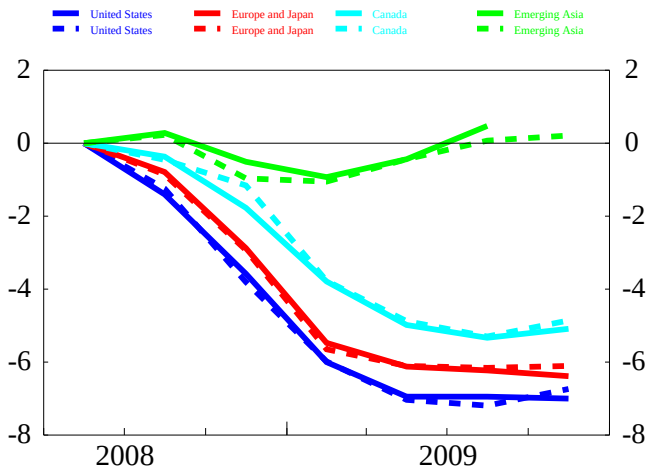


Figure 8: Gross Domestic Product
(Relative to 2008Q2)



Global Imbalances: Baseline Scenario

Figure 9: U.S. Consumption-to-GDP ratio
(Level, in per cent)

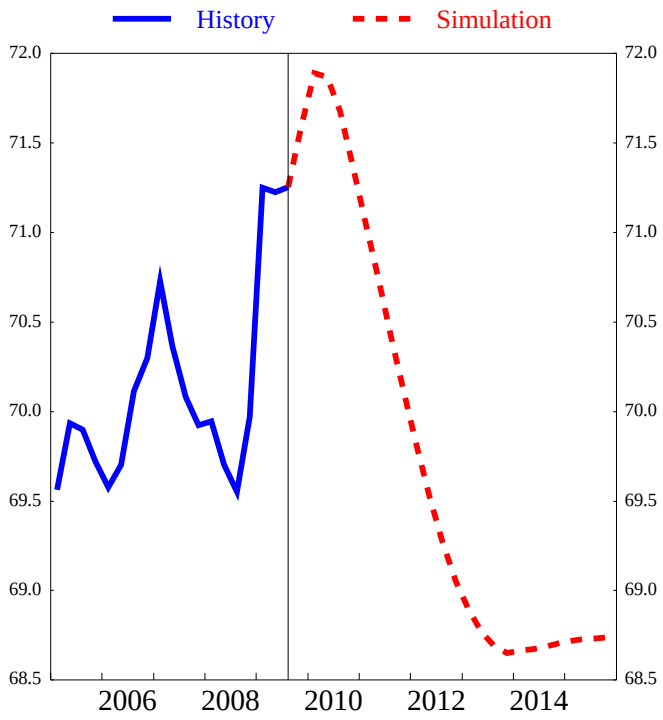


Figure 10: U.S. Household Savings Rate
(Level, in per cent)

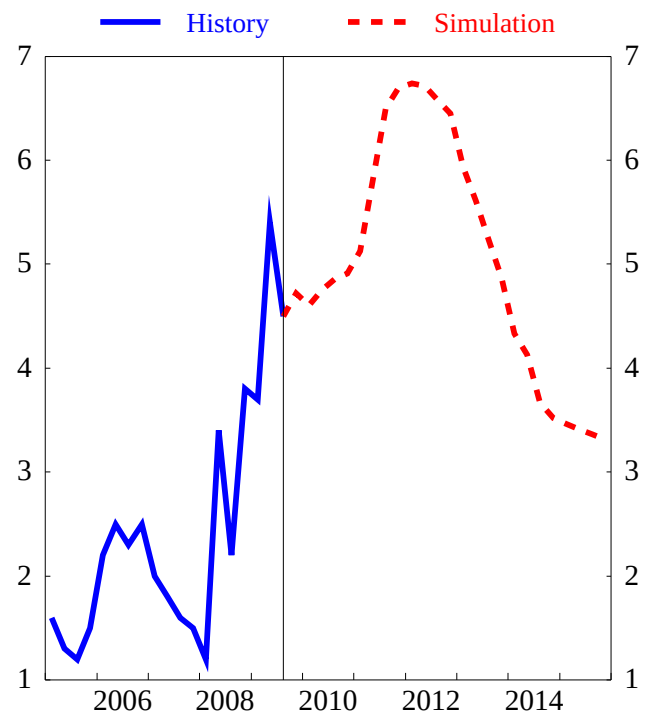


Figure 11: U.S. Government Debt-to-GDP Ratio
(Level, in per cent)

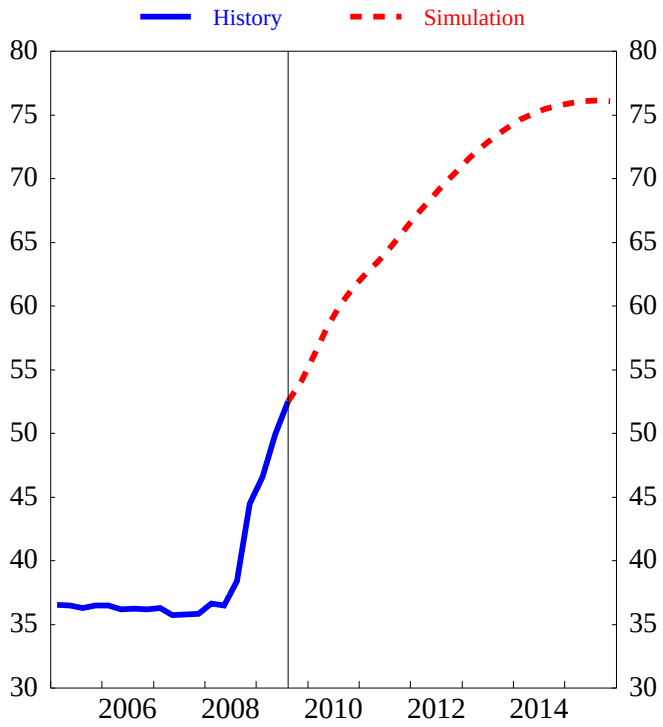
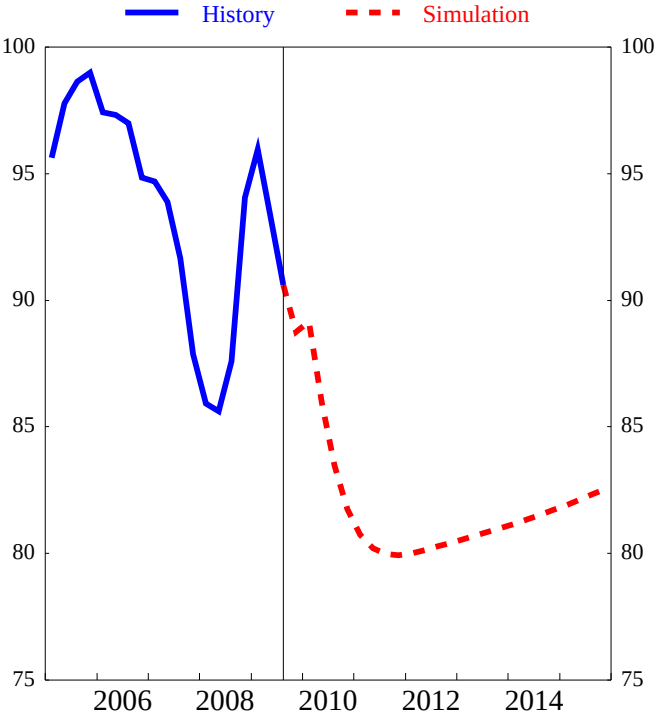


Figure 12: U.S. Real Effective Exchange Rate
(Level; +=appreciation)



Global Imbalances: Baseline Scenario

Figure 13: U.S. Current Account-to-GDP Ratio
(Level, in per cent)

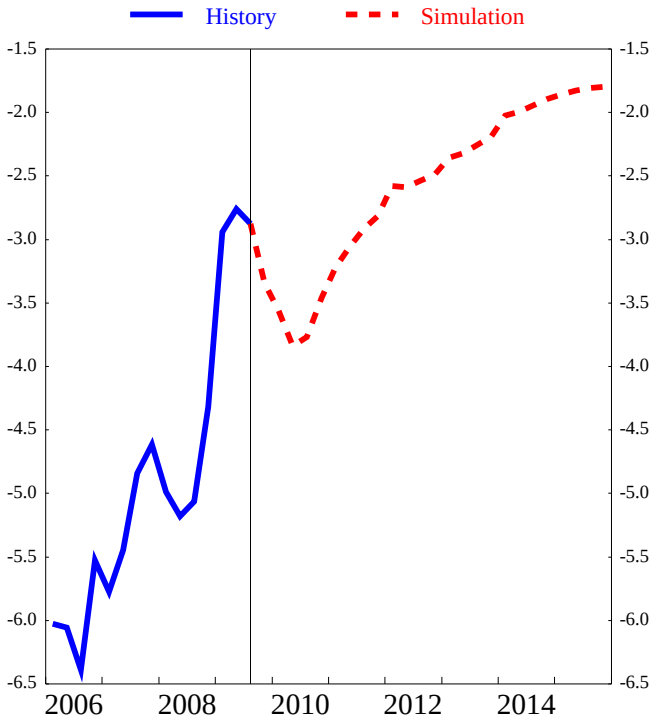


Figure 14: U.S. Real Effective Exchange Rate
(Deviation from 2009Q3 level; +=appreciation)

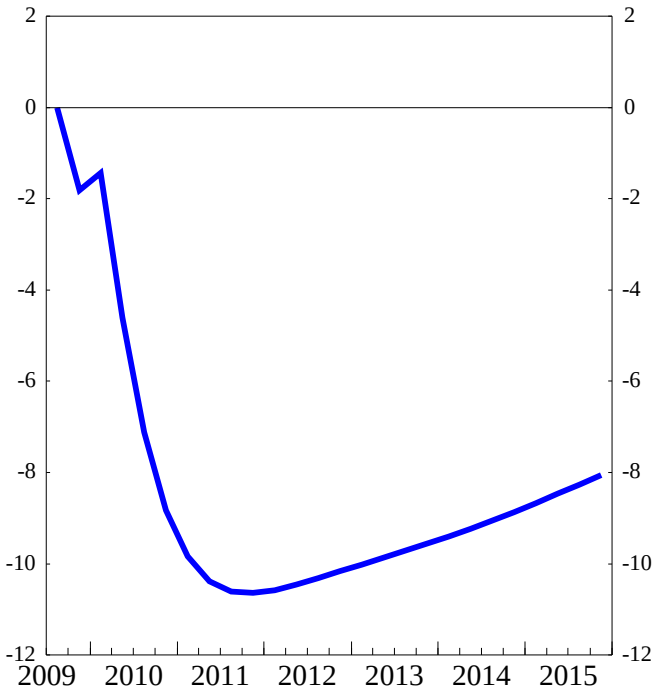


Figure 15: Real Bilateral Exchange Rate
(Projected path relative to 2009Q3 level, in per cent; +=appreciation)

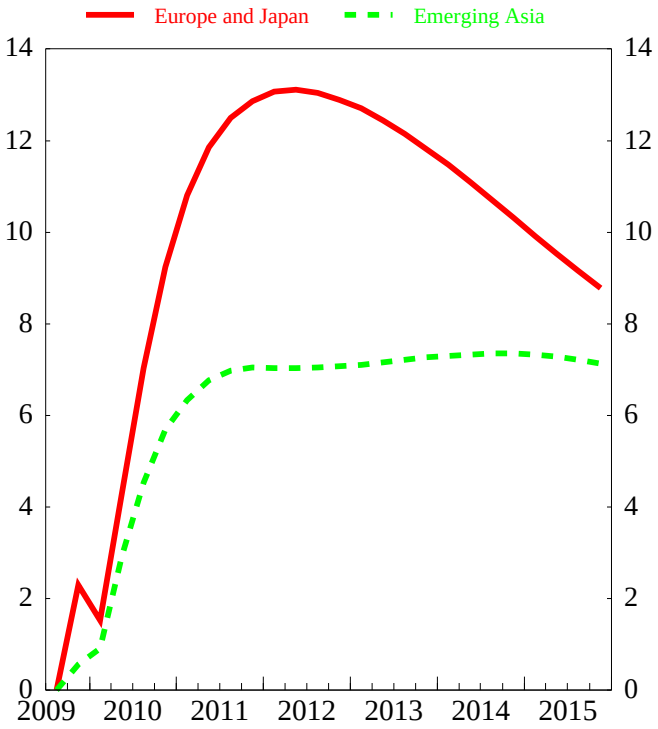
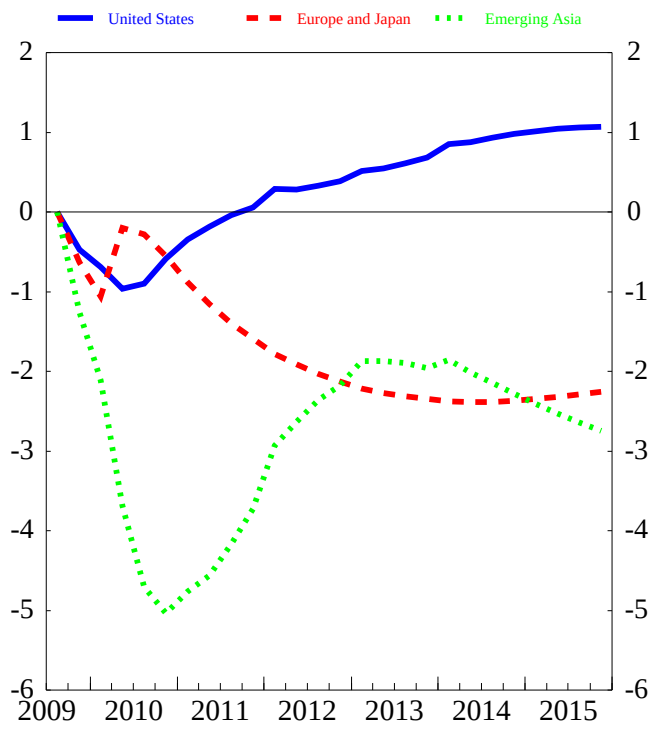


Figure 16: Current Account-to-GDP Ratio
(Relative to 2009Q3)



Global Imbalances: Pre-crisis Policy

Figure 17: U.S. Government Debt-to-GDP Ratio
(Level, in per cent)

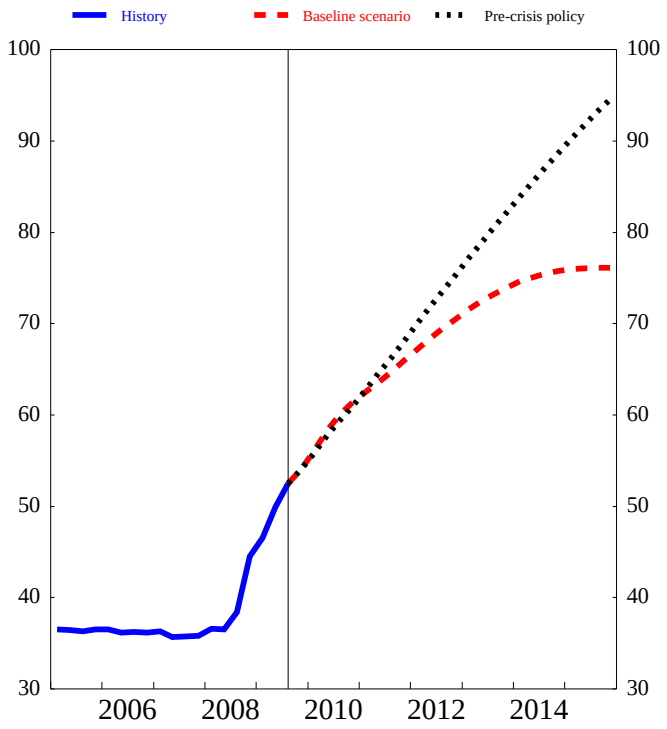


Figure 18: U.S. Household Savings Rate
(Level, in per cent)

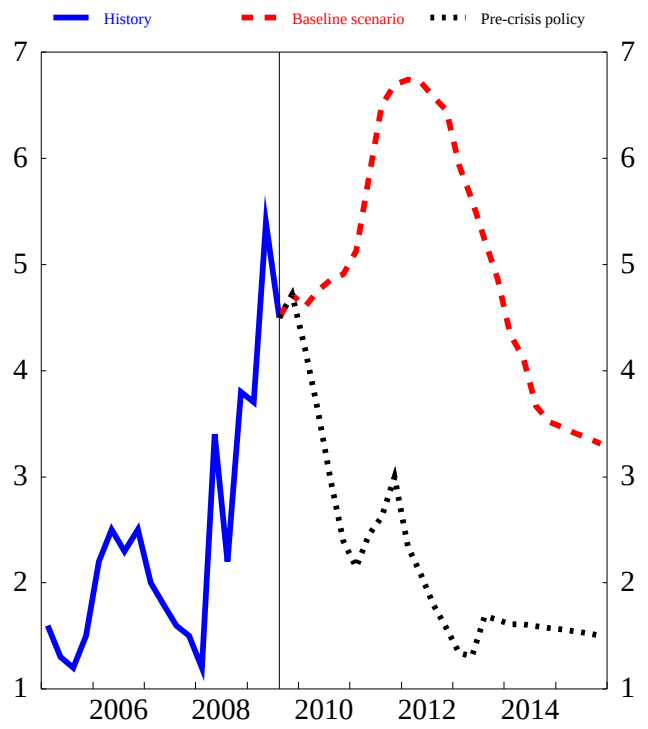


Figure 19: U.S. Real Effective Exchange Rate
(Level; +=appreciation)

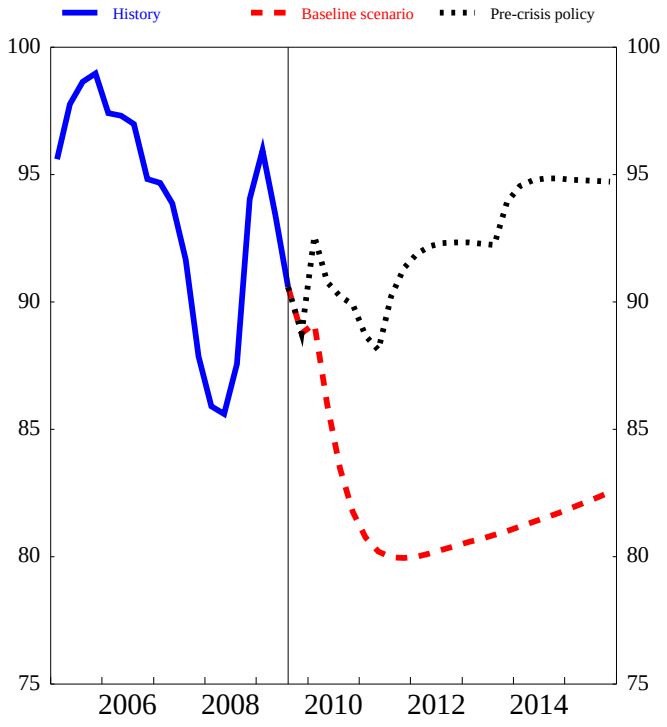
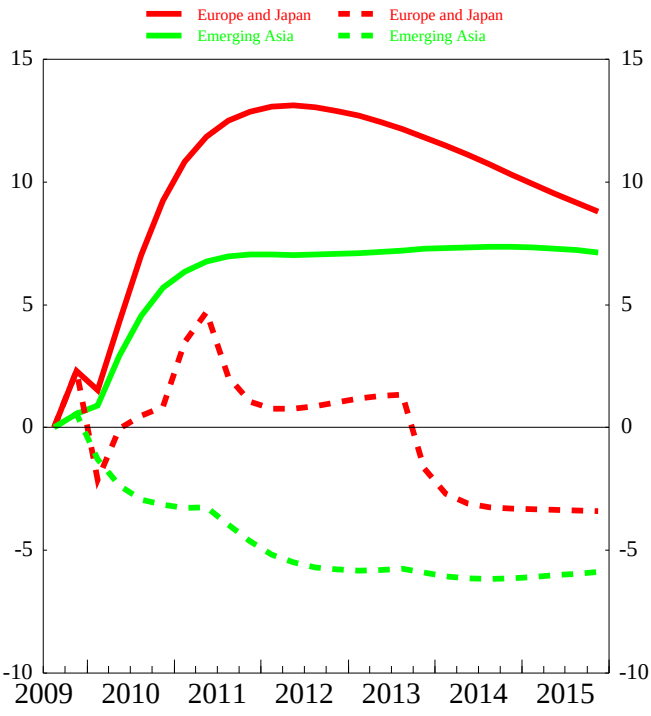


Figure 20: Real Bilateral Exchange Rate
(Projected path relative to 2009Q3 level, in per cent; +=appreciation)
Solid = Baseline; Dashed = pre-crisis



Global Imbalances: Pre-crisis Policy

Figure 21: U.S. Current Account-to-GDP Ratio
(Level, in per cent)

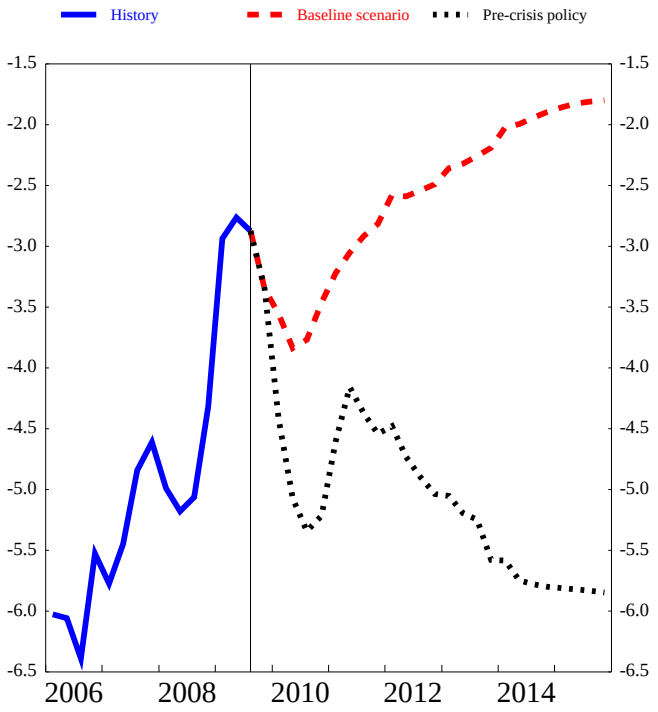


Figure 22: Current Account-to-GDP Ratio
(Level, in per cent)

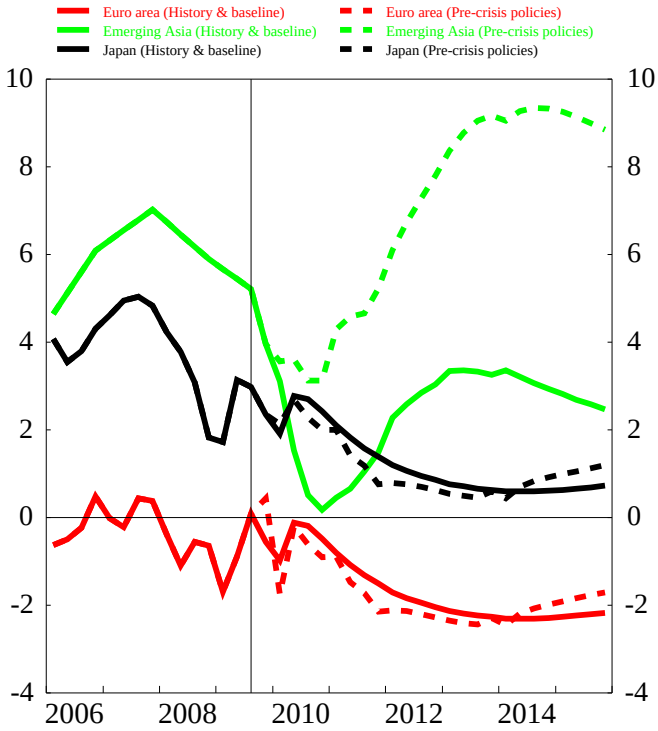
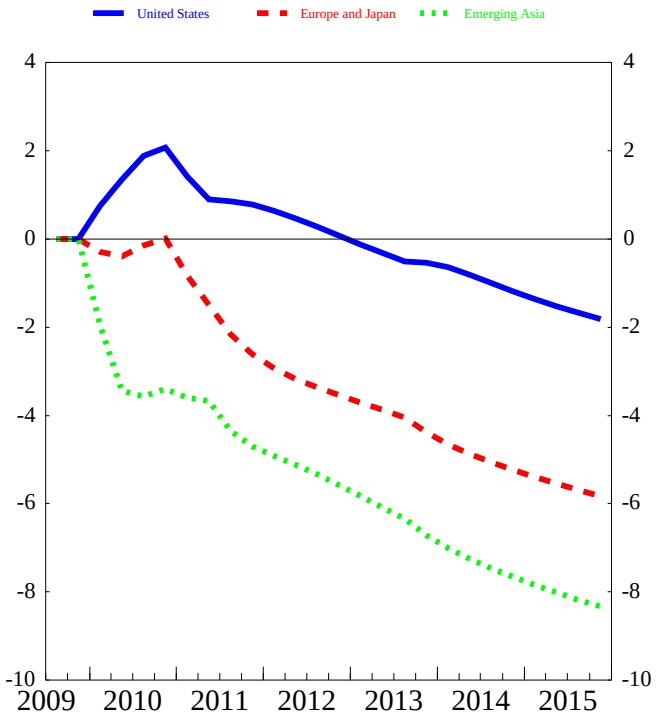


Figure 23: Difference in GDP of Pre-Crisis to Baseline
(Deviation from 2009Q3 level, per cent)



Global Imbalances: Deflation Risk

Figure 24: U.S. Current Account-to-GDP Ratio
(Level, in per cent)

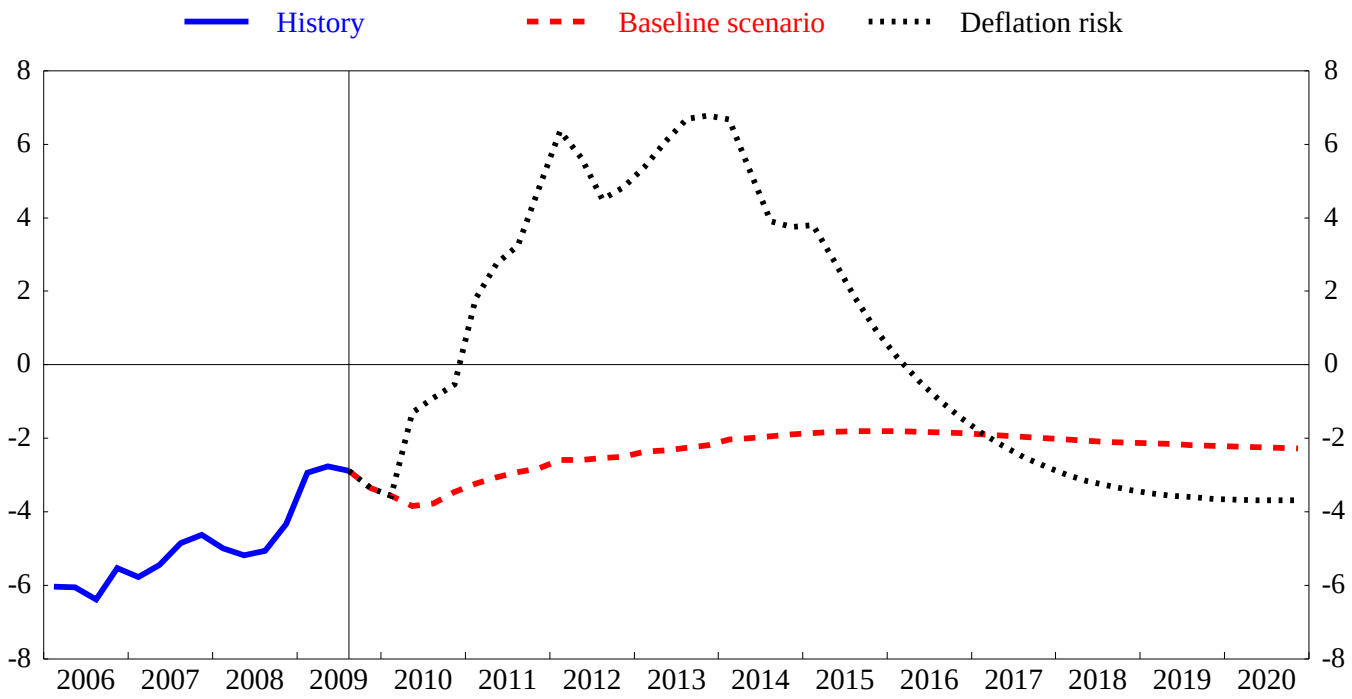


Figure 25: Current Account-to-GDP Ratio
(Level, in per cent)