

Global Imbalances and the Financial Crisis: Products of Common Causes

*Maurice Obstfeld and Kenneth Rogoff**

November 2009

Abstract

This paper makes a case that the global imbalances of the 2000s and the recent global financial crisis are intimately connected. Both have their origins in economic policies followed in a number of countries in the 2000s and in distortions that influenced the transmission of these policies through U.S. and ultimately through global financial markets. In the U.S., the interaction among the Fed's monetary stance, global real interest rates, credit market distortions, and financial innovation created the toxic mix of conditions making the U.S. the epicenter of the global financial crisis. Outside the U.S., exchange rate and other economic policies followed by emerging markets such as China contributed to the United States' ability to borrow cheaply abroad and thereby finance its unsustainable housing bubble.

*University of California, Berkeley, and Harvard University. Paper prepared for the Federal Reserve Bank of San Francisco Asia Economic Policy Conference, Santa Barbara, CA, October 18-20, 2009. Conference participants and especially discussant Ricardo Caballero offered helpful comments. We thank Alexandra Altman and Matteo Maggiori for outstanding research assistance. Financial support was provided by the Coleman Fung Risk Management Center at UC Berkeley and CEPREMAP.

In my view ... it is impossible to understand this crisis without reference to the global imbalances in trade and capital flows that began in the latter half of the 1990s.

--Ben S. Bernanke¹

Introduction

Until the outbreak of financial crisis in August 2007, the mid-2000s was a period of strong economic performance throughout the world. Economic growth was generally robust; inflation generally low; international trade and especially financial flows expanded; and the emerging and developing world experienced widespread progress and a notable absence of crises.

This apparently favorable equilibrium was underpinned, however, by three trends that appeared increasingly unsustainable as time went by. First, real estate values were rising at a high rate in many countries, including the world's largest economy, the United States. Second, a number of countries were simultaneously running high and rising current account deficits, including the world's largest economy, the United States. Third, leverage had built up to extraordinary levels in many sectors across the globe, notably among consumers in the United States and Britain and financial entities in many countries. Indeed, we ourselves began pointing to the potential risks of the "global imbalances" in a series of papers beginning in 2001.² As we will argue, the global imbalances did not cause the leverage and housing bubbles, but they were a critically important codeterminant.

In addition to being the world's largest economy, the United States had the world's highest rate of private homeownership and the world's deepest, most dynamic

¹ Bernanke (2009).

financial markets. And those markets, having been progressively deregulated since the 1970s, were confronted by a particularly fragmented and ineffective system of government prudential oversight. This mix of ingredients, as we now know, was deadly.

Controversy remains about the precise connection between global imbalances and the global financial meltdown. Some commentators argue that external imbalances had little or nothing to do with the crisis, which instead was the result of financial regulatory failures and policy errors, mainly on the part of the U.S. Others put forward various mechanisms through which global imbalances are claimed to have played a prime role in causing the financial collapse. Former U.S. Treasury Secretary Henry Paulson argued, for example, that the high savings of China, oil exporters, and other surplus countries depressed global real interest rates, leading investors to scramble for yield and under-price risk.³

We too believe that the global imbalances and the financial crisis are intimately connected, but we take a more nuanced stance on the nature of the connections. In our view, both originated primarily in economic policies followed in a number of countries in the 2000s (including the United States) and in distortions that influenced the transmission of these policies through U.S. and ultimately through global financial markets.

The United States' ability to finance macroeconomic imbalances through easy foreign borrowing allowed it to postpone tough policy choices (something that was of course true in many other deficit countries as well). Foreign banks' appetite for assets that turned out to be toxic provided one ready source of external funding for the U.S. deficit. Not only was the U.S. able to borrow in dollars at nominal interest rates kept low

² See Obstfeld and Rogoff (2001, 2005, 2007).

³ Guha (2009).

by a loose monetary policy. Also, until around the autumn of 2008, exchange rate and other asset-price movements kept U.S. net foreign liabilities growing at a rate far below the cumulative U.S. current account deficit.

At the same time, countries with current account surpluses faced minimal pressures to adjust. China's ability to sterilize the immense reserve purchases it placed in U.S. markets allowed it to maintain an undervalued currency and defer rebalancing its own economy. Complementary policy distortions therefore kept China artificially far from its lower autarky interest rate and the U.S. artificially far from its higher autarky interest rate. Had seemingly low-cost postponement options not been available, the subsequent crisis might well have been mitigated, if not contained.⁴

We certainly do not agree with the many commentators and scholars who argued that the global imbalances were an essentially benign phenomenon, a natural and inevitable corollary of backward financial development in emerging markets. These commentators, including Cooper (2007) and Dooley, Folkerts-Landau, and Garber (2005), as well as Caballero, Farhi, and Gourinchas (2008a) and Mendoza, Quadrini, and Rios-Rull (2007), advanced frameworks in which the global imbalances were essentially a "win-win" phenomenon, with developing countries' residents (including governments) enjoying safety and liquidity for their savings, while rich countries (especially the dollar-

⁴ While we would not fully subscribe to Portes' (2009) blunt assessment that "global macroeconomic imbalances are the underlying cause of the crisis," we find common ground in identifying several key transmission mechanisms from policies to the endogenous outcomes. Perhaps (to paraphrase Bill Clinton) it depends what you mean by "underlying." Jagannathan, Kapoor, and Schaumberg (2009) ascribe industrial-country policies of the 2000s to the increase in the effective global labor force brought about by the collapse of the Soviet bloc and economic liberalization in China and India. It is plausible that these changes exerted downward pressure on global inflation, as suggested by Greenspan (2004), reducing the price pressures that low policy interest rates might otherwise have unleashed. Nishimura (2008) posits that the same demographic forces placed upward pressure on industrial-country asset prices in the late 1990s and 2000s.

issuing United States) benefited from easier borrowing terms.⁵ The fundamental flaw in these analyses, of course, was the assumption that advanced-country capital markets, especially those of the United States, were fundamentally perfect, and so able to take on ever-increasing leverage without risk. In our 2001 paper we ourselves underscored this point, identifying the rapid evolution of financial markets as posing new, untested hazards that might be triggered by a rapid change in the underlying equilibrium.⁶

Bini Smaghi's (2008) assessment thus seems exactly right to us: "[E]xternal imbalances are often a reflection, and even a prediction, of internal imbalances. [E]conomic policies ... should not ignore external imbalances and just assume that they will sort themselves out."⁷ In this paper we describe how the global imbalances of the 2000s both reflected and magnified the ultimate causal factors behind the recent financial crisis. At the end, we identify policy lessons learned. In effect, the global imbalances posed stress tests for weaknesses in the United States, British, and other advanced-country financial and political systems – tests that those countries did not pass.

⁵ At the end of their paper, Caballero, Farhi, and Gourinchas (2008a) point to the risks of excessive leverage, which are not incorporated in their model. Caballero, Farhi, and Gourinchas (2008b) extend their earlier framework to analyze the aftermath of a bubble collapse. Gruber and Kamin (2008) argue that as an empirical matter, conventional measures of financial development explain neither the size of the net capital flows from emerging to mature economies, nor their concentration on U.S. assets. Gruber and Kamin also argue that U.S. bond yields have been comparable to those of other industrial countries, contrary to the view that American liabilities have been especially attractive to foreign portfolio investors. Acharya and Schnabl (2010) show that banks in industrial surplus and deficit countries alike set up extensive asset-backed commercial paper conduits to issue purportedly risk-free short-term liabilities and purchase risky longer-term assets from industrial deficit countries, mostly denominated in dollars. This finding also throws doubt on the hypothesis that emerging-market demand for risk-free assets that only the U.S. could provide was the underlying cause of the U.S. current account deficit.

⁶ See also the concerns raised by Obstfeld and Rogoff (2005, 2007), as well as Obstfeld (2005), who follows up on these themes by warning that "The complex chains of counterparty obligation that have arisen in the global economy, typically involving hedge funds and other nonbanks and impossible to track

World Policymakers React to Growing Imbalances

Between 1989 and 1997, the United States current account deficit fluctuated in a range below two percent of GDP. In 1998, with the Asian financial crisis and its backwash in full swing, the deficit reached 2.4 percent of GDP, climbing to 4.8 percent by 2003. Driven largely by high investment during the late 1990s, the U.S. deficit reflected low national saving by 2003. United States external borrowing was to climb to roughly 6 percent of GDP by 2005-06 before falling, gradually in 2007-08 and then more abruptly afterward. The IMF's October 2009 forecast was for U.S. deficits around 2.8 percent of GDP in 2009 and 2.2 percent in 2010, then rising back to around 2.9 percent by 2012. These levels are less than half those of 2005-06.

Official discussion of the risks posed by large global imbalances intensified in the fall of 2003 as G7 officials pressured Japan and (verbally) China to reduce their intervention purchases of dollars. At the G7 and IMF meeting in Dubai in 2003, the United States also pledged to take steps to promote national saving, while Europe committed to raise productivity. Later, in February 2004, the G7 finance ministers and central bank governors asserted clearly that, along with structural policies to enhance growth, "sound fiscal policies over the medium-term are key to addressing global current account imbalances." Following the October 2004 G7 meeting – which again noted the problem of imbalances – Governor Toshihiko Fukui of the Bank of Japan outlined potential hazards and asserted: "Policy makers cannot adopt benign neglect in this context."⁸ Japan, of course, had ended its massive 2003-04 foreign exchange

by any national regulator, raise a serious systemic threat.... The systemic threat raised by Long-Term Capital Management's difficulties in 1998 could pale compared with what is possible now."

⁷ Bini Smaghi (2008).

⁸ Fukui (2004).

interventions in March 2004 and, as of this writing, has refrained from further intervention.

European policymakers likewise saw risks. The European Central Bank's December 2004 *Financial Stability Review* stated that "Large and growing U.S. current account deficits have generally been perceived as posing a significant risk for global financial stability, at least since 2000." The report noted that high levels of U.S. household mortgage borrowing implied risks of interest rate hikes or employment loss, risks that ultimately could impact banks and other creditors. In turn, the ECB noted that "A widening of the household sector deficit was a pattern not seen in earlier episodes of current account deficit widening." In a presentation accompanying the press briefing for the *Financial Stability Review*, Tommaso Padoa-Schioppa flagged the U.S. external deficit and the rising price of oil as two main risks, and also mentioned the run-up in real estate values and in loan-value ratios in some eurozone countries. His general conclusion, however, was that risks to financial stability had "become less pronounced since late 2003," in part because of strength in the real economy.^{9,10}

The Federal Reserve responded in sanguine terms. Alan Greenspan opined in February 2005 that "The U.S. current account deficit cannot widen forever but ... fortunately, the increased flexibility of the American economy will likely facilitate any adjustment without significant consequences to aggregate economic activity."¹¹ In his famous Sandridge Lecture of March 10, 2005, Ben Bernanke argued that the causes of the U.S. foreign deficit, and therefore its cures, were primarily external to the U.S. While

⁹ See European Central Bank (2004, pp. 9 and 17) and Padoa-Schioppa (2004).

¹⁰ Little mention was made of the fact that, while the current account of the euro zone as a whole was more or less balanced, a number of member countries were running large and rapidly increasing current account

not disagreeing with Greenspan's expectation of a gradual, smooth adjustment process, Bernanke did note that "the risk of a disorderly adjustment in financial markets always exists, and the appropriately conservative approach for policymakers is to be on guard for any such developments."¹² Unfortunately, U.S. politicians, financial regulators, and monetary authorities did not put serious weight on these risks.

Although it was not fully realized at the time, the world economy was indeed entering a new and more dangerous phase in 2004. Developments beginning in that year led to a further widening of global imbalances. At the same time, these very same developments planted the seeds of financial fragility both in the United States and Europe, with consequences that became evident only in the summer of 2007. While the factors driving the expansion of global imbalances starting in 2004 have their roots in policies of the immediately preceding years, some powerful propagation mechanisms hugely amplified the lagged effects of the policies.

Thus, the first step in understanding the increasingly destabilizing forces driving global imbalances starting around 2004 is to return to the period following the Asian crisis – though as we shall see, the effects of the Asian crisis itself are only part of the story, and perhaps not even the most important part.

Global Imbalances: Mid-1990s through 2003

Current account configurations in the mid-1990s were on the whole unexceptional, as shown in the three panels of Figure 1. In 1995 developing Asia (which includes China)

deficits (see below). Nor was much concern expressed openly about the fragmented nature of the eurozone's system of prudential oversight of financial markets.

¹¹ Greenspan (2005). See also Greenspan (2004).

and the Western Hemisphere countries had comparable deficits, and the countries of central and Eastern Europe were also net borrowers on a smaller scale. Other regions were in surplus, with the mature economies as a group providing the main finance for the developing borrowers. True, in 1995 the United States was running a current-account deficit that was large in absolute terms, but as a percentage of U.S. GDP it was about half the size of the Reagan-era deficits at their height (about 1.5 percent of GDP).¹³

Then, in 1997, the Asian crisis struck. Bernanke (2005) provided a particularly eloquent and concise summary of the influential view that the crisis contributed to a sequence of events and policy responses in emerging-market economies that set the stage for the arrival of much larger global imbalances starting in the late 1990s.

The Asian turbulence began with Thailand's currency crisis. Thailand had long maintained a fixed exchange rate of the baht against the U.S. dollar. Prior to 1996, when a previously torrid growth rate slowed markedly, rapid credit expansion within a liberalized financial system fueled bubbles in real estate and stocks. Ascending asset prices then reversed course, as the current-account deficit reached nearly 8 percent of GDP. Fierce currency speculation against the baht broke out in May 1997, and the baht-dollar peg was broken in July. The crisis spread contagiously to other Asian countries, many of which had seemingly healthier fundamentals than Thailand's. Under market pressure, however, weaknesses were revealed in a number of Asian banking systems. Most of the affected countries turned to the International Monetary Fund for support.

¹² Bernanke (2005). Bernanke's ex post view, as expressed four years later (to the day) in Bernanke (2009), is more balanced in its assessment of the dangers of large U.S. current account deficits.

¹³ Unless otherwise noted, all data come from the International Monetary Fund's April 2009 *World Economic Outlook* database.

The harsh consequences of the crisis, and in particular the conditionality imposed by the IMF as the quid pro quo for financial assistance, left a bitter memory. As Figure 1 shows, the developing Asian countries and the newly industrialized Asian group of Hong Kong, Korea, Singapore, and Taiwan, some of them with much weaker currencies than before the crisis, went into surplus afterward. As the recessionary effects of the crisis dissipated and the dot-com boom reached a peak, global commodity prices rose (Figure 2), helping to generate surpluses for the oil-producing Middle East and the Commonwealth of Independent States. The advanced economies as a group ran a correspondingly bigger deficit. As noted above, the U.S. deficit rose to 2.4 percent of GDP in 1998. It rose to 3.2 percent in 1999 and 4.3 percent in 2000, with only a slight reduction in 2001 (when the U.S. was briefly in recession) before rising further.

The surpluses of the Asian countries and oil producers proved to be persistent. In newly industrialized Asia, gross saving remained more or less at pre-crisis levels but investment declined. In developing Asia, saving returned to the pre-crisis level of around 33 percent of GDP only in 2002, from which level it continued to rise quickly (reaching a staggering 47 percent of GDP in 2007). Gross investment returned to the pre-crisis level of about 35 percent of GDP only in 2004, and while it continued to rise significantly thereafter, it did not rise as much as saving did. In time, investment in much of Asia did recover relative to saving, but developments in China outweighed this phenomenon. China accounted for slightly over half of developing Asia's aggregate external surplus in 2000, but accounted for virtually all of it by 2005. By then, China's imbalance, along with those of the oil exporting countries, had become a major counterpart of the global deficits.

Supporting these enhanced current account surpluses were exchange rate policies that tended to maintain rates at competitive levels compared to the pre-crisis period. One motivation for foreign exchange intervention policies in Asia was to pursue export-led strategies for maintaining high economic growth rates. Another was to accumulate substantial stocks of international reserves as buffers against future financial crises that might otherwise force renewed dependence on the IMF. In the Middle East, countries such as Saudi Arabia maintained longstanding pegs to the U.S. dollar. Wolf (2008) offers an extensive discussion of how exchange-rate policies in emerging markets supported the constellation of growing global imbalances through the 2000s.

The two panels of Figure 3 shows bilateral real exchange rates against the U.S. dollar for six Asian countries, one of them (Korea) an Asian crisis graduate that is in the newly industrialized group. In the definitions used to construct this diagram, an upward movement is a real *depreciation* against the dollar. All countries remained at depreciated levels compared to 1997 for many years after the crisis. Indeed, in Figure 3, only the Korean won ever returns to its 1997 level. Intervention policies were associated with rapid growth in international reserves, as we have noted. During the closing years of the Bretton Woods system, speculation against the overvalued dollar contributed to worldwide growth in international reserves and eventually to higher global inflation. In the 2000s up until the autumn of 2008, reserve growth similarly caused inflationary pressures outside the U.S., also driving increases in commodity, housing, and other asset prices.

Figure 4 shows the evolution of international reserves for emerging and developing economies. In the developing and newly industrial Asian countries as a group,

and particularly in China, reserve accumulation tended to outstrip even the growing current account surpluses as strong inward FDI flows (and in China's case later on, hot money inflows) augmented balance of payments surpluses. In general, strong attempts were made to sterilize the incipient effects on Asian money supplies, so as to dampen inflationary pressures that might otherwise have eroded competitiveness (while simultaneously compromising macroeconomic stability). Figure 5 shows the stark contrast between the smooth growth of China's monetary base and the explosion in its international reserves (measured in renminbi). In contrast to China, Middle Eastern countries' reserves rose more slowly than overall net external assets, as a substantial portion of their surpluses flowed into investment vehicles other than liquid reserves.

In both cases, economic policies and market developments helped to generate significant current account surpluses, which in turn entailed rapid accumulation of public and private claims on industrial countries, in particular the United States. What economic adjustments elsewhere in the world allowed these emerging-market surpluses, and the counterpart advanced-country deficits, to emerge as equilibrium phenomena?

Bernanke (2005) posits that an outward shift of emerging-market saving schedules, both in Asian economies and in commodity exporters enriched by improved terms of trade, was the principal cause of the expansion of U.S. external deficits starting in the latter 1990s. According to this theory, the advent of this "global saving glut" led to worldwide asset-price adjustments that induced a number of mature economies, most importantly that of the United States, to borrow more heavily from foreigners. While we believe that Bernanke's story is incomplete in several important respects, it is useful

nonetheless to review the outlines of his argument, especially as it provides a frame of reference for so many subsequent discussions.¹⁴

Bernanke divides the 1996-2004 period into two halves. In the first period, ending early in 2000, “equity prices played a key equilibrating role in international financial markets” (Bernanke 2005, p. 8). Financial capital from emerging-market savers flowed into the U.S., “fueling large appreciations in stock prices and in the value of the dollar” and implying wealth and international competitiveness effects consistent with a larger U.S. deficit. At the same time, Bernanke argues, expectations of rapid future productivity growth in the United States encouraged investment and further discouraged saving. But he seems to view this second set of domestically generated causal factors as secondary in quantitative significance to the effects of increased emerging-market saving. Thus Bernanke posits that the “global saving glut,” rather than particularly unusual factors in the United States, drove the imbalances. In particular, he assigns only a very minor role to monetary policy. (We would assign a somewhat larger role to monetary policy, and our work at the time argued against the prevailing view that leverage-fueled asset price bubbles, particularly in the housing market, should be very secondary determinants of interest rate policy.)

The period ending in early 2000 was not accompanied by falling real interest rates in the United States. For a sample of mature economies, Figure 6 shows interest rates on ten-year government inflation-indexed obligations, a market-based measure of the real interest rate. The United States TIPS rate rose mildly over the period ending in March

¹⁴ Some econometric studies likewise conclude that the saving glut theory offers at best a partial explanation of the high U.S. external deficit over the 2000s. See Chinn and Ito (2007) and Gruber and Kamin (2007).

2000, and other industrial country rates other than the United Kingdom's do not diverge too far from the U.S. rate in those years.

Early 2000 marked the peak of the U.S. equity markets and the prelude to the dot-com collapse. Bernanke (2005, pp. 8-9) suggests that investment demand fell around the world as a result, yet with desired saving still high, he argues, real interest rates had to decline. As a result, "low real interest rates rather than high stock prices became a principal cause of lower U.S. saving."

The U.S. real interest rate indeed shows a remarkable coherence with the U.S. equity markets, as illustrated in Figure 7. Both the equity markets and the real interest rate peaked roughly in the period between February and October 2000, and then both began to decline sharply. Real long-term interest rates outside the U.S. also fell (Figure 6). The fall in equity values starting in 2000 could have been caused by a perception of lower future productivity, hence a reduced marginal productivity of capital. (Neither the size of the sharp run-up in equity prices to March 2000 nor the timing of their subsequent fall is easily rationalizable in terms of standard economic theory.) In any case, the data do not support a claim that the proximate cause of the fall in global real interest rates starting in 2000 was a contemporaneous increase in desired global saving (an outward shift of the world saving schedule). Indeed, according to IMF data, global saving (like global investment, of course), fell between 2000 and 2002 by about 1.8 percent of world GDP; aggregate global saving rose only later in the decade. If anything, the fall in real interest rates is more closely related to the global decline of the high-tech sector, which in the U.S. was a main driver of the foreign deficit during the 1990s. To restate this important point, market perceptions that the tech-driven productivity boom of the 1990s

had ended, not the rise in global saving that occurred later in the 2000s, is a more plausible explanation of the general level of low real interest rates at the decade's start.¹⁵

The fall in long-term interest rates brought down mortgage rates in the U.S. (and elsewhere in the world), with powerful effects on real estate markets. Home prices had been rising steadily in the U.S. since the middle 1990s; they began to rise more rapidly.¹⁶ Given the wide extent of homeownership in the U.S. and the relative ease, compared to other countries, of borrowing against housing equity, faster home appreciation reduced saving sharply and had an especially strong effect on the U.S. deficit, as argued by Bernanke. In most emerging markets, with much less developed financial markets, tighter borrowing constraints, and more restricted asset ownership, we would expect such asset-price effects on saving to be much weaker. For surplus countries, moreover, the conventional substitution effect on saving of lower world real interest rates was largely offset by an intertemporal terms of trade effect. But in the U.S. these effects reinforced each other (Obstfeld and Rogoff 1996). Residential investment rose along with real estate prices, adding a further impetus to deficits in countries with housing price booms.

While global factors have clearly been important for long-term real interest rates, short-term nominal interest rates are controlled by central banks. In the United States, the Federal Reserve had been allowing the federal funds rate to rise since early 2000, reaching a target rate of 6.5 percent in May of that year (see Figure 8). Perceiving rapidly accelerating weakness in the economy after the high-tech collapse, the FOMC initiated a loosening cycle after a telephone conference on January 3, 2001. The FOMC cut the

¹⁵ Even before the high-tech bust, the Asian crisis had created conditions that contributed to a long-lasting fall in investment in the crisis countries (for example, see Coulibaly and Millar 2008). This investment decline contributed to current-account surpluses (“excess” savings) for those countries.

¹⁶ Figure 7 shows the Case-Shiller ten-city index.

federal funds rate by 50 basis points immediately and then cut by a further 50 basis points at its next regularly scheduled meeting four weeks later. By the end of August 2001 the target rate stood at 3.5 percent. Further sharp cuts followed the 9/11 attacks, however, and at the end of 2001 the rate stood at 1.75 percent. The rate was reduced further through 2002 and 2003, finally reaching a level of only 1 percent in June 2003. As argued by the Bank for International Settlements (2009, p. 6), the dollar's vehicle-currency role in the world economy makes it plausible that U.S. monetary ease had an effect on global credit conditions more than proportionate to the U.S. economy's size.

In early 2003 concern over economic uncertainties related to the Iraq war played a dominant role in the FOMC's thinking, whereas in August, the FOMC stated for the first time that "the risk of inflation becoming undesirably low is likely to be the predominant concern for the foreseeable future. In these circumstances, the Committee believes that policy accommodation can be maintained for a considerable period."¹⁷ Deflation was viewed as a real threat, especially in view of Japan's concurrent struggle with actual deflation, and the Fed intended to fight it by promising to maintain interest rates at low levels over a long period. The Fed did not increase its target rate until nearly a year later. Other major central banks were also cutting their policy rates during the 2001-03 period, although not as sharply as the Fed did (Figure 8). The Bank of Japan (not included in Figure 8) had been following a zero interest rate policy since February 1999, with only a brief (but somewhat disastrous) interruption, and it reaffirmed that policy in March 2001. As Figure 7 makes clear, another U.S. stock market boom had started by the spring of 2003.

¹⁷ See Federal Reserve System (2003).

Coupled with low long-term real interest rates, the accommodative stance of monetary policy, particularly U.S. monetary policy, played a key role in the expansion of both housing-market excesses and the global imbalances starting in 2004. Among other critics of the Fed, John B. Taylor (2009) has argued that the central bank adopted an overly accommodative stance starting in 2001 and maintained it for much too long.¹⁸ That policy accommodation, according to him, helped propel house prices and residential investment upward.¹⁹ Of course, as we document later, many countries outside the U.S. likewise experienced rapid housing appreciation during the 2000s, typically accompanied by growing current account deficits. Many (but not all) of these countries were running relatively loose monetary policies, policies seemingly justified by the absence of an imminent inflation threat. We agree with Taylor that U.S. monetary ease was important in promoting the U.S. deficit and setting the stage for the crisis. We argue below, however, that the interaction among the Fed's monetary stance, global real interest rates, credit market distortions, and financial innovation created the toxic mix of conditions making the U.S. the epicenter of the global financial crisis. Given the regulatory weaknesses outside the U.S. and competitive pressures in the banking industry, financial globalization ensured that the crisis quickly spread abroad, even to some countries with current account surpluses.

¹⁸ Taylor's critique is based on departures of actual Fed policy from historical Taylor rules consistent with macro stability before the 2000s. Other dissenters, such as Borio and White (2004), argued in real time that monetary policy could not adequately safeguard financial (and therefore macroeconomic) stability by focusing only on the narrow set of macro variables included in the simple Taylor rule. Instead, they argued, a broader view of the economic landscape, including asset prices and credit flows, should inform monetary policy.

Global Imbalances: 2004 through 2008

During 2004 the global economic landscape evolved in a number of respects as global imbalances generally widened under the pressure of continuing increases in housing and equity prices. Three key interlocking causes of the widening were related to China's external position and exchange rate policies; the escalation of global commodity prices; and an acceleration of financial innovation in the U.S. and in European banks' demand for U.S. structured financial products.

The ways in which these seemingly unrelated developments might interact were certainly far from obvious at the time, yet by 2004 some policymakers were becoming nervous about the ongoing effects of low policy interest rates, with inflation as well as financial instability viewed as potential threats down the road. The minutes of the FOMC's March 2004 meeting stated that:

Some members, while supporting an unchanged policy at this meeting, nonetheless emphasized that the maintenance of a very accommodative monetary policy over an extended period in concert with a stimulative fiscal policy called for careful attention to the possible emergence of inflationary pressures. And, while adjustments in financial markets to low rates had generally been consistent with the usual operation of the monetary transmission mechanism, some members were concerned that keeping monetary policy stimulative for so long might be encouraging increased leverage and excessive risk-taking. Such developments could heighten the potential for the emergence of financial and economic instability when policy tightening proved necessary in the future.²⁰

Perceiving increasing upward pressure on prices, the FOMC embarked on a tightening cycle at the end of June 2004, initially raising the target federal funds rate from 1 to 1 ¼

¹⁹ Ahearne et al. (2005) present cross-country evidence on the effect of monetary ease on housing prices. A more recent study is by Iossifov, Čihák, and Shanghavi (2008). See also the discussion in Mishkin (2008).

²⁰ Federal Open Market Committee (2004).

percent. By November 2004 the target stood at 2 percent; from there it would rise (in a sequence of small moves) to a peak of 5 ¼ percent by July 2006 (see Figure 8).

The ECB also perceived risks. Late in 2004 Jean-Claude Trichet noted that:

The shorter-term dynamics of M3 growth have strengthened over recent months. This seems very much related to the low level of interest rates in the euro area.

This very low level of interest rates also fuels private sector demand for credit. In particular, the demand for loans for house purchases is strong, supported by strong house price dynamics in several euro area countries. The growth in loans to non-financial corporations has also picked up over recent months.

As a result of the persistently strong growth in M3 over the past few years, there remains substantially more liquidity in the euro area than is needed to finance non-inflationary growth. This could pose risks to price stability over the medium term. In addition, persistently high excess liquidity and strong credit growth could also become a source of unsustainable asset price increases, particularly in property markets. Such developments need to be monitored carefully.²¹

Yet the ECB maintained its own policy rate unchanged at 2 percent for another year. The rate would slowly rise to 4 ¼ percent by July 2007 (Figure 8).²²

In retrospect a number of interrelated macroeconomic developments were in train in different parts of the world even as the most two powerful central banks gingerly backed away from their highly accommodative stances.

One set of major repercussions on the global equilibrium emanated from China. China's real GDP growth had accelerated since the Asian crisis, averaging slightly above 10 percent per year over the 2003-05 period, then jumping to 11.6 percent in 2006 and 13 percent in 2007. Accompanying this more rapid growth was a sharply growing external surplus – China's current account surplus jumped from 3.6 percent of GDP in 2004 to 7.2

²¹ Trichet (2004).

percent in 2005, and had risen to a staggering 11 percent of GDP by 2007. As of 2004, moreover, Chinese authorities were intervening to maintain a rigid peg of the renminbi against the U.S. dollar. China's export success – in the mid-2000s it was on track to overtake Germany as the world's premier exporter – fueled both the country's rapid growth rate and strong protectionist sentiment in destination markets.

Perhaps even more remarkable than China's trade surplus was the huge size of the underlying saving and investment flows that generated it. China's gross investment rate grew inexorably during the 2000s, reaching over 45 percent at the time of the crisis. But its saving rate grew even faster. Whereas in earlier years, China's high saving had been fueled by the household sector (due to a mix of financial repression and a weak social safety net), during the 2000s, the booming Chinese corporate sector accounted for close to half of overall Chinese saving.²³

The years since the late 1990s had seen China's accession to the World Trade Organization as well as a major reorientation of trade within Asia, with China becoming a major re-export center. In particular, many Japanese exports that had previously flowed directly to the United States, making Japan the leading target for U.S. trade pressure through the mid-1990s at least, now flowed to China for re-export to the U.S. Along with China's overall current account surplus, its bilateral surplus with the United States (and slightly later, its surplus with the European Union) rose sharply as well in the early 2000s; see Figure 9. With an election looming in 2004, sentiment to label China as a "currency manipulator" intensified in the U.S. Congress, culminating in the real threat of

²² The Bank of Japan did not begin to tighten until well after the Fed and the ECB. In July 2006 the BOJ raised its target overnight lending rate from zero to 25 basis points. In February 2007 the BOJ raised the rate to 50 basis points.

²³ See Goldstein and Lardy (2008).

punitive trade legislation in 2005. China gained a temporary reprieve by slightly revaluing the renminbi in July 2005 and embarking on a gradual appreciation process against the dollar that lasted until the summer of 2008.

An undervalued renminbi peg subject to external political pressure attracted a torrent of hot money, despite the Chinese government's efforts to exclude financial inflows and encourage outflows. These trades were especially attractive to speculators because U.S. and European interest rates remained relatively low. Normally such a process would spark inflation as in Germany and other U.S. trade partners at the end of the Bretton Woods period, leading to *real* currency appreciation. Through aggressive sterilization and other measures, however, China restrained inflation as well as the consumption boom that would have driven prices higher. Output grew at an increasing rate, as did the country's current account surplus and its holdings of international reserves (Figure 5). Of course, a number of other emerging markets intervened to discourage real appreciation against the dollar, all the while accumulating reserves and battling the resulting upward pressure on prices (see Figure 3).

Had the natural "Humean" international adjustment process been allowed to function earlier on, rather than a combination of undervaluation and expenditure compression policies, the dollar would have been weaker in real effective terms, there would have been more upward pressure on world real interest rates, and the U.S. external deficit would likely have been smaller. The Federal Reserve and ECB might have been induced to raise interest rates earlier and more sharply.

The policies and performance of China and some other emerging markets were not alone in adding to the world supply of excess savings. Commodity exporters were

another important source. Under the influence of monetary accommodation, low real interest rates, and the emerging (and indeed advanced) world's accelerating economic growth, commodity prices, notably the price of oil, began to rise at an accelerating price (see Figure 10 for real GDP growth rates and Figure 2 for commodity prices). An immediate effect, familiar from past episodes of commodity-price boom, was a big increase in the current account surpluses of commodity exporters.²⁴ Figure 1 shows the growing external surpluses of the Middle East and other developing commodity exporters – as well as China's growing surplus – starting in 2004.²⁵

Other countries had to absorb these flows of excess savings. What increased deficits in the world economy corresponded to the higher surpluses of China and the commodity exporters? As Figure 1 also shows, the overall surplus of advanced countries other than the United States, which had been rising quickly prior to 2004, peaked in that year and then declined. The deficit of the United States continued to rise through 2006. As a result, the *overall* deficit of the advanced countries rose dramatically after 2004, with Eastern Europe's deficits adding to the total world demand for excess savings. In part this increased deficit reflected the higher cost of commodity imports, but as we argue below, that was only part of the story.

²⁴ On the link between monetary policy and commodity prices, see Frankel (2008). Caballero, Farhi, and Gourinchas (2008b) model the effect of a commodity boom on global net capital flows.

²⁵ The events leading to the developing country debt crisis of the 1980s provide an instructive parallel with recent financial history. Then, inflationary monetary policies helped to create an oil price boom resulting in big oil exporter surpluses. The surpluses were recycled to "subprime" developing country borrowers through money-center banks in the industrial countries. Because loan contracts featured *adjustable* dollar interest rates, the Volcker disinflation led to repayment problems severe and widespread enough to endanger the capital of the lending banks. Although a number of economic analysts argued prior to the early 1980s that the sizable developing-country borrowings were justified by growth prospects, that episode of global imbalances also ended in tears – especially for the developing borrowers, who lost many years of growth.

IMF data on the global saving rate show overall world saving to be increasing over this period. World gross saving averaged 22.6 percent of global output in 1987-94 and 22.0 percent in 1995-2002. But from 2003 through 2007 the annual numbers rise steadily from 20.9 percent to 24.4 per cent. Evidently, increased saving by commodity exporters and developing Asia outweighed decreased saving elsewhere in the world economy.

This increase in world saving may help explain why long-term global real interest rates remained relatively low (Figure 6), as did nominal long-term rates (Figure 11), despite a shift toward monetary tightening in industrial countries starting in 2004 (Figure 8). Of course, world saving and investment must be equal in principle, but an interpretation of the data as being driven by an exogenous increase in investment demand seems inconsistent with the failure of long-term real interest rates to rise to anywhere near late 1990s levels in the middle 2000s.²⁶

We emphasize that this increase in global saving starting in 2004 plays out largely *after* the period Bernanke (2005) discussed in his “saving glut” speech, and arguably was triggered by factors including low policy interest rates. In our view, the dot-com crash along with its effects on investment demand, coupled with the resulting extended period of monetary ease, led to the low long-term real interest rates at the start of the 2000s. However, monetary ease itself helped set off the rise in world saving and the expanding global imbalances that emerged later in the decade. Indeed, it is only around 2004 that the

²⁶ A curious and so far unresolved aspect of the saving and investment data is the huge positive statistical discrepancy that emerged between 2003 and 2008. The more customary “world current account deficit” disappeared after 2002 and by 2007 and 2008, measured world saving exceeded measured world investment by amounts in excess of \$300 billion. There is a “mystery of the missing deficit.”

idea of a global saving glut (as opposed to a global dearth of investment) becomes most plausible.

A further factor contributing to lower interest rates in the United States in particular was the rapid pace of dollar reserve accumulation by emerging and developing countries, which also accelerated in 2004 (Figure 4). Estimates by Krishnamurthy and Vissing-Jorgensen (2008) and Warnock and Warnock (2009) suggest that official foreign demand for U.S. government debt depressed Treasury yields by at least 50 basis points. Partial-equilibrium estimates, however, almost certainly overstate the general-equilibrium yield effects of diversification out of dollars by official reserve holders. While the true magnitude is probably secondary to the effects of global saving flows and monetary policy, reserve accumulation nonetheless probably contributed something to the compression of yields in U.S. financial markets.

In principle, a country with a currency peg and running a current-account surplus need not simultaneously have a surplus in its balance of payments.²⁷ In other words, it need *not* be building up foreign exchange reserves. Indeed, the flow of net purchases of claims on rich countries by developing-country residents expanded dramatically over the 2000s up until the crisis; and if the capital account is open to financial outflows, the central bank can reduce its reserves at a given exchange rate by purchasing domestic assets. In practice for emerging markets, financial outflows are not completely frictionless, but it also seems clear that in many cases countries purposefully accumulated reserves as a precaution against internal or external financial crises.²⁸ Emerging market borrowing spreads fell to very low levels in the mid-2000s as investors in richer countries

²⁷ Conversely, a country can accumulate reserves even if its current account is in deficit.

²⁸ See Obstfeld, Shambaugh, and Taylor (2010).

searched for higher yields, and the resulting financial inflows, resulting from interventions meant to slow appreciation against the dollar, led to further increases in foreign exchange reserves. Higher reserve war chests contributed to the perception of increased safety.

China, with a relatively restricted capital account and a tightly managed (albeit adjustable) exchange rate peg, had less flexibility than countries with better developed and more open financial markets to put a brake on reserve acquisition. It also was (and remains) the largest buyer of dollar reserves. Although the Chinese authorities undertook opportunistic financial outflow liberalizations in an attempt to reduce balance of payments pressures, the combination of a growing current account surplus, strong inward FDI, and hot money inflows in response to expected appreciation spelled massive growth in foreign exchange reserves, as we have noted.²⁹

Holding the bulk of reserves in dollars rather than, say, euros was a matter of pure choice, however, motivated by the liquidity of U.S. bond markets and the dollar's dominant vehicle-currency position in world trade and finance. A country pegging its currency to the dollar need not hold dollar reserves at all, as it can maintain an unchanged domestic monetary stance while selling any dollars it acquires for a nondollar foreign currency. Most official emerging-market reserve holdings were held in dollars nonetheless.

Within the group of advanced countries, as noted above, the two current-account developments that stand out starting in 2004 are the sharp increase in the U.S. external deficit and a halt in the earlier trend of increasing surpluses for the aggregate of other advanced economies, including the euro zone. Fueling the higher overall deficit of the

advanced-country group was (along with higher commodity import prices) equity-market appreciation and, more powerfully, an acceleration in real estate appreciation and real estate investment.³⁰ The euro zone itself, wherein the ECB set a single interest rate for a diverse set of national economies, presented a microcosm of the divergence in current account positions concurrently taking place on a global scale. Starting in 2004, the German external surplus rose sharply, but was offset by increasing deficits for a number of other member countries such as Italy, Greece, and especially, Spain (Figure 12).

In the United States, low interest rates fed into a powerful multiplier mechanism based on unrealistic expectations, asset-market distortions, and agency problems, notably in markets for housing finance. The resulting asset appreciation, especially housing appreciation, was a major driver of high consumer spending and borrowing. Home prices in the U.S. had been rising steadily for nearly a decade. Starting in March 1997, the Case-Shiller 10-city home price index declined in only two months before July 2006 – in November 1998 and December 2001, and in those cases by very small amounts. Thus, neither the Asian crisis and its aftermath nor the dot-com crash and ensuing recession did much to dent the upward trend in U.S. home prices.

Entrenched expectations of housing appreciation interacted with low interest rates and financial innovation to push home prices up even more rapidly after 2003. The stock of mortgage debt expanded rapidly, as did residential investment, while at the same time, mortgage quality in the U.S. deteriorated. Figure 13 shows how subprime and nonprime mortgage originations more generally jumped up in 2004. At the same time, the share of

²⁹ For a useful chronology and discussion, see Lane and Schmukler (2007).

subprime originations being securitized increased until it reached over 80 percent in 2005 and 2006. In the low interest rate environment, the share of adjustable-rate mortgages (ARMs) also rose. As has often been noted, these loans were designed to refinance or default when the interest rate reset, but in many cases the refinance contingency was predicated on the assumption that home prices would not fall. Figure 14 shows the rapid growth of residential investment and mortgage debt outstanding (both expressed as shares of GDP, with the mortgage debt series covering commercial as well as family-owned properties). U.S. home prices rose at double-digit rates in 2004 and 2005, while the stock of mortgage debt pulled even with total annual U.S. GDP in 2006.

Low nominal short-term U.S. interest rates, and the expectation that rates would rise only at a measured pace, encouraged the proliferation of ARMs. At the same time, low nominal rates and the low-inflation environment, in and of themselves, eased credit constraints. At higher inflation rates, the monthly nominal interest payment in part reflects real amortization of the loan, which places an additional strain on the borrower's cash flow. Of course, the evidence indicates that mortgage-lending standards in the U.S. deteriorated far beyond what any prudent assessment of borrowers' repayment prospects would suggest.

As many commentators have noted, the process was fed by wider financial innovation that repackaged mortgages (as well as other forms of debt, including consumer debt) into structured products endowed with very high levels of systemic risk – what Coval, Jurek, and Stafford (2009) have aptly labeled as “economic catastrophe bonds.” These products began to proliferate in the mid-2000s. For example, CDO

³⁰ Mishkin (2008) surveys evidence on the impact of housing wealth on consumption. In subsequent work, Greenspan and Kennedy (2007) document the strong link between home equity extraction in the U.S. and

issuance started to rise markedly in 2004, as indicated by figure 10.2 in Acharya et al. (2009, p. 238); or see figure 3 in Blundell-Wignall and Atkinson (2008). Rajan (2006) suggests mechanisms through which low interest rates might promote such financial innovation, as well as more risk taking. Hoping to reduce their required regulatory capital under the Basel II framework, European banks eagerly acquired AAA-rated (but systemically risky and opaque) structured products.³¹

Such regulatory arbitrage was one factor underlying the sharp increase in gross industrial-country external assets and liabilities documented by Lane and Milesi-Ferretti (2007) for the 2000s; see Figure 15, which shows some of their updated data series. In many cases, for example, European banks funded their dollar positions in U.S. structured products with dollars obtained through repo deals with U.S. money market mutual funds.³² Such socially unproductive *gross* flows into (and out of) the U.S. could of course have taken place even if the U.S. current account had been in surplus at the time.

The role of the U.S. *net* external deficit, in our view, was to enable a constellation of interest rates and asset prices consistent with apparently low inflation but simultaneously conducive to housing appreciation, lax mortgage lending practices, overall credit expansion, and strong incentives toward high leverage and regulatory arbitrage.³³ These market dynamics created a vicious circle in which the expectation of ongoing housing appreciation fed mortgage credit expansion, which in turn pushed

consumption in the 2000s.

³¹ Acharya and Schnabl (2009). See also Blundell-Wignall and Atkinson (2008, p. 64), who suggest that “about one-third of the securitised sub-prime related products were sold to offshore investors.”

³² See Baba et al. (2009).

³³ Asset swapping leading to gross flows may be motivated by many factors beside regulatory arbitrage, of course, ranging from risk-sharing opportunities to differences in risk aversion. The U.S. external portfolio as a whole has tended to be short on (dollar) bonds and long on foreign equities (and currencies), with foreign official holdings of dollar reserves comprising one important component of U.S. foreign liabilities.

housing prices higher (Mian and Sufi 2008). All the while, the U.S. current account deficit widened.

Housing appreciation was not limited to the United States, of course, though it was mainly financial innovators in the U.S. who built an inverted pyramid of leverage on the narrow fulcrum of ongoing domestic home-price appreciation. Over the 2000s, real estate prices rose even more rapidly in some European Union countries, in Eastern Europe, and elsewhere than in the United States. But the trend was not universal – house prices in Germany did not rise, while land prices in Japan fell in real terms. Certainly the high level of global liquidity, including the possibly global reach of U.S. monetary ease, contributed to the worldwide upward pressure on housing. An intriguing regularity is the negative unconditional correlation between current account surpluses and housing appreciation, illustrated in Figure 16 for a sample of 43 mature and emerging countries. The figure plots the change in the ratio of the current account to GDP over 2000-2006 against cumulative real housing appreciation over the same period.³⁴ There is a clear negative relationship, in which greater appreciation is associated with bigger deficit increases. Figure 17 shows the same relationship for the advanced-country subsample.³⁵

The negative relationship in the figures likely reflects two-way causality. Housing appreciation fuels increased borrowing from abroad in several ways, whereas increased availability of foreign funds could ease domestic borrowing terms and encourage housing

Caballero and Krishnamurthy (2009) present a model of how foreign demand for safe U.S. assets may have led to low risk-free rates, asset appreciation, and financial fragility.

³⁴ The basic data come from Aizenman and Jinjark (2009), though we have added to their sample Iceland and removed two countries with rather special circumstances, Russia and Serbia. The negative correlation survives the addition of Russia and Serbia, but it is somewhat attenuated. Figures 14 and 15 are inspired by chart 5 in European Central Bank (2007), which covers an advanced-country sample over 1995-2005. We are grateful to Joshua Aizenman for sharing these data.

³⁵ Of course, there is a long historical association between housing booms, current account deficits, and financial crises; see Reinhart and Rogoff (2009).

appreciation. In addition, the bivariate plots are silent on the influence of third variables. Aizenman and Jinjarak (2009) regress real estate prices on the lagged current account and other control variables, including financial depth, the real interest rate, and urban population growth. Their baseline estimate suggests that a one percent of GDP increase in the current account deficit is associated with a 10 percent increase in real estate prices.³⁶ In many countries, easy lending conditions, including an influx of finance from foreign banks, helped to fuel housing booms. Similar capital inflow and real estate dynamics helped set the stage for the 1997-98 Asian crisis.³⁷

As the U.S. external deficit swelled after 2004, the Fed gradually raised the funds rate, as noted above. That rate peaked in the summer of 2006 (by which time ECB and Bank of England policy rates were also on the rise; see Figure 8). The U.S. long-term real interest rate had also risen to a peak by then, and real long-term rates began to rise in some other industrial countries (Figure 6). According to Federal Reserve data, the rate on thirty-year, fixed-rate, conventional mortgages, having bottomed at 5.23 percent in June 2003, hit 6.76 percent in July 2006. United States housing appreciation stopped in late 2005 and 2006 and went mildly into reverse, although the stock market continued upward (Figure 6). Around this time 2/28 and 3/27 ARMs were resetting at sharply higher interest rates than when they were issued, straining or exceeding the payment capacities of many who had signed mortgage contracts two or three years before. Mayer et al.

³⁶ See also the regression evidence in Jagannathan, Kapoor, and Schaumberg (2009). Fratzscher, Juvenal, and Sarno (2009) use a Bayesian VAR methodology to show that positive home and equity price innovations, especially the former, have large negative effects on the U.S. trade balance. For other VAR evidence documenting the importance of housing, see Punzi (2007) and Gete (2009). Gete (2009) also documents the strong cross-sectional relationship between housing booms and external deficits. In their cross-country study, Iossifov, Čihák, and Shanghavi (2008) find only a marginally significant correlation of home prices with the current account in equations that also control for the policy interest rate.

³⁷ See, for example, Edison, Luangaram, and Miller (2000), Quigley (2001), and Koh et al. (2005).

(2009) document how, starting in 2006, the share of nonprime housing loans with negative equity shot up, first in the Midwest, and then, much more rapidly, in California, Florida, Arizona, and Nevada. The stage was set for the more general financial crisis that finally erupted in August 2007.

Global Imbalances in 2009 and Beyond

As we predicted in our earlier work, the decline in U.S. housing prices starting in 2006 set off a process of current account adjustment for the United States. In some respects, though, the process has been quite different from what we foresaw. Most notably, the dollar's foreign exchange value, while quite volatile since August 2007, has not collapsed. Financial instability spread globally from the United States, not due to the large and abrupt exchange rate movement that we feared, but because of international financial linkages among highly leveraged institutions as well as the global nature of the housing bust. The fragility of the international financial system was not well appreciated before the crisis. The magnitude of global imbalances up to 2008 both reflected that underlying fragility and allowed the system to become ever more fragile over time.

Figure 18 shows quarterly data on the U.S. current account balance, expressed as a percentage of GDP at an annual rate. Although the deficit has been on a declining trend since late in 2006, the decline in recent quarters is particularly dramatic. The IMF forecast as of October 2009 was that the U.S. external deficit would average somewhat below 3 percent of GDP over the following half-decade or so, less than half its value in 2005-06. This is a very significant adjustment. Nonetheless, that balance may well grow over time if U.S. monetary and fiscal policies remain accommodative. Indeed, as the U.S.

public debt/GDP ratio grows, it will become more difficult for the Fed to raise interest rates without creating significant additional fiscal tensions.

Figure 1 gives a sense of the global reconfiguration of global imbalances, measured in dollars (2009 figures are IMF forecasts). Alongside the sharply reduced deficit of the United States, the surpluses of the other advanced countries and of the oil-exporting CIS and Middle East have fallen dramatically. Newly industrialized Asia has maintained its surplus while that of developing Asia (largely due to China) has continued upward.

Reduction of a current-account deficit always entails a medium-term real currency depreciation (while appreciation is needed when a surplus falls). The required compression of relative domestic demand compared to relative domestic supply implies a fall in the relative price of domestic nontraded goods, as well as a terms of trade deterioration that lowers the relative price of domestic tradables consumed intensively at home. This reasoning led us, in our earlier work on the U.S. current account, to predict significant real dollar depreciation (in some simulations, 30 percent or more) as a result of a disappearing U.S. deficit.

Figure 20 illustrates the dollar's evolution in real multilateral terms since the start of 1995. Over brief spans of time, exchange rates can be moved far away from long-term equilibria by developments in financial markets, such as changes in policy interest rates, expectations shifts, fluctuations in risk aversion, safe haven effects, and credit-market disruptions. Each of these short-term factors has played a role in recent years. To illustrate the forces at work, Table 1 reports numerical changes in the dollar's real

exchange rate over different subperiods. (Changes are expressed in log points so as to be additive over time.)

The large U.S. deficit's emergence starting in the latter 1990s we marked by strong real dollar appreciation of more than 20 percent. Appreciation was propelled by booming investment, the Asian crisis, and the growing perception of a "Great Moderation." Under the pressure of very loose U.S. monetary policy after the dot-com

Table 1: Movements in the Real Dollar Exchange Rate

Period	Percent change
<i>January 1995 - February 2002</i>	20.3
<i>February 2002-January 2007</i>	-16.2
<i>January 2007-April 2008</i>	-11.5
<i>April 2008-March 2009</i>	16.4
<i>March 2009-October 2009</i>	-10.8

crash and 9/11, however, the dollar depreciated by more than 16 percent from early 2002 through the start of 2007, with a significant (but temporary) reversal over 2005 as the Fed tightened. Through 2006, however, the U.S. current account deficit only widened as imports outstripped exports.

As the U.S. housing boom stopped and went into reverse, and as the external deficit began slowly to shrink, the dollar plummeted, falling by better than 11 percent between January 2007 and April 2008. But with the intensification of perceived financial

instability in the spring of 2008, the dollar began to rise again, benefiting from a safe haven effect in the presence of a financial crisis that was truly global in scope rather than U.S.-specific. A second factor pushing the dollar up was a global shortage of short-term dollar funding for foreign banks' long positions in illiquid (often toxic) U.S. assets.³⁸ These factors helped produce a 16 percent real dollar appreciation between April 2008 and March 2009, deepening the onset of the recession in the U.S.

Since the spring of 2009, the dollar has resumed its descent, leaving its real exchange rate currently about 6 percent below its level of January 2007, shortly after the process of current account adjustment began. The dollar is likely to depreciate quite a bit further as adjustment proceeds, although the process will be slower to the extent that major U.S. trading partners, notably China, resist the appreciation of their own currencies.

Are today's somewhat compressed external imbalances still a problem? Perhaps one could hope that the current pattern is sustainable and will require little further adjustment. A number of considerations suggest, however, that global imbalances remain problematic, both for the U.S. and the world:

- The large private foreign purchases of U.S. assets that helped finance the U.S. deficit in past years have, for the moment, contracted. Given the prospect of much larger U.S. public-sector deficits down the road, with no clear and credible timetable for their reduction, U.S. external borrowing will be prolonged and investor faith in the dollar cannot be taken for granted. Recent research on crises suggests several avenues of vulnerability as U.S. government deficits and debt

³⁸ See McGuire and von Peter (2009).

grow, including self-fulfilling funding crises and currency collapses once fiscal fundamentals enter a danger zone. Given the multiple equilibria involved, the timing of such events is inherently impossible to predict. It is even conceivable, if the fiscal regime comes to be perceived as non-Ricardian and therefore not self-financing over time, that inflation expectations lose their customary monetary anchor, thereby making inflation control by the Fed more difficult.³⁹ In short, the prospect of dollar instability remains.

- In the past a combination of exchange rate and other asset price movements benefited the U.S. by bestowing capital gains on its external asset portfolio and losses on holders of U.S. external liabilities.⁴⁰ These gains and losses were not fully offset by differences in dividend and interest flows. As a result, the U.S. net external position did not keep pace with cumulated current account balances; in effect, the U.S. was borrowing at very low cost. That pattern has, however, swung into reverse. In 2008 the U.S. deficit was slightly over \$500 billion, whereas exchange rate changes and equity-market losses inflicted an additional loss of over \$800 billion on the net international investment position (NIIP). The full result was an increase in U.S. net liabilities to foreigners of nearly 10 percent of GDP; see Figure 19. If such patterns continue for long, even a reduced level of U.S. foreign borrowing raises sustainability concerns. It seems plausible that in the future, foreign private investors will become less willing to hold dollar debt in view of the unsettled U.S. fiscal predicament, while official holders of dollar reserves may well wish to diversify into euros or other

³⁹ See, for example, Woodford (2001).

currencies. As Figure 21 shows, there is a long-term trend of official reserve diversification away from U.S. dollars, especially among the fast-growing, reserve-hungry emerging and developing economies, and this trend continues in recent data.⁴¹ If a global portfolio shift out of dollars occurs, U.S. external borrowing rates could rise, while the customary favorable impact of dollar depreciation on the U.S. NIIP would be muted.

- China's current and projected external surpluses remain huge. In terms of an intertemporal trade analysis, Chinese policy is subsidizing the country's export of current consumption power in world asset markets, thereby keeping world real interest rates below their true equilibrium levels. Apart from the implied deflationary pressure on the world economy, the rest of the world's monetary response to this phenomenon – in the form of exceptionally low policy interest rates – provides a breeding ground for potential new bubbles. Reduced surpluses by China (and by Asian and other high-surplus countries more generally) would make it easier for the U.S. to reduce its deficit further. As a concomitant, Asian currencies would need to appreciate in real terms. These changes would have the further benefit of reducing protectionist tensions, notably those between China and the United States. The Asian model of export-led growth becomes more problematic if the U.S. is no longer the world's borrower of last resort.

⁴⁰ See footnote 33 above. Gourinchas and Rey (2007) present an econometric analysis demonstrating that U.S. net exports have predicted these price adjustments in past decades.

⁴¹ There was an abrupt decline in the dollar's reserve share for emerging and developing economies between 2002 and 2004 (as the dollar began its recent depreciation trend). The euro was the main beneficiary. There is evidence of a further decline in relative dollar holdings in recent quarters. In Figure 21, the dollar shares are computed relative to the reserves of only those countries that report reserve composition to the IMF.

- Global imbalances reflect national regulatory systems that still await major reforms. With the added post-Lehman investor perception that more big institutions are operating under a predictable umbrella of government protection, future financial instability could be in store. Large net capital inflows could inflate asset prices and make it easier for policymakers to avoid tough choices, including the politically difficult choice to tighten financial-sector regulation. Historically, it has been difficult to tighten prudential supervision in bubble episodes because inflated asset prices allow financial actors to argue that their balance sheets are strong.

What changes in the international monetary system might mitigate global imbalances in the future? A first concern is the proper reaction of domestic monetary policies to outsize movements in asset prices or credit flows. It has now become clear that ex post cuts in interest rates cannot be relied upon clean up the debris of a financial collapse. To some degree, monetary policies should take greater account of financial-market developments than they have in the recent past (although effective financial regulation must be the first line of defense, as discussed below). In particular, there is a case to be made that large current account deficits, other things equal, call for a tightening of monetary policy. Ferrero, Gertler, and Svensson (2008) present an example in which better macro performance comes from a monetary rule that recognizes how an external deficit raises the natural real rate of interest. The question deserves more research attention.

Another aspect of the international monetary system that is ripe for improvement is the surveillance of and coordinated response to large imbalances. The current

configuration of imbalances again reveals the familiar asymmetry between the adjustment pressures facing deficit and surplus countries. The continuing U.S. external deficit is perilous, as we have noted. Yet, reducing that deficit is hard in the face of ongoing recession; the U.S. is in no position to take the lead.

On the other hand, China, with its international reserves at \$2 trillion and rising, has plenty of room to take the lead and should. Until now China has followed the Asian model that Japan pioneered, orienting its economy towards exports in order to exploit scale economies in production, to learn by doing, and to move up the value chain. With its vast internal market, however, China (unlike smaller Asian economies) is in a unique position to reorient its growth toward domestic demand without losing the advantages of scale. That difficult task will require an improved social safety net, but with Chinese consumption well under 40 percent of GDP, roughly half the U.S. rate, there is enormous room for upward adjustment. China's position as the leading international lender, however, gives it little incentive to undertake consumption-enhancing reforms that would benefit not only its citizens, but also the entire world economy. Nor, as a surplus country able to sterilize reserve gains, is China under pressure to revalue its currency rapidly. In the past, even credible threats of trade barriers have evoked only minor exchange-rate changes, while China's trade surplus has continued to rise as share of GDP.

The September 2009 G-20 Pittsburgh statement on the surveillance of external imbalances therefore is a useful step in drawing attention to the dangers they create and to their underlying origin in national policy choices. The recent crisis has dramatically illustrated the important and pervasive external effects of domestic macro and financial policies. In the interest of global stability, the policy choices of sovereign nations,

including their exchange rate arrangements, must be viewed as legitimate subjects for international discussion and negotiation.

Another area that deserves attention is the system of self-insurance through large holdings of international reserves. While a large stock of international reserves may enhance the financial stability of an individual country, a system in which many countries hold reserves as their primary form of liquidity insurance could be collectively destabilizing. Aside from the opportunity costs of reserves to individual countries, there are *systemic* costs due to external effects of reserve management. Reserve holdings may unduly depress reserve-currency interest rates, reduce liquidity abroad when they are mobilized in a crisis, or create exchange rate instability as markets speculate on official portfolio shifts between different reserve currencies. Such systemic problems – discussed in earlier incarnations by Robert Triffin and others – have come to the fore in recent discussions of financial-system resilience.⁴² They could be mitigated by international institutions capable of creating and allocating outside liquidity in a crisis. But even a better-endowed IMF is a very partial answer to this need. Its effectiveness requires significant governance changes, as well as greater global attention to the worsening of moral hazard that a bigger international lender of last resort entails. Reform of the international monetary system is bound up with reform of the international financial system.

What changes in the international financial system might mitigate global imbalances in the future? We see at least two first-order agenda items.

⁴² For an early and insightful discussion, see Crockett (2000).

The first is domestic financial development in the poorer economies. In some emerging-market countries, notably China, high saving is promoted by underdevelopment and inefficiencies in financial markets. Structural shortcomings tend to raise both corporate and household saving rates. For example, if typical Chinese savers had access to relatively safe instruments offering higher rates of return, huge positive income effects would in all likelihood swamp substitution effects, resulting in lower, not higher, household saving. The result would be higher household welfare in China, as well as a reduction in China's foreign surplus.

The second agenda item is the regulation of internationally integrated financial markets. Now that the fig leaf of constructive ambiguity has been torn away, development of a globally more effective framework for financial regulation is an urgent priority. It is well understood that a rational and politically robust regulatory framework will have to be based on more extensive international cooperation than currently exists – notwithstanding the considerable progress made since the initiation of the Basel process in the 1970s. Given their significant and growing importance in world trade and finance, the emerging markets will rightly be full partners in any new arrangements.

As the 2009 Pittsburgh G-20 summit illustrated, however, international agreement on further concrete common measures is far away. While this is the case, large global imbalances will remain dangerous as possible manifestations of underlying financial excesses. Macro-prudential regulatory stringency that responds forcefully to financial booms will be the most important lever for avoiding financial busts in the future. A key challenge is to devise a set of reasonably simple and transparent *rules* for macro-prudential interventions, rather than relying on a complex and shifting web of

discretionary levers. Some observers have suggested that emerging markets use countercyclically intensive regulatory oversight in response to big financial inflows (Mohan and Kapur 2009; Ocampo and Chiappe 2003). Richer countries can usefully apply the same precepts in the face of big current account deficits.

References

- Acharya, Viral V., Menachem Brenner, Robert F. Engle, Anthony W. Lynch, and Matthew Richardson (2009). "Derivatives: The Ultimate Financial Innovation." In Viral V. Acharya and Matthew Richardson, editors, *Restoring Financial Stability: How to Repair a Failed System*. New York: John Wiley & Sons.
- Acharya, Viral V. and Philipp Schnabl (2009). "How Banks Played the Leverage Game." In Viral V. Acharya and Matthew Richardson, editors, *Restoring Financial Stability: How to Repair a Failed System*. New York: John Wiley & Sons.
- Acharya, Viral V. and Philipp Schnabl (2010). "Do Global Banks Spread Global Imbalances? The Case of Asset-Backed Commercial Paper during the Financial Crisis of 2007-09." *IMF Economic Review*, forthcoming.
- Ahearne, Alan G., John Ammer, Brian M. Doyle, Linda S. Kole, and Robert F. Martin (2005). "House Prices and Monetary Policy: A Cross-Country Study." International Finance Discussion Papers 841, Board of Governors of the Federal Reserve System (September).
- Aizenman, Joshua and Yothin Jinjark (2009). "Current Account Patterns and National Real Estate Markets." *Journal of Urban Economics* 66 (2): 75-89.
- Baba, Naohiko, Robert N. McCauley, and Srichander Ramaswamy (2009). "US Dollar Money Market Funds and Non-US Banks." *BIS Quarterly Review* (March): 65-81.
- Bank for International Settlements (2009). *79th Annual Report: 1 April 2008-31 March 2009*. BIS, Basel (June 29).
- Bernanke, Ben S. (2005). "Remarks by Governor Ben S. Bernanke: The Global Saving Glut and the U.S. Current Account Deficit." The Sandridge Lecture, Virginia Association of Economists, Richmond, VA (March 10). URL: <http://www.federalreserve.gov/boarddocs/speeches/2005/20050414/default.htm>
- Bernanke, Ben S. (2009). "Financial Reform to Address Systemic Risk." Speech at the Council on Foreign Relations, Washington, D.C. (March 10). URL: <http://www.federalreserve.gov/newsevents/speech/bernanke20090310a.htm>

- Bini Smaghi, Lorenzo (2008). "The Financial Crisis and Global Imbalances: Two Sides of the Same Coin." Speech at the Asia Europe Economic Forum, Beijing (December 9). URL: <http://www.bis.org/review/r081212d.pdf>
- Blundell-Wignall, Adrian and Paul Atkinson (2008). "The Subprime Crisis: Causal Distortions and Regulatory Reform." In Paul Bloxham and Christopher Kent, editors, *Lessons from the Financial Turmoil of 2007 and 2008*. Sydney: Reserve Bank of Australia.
- Borio, Claudio and William R. White (2004). "Whither Monetary and Financial Stability? The Implications of Evolving Policy Regimes." In *Monetary Policy and Uncertainty: Adapting to a Changing Economy*. Kansas City, MO: Federal Reserve Bank of Kansas City.
- Caballero, Ricardo, Emmanuel Farhi, and Pierre-Olivier Gourinchas (2008a). "An Equilibrium Model of 'Global Imbalances' and Low Interest Rates." *American Economic Review* 98 (March): 358-93.
- Caballero, Ricardo, Emmanuel Farhi, and Pierre-Olivier Gourinchas (2008b). "Financial Crash, Commodity Prices, and Global Imbalances." *Brookings Papers on Economic Activity* (Fall): 1-55.
- Caballero, Ricardo and Arvind Krishnamurthy (2009). "Global Imbalances and Financial Fragility." *American Economic Review Papers and Proceedings* 99 (May): 584-88.
- Chinn, Menzie D. and Hiro Ito (2007). "Current Account Balances, Financial Development and Institutions: Assaying the World 'Saving Glut'." *Journal of International Money and Finance* 26 (4): 546-69.
- Cooper, Richard N. (2007). "Living with Global Imbalances." *Brookings Papers on Economic Activity* 2: 91-110.
- Coulibaly, Brahim and Jonathan N. Millar (2008). "The Asian Financial Crisis, Uphill Flow of Capital, and Global Imbalances." International Finance Discussion Papers 942, Board of Governors of the Federal Reserve System (August).
- Coval, Joshua D., Jakub W. Jurek, and Erik Stafford (2009). "Economic Catastrophe Bonds." *American Economic Review* 99 (June): 628-66.
- Crockett, Andrew D. (2000). "Marrying the Micro- and Macro-Prudential Dimensions of Financial Stability." Remarks before the Eleventh International Conference of Banking Supervisors, Basel, Switzerland (September 20-21). URL: <http://www.bis.org/speeches/sp000921.htm>
- Dooley, Michael, David Folkerts-Landau, and Peter Garber (2005). *International Financial Stability: Asia, Interest Rates, and the Dollar*. New York: Deutsche Bank Global Research.

- Edison, Hali, Pongsak Luangaram, and Marcus Miller (2000). "Asset Bubbles, Leverage, and 'Lifeboats': Elements of the East Asian Crisis." *Economic Journal* 110 (January): 3209-34.
- European Central Bank (2004). *Financial Stability Review* (December).
- European Central Bank (2007). "Adjustment of Global Imbalances in a Financially Integrating World." *Monthly Bulletin*, August, pp. 61-73.
- Federal Open Market Committee (2004). Minutes of the March 16, 2004 meeting. URL: <http://www.federalreserve.gov/fomc/minutes/20040316.htm>
- Federal Reserve System (2003). "Press Release" (August 12). URL: <http://www.federalreserve.gov/boarddocs/press/monetary/2003/20030812/default.htm>
- Ferrero, Andrea, Mark Gertler, and Lars E. O. Svensson (2008). "Current Account Dynamics and Monetary Policy." Working Paper 13906, National Bureau of Economic Research (April).
- Frankel, Jeffrey A. (2008). "The Effect of Monetary Policy on Real Commodity Prices." In John Y. Campbell, editor, *Asset Prices and Monetary Policy*. Chicago: University of Chicago Press.
- Fratzscher, Marcel, Luciana Juvenal, and Lucio Sarno (2009). "Asset Prices, Exchange Rates, and the Current Account." Federal Reserve Bank of St. Louis Working Paper 2008-031B (May).
- Fukui, Toshihiko (2004). "Global Imbalances and Exchanges." Speech at the annual meeting of the World Federation of Exchanges, Tokyo (October 13). URL: <http://www.bis.org/review/r041019a.pdf>
- Gete, Pedro (2009). "Housing Markets and Current Account Dynamics." Mimeo, Georgetown University (October).
- Goldstein, Morris and Nicholas R. Lardy, editors (2008). *Debating China's Exchange Rate Policy*. Washington, D.C.: Peterson Institute for International Economics.
- Gourinchas, Pierre-Olivier and Hélène Rey (2007). "International Financial Adjustment." *Journal of Political Economy* 115 (August): 665-703.
- Greenspan, Alan (2004). "Remarks by Chairman Alan Greenspan: Globalization and Innovation." Speech at the Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, Chicago (May). URL: <http://www.federalreserve.gov/BoardDocs/Speeches/2004/200405062/default.htm>
- Greenspan, Alan (2005). "Remarks by Chairman Alan Greenspan: Current Account." Speech at Advancing Enterprise 2005 Conference, London (February 4). URL: <http://www.federalreserve.gov/boarddocs/speeches/2005/20050204/default.htm>

- Greenspan, Alan and James Kennedy (2007). "Sources and Uses of Equity Extracted from Homes." Finance and Economics Discussion Series 2007-20, Federal Reserve Board (March).
- Gruber, Joseph W. and Steven B. Kamin (2007). "Explaining the Global Pattern of Current Account Imbalances." *Journal of International Money and Finance* 26 (4): 500-22.
- Gruber, Joseph W. and Steven B. Kamin (2008). "Do Differences in Financial Development Explain the Global Pattern of Current Account Imbalances?" International Finance Discussion Papers 923, Board of Governors of the Federal Reserve System (March).
- Guha, Krishna (2009). "Paulson Says Crisis Sown by Imbalance." *Financial Times* (January 1). URL: <http://www.ft.com/cms/s/0/ff671f66-d838-11dd-bcc0-000077b07658.html>
- Iossifov, Plamen, Martin Čihák, and Amar Shanghavi (2008). "Interest Rate Elasticity of Residential Housing Prices." IMF Working Paper WP/08/247 (October).
- Jaffee, Dwight, Anthony W. Lynch, Matthew Richardson, and Stijn van Nieuwerburgh (2009). "Mortgage Origination and Securitization in the Financial Crisis." In Viral V. Acharya and Matthew Richardson, editors, *Restoring Financial Stability: How to Repair a Failed System*. New York: John Wiley & Sons.
- Jagannathan, Ravi, Mudit Kapoor, and Ernst Schaumburg (2009). "Why Are We in a Recession? The Financial Crisis is the Symptom Not the Disease!" Mimeo, Northwestern University and India School of Business (November).
- Koh, Winton T. H., Roberto S. Mariano, Andrey Pavlov, Sock Yong Phang, Augustine H. H. Tan, and Susan M. Wachter (2005). "Bank Lending and Real Estate in Asia: Market Optimism and Asset Bubbles." *Journal of Asian Economics* 15: pp. 1103-18.
- Krishnamurthy, Arvind and Annette Vissing-Jorgensen (2008). "The Aggregate Demand for Treasury Debt." Mimeo, Northwestern University, Evanston, IL.
- Lane, Philip R. and Gian Maria Milesi-Ferretti (2007). "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004." *Journal of International Economics* 73 (2): 223-50.
- Lane, Philip R. and Sergio L. Schmukler (2007). "The International Financial Integration of China and India." In L. Alan Winters and Shahid Yusuf, editors, *Dancing with Giants: China, India, and the World Economy*. Washington, DC: World Bank.
- Mayer, Christopher, Karen Pence, and Shane M. Sherlund (2009). "The Rise in Mortgage Defaults." *Journal of Economic Perspectives* 23 (Winter): 27-50.
- McGuire, Patrick and Goetz von Peter (2009). "The US Dollar Shortage in Global Banking and the International Policy Response." BIS Working Papers 291, Bank for International Settlements (October).

- Mendoza, Enrique G., Vincenzo Quadrini, and José-Victor Rios-Rull (2007). "Financial Integration, Financial Deepness, and Global Imbalances." Working Paper 12909, National Bureau of Economic Research (February).
- Mian, Atif R. and Amir Sufi (2009). "The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis." *Quarterly Journal of Economics* 124 (November): in press.
- Mishkin, Frederic S. (2008). "Housing and the Monetary Transmission Mechanism." In *Housing, Housing Finance, and Monetary Policy*. Kansas City, MO: Federal Reserve Bank of Kansas City.
- Mohan, Rakesh and Muneesh Kapur (2009). "Liberalisation and Regulation of Capital Flows: Lessons for Emerging Market Economies." Mimeo, Stanford University Center for International Development and Reserve Bank of India (July).
- Nishimura, Kiyohiko (2008). "Globalisation, Ageing, and Asset Prices: A Market-World Demography Perspective." Speech at the Judge Business School, Cambridge University (November).
- Obstfeld, Maurice (2005). "America's Deficit, the World's Problem." *Monetary and Economic Studies* (Bank of Japan) 23 (October): 25-35.
- Obstfeld, Maurice and Kenneth Rogoff (1996). *Foundations of International Macroeconomics*. Cambridge, MA: MIT Press.
- Obstfeld, Maurice and Kenneth Rogoff (2001). "Perspectives on OECD Capital Market Integration: Implications for U.S. Current Account Adjustment." In *Global Economic Integration: Opportunities and Challenges*. Kansas City, MO: Federal Reserve Bank of Kansas City.
- Obstfeld, Maurice and Kenneth Rogoff (2005). "Global Current Account Imbalances and Exchange Rate Adjustments." *Brookings Papers on Economic Activity* 1: 67-146.
- Obstfeld, Maurice and Kenneth Rogoff (2007). "The Unsustainable U.S. Current Account Position Revisited." In Richard H. Clarida, editor, *G7 Current Account Imbalances: Sustainability and Adjustment*. Chicago: University of Chicago Press.
- Obstfeld, Maurice, Jay C. Shambaugh, and Alan M. Taylor (2010). "Financial Stability, the Trilemma, and International Reserves." *American Economic Journal: Macroeconomics*, forthcoming.
- Ocampo, José Antonio and Maria Luisa Chiappe. *Counter-Cyclical Prudential and Capital Account Regulations in Developing Countries*. Stockholm: Almqvist & Wiksell International, 2003.
- Padoa-Schioppa, Tommaso (2004). "Financial Stability Review: December 2004." Powerpoint presentation. Frankfurt (December 15). URL: http://www.ecb.int/press/key/date/2004/html/sp041215_annex.en.pdf

- Portes, Richard (2009). "Global Imbalances." In Mathias Dewatripont, Xavier Freixas, and Richard Portes, editors, *Macroeconomic Stability and Financial Regulation: Key Issues for the G20*. London: Centre for Economic Policy Research.
- Punzi, Maria Teresa (2007). "The Link between Housing Prices and Current Account Deficit: A Study of 10 OECD Countries." Mimeo, Boston College (June). URL: http://merlin.fae.ua.es/punzi/Panel_Var.pdf
- Quigley, John M. (2001). "Real Estate and the Asian Crisis." *Journal of Housing Economics* 10 (2): 129-61.
- Rajan, Raguram G. (2006). "Monetary Policy and Incentives." Address at the Bank of Spain conference on Central Banks in the 21st Century, Madrid (June 8). URL: <http://www.imf.org/external/np/speeches/2006/060806.htm>
- Reinhart, Carmen M. and Kenneth Rogoff (2009). *This Time It's Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press.
- Taylor, John B. (2009). *Getting Off Track*. Stanford: Hoover Institution Press.
- Trichet, Jean-Claude (2004). "Testimony before the Committee on Economic and Monetary Affairs of the European Parliament." Strasbourg (November 30). URL: <http://www.ecb.int/press/key/date/2004/html/sp041130.en.html>
- Warnock, Francis E. and Veronica Cacadac Warnock (2009). "International Capital Flows and U.S. Interest Rates." *Journal of International Money and Finance* 28 (6): 903-19.
- Wolf, Martin (2008). *Fixing Global Finance*. Baltimore, MD: Johns Hopkins University Press.
- Woodford, Michael (2001). "Fiscal Requirements for Price Stability." *Journal of Money, Credit, and Banking* 33 (August 2001): 669-728.

Figure 1(a): Global Imbalances, 1995-2009

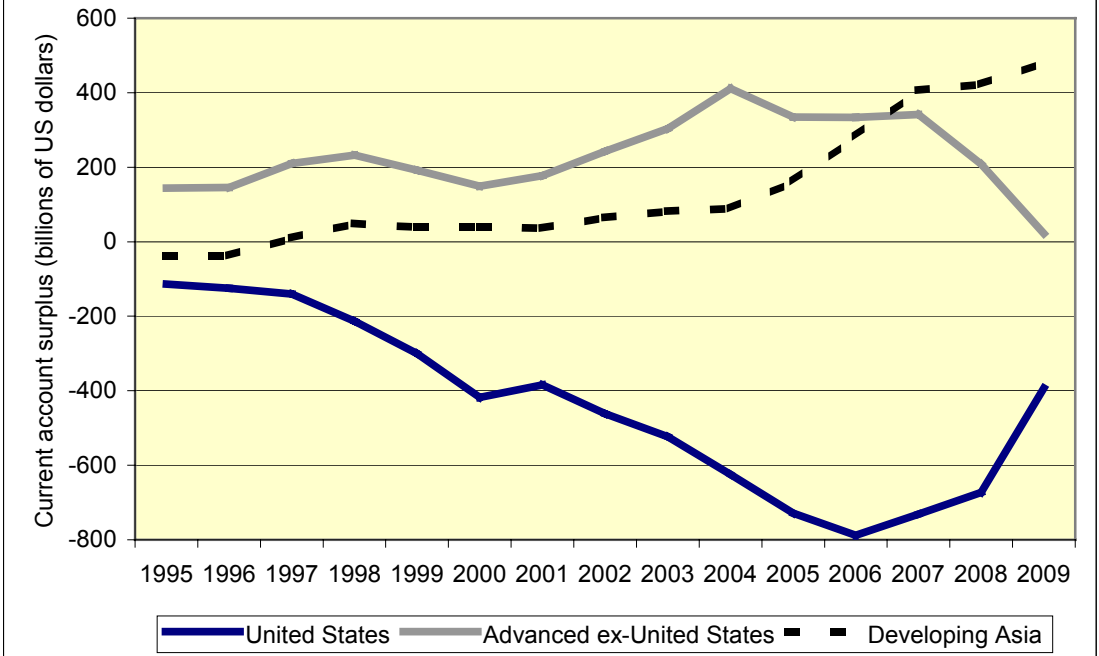


Figure 1(b): Global Imbalances, 1995-2009

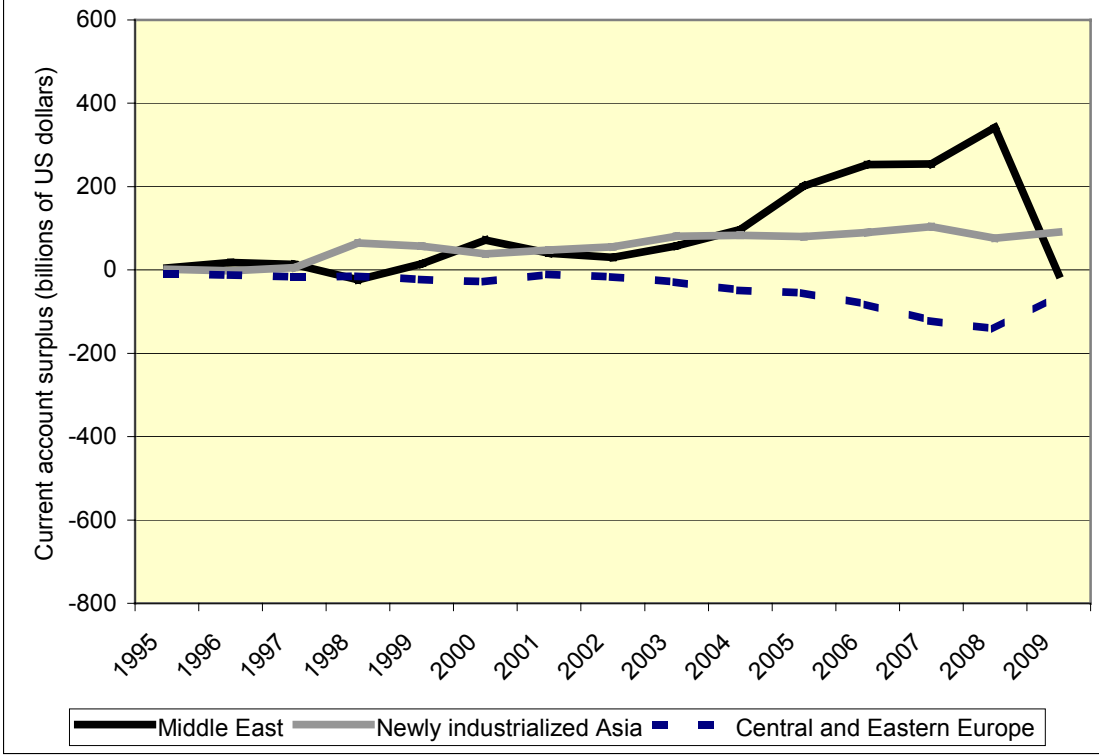


Figure 1(c): Global Imbalances, 1995-2009

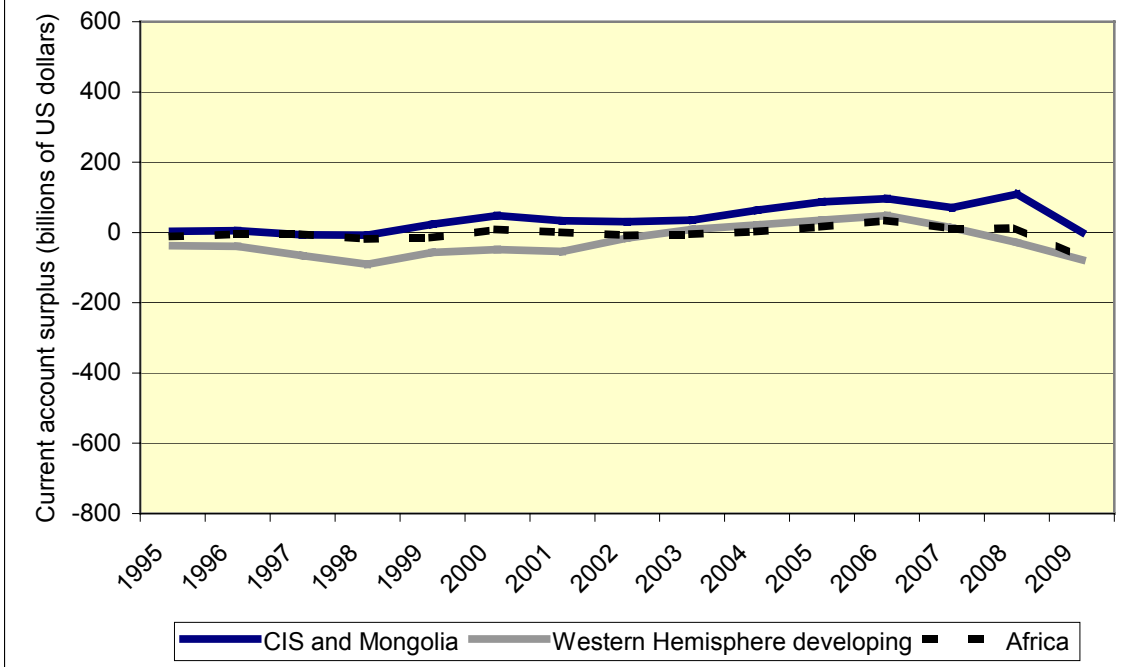


Figure 2: Global Commodity Prices

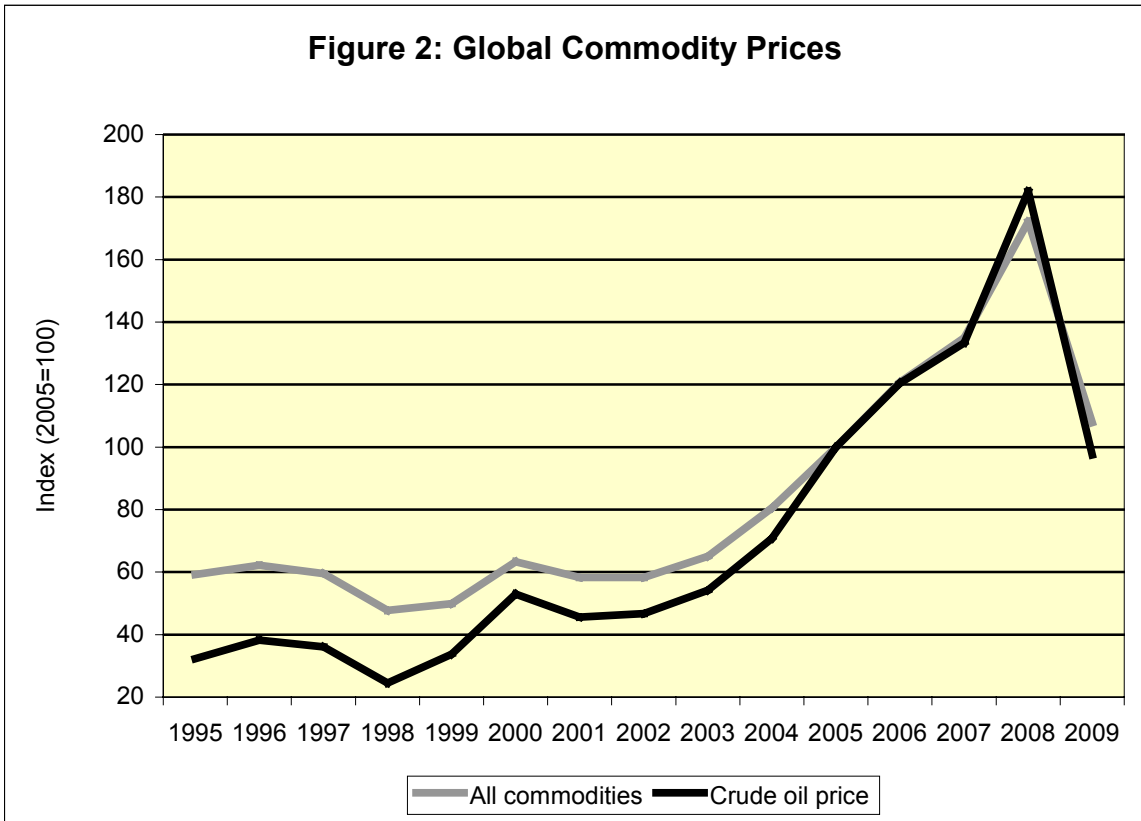
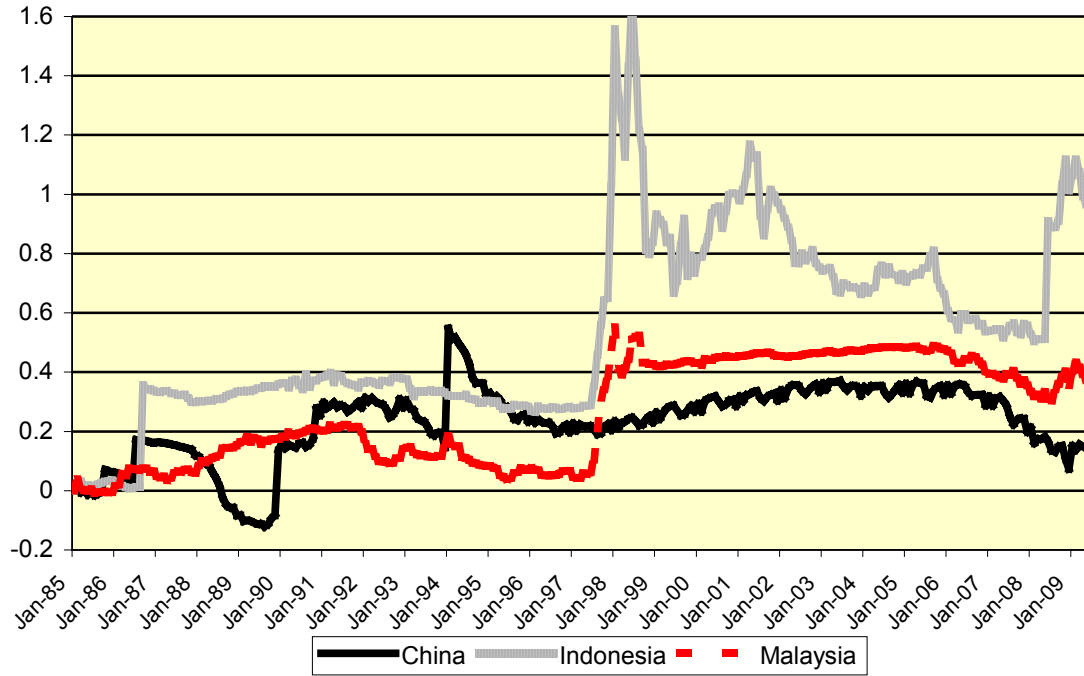
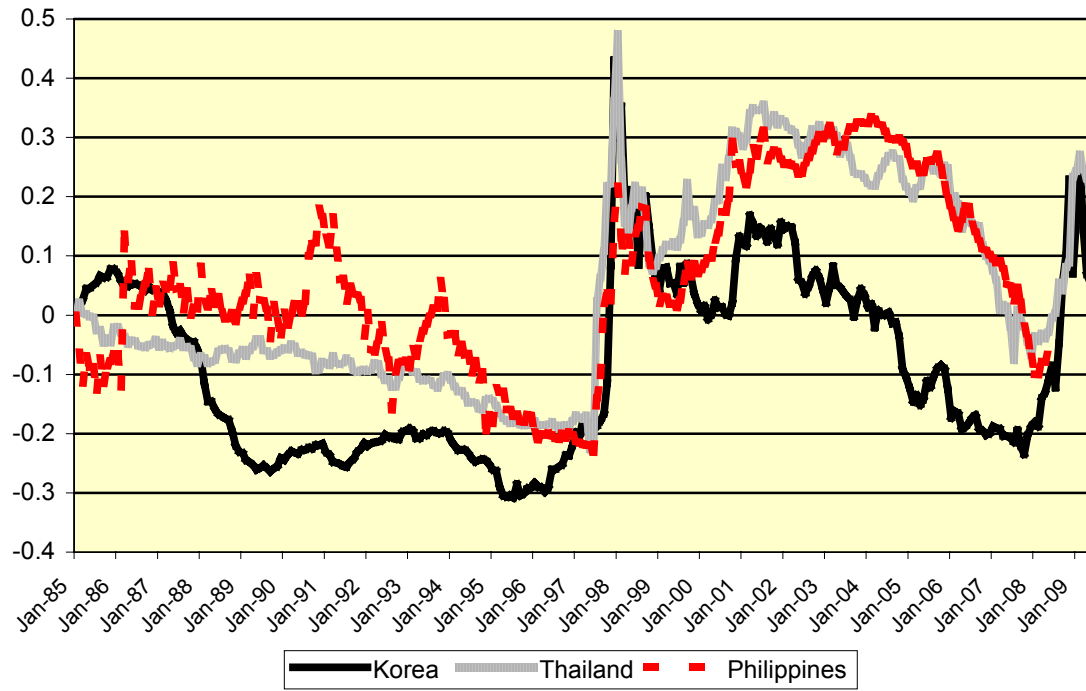


Figure 3(a): Real Exchange Rates of Selected Asian Currencies



Source: Authors' calculations based on Global Financial Data

Figure 3(b): Real Exchange Rates of Selected Asian Currencies



Source: Authors' calculations based on Global Financial Data

Figure 4: Growth in Official Foreign Exchange Reserves

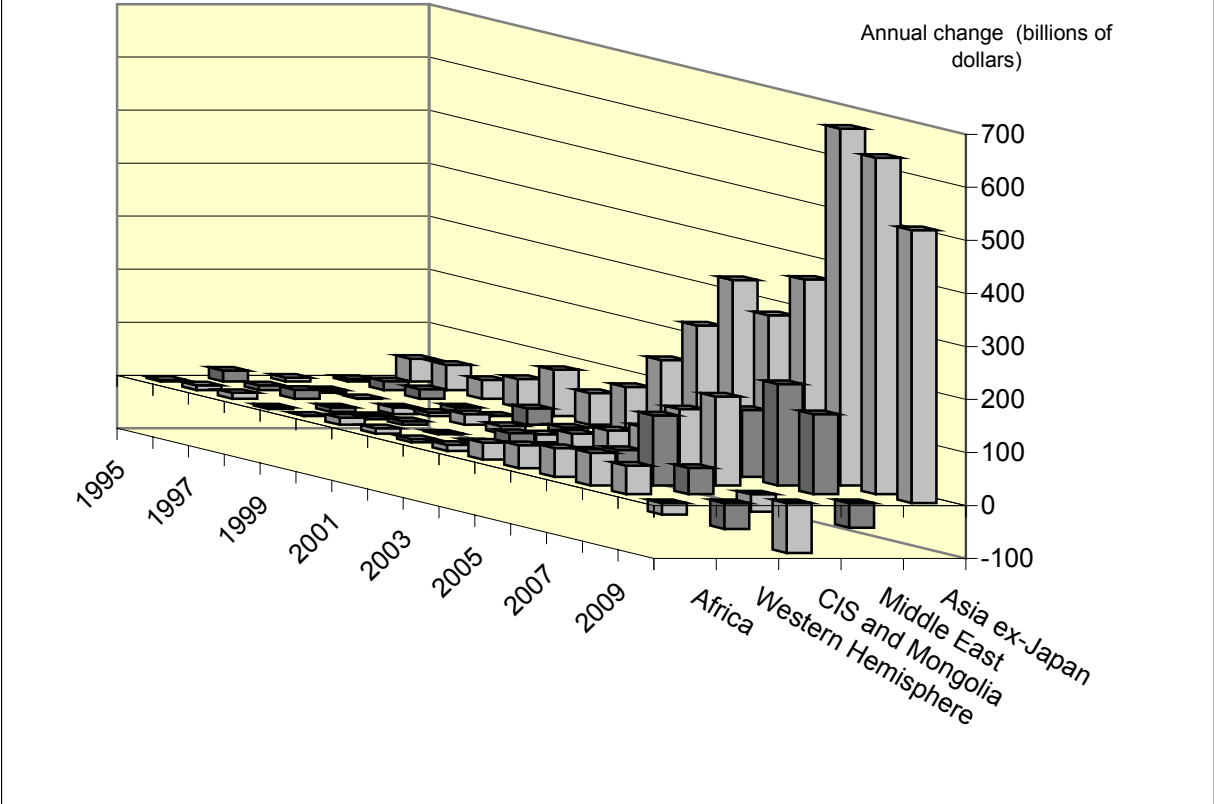
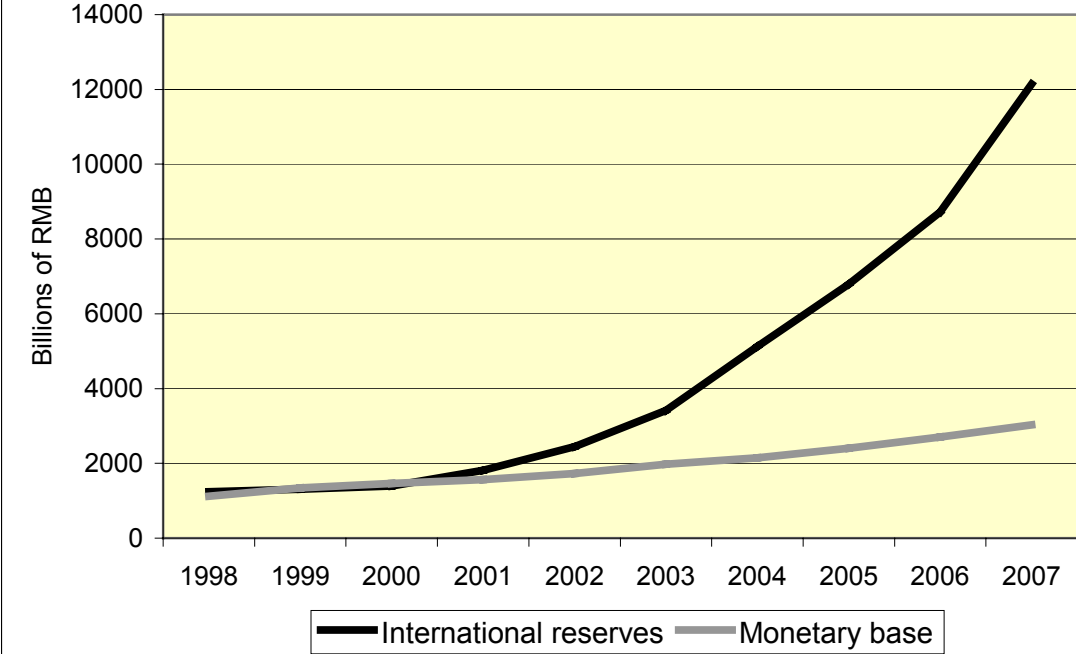


Figure 5: China's Monetary Base and International Reserves



Source: International Financial Statistics

Figure 6(a): Long-Term Real Interest Rates

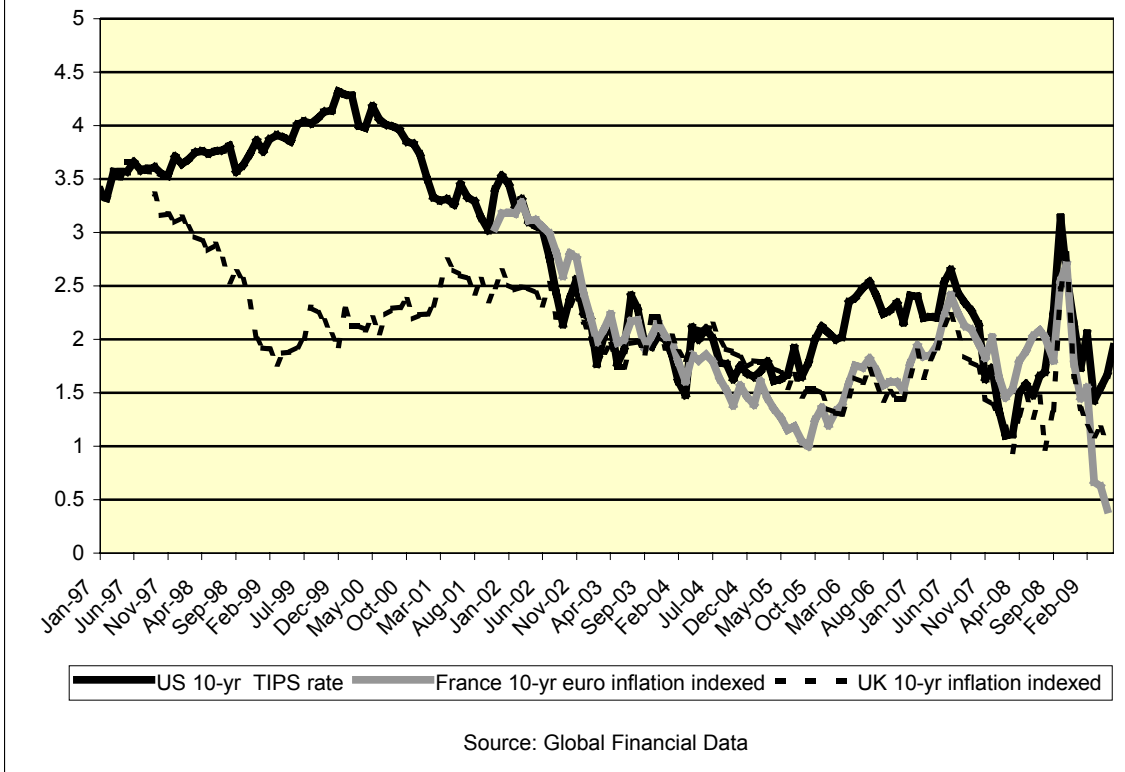


Figure 6(b): Long-Term Real Interest Rates

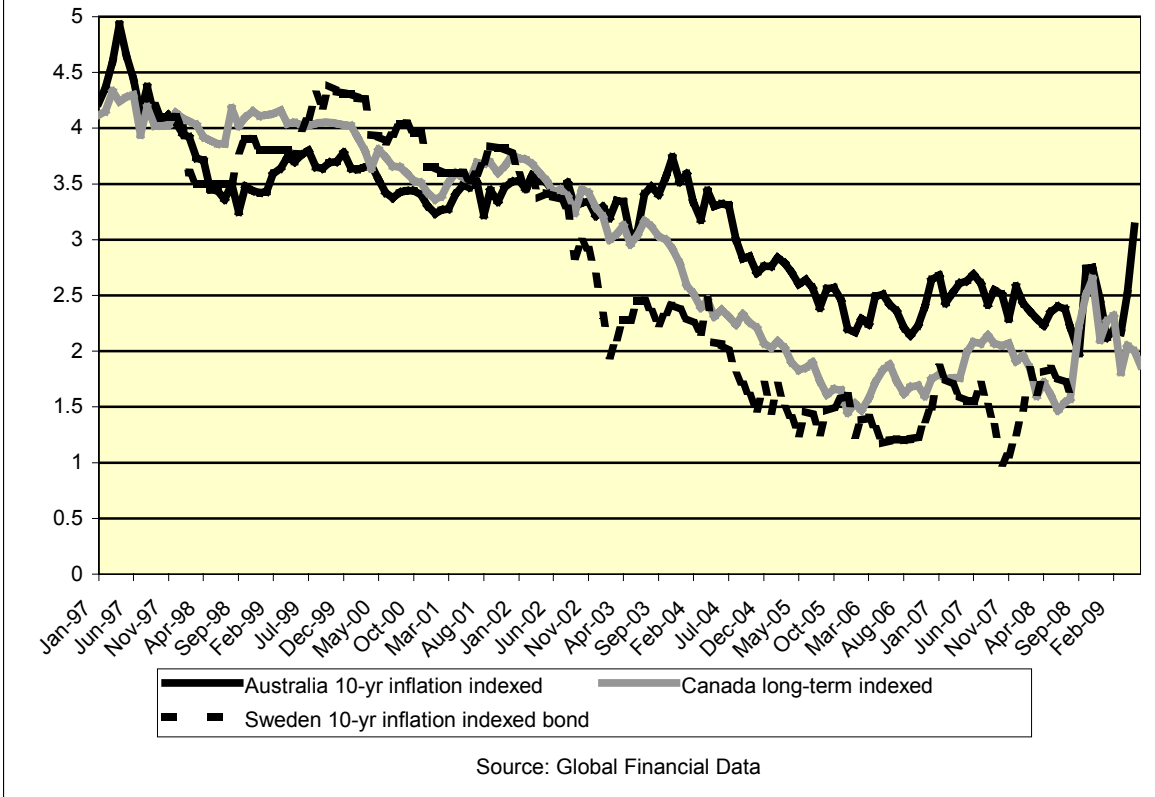
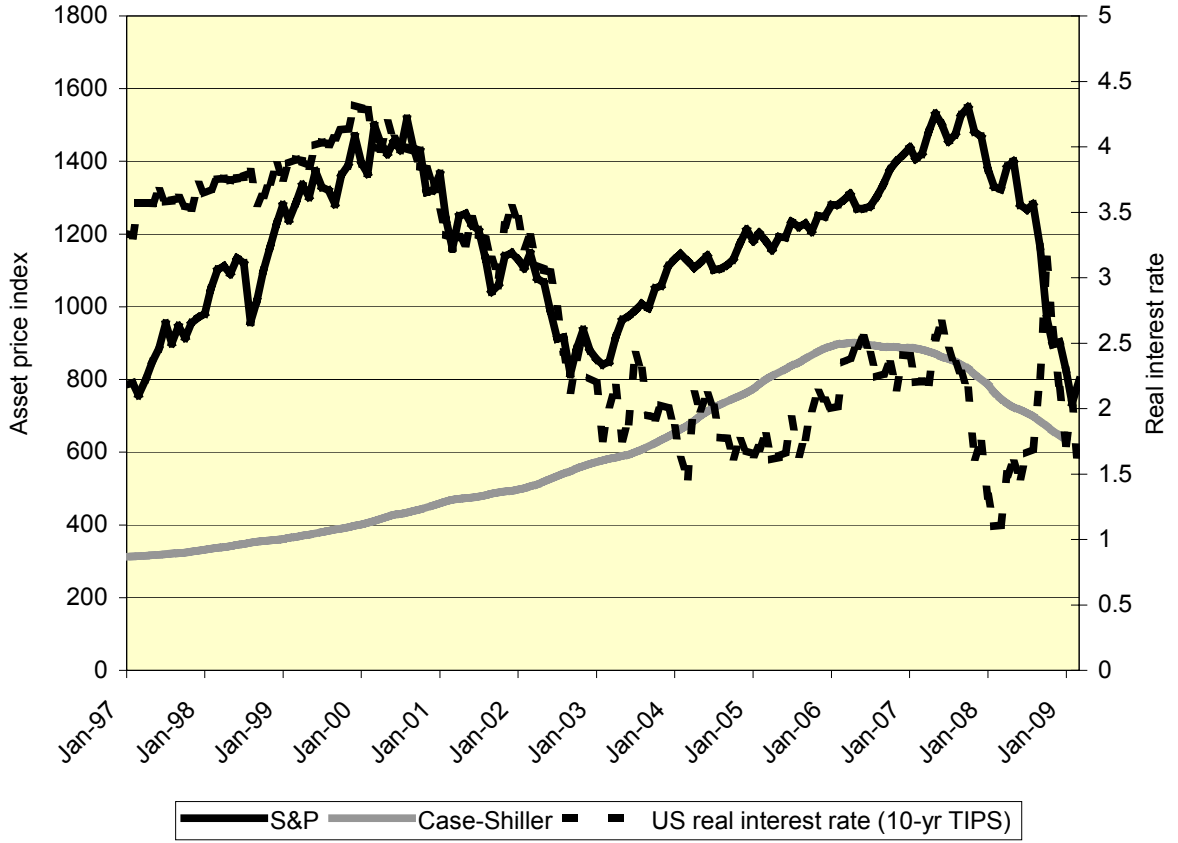
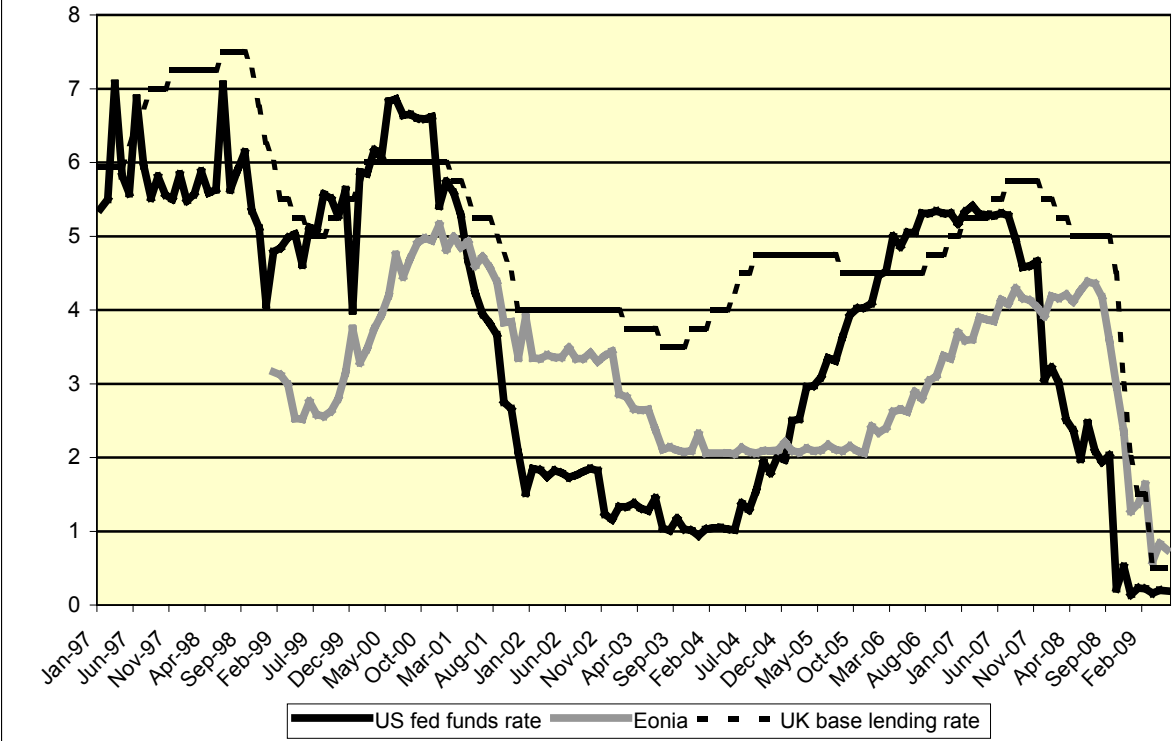


Figure 7: Nominal U.S. Asset Prices and Real Interest Rate



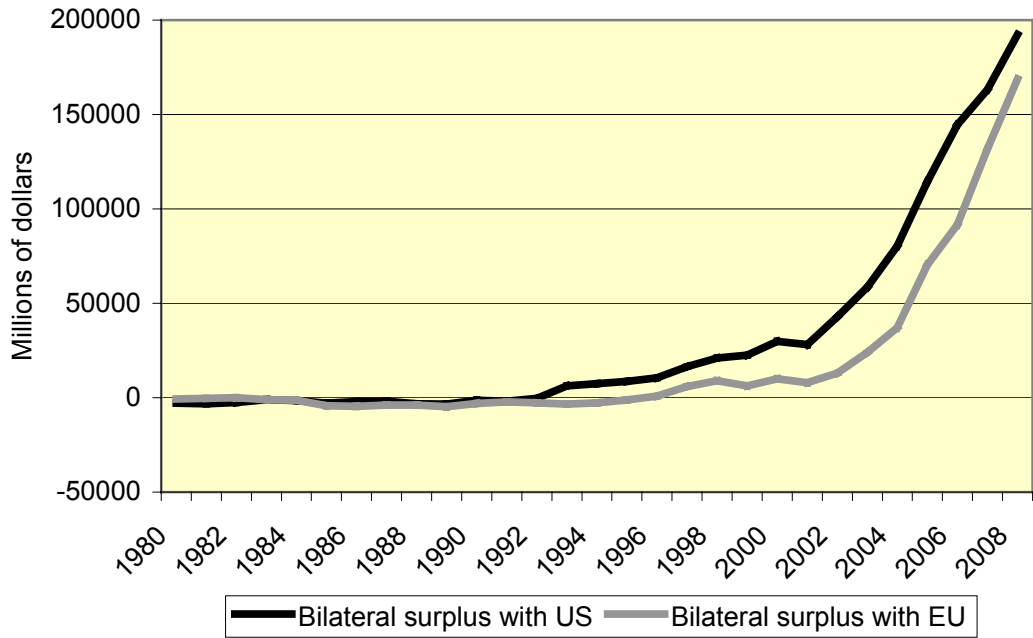
Source Standard and Poors and Global Financial Data

Figure 8: Policy Interest Rates



Source: Global Financial Data

Figure 9: China's Trade Surpluses with United States and European Union



Source: IMF, *Direction of Trade*

Figure 10: Annual Growth Rates of Real GDP

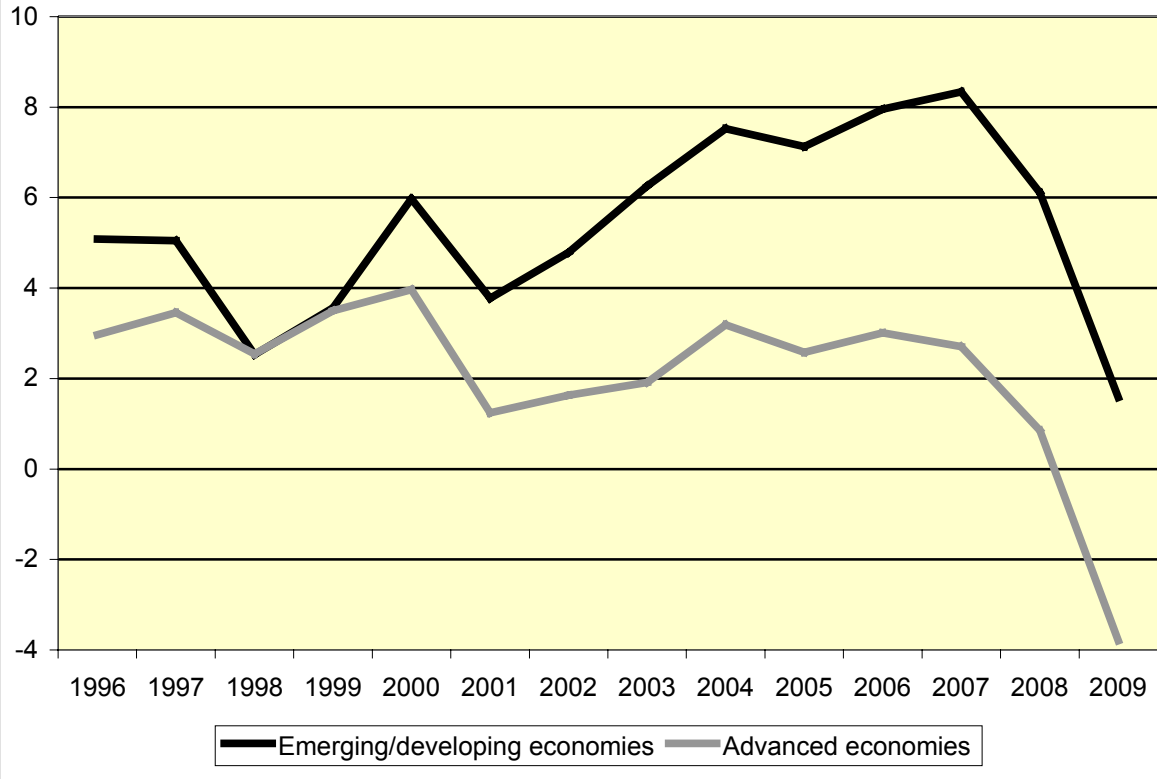
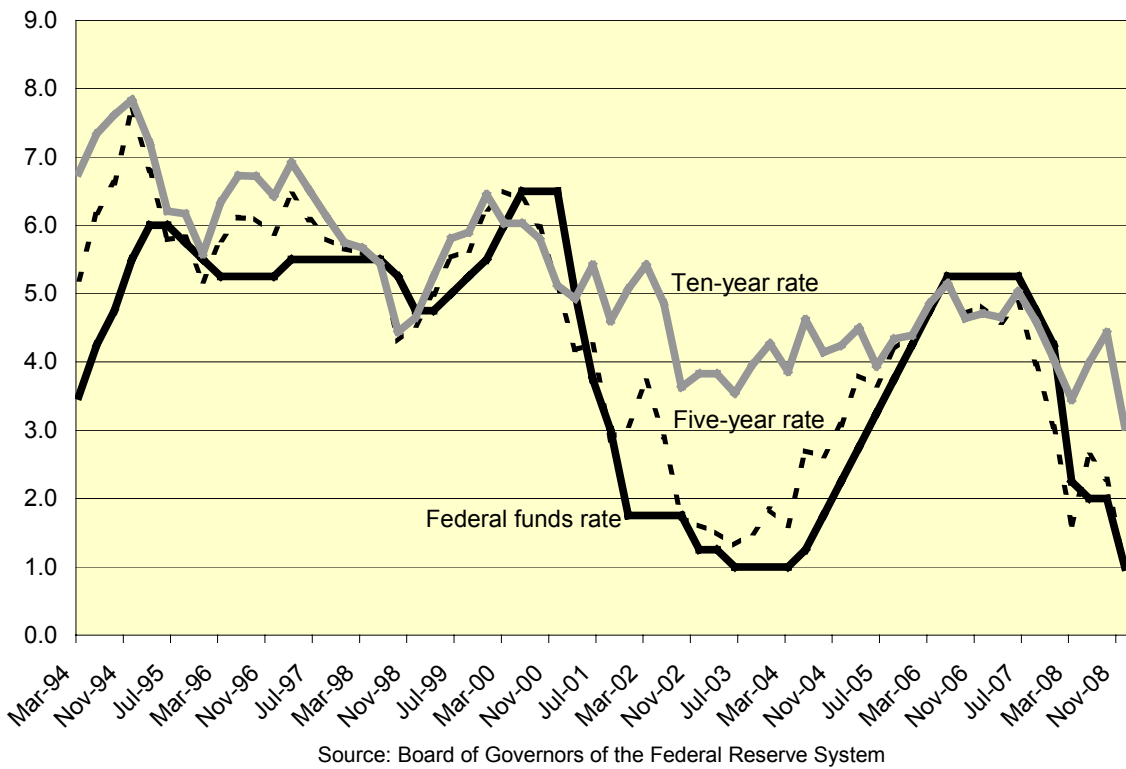


Figure 11: Term Structure of U.S. Interest Rates



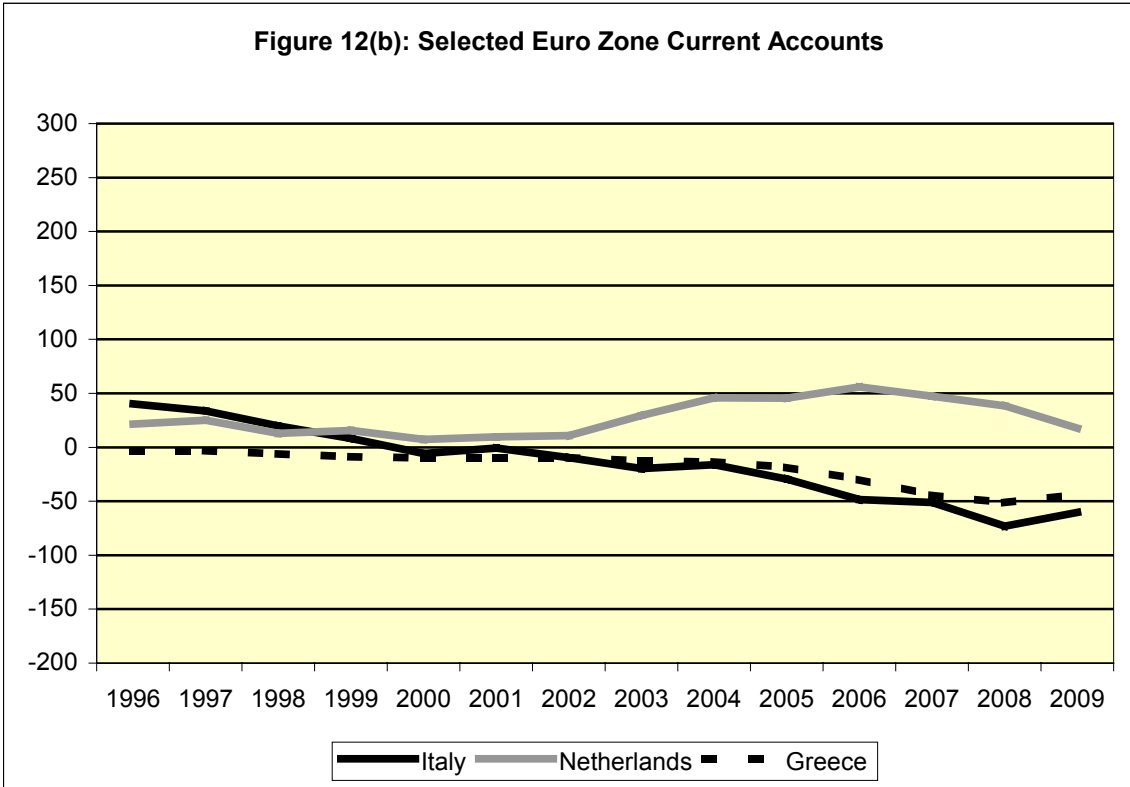
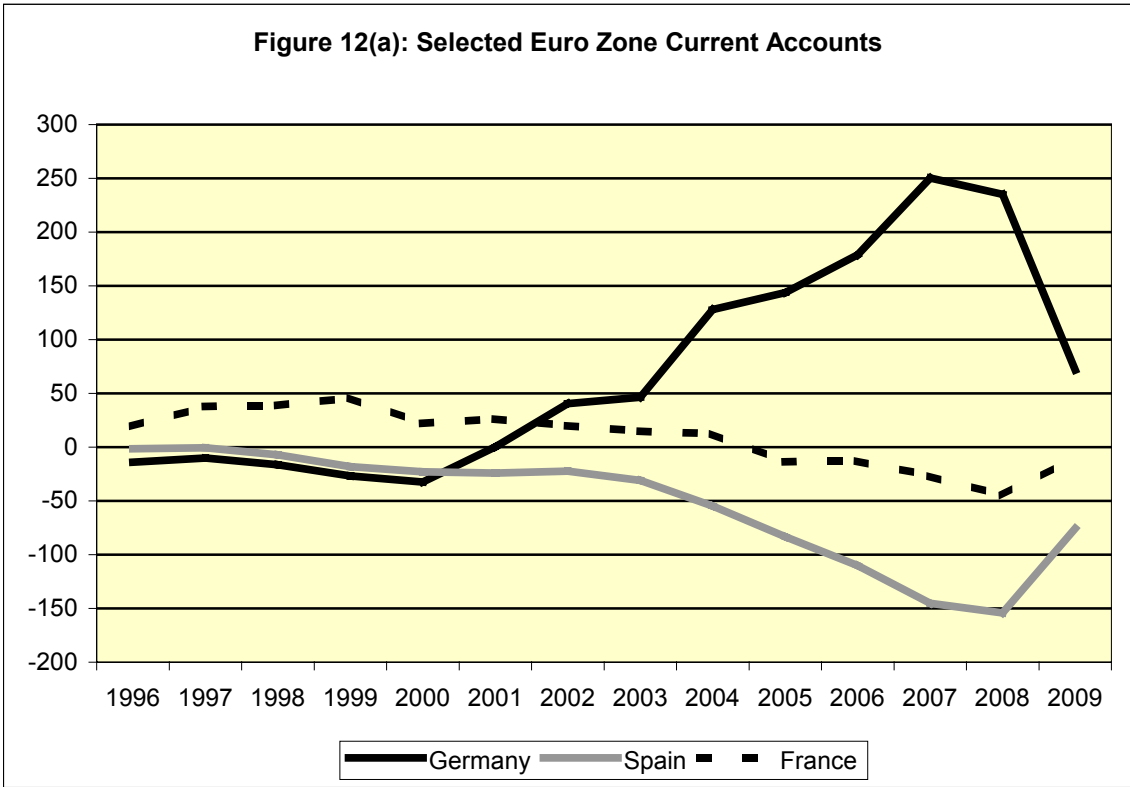


Figure 13: Nonprime and Subprime Mortgage Originations

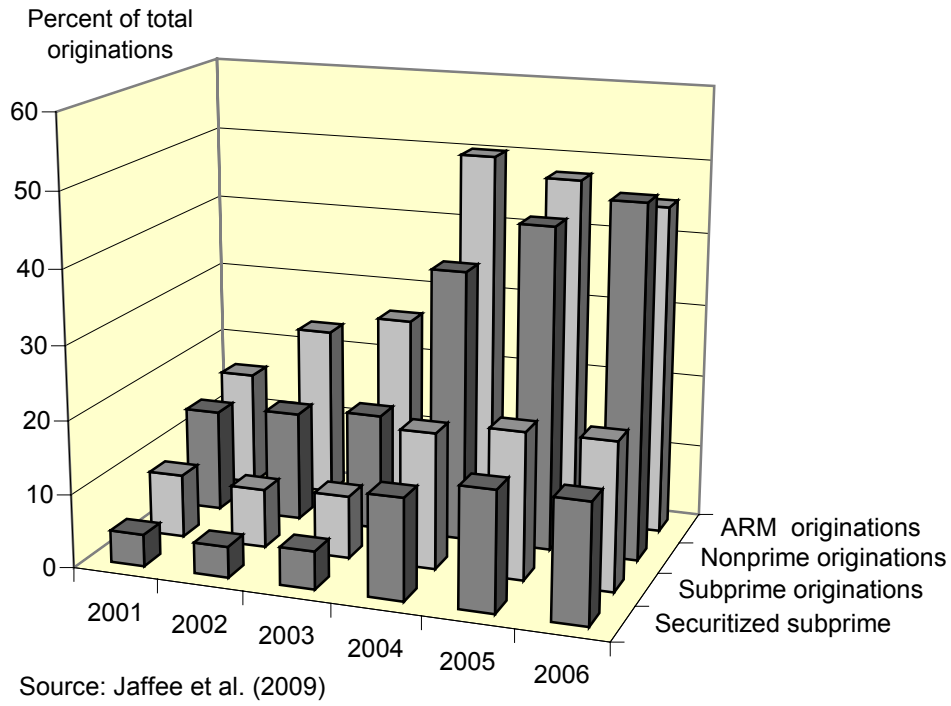
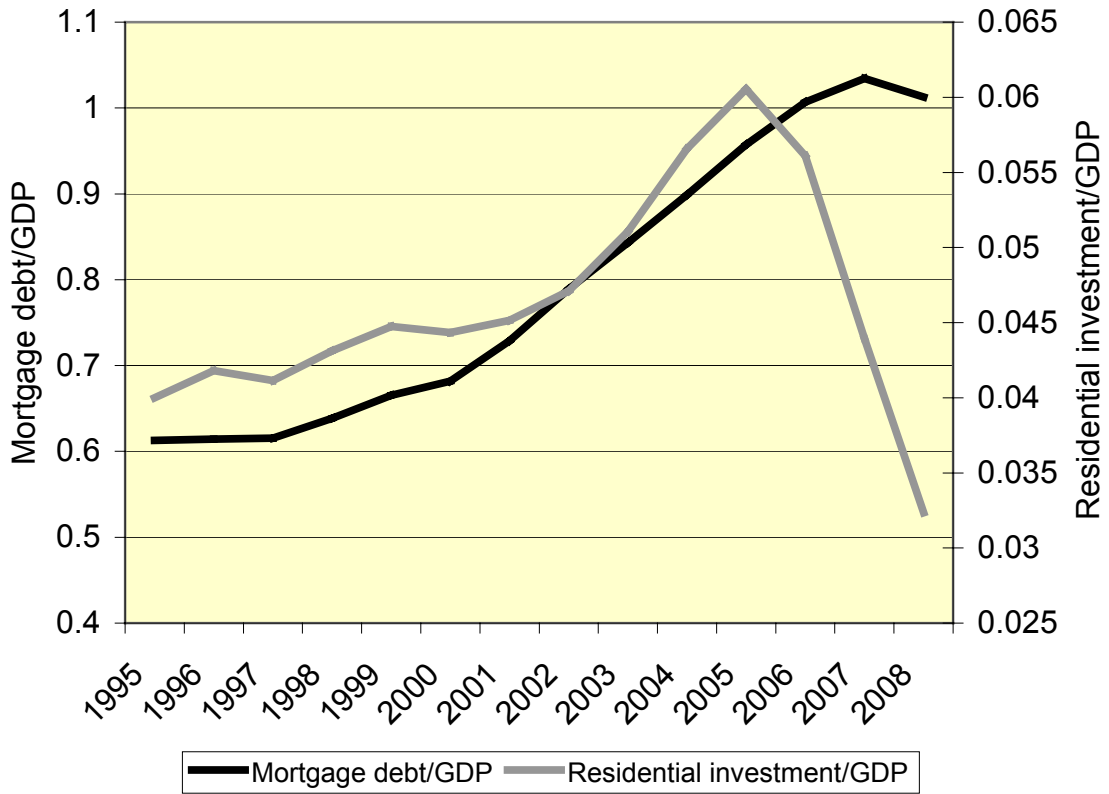


Figure 14: U.S. Mortgage Debt and Residential Investment



Source: Board of Governors of the Federal Reserve System and U.S. Department of Commerce

Figure 15: Gross External Assets and Liabilities, Selected Countries

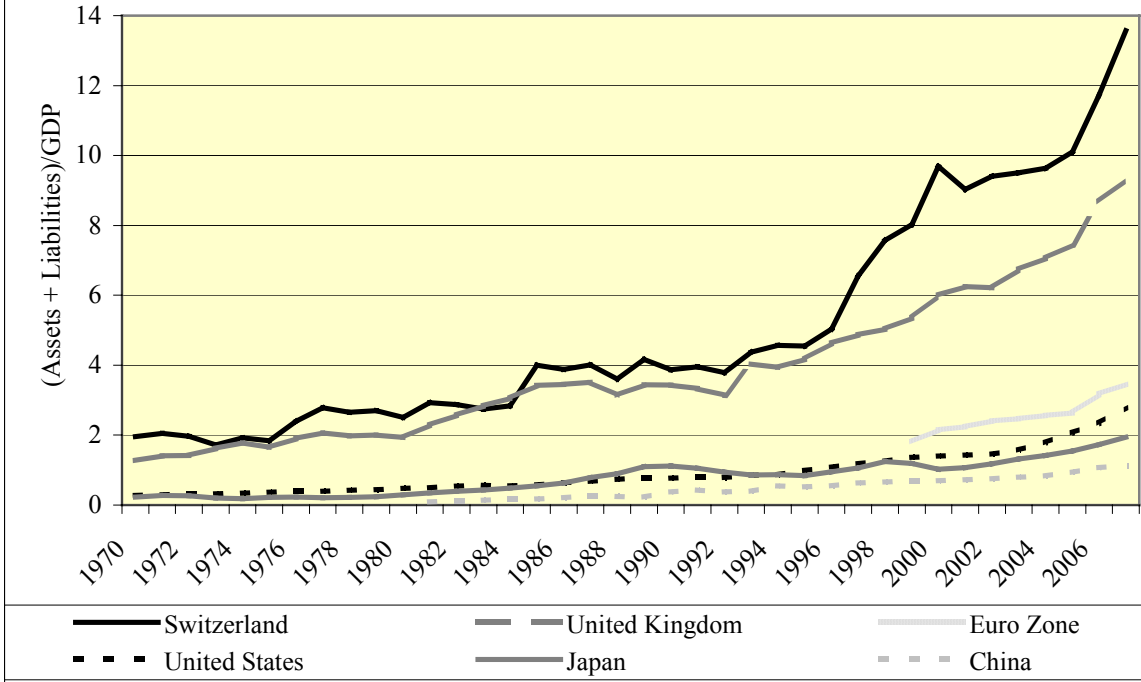


Figure 16: Real estate appreciation and change in current account, 2000-06, all countries

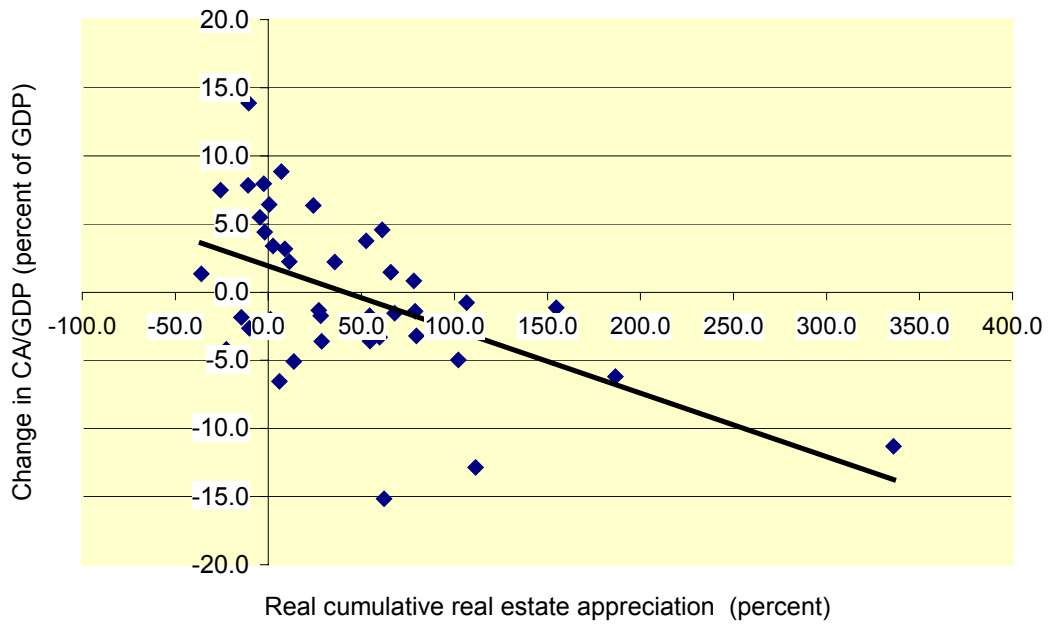


Figure 17: Real estate appreciation and change in current account, 2000-06, industrial countries

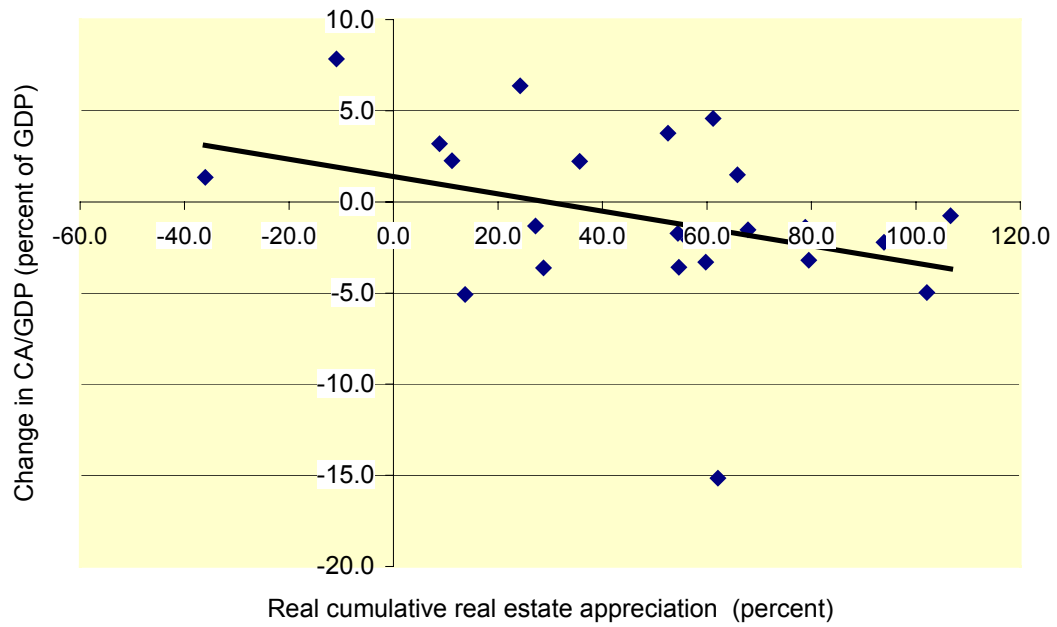


Figure 18: U.S. Current Account

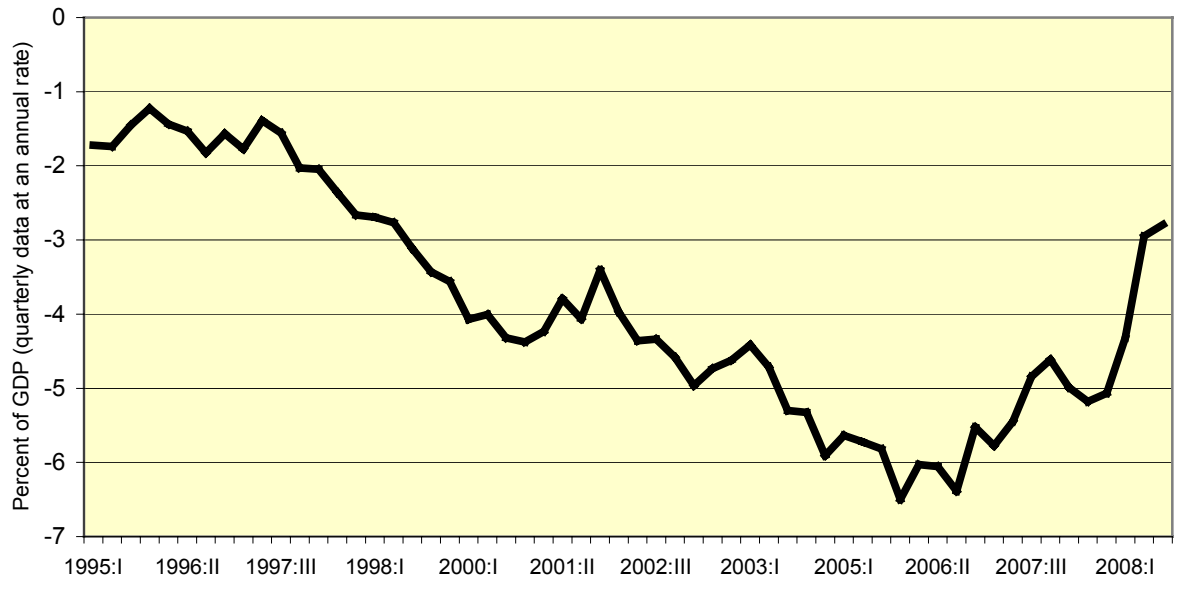


Figure 19: U.S. Net International Investment Position versus Cumulated External Deficits

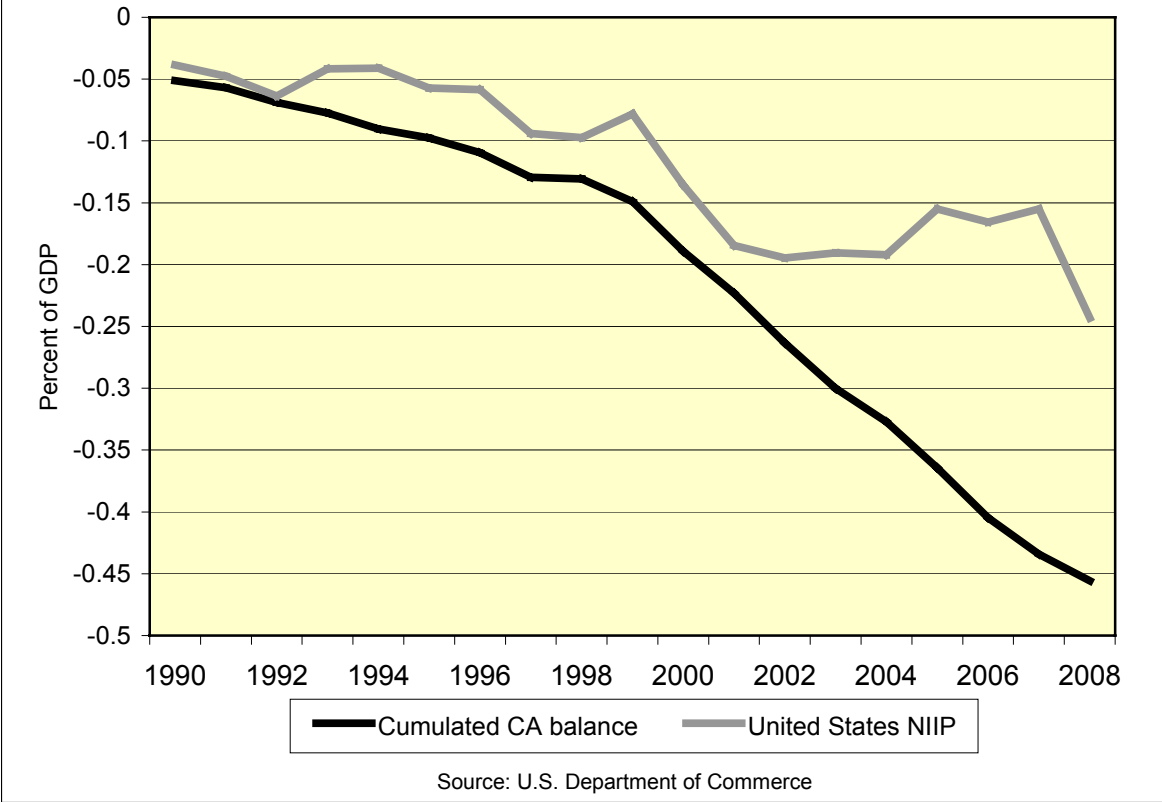


Figure 20: Real Exchange Rate of the U.S. Dollar

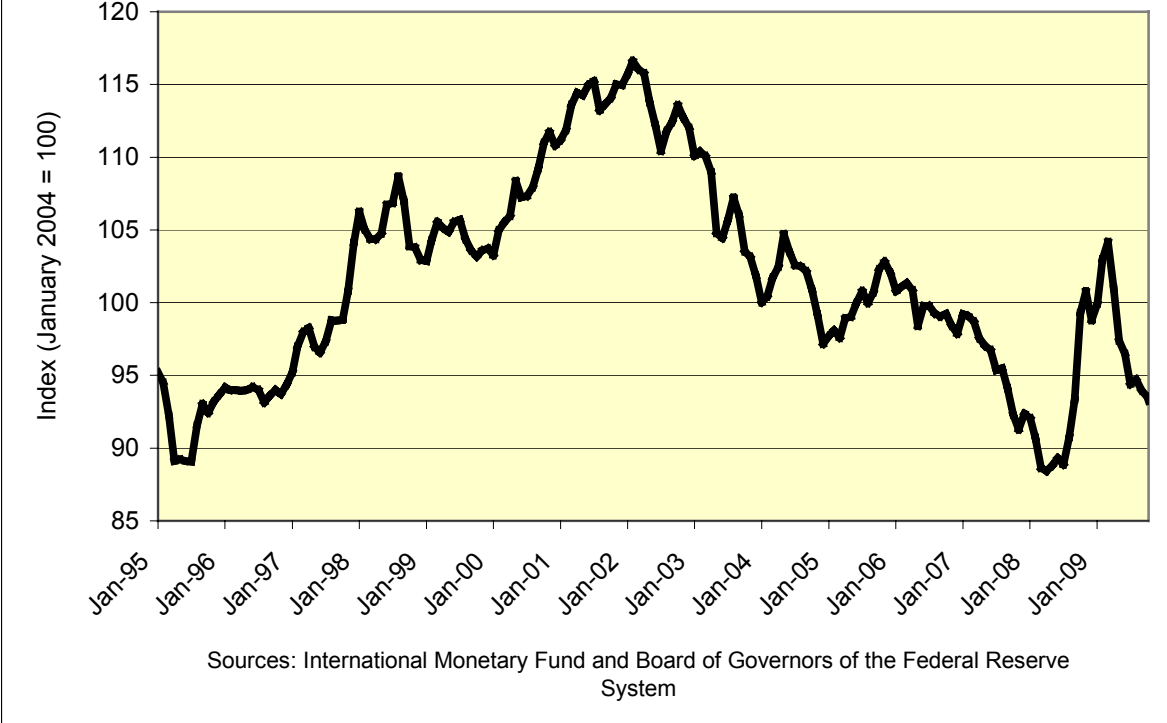
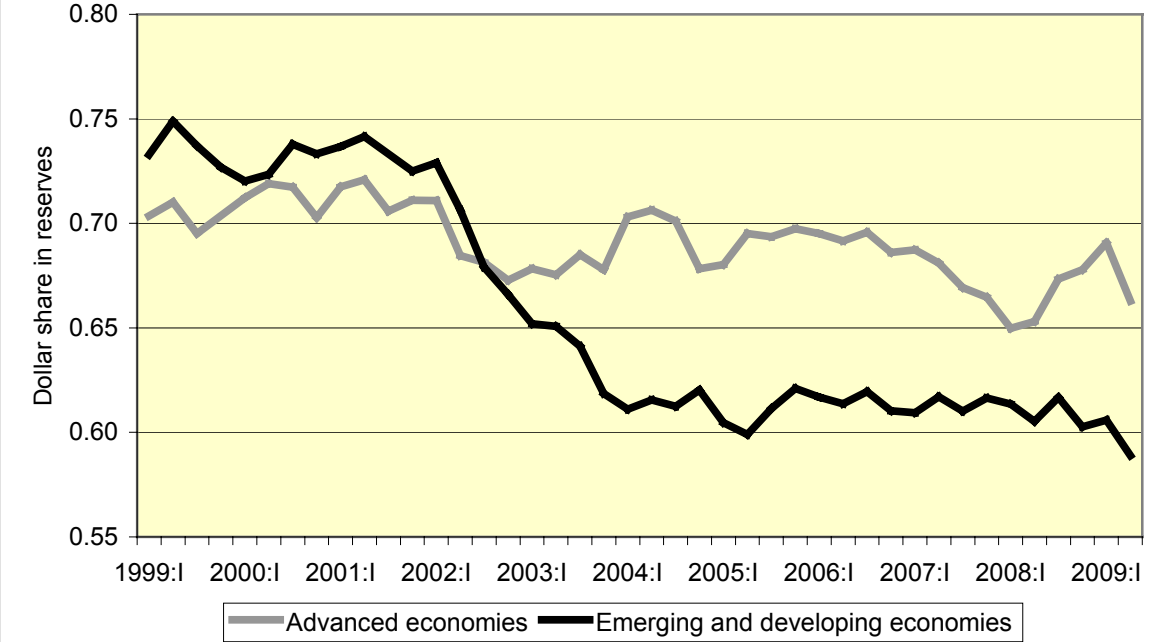


Figure 21: Official U.S. Dollar Reserves as Shares of Country-Group Totals



Source: IMF, Currency Composition of Official Foreign Exchange Reserves (as of September 30, 2009), URL: <http://www.imf.org/external/np/sta/cofer/eng/index.htm>