Global Imbalances and Global Liquidity

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The financial crisis has entered a dangerous phase. I argue in this article that the retrenchment currently taking place in the European banking sector has broad implications for financial stability. More generally, I argue that the focus should be on "global liquidity imbalances," rather than "global imbalances." Global liquidity imbalances track the liquidity mismatch across countries and over time, which may or may not result in current account deficits and surpluses (that is, global imbalances).

1. Introduction

Starting a little more than three years ago, the world economy experienced a dramatic convulsion, the ripple effects of which are still with us. The years preceding the crisis were—as is often the case—accompanied by robust growth, low inflation, and a generally benign attitude towards the potential risks facing the global economy. Despite this generally complacent attitude, one such risk factor was widely debated by academics and policymakers at the time: the growing external deficits of the United States and the corresponding surpluses in other parts of the world, that is, the question of "global imbalances."

The global financial crisis and its aftermath have thrown this issue into even sharper relief. In the years since the crisis, much attention has been devoted to the connection, if any, between global imbalances and the financial and economic meltdown that ensued.

A casual look at the evidence should convince anyone that the connection between external balances and the occurrence or severity of crises is likely to be subtle. For instance, the commonly shared pre-crisis worry that large external deficits would make the United States vulnerable to a sudden stop never materialized. While the U.S. current account deficit contracted from $800 billion in 2006 to $470 billion in 2010, U.S. funding rates remained low. In many

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other instances, however, current accounts clearly matter. Consider the three euro-zone countries currently under International Monetary Fund (IMF) programs.[1] All three were running current account deficits of around 6.5 percent of output on average between 2000 and 2007. Conversely, with an average current account surplus of 2.5 percent of output between 2000 and 2007, the group of emerging market and developing economies experienced a relatively mild crisis. Even within groups of countries, the evidence is more complex, and one is at pains to document a robust relationship between current account balances and crises.[2]

Perhaps even more elusive is the notion that global imbalances may have contributed to global financial instability. A commonly heard argument is that global imbalances depressed world interest rates, fueling a search for yield, increasing leverage, and triggering financial market instability. But if low real interest rates can conceivably be at the root of the recent financial instability, they need not be associated with a particular pattern of global imbalances. The latter reflect asymmetries in the cross-country pattern of savings and investments. In a globalized economy, the former is in principle determined by *global* savings and investment, not their geographic distribution. In other words, a given world real interest rate is equally consistent with large, small, or the absence of any current account imbalances.

Does it follow that global imbalances are unimportant, or unworthy of study? The answer to this question is a qualified "no." First, as argued by Obstfeld and Rogoff (2010) in a very careful and nuanced account on this question—fittingly enough, presented at the inaugural edition of this conference in 2009—global imbalances and the 2008 financial crisis can be seen as the product of common causes. Among the causes emphasized by the authors are domestic economic policies, credit market distortions, and poorly supervised or understood financial innovation. In other words, *global* imbalances provide a useful lens on patterns of *domestic* imbalances that determine macroeconomic outcomes.

Second, current account reversals, when they happen, are always painful affairs. They require drastic adjustments both in relative prices and in patterns of demand. Domestic demand needs to shift away from traded towards nontraded sectors, while production needs to experience the reverse shift from nontraded towards the traded sector. Equivalently, national saving needs to rise and domestic investment needs to decline, a sure recipe for a decline in aggregate demand. These adjustments never happen costlessly.

Third, and this is the line I will pursue in this paper, current account balances provide a particularly useful warning sign when they adequately measure funding risks. Whether this is the case or not has changed dramatically in the

last 40 years, e.g., since the advent of the modern era of financial globalization in the early 1970s. This process has been accompanied by extremely rapid growth of *gross* external claims and liabilities. Nowadays, it is these gross external positions and in particular their maturity and currency structure that determine whether a country is vulnerable or not. In other words, rather than global imbalances, narrowly defined as current account deficits, it is *global liquidity imbalances*, defined as the cross-border mismatch between pledgeable assets and funding outlays, that matter. In some instances, as for the countries of the euro area now, current account balances accurately capture these risks. In many other cases they do not, and funding risks could materialize regardless of the current account balances. It follows that while the current account may still be a useful metric of external financial stress, its use should come with a robust *health warning* since it also fails to capture a growing share of episodes of financial stress. Nowhere was this more evident than for Europe as a whole during the recent financial crisis. As McGuire and von Peter (2009) and Shin (forthcoming) demonstrate, despite a current account close to balance, Europe experienced a sudden U.S. dollar shortage in 2007 and 2008 when wholesale dollar markets refused to roll over short-term dollar liabilities of European global banks. Understanding how the pattern of vulnerabilities has changed over time is therefore of paramount importance.

In short, the views presented here are in broad agreement with Obstfeld's excellent Ely lecture (Obstfeld 2012). Protracted current account imbalances should always be looked upon with a wary eye by policymakers as a potential symptom of deeper macroeconomic excesses. In addition, it is becoming increasingly important to monitor the financial and liquidity imbalances that are the main focus of this paper.

In the years since the crisis, both global imbalances and global liquidity patterns have shifted in important ways. Some rebalancing is clearly under way. According to the September 2011 World Economic Outlook, the current account deficit of the United States declined from –1.62 percent of world output at its trough in 2006 to –0.75 percent in 2010 and is expected to shrink further to –0.67 in 2011. One might conclude from this evolution that the world economy is on a firmer footing, even if the rebalancing is incomplete and IMF statisticians forecast global imbalances to widen somewhat in coming years. I do not share this view: it overlooks the ways in which patterns of global liquidity have shifted in recent years. One of the most damaging consequences of the necessary deleveraging that accompanied the crisis has been a broad reclassification and repricing of liquid and information-insensitive assets into illiquid and information-sensitive ones. Information-sensitive assets suffer from asymmetric

information problems, especially adverse selection resulting in market shutdowns. The acute shortage in safe liquid transaction instruments that existed before the crisis has been *exacerbated* by the crisis. This fuels deleveraging, contaminates financial and public-sector balance sheets, and further amplifies the crisis. Even solvent institutions or sovereigns can find themselves suddenly in the crosshairs of the markets. As the scarcity of cross-border liquidity grows, it fuels additional precautionary demands: Households, the corporate sector, and the public sector try simultaneously to secure access to safe assets. Whether and how this liquidity imbalance gets resolved is critical for the stabilization of the world economy, regardless of the consolidation in current account imbalances achieved so far.

Of particular importance to the pattern of global financial risks will be the relative patterns of demand and supply of liquidity between the United States, Europe, and emerging market economies (EMEs), especially those arising from rapidly growing emerging Asian economies.

This article begins with a broad discussion of the pattern of global imbalances in the run-up to and the aftermath of the crisis. Since the topic has been covered extensively in the previous literature, I do not dwell on details, and rather focus on the relevant facts. Section 3 reviews when and how the concept of current account imbalances is useful from a theoretical perspective. A key focus will be on sudden stops, that is, the inability to roll over maturing liabilities. The aim of this section, borrowing from Calvo's (1998) important paper is to provide a discussion of *varieties of funding crisis*. A central conclusion is that, in a globalized financial environment, gross positions often provide a more accurate picture of funding risks than current account balances and calls for better measures of cross-border liquidity. Section 4 explores the current patterns of global liquidity imbalances and draws out the implications of the deleveraging process currently under way for the supply of liquidity and the stability of the financial system.

2. Global Imbalances

The literature contains many fine accounts of the evolution of global imbalances until the onset of the global financial crisis in 2008. I follow here Blanchard and Milesi-Ferretti (2009) and distinguish three phases.[3]

First, between the mid-1990s and 2001, the external deficits of the United States were largely driven by the consequences of the East Asian financial crisis of 1997, as well as the dot-com boom in the United States. Between 1996 and 1998, the current account of developing and newly industrialized Asian economies shifted from –0.12 percent to 0.39 percent of world output (see Table 1

and Figure 1). With the additional improvement of Japan's current account, whose economy was still mired in the aftermath of the 1997 banking crisis, the shift represents 0.69 percent of world output. At the same time, U.S. investment increased briskly, fueled by the high-technology boom and expectations of further increases in productivity growth, attracting substantial equity and direct investment flows. Consequently, between 1996 and 2001 the U.S. current account worsened by 0.83 percent of world output.

The second phase started with the dot-com crash of 2001 and lasted until 2005. While private foreign investor's enthusiasm for portfolio investment in the United States suffered a blow in the aftermath of the stock market collapse, this did not affect much U.S. current account imbalances, which deteriorated by a further 0.40 percent of world output. Instead, rapidly growing foreign official demand for U.S. assets more than replaced private net capital inflows, allowing U.S. current account deficits to keep growing from –1.24 percent of world output in 2001 to –1.64 percent in 2005. That period is also characterized by the growing importance of China and oil producing country surpluses. Between 2001 and 2005, China's external surplus increased from 0.05 percent to 0.29 percent of world output, while that of oil producing countries expanded even more from 0.26 to 0.89 percent.[4]

The third phase, from 2005 to 2008, is marked by the growing surpluses of China, from 0.29 percent to 0.67 percent of world output, and the continued large surpluses from oil and commodity producing countries. By 2008, the combined surpluses of these two groups of countries represented 1.58 percent

TABLE 1

Change in Current Account Balances

as a fraction of world GDP

	1996	1996–2001	2001–2005	2005–2008	2008–2010	2010
United States	–0.41	–0.83	–0.40	0.53	0.36	–0.75
Euro area	0.23	–0.23	0.08	–0.25	0.22	0.06
Other advanced	0.25	0.14	0.08	–0.15	0.02	0.34
of which: Japan	0.22	0.06	0.09	–0.11	0.05	0.31
Newly industrialized Asia	–0.01	0.16	0.03	–0.04	0.07	0.21
Developing Asia	–0.12	0.24	0.18	0.37	–0.18	0.50
of which: China	0.02	0.03	0.24	0.38	–0.19	0.49
Oil producers	0.11	0.15	0.63	0.02	–0.53	0.37
Rest of the world	–0.22	–0.02	–0.06	–0.18	0.27	–0.20

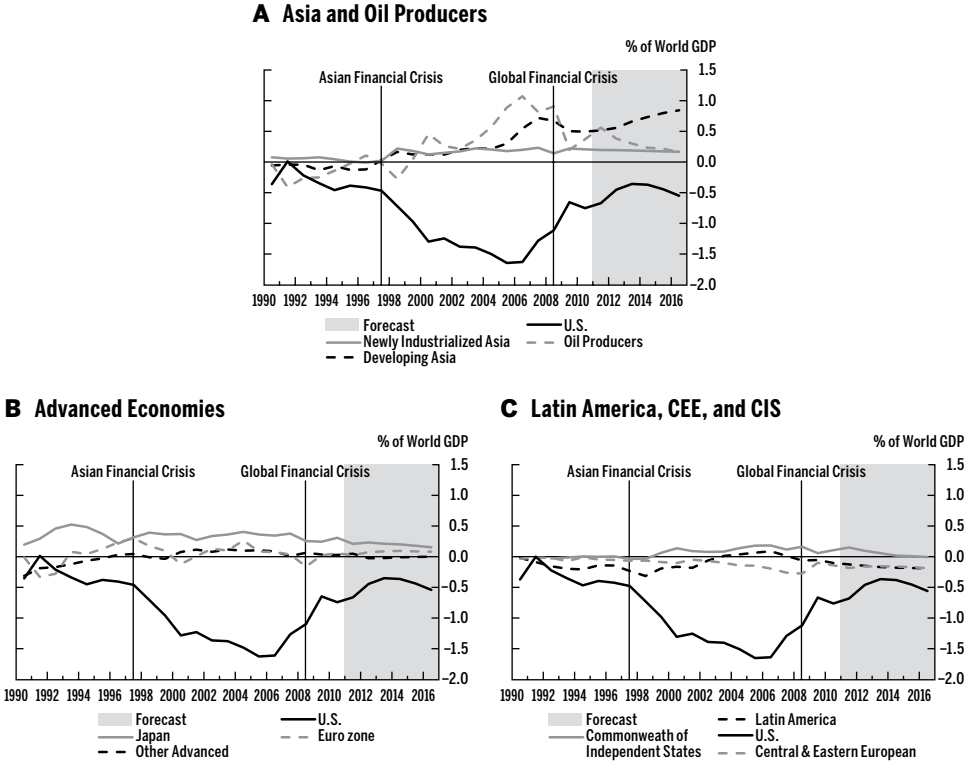
Notes: The first and last columns report the current account in the corresponding years. Other columns report the change in current account over the period considered. The sum of current account changes does not add to zero because of the statistical discrepancy between global saving and global investment.

Sources: World Economic Outlook database, October 2011, and author's calculations.

FIGURE 1

Global Imbalances, 1990–2016

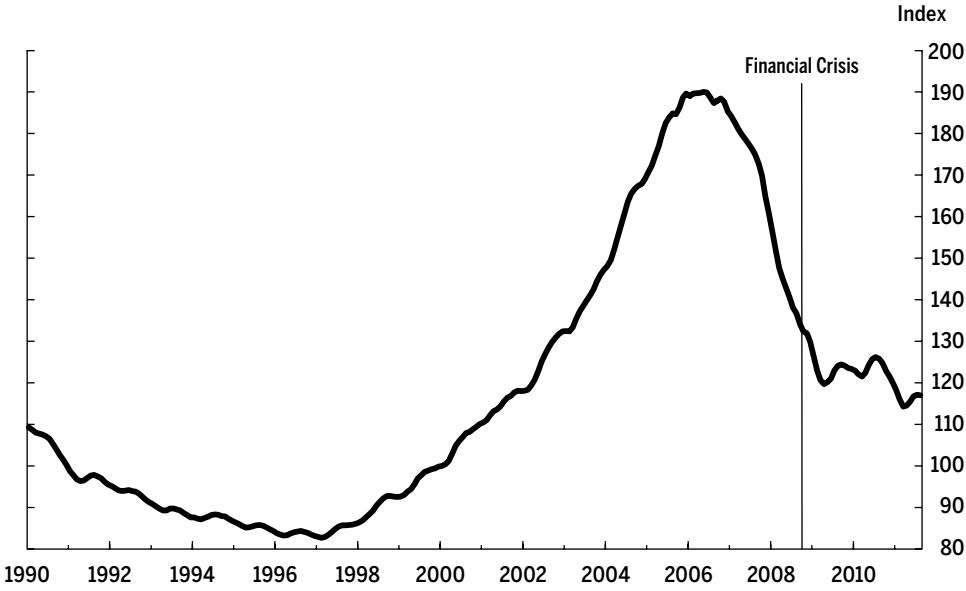
Current Account Deficits as Percent of World GDP



Source: International Monetary Fund.

of world output. As Bernanke et al. (2011) document, the resulting excess savings from these economies were recycled mostly in the form of U.S. government and agency bond purchases via official reserve accumulation. In the United States, this period corresponds to the most acute and unsustainable phase of the U.S. residential housing market bubble. Between 1996 and 2005, real U.S. housing prices increased at an annual rate of 9.6 percent according to the Case-Shiller price index (see Figure 2). By the end of 2005, the U.S. housing market was showing increasing signs of fragility, peaking in March 2006. Not coincidentally, this is also the year when the U.S. current account deficit bottomed out, at $801 billion. In fact, between 2005 and 2008, the U.S. current account improved by a sizable 0.53 percent of world output. Yet the period is also marked by increasing and ultimately unsustainable financial excesses. At the same time that the broader housing market was cooling off, the U.S. financial industry,

FIGURE 2
U.S. Real Housing Price Index, 1990–2011

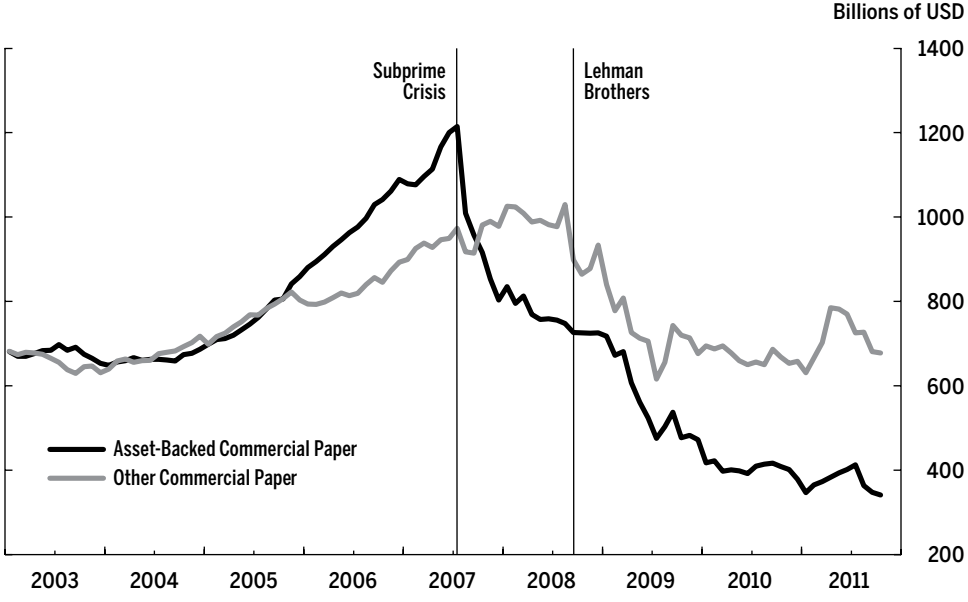


Source: Case-Shiller composite-10 Home Price Index deflated by U.S. consumer price index for all urban consumers, all items.

faced with abundant and cheap funding, embarked on an unprecedented orgy of securitization of U.S. residential mortgages. The amount of outstanding asset-backed commercial paper—the short-term funding instruments often used to acquire residential mortgage-backed securities, remained relatively constant around $500 billion between 2001 and 2005. It then started to increase dramatically, peaking at more than $1.2 trillion in July 2007 when the subprime crisis erupted, and collapsed precipitously afterward (Figure 3). As argued by Acharya and Schnabl (2010), Bernanke et al. (2011), and Shin (forthcoming), European financial institutions' appetite for U.S. structured credit products, driven in no small part by regulatory arbitrage, played a key role in the buildup and the subsequent collapse of the global financial system. This last development highlights what will be a central theme of this paper: Current account balances provide a poor guide to subsequent financial vulnerabilities. The improvement in global imbalances after 2006 occurred *despite* an increase in global liquidity misallocation that ultimately proved fatal.

The last—and ongoing—phase begins with the onset of the systemic part of the financial crisis towards the end of 2008. Since that time, the consolidation of global imbalances has continued, albeit at a more moderate pace. After an

FIGURE 3
Outstanding Commercial Paper, 2003–11

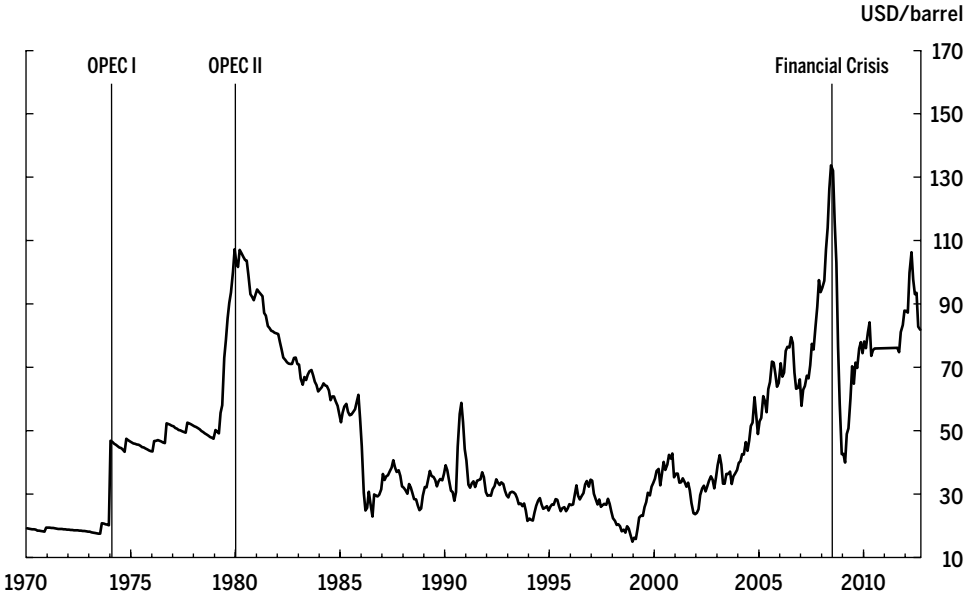


Source: Board of Governors of the Federal Reserve System.

initial sharp contraction in 2009, as world trade came to an abrupt stop, the U.S. current account deficit stabilized in 2010, around –0.75 percent of world GDP, or $471 billion. This adjustment was offset partly by a decline in China's large surpluses from 0.67 percent to 0.49 percent of world output, and a sharp decline in the surpluses of oil producing countries from 0.91 percent to 0.37 percent of world output, following the sharp decline in oil prices (see Figure 4). In Europe, 2009 marked the beginning of the euro area's sovereign debt crisis, with a significant reduction of current account deficits in many of the more indebted countries.[5] Overall, the region's current account moved from –0.22 percent of world output in 2008 to 0.06 percent in 2010.

What are the prospects going forward? I can see three main considerations. First, we have entered an age of fiscal consolidation. After years of complacent attitudes towards public-sector or quasi-public-sector borrowing, markets—or, in some countries like the United States and the United Kingdom, public sentiment—are forcing sometimes severe fiscal adjustments. The contractionary consequences of this shift cannot be underestimated. A strong body of recent evidence convincingly establishes that fiscal consolidations have severe contractionary consequences, especially when not offset by a very activist monetary

FIGURE 4
Real Price of Oil



Sources: West Texas Intermediate (USD/barrel): International Financial Statistics. Consumer Price Index: Federal Reserve Bank of St. Louis FRED database 34.

policy or a depreciation of the currency.[6] Fiscal policy has turned procyclical, and this is likely to weigh down on growth prospects in the short and medium term. At the same time, monetary policy remains resolutely expansionary in most parts of the advanced world, including the United States, Japan, the United Kingdom, or even the euro area. With many of these economies still at or close to the zero lower bound, activist monetary policy requires the use of nonconventional interventions. But the precise manner in which these nonconventional interventions shape private-sector expectations is still poorly understood or controlled, which may limit their effectiveness. Consider for instance the lack of understanding in important segments of the U.S. political spectrum as to how quantitative easing (QE1 and QE2) or central bank swap arrangements are designed to work. The political economy of these interventions complicates matters enormously in the current environment, preventing them from being as aggressive as they should be. Per se, these considerations suggest that advanced economies will continue to experience some consolidation in their current account imbalances, as envisioned by the IMF World Economic Outlook forecasts. The third consideration comes from the contrasted economic fortunes of advanced and emerging countries. Robust growth in the emerging world and

stalled recovery at best in many parts of the advanced world call for different monetary prescriptions: maintained easing in the advanced economies and gradual tightening in the emerging economies. The immediate and first-order implication is that currency prices need to adjust, contributing a further boost to the rebalancing of current account imbalances. That rebalancing is already under way, although fiercely resisted in some parts of the emerging world under the banner of "currency wars." Since traditional monetary resistance via a combination of increased interest rates to tame domestic price pressures and sterilization of net capital inflows to limit the appreciation of the currency proves eventually futile, the discussion has shifted towards the use of capital controls. The danger is that the newly discovered tolerance of the IMF towards international capital movement restrictions, however nuanced, provides too much cover for what is often an attempt to prevent some much-needed macroeconomic rebalancing. As I will discuss, by driving up the accumulation of reserves by emerging economies, this further aggravates liquidity imbalances and contributes to the ongoing fragility of the world economy.

3. Varieties of Funding Crises

From a conceptual point of view, it is well-understood that current account deficits (or surpluses) are not inherently good or bad. Modern economic theory provides many reasons why countries may optimally run large imbalances. Typical examples include the desire to smooth consumption over time, or the efficient allocation of capital across areas at different stages of economic development and with different returns to capital, or the consequences of aging populations in the advanced world. Typical examples of bad imbalances include the capital flow bonanzas described by Reinhart and Reinhart (2009) and Reinhart and Rogoff (2009), driven by fads, poor domestic regulatory oversight, or excessive public borrowing. Blanchard and Milesi-Ferretti (2011) provide a clear and concise treatment of the relevant issues. In their analysis, the authors distinguish current account deficits from surpluses, and domestic versus multilateral considerations. Their first message is that current accounts (surpluses or deficits) are bad when they result from domestic distortions, in which case it is in the interest of countries to remove the distortions and reduce imbalances, or when they inflict externalities on the rest of the world, in which case it might be of broader interest to reduce these imbalances, but not necessarily in the narrow interests of the country. A second message is that deficits and surpluses are not symmetric. While countries may face little pressure to counteract external surpluses, even good external deficits may make countries vulnerable to a sudden withdrawal of foreign capital, precipitating a crisis.

I want to focus here specifically on the connection between current account balances and these *funding crises*, in the spirit of the Calvo (1998) analysis of varieties of capital market crisis. Elements of this discussion echo earlier arguments about the *correct* definition of the surplus or deficit of the overall balance of payments.

As a preamble, write the following combination of the national income and balance of payment identities[7]

$$S - I \equiv CA \equiv PFF + ORT, \tag{1}$$

where S denotes national saving, I is domestic investment, CA is the current account, PFF represents net *private financial flows* and ORT denotes net *official reserve transactions*. According to this expression, a current account deficit ($CA < 0$) needs to be offset either by net private ($PFF < 0$) or official ($ORT < 0$) inflows.

Consider the following baseline situation.[8] There are three periods, 0, 1, and 2. A small open endowment economy with no initial external debt suffers from an unexpected decline in output in period 0, offset by increased output in period 2, but unchanged output in period 1. Two questions arise: First, how does the country's current account respond to this adverse development? Second, how is the current account financed? If financial markets were complete, in the sense that a full set of state-contingent securities could be traded before period 0 realization of income, the country could have purchased a portfolio of these state-contingent claims, ensuring it against a low realization of income in the initial period. In such a world, the current account would be largely irrelevant. The country would run a trade deficit—consuming more goods than it produces—offset by the positive net factor payments it would receive on its portfolio of state-contingent claims.[9] Unfortunately, while the notion of complete financial markets is a useful teaching and modeling concept, it is largely irrelevant when looking at the real world! Without access to full insurance, the country wants to run a current account *deficit* at time 0, to buffer the impact of the reduction in income on current consumption. The more interesting question is: *how* is this current account deficit financed?

One could imagine, for instance, that the country issues long-term debt to be repaid in period 2, when output is high. Alternatively, it could sell claims to output in period 2 (equity). Either way, this allows the country to avoid a painful decline in consumption. Moreover, by matching the maturity of the external debt (two-period) to the maturity of the income stream (also two-period), it also eliminates rollover risk.

Consider what happens instead if the country issues one-period debt in period 0. Since output is unchanged in period 1, the country wants to roll the debt over until period 2 when higher income allows it to repay international lenders. The maturity mismatch between the debt (one-period) and the repayment stream (two-period) creates the possibility of a rollover crisis, as in the classical Diamond and Dybvig (1983) analysis. Suppose that in period 1, some of the external lenders need to liquidate their position. Unless it is known that fresh funding will come in and take their place, this opens the possibility of a run on the country, i.e., a *sudden stop.*

This simple analysis can be extended in a number of directions. Consider the following alternative scenario: In period 0, the country discovers natural resources or has the option to invest in a productive project that will take two periods to mature and requires an initial investment in period 0.[10] Financing this investment via external borrowing is optimal. However, if the debt is short term, the country is again exposed to rollover risk. Foreign lenders could become less optimistic about the country's prospects. More importantly, they could also become less sanguine in their belief about how optimistic other investors are likely to be. As a result, a sudden stop could occur in period 1. This situation is what most of us have in mind when we think of the relationship between capital flows and economic development for emerging and developing countries: Capital should flow to developing countries. However, funding risks are important and therefore large current account deficits are to be viewed with caution.

As the discussion above emphasizes, the current account accurately measures the country's vulnerability only if there is a maturity mismatch between (external) liabilities and (total) assets. In that case, and ignoring official flows for the time being, we can rewrite equation (1) as

$$S - I = CA = PF_D^{st} + PPF', \tag{2}$$

where PF_D^{st} denotes net private *short-term* debt inflows and PPF' denotes other net private capital flows. In the examples described above, PPF' represents long-term debt or equity inflows. The current account deficit measures both the increase in net short-term external borrowing—which creates a vulnerability—and the long-term flows, which do not.

Adding one layer, consider the following scenario. In period 0, the country learns of a valuable *foreign* investment opportunity that requires some initial investment. As before, the investment opportunity matures in period 2, but investment needs to occur in period 0. The only difference is that the investment opportunity is foreign, not domestic. The economics are unchanged: It is

optimal to finance this opportunity with external borrowing, a maturity mismatch arises if the borrowing is short term, which exposes the country to rollover risk. The important difference is that while the country is still vulnerable, there is *no* current account deficit.[11] In case of a sudden stop, the country will have to (a) liquidate the project (possibly at a loss) before it fully matures and/or (b) cut down on domestic absorption to ensure that foreign lenders are repaid while maintaining the scale of the project. Either way, the crisis will be largely unrelated to the size and direction of the current account balance. This is a good characterization of Europe on the eve of the financial crisis. European banks funded long-term investments in the U.S. housing market through U.S. dollar wholesale money markets (Acharya and Schnabl, 2010, and Shin, forthcoming). The region's current account was largely balanced.[12] Yet it suffered drastic dollar funding crises in 2007, 2008, and again in 2011, when global European banks found themselves unable to roll over their short-term dollar liabilities. In terms of equation (2), this example means that $CA = 0$ while $PF_D^{st} < 0$ and $PPF' > 0$: The country is taking a leveraged external position, funding long-term foreign investment with short-term external debt. Beyond the European example, this example is of relevance given the rapid growth in gross international asset and liability flows and positions since the mid-1970s.[13] Gross financial flows dwarf net flows, just as gross asset and liability positions dwarf net positions.[14]

In the previous examples, funding risks could be measured by the amount of net short-term capital inflows, PF_D^{st}. It is immediate that this is an *artifact* of the assumption that the country begins in period 0 with no initial external debt. Otherwise, the correct measure of the funding risks needs to be adjusted by the stock of *maturing external liabilities*. To illustrate, suppose that the country enters a given period with gross external assets A and gross external liabilities L. The difference between A and L represents the net international investment position of the country $NA = A - L$. By analogy with the previous analysis, the country faces a rollover risk to the extent that foreigners may decide not to renew the funding on the component of L maturing at time t. This includes all short-term liabilities as well as the maturing part of longer term liabilities. Denote this component L_D^m. Imagine that the country also holds external claims and, importantly, that a component of these external claims A^l are held in *liquid* instruments. Conceptually, liquid instruments would include short-term claims that convert into cash during the period, but also the fraction of long-term claims that can be *pledged* against liquidity, for instance through outright sales or repo transactions. If the stock of liquid claims A^l exceeds outstanding maturing debt liabilities L_D^m, the country can meet the liquidity demand from foreigners by selling or pledging external assets. The resulting retrenchment

would allow the country to avoid a sudden stop. In all likelihood, the knowledge that the country holds enough claims that it is willing to liquidate to meet foreign redemptions could be sufficient to deter the sudden stop in the first place. In effect, it is as if the country has *collateralized* its external funding needs with liquid external claims. Of course, one can readily understand the role of official reserves holdings from that perspective. Importantly, neither the current account *CA*, nor the international investment position *NA* capture the correct funding risk $L_D^m - A^l$. A country could run a current account surplus (like Germany) yet face a serious funding risk ($L_D^m - A^l > 0$), or run a large current account deficit (like the United States) and be relatively immune ($L_D^m - A^l < 0$).

In reading this discussion, older hands may be reminded of the active debates occurring in the mid-1960s on the proper definition of the balance of payment surplus or deficit.[15] Because the balance of payments is a statistical statement using the double-entry accounting system, each transaction is reported twice (once as a credit, once as a debit) and there is, strictly speaking, no surplus or deficit. However, at various points in time, attempts were made to summarize the statement with a single concept of surplus or deficit, obtained by drawing a line through the accounts. The purpose of these various definitions was to obtain a measure of the liquid resources available to the United States to offset potential liquid liabilities coming due. In other words, it was precisely trying to provide a measure of *funding risks*. For instance, Walther Lederer, chief of the U.S. Department of Commerce's Balance of Payments Division in the 1960s, favored a definition of the balance of payments (sometimes called the liquidity concept) as the increase in official reserves, plus the decrease in all liquid liabilities to foreigners, specifically private short-term liabilities and U.S. government bonds and notes. While the shortcomings of this definition were widely noted, the important thing is to note that it looked at the structure of the gross flows, rather than net flows.[16] The Bernstein report, written in 1965, proposed instead to define the balance of payments as the balance on official settlements, corresponding to *ORT* in equation (1), on the ground that changes in official reserves captured the residual funding that private investors were unwilling to provide at current exchange rates, and that needed to be covered by official transactions to maintain stable exchange rates. That measure did not separate net and gross flows, but singled out official versus unofficial transactions. The various concepts were definitely colored by the constraints of the Bretton Woods system, especially the need to maintain fixed nominal exchange rates. They were also developed in an era where private financial transactions remained limited. Yet, they highlight the need to look more closely at the various components of the financial account, rather than simply the current account.[17]

The common shortcoming of all these measures was a focus on *flows*, rather than *positions*.

The previous examples can be readily extended to introduce public debt, banks, currencies, etc. Consider, for instance, a situation where a government borrows from domestic residents and promises to repay using future tax revenues. In practice, the liability side of the public-sector balance sheet always exhibits shorter maturity than the asset side, since the latter is equivalent to a perpetuity claim on future tax revenues. Therefore, governments are *naturally* vulnerable to funding crises, and a purely domestic run on government debt can occur, whereby domestic residents refuse to roll over their holdings of public debt. If the rollover crisis results in capital flight, the country is vulnerable, regardless of the current account balance. This indicates that it matters little whether the holders of public debt are domestic or foreign. What ultimately matters is the inability to roll over maturing liabilities, regardless of the jurisdiction where they are issued.[18] A similar situation arises if the borrowing is performed by domestic banks. What typically prevents self-fulfilling runs on governments or banks is the intervention of domestic monetary authorities ready to backstop vulnerable liabilities. In both cases, however, the official resources of a national central bank might not be sufficient to backstop the domestic banking or public sectors and simultaneously prevent a sudden stop on the external side. As the current situation in many European countries highlights, the distinction between private and public borrowing is often complex given the web of guaranties governments need to provide to their banking sector.[19] As Obstfeld, Shambaugh, and Taylor (2010) argued, this suggests that M2 is perhaps a more relevant concept of demandable financial liabilities that can be converted into foreign currency. But even M2 may provide an incomplete picture when financial intermediation operates through the shadow banking system. Again, the example of the euro area is illuminating on that point and suggests that we should add wholesale short-term bank funding as a potential source of *external* instability.

Funding vulnerabilities increase when liabilities are funded with short-term debt instruments. This begs the question: Why don't countries rely less on short-term debt and more on long-term funding or equity? As Rogoff (2011) aptly observed, reducing the reliance on debt and increasing that on equity-like instruments would likely make the international financial system much more resilient. Abstracting from possible tax or policy-induced distortions, the answer lies with the informational frictions and asymmetries that shape financial transactions.[20] Consider that every financial transaction involves potential adverse selection. Sellers of a risky claim to future income often possess superior

information than buyers. This adverse selection potentially reduces financial trade and efficiency, and in the limit can trigger a collapse in the market. As Dang, Gorton, and Holmström (2010) showed, debt instruments may be optimal because they are least *information-sensitive*. Information-insensitive assets—i.e., assets whose payoff is relatively unaffected by new information—are useful precisely because they mitigate the potential for adverse selection. Debt instruments are more information-insensitive because they offer a constant payoff, as long as default events remain remote. As Holmström (2008) argued, the safer the debt, the less information is needed for markets to operate and the smaller the scope for adverse selection. But debt does not alway remain information-insensitive. If the assets backing the debt fall, or the net worth of the borrower declines, there comes a point where default events become more likely. At that point, debt instruments do become information-sensitive and lenders need to assess the quality of their investments and the extent of counterparty risk. This increase in counterparty risk, by reintroducing the potential for adverse selection, can lead to a market shutdown. Debt both increases trade—which otherwise may not take place at all—and also increases vulnerability to crises. Doesn't that mean that countries should issue long-term debt, rather than short-term? The answer is, not necessarily. First, short-term debt plays a disciplining role for borrowers. Jeanne (2009) provided a clean analysis of this point in a model where borrowers can divert part of the resources borrowed (through reduced efforts or otherwise). Short-term debt, precisely because it allows lenders to walk out, disciplines borrowers. At the same time, it makes the economy more vulnerable to aggregate shocks. This suggests that countries with poor fundamentals or weak domestic institutions may have little choice but to issue short-term debt. A second argument can be made in terms of liquidity provision, following the classic analysis of Diamond and Dybvig (1983). By issuing demandable deposit-type instruments, such as short-term debt, borrowers are providing insurance to lenders against liquidity shocks. A panic-based equilibrium may also occur as the belief that lenders will not roll over short-term loans is self-fulfilling. In the world with moral hazard of Jeanne (2009), the possibility of a run is essential to discipline borrowers. Instead, in Diamond and Dybvig (1983), runs are an inefficient byproduct. Because international liquidity is valuable, this suggests that countries with strong fundamentals and little likelihood of runs would become net liquidity providers. In practice, this liquidity provision is a defining feature of reserve asset countries.[21] The upshot of this analysis is that short-term debt contracts play a critical role in domestic and international transactions, for countries both with strong or weak balance sheets, and monitoring the risks involved should be a priority.

4. Global Liquidity Imbalances

If the current account is not an accurate measure of funding risks, what is? The previous discussion indicates that one should focus also on *global liquidity imbalances*, that is, the mismatch between maturing liabilities and pledgeable assets. This suggests looking at a *liquidity-coverage ratio* (LCR), defined as the ratio of the stock of pledgeable claims to maximum short-term funding outlays:[22]

$$LCR = \frac{A^l}{L_D^m}. \tag{3}$$

Unfortunately, an accurate measure of either the numerator or the denominator of this ratio is likely to be exceedingly difficult to obtain. First, the pledgeability of external claims is market-determined. Consider for instance the "haircut" that an asset receives in a repo transaction.[23] With a zero haircut, the full market value of the asset can be pledged against cash. An increase in haircut—as will happen if lenders develop doubts about the safety of their counterparties, for instance—reduces the market value of pledgeable claims A^l, increasing the possibility of rollover risk and market freezes.[24] From that perspective, it is also likely that domestic currency assets may lose their value precisely in times of stress because of uncertainties about the future value of the currency. In that case, the haircut applied to domestic collateral in exchange for international currencies is likely to increase significantly. This suggests that the relevant assets to be considered are high-quality, *safe* assets denominated in international currencies, whose market value and pledgeability remain stable, even during episodes of severe stress. This endogeneity is critical to understand how patterns of global liquidity have shifted in recent years.

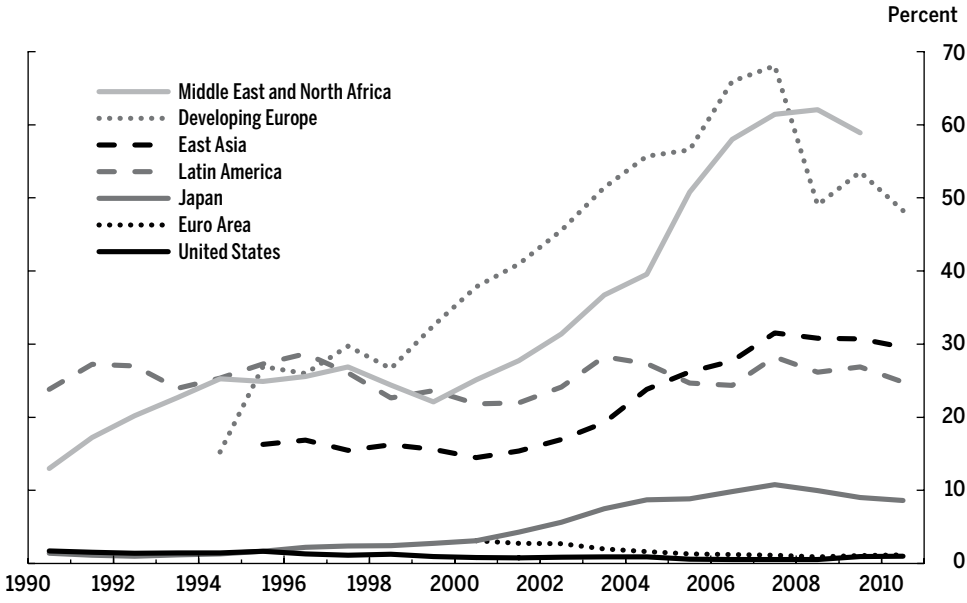
Second, the market value of short-term external liabilities is also not accurately observed. The relevant measure of maturing financial liabilities that could be converted into foreign currency may be closer to M2 or even broader aggregates, than to gross short-term external debt liabilities.[25] Last, a nontrivial difficulty arises from the fact that even if assets are pledgeable and liabilities are measured accurately, this approach assumes that the legal entity—a bank or government—that issued the short-term liabilities also controls the liquid assets so that one can offset the other. For some transactions, especially collateralized ones such as repo transactions or collateralized loans, this is accurate. But it is worth keeping in mind that this netting is far from automatic and in many instances who controls the assets and who issued the liabilities are different legal entities, with different incentives, in which case liquid external claims cannot be considered as an offset for short-term gross liabilities.[26,27]

From a policy point of view, an important distinction is that between public and private liquidity. Public liquidity consists of cash-like or pledgeable public instruments. It includes the reserves held in central banks by financial institutions (a component of high-powered money) but also the outstanding amounts of safe government or agency securities insofar as they serve as a secure store of value. Private liquidity is typically much larger. While it traditionally arises from the demandable deposits issued by the banking sector, it also includes money market fund deposits as well as all private-label safe assets issued by the financial sector.[28] As discussed earlier, the pledgeability of many of the private-label assets is determined endogenously. In the absence of counterparty risk, assets have a high pledgeable value, which implies that liquidity is high. This abundant liquidity allows investors to bid up asset prices, which means counterparty risk is low. Instead, when counterpary risk is high, liquidity is reduced, which brings down asset prices, and increases counterparty risk.

The sudden disappearance of *private* liquidity due to a market freeze, what Caballero (2010) called a "sudden financial arrest," requires a massive injection of *public* liquidity to offset fire sales and deleveraging spirals. In the international context, an important twist comes from the fact that economic agents often need liquidity in foreign currency. To prevent a sudden stop, authorities need access to international means of payments that they can channel to domestic firms and financial institutions. This means that the question of the *international* provision of liquidity becomes first order.

As an illustration, Figure 5 reports the ratio of total reserves (minus gold) to M2 between 1990 and 2010 for the United States, the euro area, and Japan, as well as various groups of developing countries. This is a rather conservative ratio since it takes a narrow view of the pledgeable external assets (total non-gold reserves) and a rather extended definition of maturing liabilities, equated with demandable domestic deposits.[29] Figure 5 reveals a number of interesting patterns. First, the ratio increased tremendously for all groups of emerging countries, from an average of 23 percent in 1995 to 42 percent in 2009. Next, we observe a similar increase in Japan, from 1 percent in 1990 to 8.6 percent in 2010. By contrast, the ratio of reserves to M2 for both the United States and the euro area remained much lower, around 1 to 3 percent. But the similarity in the coverage ratio of the two regions masks a fundamental asymmetry. With the U.S. dollar still the uncontested reserve currency, the Federal Reserve does not need to hold large amounts of foreign reserves to provide liquidity to its domestic banking system. By contrast, the large foreign currency funding needs of the European banking system require ready access to potentially large amounts of international currencies. With such a low coverage ratio, the euro area suffers

FIGURE 5
Example of Liquidity Coverage Ratio
Total Reserves minus Gold/M2



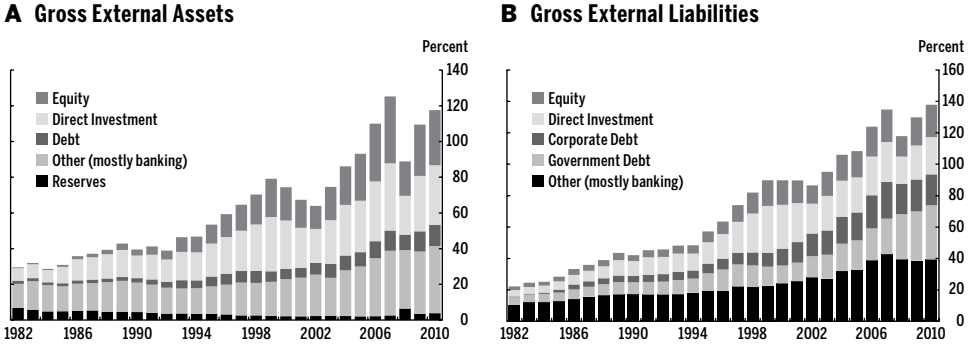
Source: World Development Indicators.

from a fundamental weakness. It is therefore important to understand the ways in which these global liquidity imbalances have built and evolved over time.

4.1. Global Liquidity Sources and Sinks

The first observation comes from looking at the structure of the external position of various countries. Figure 6 reports the breakdown of gross assets and liability positions for the United States since 1970. As is well-known, in the aggregate, the United States exhibits an asymmetric external balance sheet, investing in foreign equity and direct investment and issuing debt liabilities, where much of these liabilities take the form of government liabilities. In the words of Kindleberger (1965), the United States is a global liquidity provider.[30] Writing in the mid-1960s, Kindleberger argued that this was a natural specialization since the United States had more developed financial markets that allowed it to provide maturity transformation services to the rest of the world. The rest of the world at the time consisted mostly of Europe: Most of the U.S. external claims were long-term dollar bank loans to or direct investment in Europe, while most of the external liabilities consisted of European

FIGURE 6
U.S. Gross External Assets and Liabilities
as a percent of U.S. GDP, 1982–2010



Source: Bureau of Economic Analysis.

bank deposits in New York or purchases of U.S. government securities. In other words, the United States was a liquidity source and Europe was a liquidity sink.

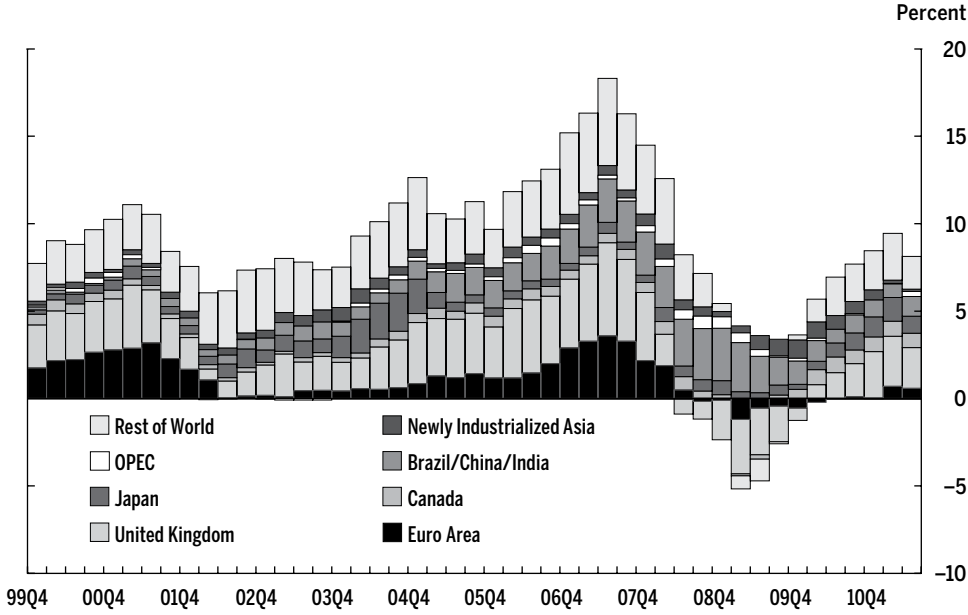
Things have changed significantly since the 1970s. While the United States is still a net liquidity source, a number of studies recently established that Europe, too, became a net liquidity provider, especially to the United States, through the cross-border activities of its global banks.[31] More specifically, European banks used their access to U.S. dollar wholesale funding markets to finance a significant share of their investment activities in the United States—notably in the U.S. housing market—and abroad. For instance, Figure 7 reports U.S. gross capital inflows and outflows by region since 1999. It is immediate, as Borio and Disyatat (2011) noted, that a substantial share of the gross inflows into the United States were coming from Europe and not from the high-saving emerging countries. Between 2002 and 2007, gross inflows from the United Kingdom and the euro area represented more than half of both gross inflows (panel A). A substantial share of the gross capital outflows was also going to Europe (panel B). If these flows had been matched in terms of maturity, this would not have created any significant funding risk for European banks. This was not the case. As Bernanke et al. (2011) showed, a substantial share of the gross inflows went into the acquisition of securitized U.S. residential assets. Many of these assets were considered low risk, or private-label safe assets. Figure 8, panel A, reproduced from their work, shows that between 2003 and the first semester of 2007, Europeans increased mostly their holdings of these private-label AAA-rated securities. By contrast, high-saving emerging and oil producing countries (labeled GSG, or global saving glut in this figure) invested

FIGURE 7

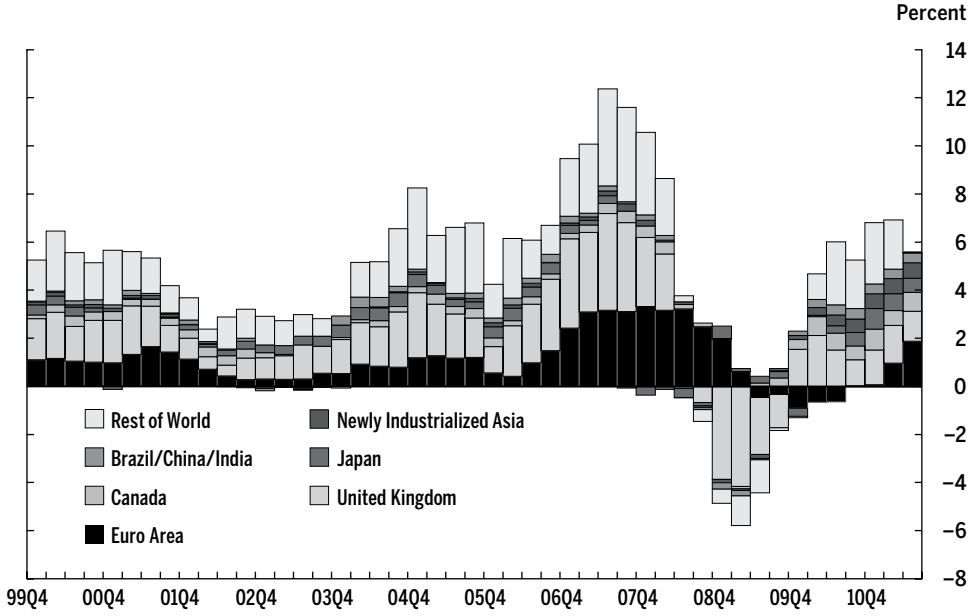
U.S. Gross Capital Flows by Region

as a percent of U.S. GDP, 1999–2011

A Gross Capital Inflows



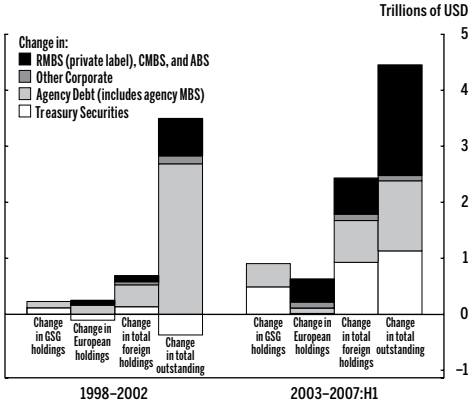
B Gross Capital Outflows



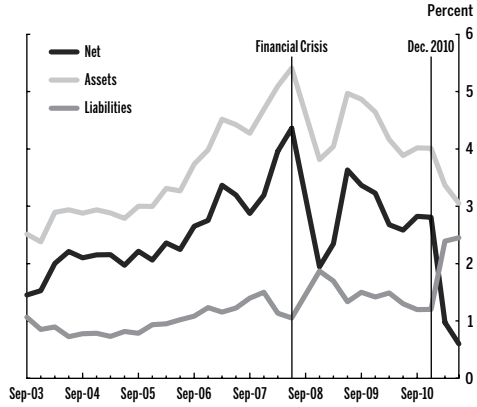
Source: Bureau of Economic Analysis.

FIGURE 8
European Banking Liquidity

A Inflows to AAA-rated Securities, 2003–07



B Interoffice Assets and Liabilities of U.S. Foreign Bank Subsidiaries and Branches, 2003–11
Percent of U.S. GDP



Source: Panel A: Bernanke et al. (2011); panel B: Board of Governors of the Federal Reserve System.

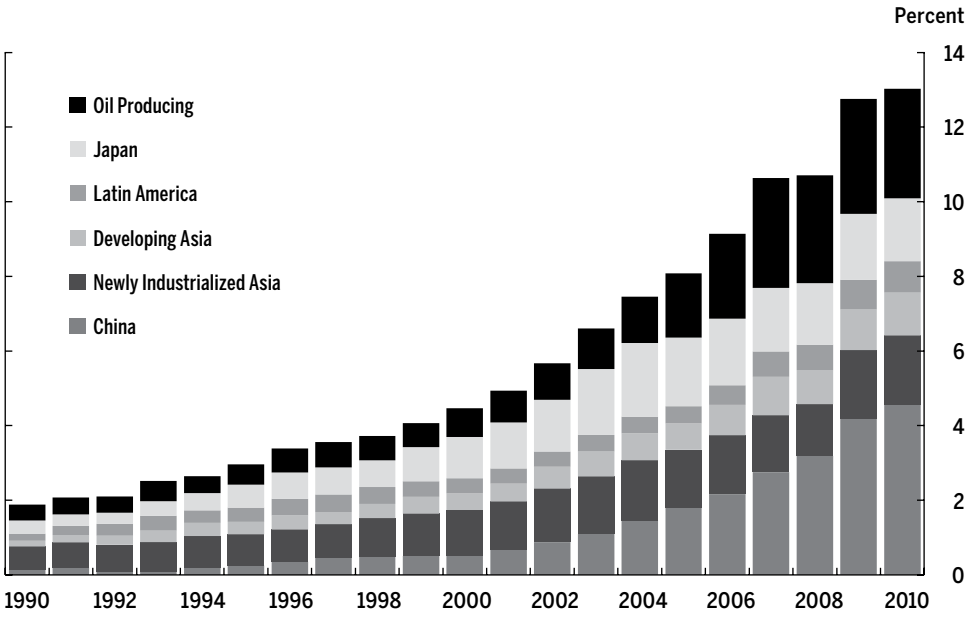
primarily into U.S. Treasuries and agency debt. European banks funded themselves in part using asset-backed commercial paper (ABCP) conduits (see Figure 3). According to Acharya and Schnabl (2010, Table 2), out of $1.235 trillion outstanding ABCPs in January 2007, only 40 percent had a U.S. sponsor, with Germany and the United Kingdom sponsoring 53 percent of the rest.[32] Because the conduits included a guarantee from the sponsor bank, European financial institutions were in fact exposed to a significant degree of liquidity mismatch. In other words, Europe had become a source of liquidity too.[33]

In addition to their funding activity in the United States, European banks also used the dollar market as a funding market for their lending activities worldwide. Panel B of Figure 8 follows Shin (forthcoming) and reports the gross and net interoffice position of the branches and subsidiaries of foreign banks in the United States as a fraction of U.S. GDP. Starting in 2000, the gross interoffice asset position became positive, increasing rapidly to about 5 percent of U.S. output by the end of 2007. While a breakdown by nationality of the parent bank is not available, most of this net funding activity was likely concentrated with European banks. While some of these funds were re-intermediated back into the United States directly by the parent bank, it also served to fund the dollar lending activities of European banks worldwide. Another confirming piece of evidence provided by Shin (forthcoming) comes from the Federal Reserve's

disclosure on its liquidity support operations under the Term Auction Facility. The subsidiaries of European banks were prominent users of this facility, indicating difficulties in channeling private U.S. dollar funding to their headquarters. Extensive use of this liquidity facility explains why, in panel B of Figure 8, net interoffice positions rebounded so quickly in 2009. Public provision of dollar liquidity from the Federal Reserve played a critical role in maintaining safe levels of dollar funding for foreign financial institutions.

If both the United States and Europe have become *liquidity sources*, then the rest of the world must be a *liquidity sink*. This is particularly the case of the EMEs and commodity producing countries holding vast amounts of liquid assets. As Bernanke et al. (2011) have shown, this is precisely where most of the demand for U.S. Treasuries and agencies originated, especially in the form of official reserve accumulation. Figure 9 reports the official reserve holdings of various countries and groups of countries as a fraction of world output.[34] What is remarkable from this graph is the absence of structural break when the financial crisis erupts. If anything, official reserve accumulation simply marked a

FIGURE 9
Official Reserve Holdings
percent of world GDP



Source: Lane and Milesi-Ferretti (2007), updated External Wealth of Nations database.

one-year pause before resuming its upward trend. As of 2010, the reserve accumulation of these countries exceeded 12 percent of world GDP, up from around 2 percent in 1990.[35]

This global pattern of liquidity provision is consistent with theories that emphasize the lack of financial development in the emerging world relative to their economic growth. In models such as Gourinchas, Rey, and Govillot (2010) or Mendoza, Quadrini, and Rios-Rull (2009), rapidly growing but financially underdeveloped emerging economies seek safe stores of value abroad. Because of their limited financial development, these countries find it preferable to invest in the relative safety of developed countries' government bonds. This accumulation is also consistent with the growing body of work that finds that reserves can play a significant role in reducing the likelihood of crisis.[36]

Nevertheless, it raises a number of important and yet unanswered questions: What is the optimal level of reserve holdings that emerging economies should reasonably aim for? More importantly, in a world where the very notion of a safe asset is increasingly being challenged and the pool of safe assets—a category that not so long ago included private-label assets as well as most European sovereign debt outstanding—is shrinking, what is the optimal diversification strategy? Clearly, the demand for liquid and stable stores of value from emerging economies is still growing robustly. The supply, on the other hand, is dwindling rapidly. This global liquidity imbalance is, in my view, far more serious than the usual global imbalance.

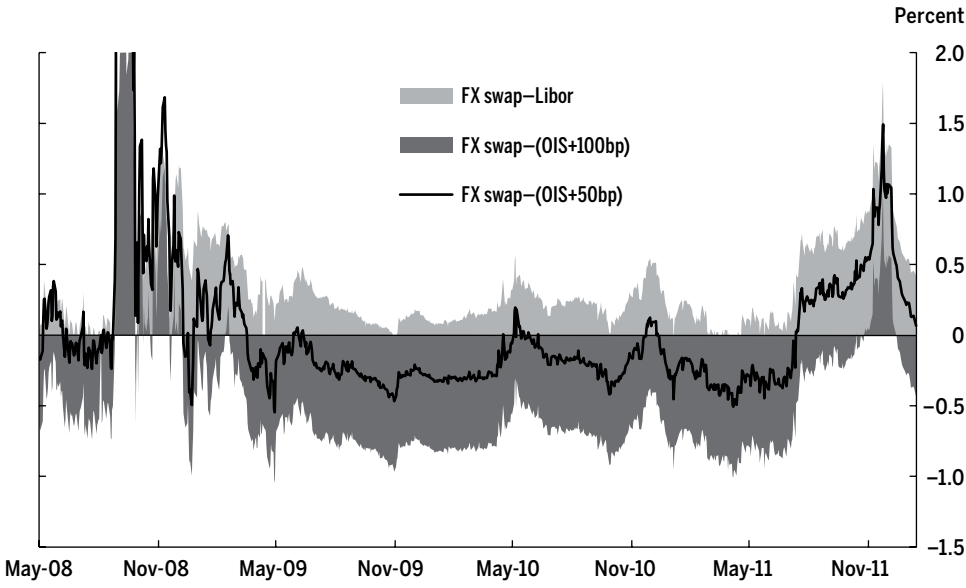
4.2. From Banking Glut to Banking Drought: The Consequences of the Euro-Area Crisis

Inspecting Figure 8, panel B reveals a worrying deterioration in the interoffice net position of foreign bank branches and subsidiaries in the United States. From December 2010 to March 2011, the net interoffice position dropped from 2.81 percent of U.S. output to 0.97 percent. This decline comes from a sharp decline in the gross claims on headquarters (from 4.01 to 3.36 percent of output), as well as a large increase in claims from headquarters (from 1.20 to 2.39 percent). The likely cause, in an eerie reoccurrence of the 2008 crisis, is the sudden decline in private dollar funding available to European banks as the European sovereign debt crisis worsened. This time, however, the associated liquidity squeeze has not been offset by a surge of public liquidity from the Federal Reserve. Instead, in August 2011, the Federal Reserve Bank of New York announced that it was stepping up its surveillance, requiring that U.S. units of European banks maintain sufficient access to liquidity.

European banks with short-term dollar liabilities and no access to the wholesale U.S. dollar markets can fund themselves in one of three ways. First, they can obtain U.S. dollars from the Federal Reserve discount window. Alternatively, they can obtain U.S. dollars from the European Central Bank (ECB) by tapping the ECB-Fed swap line that was reactivated in May 2010 and renewed since. Borrowing at the Federal Reserve's discount window is seen by the market as a sign of impending collapse and therefore rarely used, if at all. It is also not encouraged by the Fed. Borrowing dollars at the ECB was penalized until recently with a 100 basis point premium over the corresponding Fed rate, and therefore somewhat discouraged as well.[37] As a result, both liquidity facilities have remained largely dormant.[38] The last option consists of borrowing euros swapped into dollars. Yet, as Figure 10 indicates, the dollar-euro swap market is again showing intense signs of stress. The top line in that figure reports the deviation from covered interest rate parity at the one-month horizon. Specifically, it reports the spread between borrowing euros swapped into U.S. dollars,

FIGURE 10

Top part: **Deviation of the Euro/USD Swap-induced Dollar Rate from LIBOR (1-Month) in Percent**
Bottom part: **Difference between Euro/USD Swap-induced Dollar Rate and Overnight Interbank Swap plus 100bp Penalty (1-month)**



Source: MorganMarkets.

and the LIBOR rate. The deviation from covered interest parity jumped dramatically from less than 10 basis points in July 2011 to 90 basis points by the end of November of that year. This is a level not reached since early 2009. The bottom line reports the spread between the foreign-exchange swap euro-dollar rate and the cost of borrowing dollars at the ECB dollar window under the central bank swap line, at a rate roughly equal to the one-month overnight interest swap (OIS) plus a penalty (100 or 50 basis points). As long as this spread is negative, it is not profitable to tap the central bank swap line. Once this line becomes positive, the stress in the wholesale market reaches a level such that the central bank swap lines will be activated. As is clear from Figure 10, this point was reached on November 15, 2011. The subsequent reduction in the penalty from 100 to 50 basis points by the Federal Reserve a week later also helped make the swap lines significantly more attractive.

The intensity of the cutback on interoffice net claims (2.2 percent of U.S. output in six months) and the jump in dollar funding for euro-area banks illustrate the severity of the banking crisis that European countries faced toward the end of 2011.[39]

In an effort to strengthen bank balance sheets and reduce counterparty risks, in September 2011, European regulators instructed banks to reach Tier-1 capital ratios of 9 percent by June 2012, representing an additional 106 billion euros in fresh capital. Faced with increased capital requirements, an increase in wholesale funding costs, and depressed valuations, European banks tried desperately instead to reduce their leverage by shrinking their balance sheets.[40] Unsurprisingly, the result was a fire sale of epic proportions.

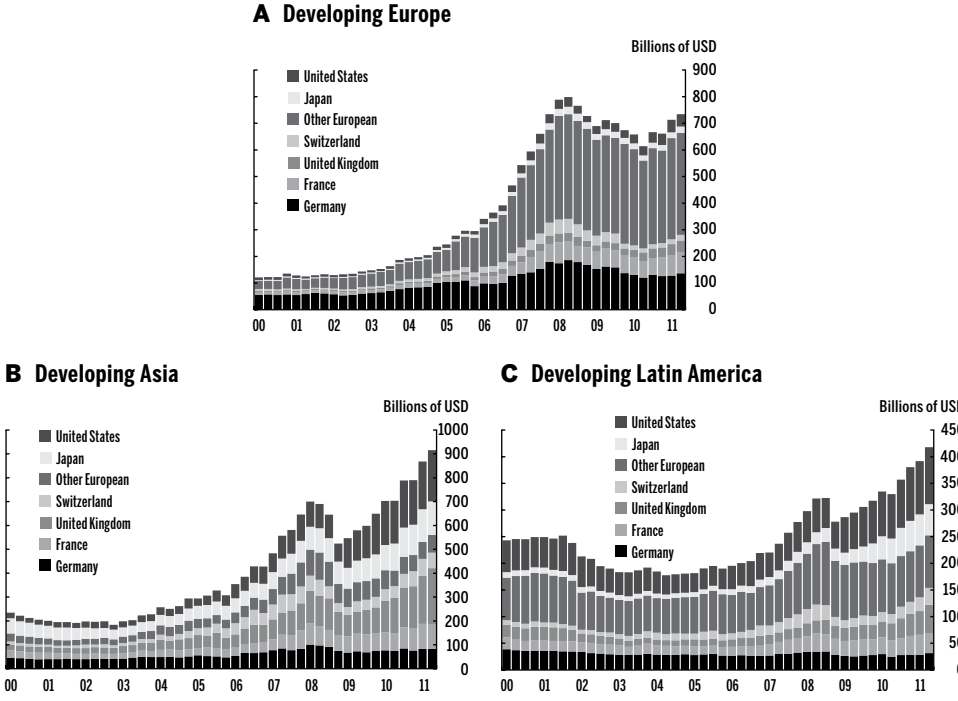
The consequences of this phase of the crisis, possibly the most dangerous so far, are likely to be felt far and wide, especially in emerging market economies. First, this liquidity crunch is the third 180-degree gyration in capital flows to EMEs since 2008. The first reversal occurred in 2008, at the onset of the crisis as investors worldwide liquidated their cross-border risky positions and flew to safety. This retrenchment triggered a massive sudden stop in many emerging market economies. Yet, the impact on EMEs was relatively short-lived, and a strong rebound occurred in 2009. The second reversal came with the continued easing of monetary conditions in advanced economies, especially the Federal Reserve's renewed efforts at quantitative easing (QE2) in November 2010 with a $600 billion expansion until June 2011. That move, roundly criticized by many emerging market economies, rekindled gross capital flows to emerging market economies.

We are now likely to enter a third reversal, with the deleveraging of the European banking system again reducing global liquidity worldwide. In particular, it

is safe to assume that European banks will attempt to separate primarily from noncore assets. This implies, in particular, a reassessment of lending activity to non-Europearn countries. One would expect EMEs with active intermediation activities from European banks to be especially vulnerable.[41]

We can get a glimpse of the exposure of emerging market economies to European banks from the Bank for International Settlements (BIS) consolidated banking data. Figure 11 reports the geographic composition of international claims by emerging market destination and reporting bank origins. The data indicate that the overall exposure is large in all destinations. It is especially important in developing Europe, where most of the international claims come from European banks ($700 billion), but it is also high in developing Asia ($500 billion) and Latin America ($250 billion). Of the three groups, developing Europe is the most vulnerable since the outstanding international claims represent a quarter of the region's GDP. By contrast, developing Asia is perhaps

FIGURE 11
Foreign Claims of Reporting Banks in Developing Countries, by Region



Source: International Monetary Fund.

least vulnerable, with an exposure of 2.7 percent of GDP, given the large stock of official reserves at its disposal and the relative strength of its fundamentals.

5. Conclusion

This paper begins with a general overview of the evolution of global imbalances. While current account balances can be symptomatic of more serious illnesses, I argue that the focus should be instead on *global liquidity imbalances*. Liquidity imbalances measure the gap between maturing external liabilities (short term and otherwise) and the pledgeable value of external assets. Accurately measuring these global liquidity imbalances is a difficult but essential task, upon which global regulators at the BIS and the IMF have now embarked. Liquidity is an endogenous characteristic, and many liquid assets can be fair-weather friends. Unlike the pattern of global imbalances that has stabilized, if not disappeared, global liquidity imbalances are rapidly shifting, with the ongoing efforts at balance sheet consolidation in the euro-area banking sector. But these efforts carry their own risks. Looking ahead, one can imagine a number of policy responses to strengthen the international financial system and reduce the impact of liquidity imbalances. These range from the obvious (better data collection efforts to monitor global liquidity cycles) to the more ambitious (systematic use of central bank swap lines and multilateral provision of liquidity under IMF supervision). The central objective remains how to evolve from an international monetary system where financial intermediation takes place across borders but liquidity provision remains national, to a system where liquidity can be provided on a sufficient scale in times of global financial stress.

APPENDIX

Current Account Balances and Rollover Risk

Consider the following baseline situation. A small open economy lasts for three periods, $t = 0, 1, 2$. There is no initial external position, and income in each period is y_t. Preferences are defined over consumption streams according to $U = E_0\left[\sum_{t=0}^{2} \beta^t u(c_t)\right]$ where $\beta \leq 1$ is the discount factor. The world interest rate r is assumed constant and equal to $1/\beta - 1$. In period 0, the economy suffers an income shock, offset by a change in output in period 2, but unchanged income in period 1. Formally, $y_0 + \beta\bar{y} + \beta^2 y_2 = (1 + \beta + \beta^2)\bar{y}$ so that the permanent income remains unchanged and equal to $\bar{y}$. Manipulating this condition, the change in output in period 0 is related to the change in period 2 income according to $y_0 - \bar{y} = \beta^2(\bar{y} - y_2)$.

Complete Markets

Assume now that there are complete markets. Specifically, assume that there exists a set of state-contingent securities spanning the states of nature. These markets are opened before period 0, that is, before the realization of the initial period income y_0. Denote s_t a possible state of nature in period t, and $s^t = (s_0, \ldots, s_t)$ the history up to period t. Denote also $\pi(s^t)$ the probability of history s^t being realized. Write $q(s^t)$ the price of a state-contingent security that pays one unit of income in period t when history s^t is realized. The agent chooses consumption $c_t(s^t)$ so that $\pi(s^t)\beta^t u'(c_t(s^t)) = \lambda q(s^t)$ where λ is the strictly positive Lagrange multiplier on the budget constraint $\sum_{t,s^t} q(s^t)(y_t(s^t) - c_t(s^t)) \geq 0$. Assume further that country risk is perfectly diversifiable, that is, $q(s^t) = \beta^t \pi(s^t)$.

Under these assumptions, consumption is constant and satisfies $c = (1 + \beta + \beta^2)^{-1}(E[y_0] + \beta\bar{y} + \beta^2 E[y_2]) = \bar{y}$ and the portfolio of state-contingent assets satisfies $b(s^t) = \bar{y} - y(s^t)$. In other words, in each period, the current account, defined as the trade balance plus the net factor payment on the cross-border portfolio, is equal to zero.

Incomplete Markets

Assume now that markets are incomplete. Specifically, suppose the only available asset is either a two-period risk free bond, or a one-period risk free bond. Under either scenario, the country will want to run a current account deficit if income in period 0 is lower than $\bar{y}$. One can show that consumption will still be equal to $\bar{y}$. Consequently, the current account in period 0 is simply $CA_0 = y_0 - \bar{y} < 0$. The interesting question is how this current account deficit is financed.

Two-period bond

Suppose that the country can issue two-period bonds at time $t = 0$. Denote d_0 the amount of two-period debt issued. Then, $d_0 = \bar{y} - y_0$ is issued in period 0 and $\beta^2 d_0$ is repaid in period 2. Importantly, in period 1, the country does not need to go to the financial markets since $c_1 = y_1 = \bar{y}$.

One-period bond and rollover risk

Consider now what happens if the country issues instead one-period debt in the amount b_0. Under the optimal consumption plan, an amount $b_0 = \bar{y} - y_0$ needs to be issued in the initial period. This one-period debt matures in period 1 and needs to be rolled over. The amount of the rollover is $b_1 = \beta b_0 = \beta(\bar{y} - y_0)$. Importantly, while there are enough resources to fund consumption at time 1, the country still needs to go to the market to roll over b_1.

Financing Investment

Suppose now that the country can invest an amount I in a project. The project takes two periods to mature. In the absence of investment, income is $\bar{y}$ in all periods. With investment, the project returns an income R in period 2. For simplicity, assume that $R = \beta^2 I$ so that the return on the project is equal to the world interest rate. The analysis is then identical to the previous case. Assuming that it is valuable to fund the project (this is true at the margin), the country will want to fund the project via external borrowing to smooth consumption. It may face a rollover risk if the debt is short term, since the project is long term. It does not matter whether the project is domestic or foreign, although recorded current accounts would differ. To see this more clearly, observe that in the case where the project is foreign, the country borrows I at time 0 and invests I in the project. While net debt and the current account CA_0 remain equal to 0, the country has become vulnerable to a rollover crisis because of the maturity mismatch between gross external assets (two-period) and gross external liabilities (one-period).

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NOTES

1 Greece, Portugal, and Ireland at the time of this writing.

2 Looking at the short-term impact of the crisis for emerging market economies, Blanchard, Faruqee, and Das (2010) failed to find a strong and significant relation between external deficits and the severity of the crisis. Similarly, Gourinchas and Obstfeld (2012) did not find support for the claim that external balances are significant precursors of crises, whether for advanced or emerging economies. Jordà, Schularick, and Taylor (2011) studied 14 developed countries over 140 years and also found a limited role for external balances in predicting subsequent crises. Frankel and Saravelos (2010) surveyed a large number of earlier studies on crisis prediction. In their analysis too, current accounts fail to appear as consistent predictors of crisis.

3 See also Obstfeld and Rogoff (2010) for a largely consistent analysis.

4 The sum of current account changes in Table 1 does not sum to zero because of the discrepancy between global saving and investment. As Obstfeld and Rogoff (2010) observed, the historical "missing surplus" (i.e., excess of global investment over global saving) disappeared after 2004, replaced by a "missing deficit" of roughly equal proportions, about 0.5 percent of world output.

5 Greece, Ireland, Slovenia, and Spain each reduced their current account deficits by at least 4 percent of their output between 2008 and 2010.

6 See Guajardo, Leigh, and Pescatori (2010).

7 This expression uses the new set of conventions adopted in the IMF's (2009) 6th edition of the Balance of Payments Manual. Purchases (sales) of foreign assets enter positively (negatively). Unless otherwise noted, I ignore the capital account and the statistical discrepancy.

8 The appendix provides a simple formalization of the discussion that follows.

9 In an endowment economy, the current account would be identically equal to zero after the period when state-contingent claims are traded.

10 Of course, the two scenarios are economically very similar. They only differ insofar as the proceeds from external borrowing go towards consumption in one case and investment in the other. In practice, the distinction is not clear-cut, and one would expect shocks that affect production possibilities to also influence consumption choices, but I abstract from this effect here and work under the veil of the Fisherian separation.

11 Strictly speaking, this is true in the limit case where the return on the investment equals the world interest rate. Otherwise the increase in net resources brought about by the project leads to an increase in consumption and a current account deficit.

12 The European Union current account deficit fluctuated between –1 and 0.5 percent of output between 2000 and 2010.

13 See Obstfeld (2011) for a recent discussion. See also Forbes and Warnock (2011) for an analysis of extreme gross vs. net financial flow movements.

14 The rapid increase in gross cross-border positions has also been accompanied by a decrease in the correlation between current account and changes in net asset positions, due to the growing importance of valuation effects that are not recorded in the current account (Gourinchas 2008). I agree with Obstfeld (2011, 2012) that these valuation effects cannot be counted on—theoretically, or empirically—to provide a permanent "manna from heaven" relaxing the external borrowing constraint. Yet from year to year, their contribution can more than offset a given current account surplus or deficit.

15 See Cooper (1966) and Kindleberger (1965) for a summary.

16 This definition suffers a number of drawbacks. For instance, it treats short-term claims and liabilities asymmetrically so that all countries can simultaneously record a surplus (or a deficit). Further, it assumes that short-term external claims of U.S. residents cannot be used to offset a sudden funding gap.

17 Along the same lines, in a recent paper, Forbes and Warnock (2011) look at extreme movements in gross capital flows, rather than the current account, to characterize episodes of capital surge, stop, flight, and retrenchment.

18 Of course, the jurisdiction of issuance matters a lot for the resolution of funding crises.

19 The difficulties are compounded in the case of the euro area since national central banks cannot play the role of residual buyers of either bank or government liabilities when faced with a liquidity crisis. The belated realization by the markets that the euro area lacked such a mechanism plays an important role in the current crisis.

20 For early contributions emphasizing the role of asymmetric information in financial crises, see Mishkin (1991, 1999).

21 See Gourinchas, Rey, and Govillot (2010) for evidence on the United States.

22 Under Basel III's liquidity rules, banks will need to maintain a Liquidity Coverage Ratio, defined as the ratio of the stock of high-quality liquid assets to total net cash outflows over a 30-day period, in excess of 100 percent. Banks will also need to maintain a Net Stable Funding Ratio, defined as the ratio of available long-term funding to a weighted measure of long-term asset holdings. In the context of this paper, the two concepts are interchangeable.

23 In a repo transaction, the owner of an asset with face value 100 and a haircut h can obtain $100(1–h)$ in cash.

24 See Gorton and Metrick (2012) for a discussion of the 2007 run on the repo market and Acharya, Gale, and Yorulmazer (2011) for a model of rollover risk and market freezes.

25 This explains why measures such as the Greenspan-Guidotti ratio of official reserves to short-term external debt may also fail to capture the true vulnerability of an economy.

26 For instance, a bank may borrow externally and make a loan to a domestic corporation that invests overseas in a subsidiary. If the bank faces a run, it is only holding a claim on the domestic firm, not on the foreign subsidiary.

27 This measure of liquidity imbalance is related to the cross-currency funding gaps advocated by McGuire and von Peter (2009). The latter decomposes liquidity imbalances by currency. This is an important distinction insofar as it is in theory easier for monetary authorities to deal with liquidity imbalances in their domestic currency. The Bank for International Settlements (BIS), the IMF, and the Committee on the Global Financial System have also recently focused on the issue of global liquidity, as part of a G-20 subgroup working on global liquidity management (see BIS 2011). While acknowledging important data and conceptual issues in measuring "global liquidity," this working group proposes constructing indicators from data on quantities (cross-border credit, core, and noncore deposits) as well as prices (spreads) and tracking both over time and across countries.

28 In principle, some of these claims should net out. In practice, a certain amount of double counting may be unavoidable and necessary, to capture the tower of claims backed by safe assets that tumbles down once market liquidity dries up.

29 As Obstfeld, Shambaugh, and Taylor (2010) argue, the ratio of reserves to M2 provides a good measure of funding risks.

30 See Gourinchas and Rey (2007) and Gourinchas, Rey, and Govillot (2010) for an analysis of the U.S. external balance sheet.

31 See Acharya and Schnabl (2010), Bernanke et al. (2011), Cetorelli and Goldberg (2011), and Shin (forthcoming).

32 The European-sponsored conduits also tended to be larger, about twice the size of U.S.-sponsored conduits.

33 There remains the question of why European banks leveraged so much of their activity in the United States. The most convincing explanation has to do with regulatory arbitrage, allowing banks in some European countries, most notably Germany, Ireland, and the United Kingdom to exploit the loopholes in the capital rules instituted under Basel II.

34 The data on reserves come from the updated Lane and Milesi-Ferretti (2007) data set on the External Wealth of Nations, covering the years 1970 to 2010. Reserves are defined as official foreign exchange reserves minus gold.

35 After a careful look at the evolution of reserves during the crisis, Dominguez, Hashimoto, and Ito (2011) find that emerging countries did actively deplete their reserves during the crisis, but restored their reserves to pre-crisis levels rapidly once the crisis abated. They also find evidence that output recovery was stronger in countries with larger pre-crisis reserve accumulation.

36 See Gourinchas and Obstfeld (2012) for recent evidence. That paper emphasizes, however, that the causality runs both ways: Reserves are likely to decline in countries with higher likelihood of a crisis.

37 The penalty was reduced to 50 basis points on Wednesday, November 30, 2011. Tapping the swap lines also carries some stigma.

38 The outstanding total ECB-Fed swap line was $2.35 billion as of Nov. 16, 2011. This number pales in comparison with the $280 billion ECB-Fed swap outstanding in December 2008.

39 Another indirect observation of the stress on the European banking sector comes from the Federal Reserve balance sheet. Under the heading "reverse repurchase agreements—foreign official and international account," it records transactions with foreign central banks that deposit their U.S. dollars directly with the Federal Reserve Bank of New York with government securities as collateral. Between May 2011 and November 2011, the amount of these reverse repos more than doubled, from $54 billion to $124 billion. It is likely that some of these operations reflect the decision of foreign central bank portfolio managers to move their U.S. dollar holdings out of European banks and deposit them directly with the Federal Reserve.

40 For instance, BNP Paribas announced on September 14 the sale of 70 billion euros in risk-weighted assets.

41 In a recent development, Austria's regulator directly curbed the cross-border lending activity of Austrian banks to Eastern European countries. Not coincidentally, Hungary announced on the same day that it was seeking a precautionary line from the IMF.