

The 2007-2009 Financial Crisis, Global Imbalances and Capital Flows: Implications for Reform

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Abstract:

The paper discusses the currents that led to the 2007-2009 financial crisis. We discuss the crisis in a historical context and present evidence regarding the incidence and unit price of risk. Our results show that the unit price of risk prior to the subprime crisis is comparable to the price of risk prior to the great depression and similar to the price of risk at onset of the technology bubble. We then discuss global imbalances, the associated risks with regards to international optimal allocation of capital, and arrangements to minimize problems of global imbalances.

Keywords: financial crisis, international capital flows.

JEL: G28, F32, F42

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1. Introduction

The financial crisis that started in 2007 is the most serious setback the world economy has experienced since the great depression. What started as a credit crunch in July 2007 in the U.S. spread to other countries and brought the financial system to a halt. As hundreds of billions of dollars worth mortgage related investments went sour, investment banks totally disappeared and the U.S. Federal Reserve and other central banks took unprecedented steps to contain the crisis. The FED steps included large cuts in the target federal funds target rate which brought it to near zero, currency swaps with foreign central banks, and additional lending mechanisms (term auction facility, term securities lending facility, the primary dealer credit facility, term asset backed securities loan facility, commercial paper lending facility, and purchase of long term US Treasury securities, among other steps). In addition, the US Treasury launched its Troubled Asset Relief Plan (TARP) where it committed \$700 billion to purchase risky securities in order to remove them from the banks' balance sheets. The freefall of home values coupled with the collapse of stock markets around the world and the associated wealth reduction made households cutback on spending sending major economies into a deep recession.

As the crisis unfolds, the U.S and other major countries designed "fiscal stimulus" packages that are aimed at reviving the real sector to a limited success. In contrast to previous downturns, the current crisis impacted all major economies at once making recovery the more difficult. There is evidence that economic crises associated with credit crunches and busts are worse than others as they tend to be longer on average and have much larger output losses than others. (Claessens, Kose, Terrones, 2008; Reinhart and Rogoff, 2008a). Moreover, problems in the financial sector are having a negative effect on international trade¹ exacerbating the problems of an already constricted aggregate demand.

The onslaught of the financial crisis of 2007-2009 and the economic downturn that followed came after the so called "great moderation," a term coined to describe a large fall in the cyclical volatility of real economic activity in general, and output

volatility in particular starting in 1984². What is also surprising is that the crisis, at least in its scope and magnitude, caught policymakers and all but few academic economists by surprise³.

The principle objective of this paper is to discuss the current crisis in historical context with a focus on the incidence of risk and the evolution of the unit price of risk in a historical context. To that end, we estimate simple models of conditional volatility and measure the unit price of risk using an ARCH-M model. Since one of the major explanations of the current crisis is an increase in risk taking, we evaluate this hypothesis by comparing the incidence and price of risk in the current crisis to other major episodes including the great depression. To preview our results, we show that the unit price of risk prior to the subprime crisis is comparable to the price of risk prior to the great depression and similar to the price of risk at onset of the technology bubble. The second objective of this paper is to discuss global imbalances as a major contributor to the current crisis and arrangements that can be designed to minimize their negative effects. In Section 2, we discuss the origins of the crises. Section 3 presents the evaluation of the crisis from a historical perspective, the evolution of the incidence and unit price of risk, and other measures such as the composite treasury-Baa spread. We then focus on global imbalances that are at the root of the current crisis, how they manifested themselves and the environment that amplified their effects in Section 4. Finally, we discuss problems associated with global imbalances and arrangements to minimize these problems before we offer some concluding remarks.

2. Origins of the Crisis

The crisis started in July 2007 with the collapse of two Bear Stearns hedge funds, the *Bear Stearns High-Grade Structured Credit Fund*, and the *Bear Stearns High-Grade Structured Credit Enhanced Leveraged Fund*. With this collapse, the so-called subprime mortgage crisis became apparent with a substantial increase in mortgage delinquencies and foreclosures in the United States. As credit markets froze, the Treasury bill-Eurodollar spread known as the TED spread (difference between the three-month US Treasury bill yield and LIBOR) started to increase dramatically; see Figure 1. The spread is an indicator of perceived credit risk in the wholesale credit market as investors flee to

the safety of the short term US Treasury bills. The TED spread also reflects liquidity risk as banks may prefer keeping any extra cash in Treasuries rather than lending them 3 months unsecured. It reached a record high of 463 basis points on October 10, 2008 and fell thereafter with massive injection of liquidity into the financial system by central banks. As of early July 2009, the spread stands at 35 basis points, which is slightly above historical norms.

There are numerous factors that have contributed to the financial crisis. Of particular importance are global macroeconomic imbalances, poor risk management practices, and weak financial regulations and supervision. Perhaps due to the integration of the world economy (financial globalization), the asymmetric distribution of investment opportunities, and due to the desire to accumulate official exchange reserves for precautionary purposes, the world economy has witnessed major macroeconomic imbalances since the mid 1990s. The United States, Great Britain, Mediterranean countries, including Portugal, Spain, Italy, Greece, Turkey, Central and East European countries run large current account deficits on one hand and Germany and oil exporting countries and various Asian countries including China, Japan, South Korea, Taiwan, and Malaysia run surpluses on the other (IMF 2009). These imbalances and the accompanying capital flows caused unusually low interest rates in the United States and European banks, intensifying the search for higher yields and increased leverage and risk taking by relying on complex and opaque financial instruments. In the absence of proper regulation and supervision, the rally went on so long as the arrangement was *self sustaining*.

How did the global imbalances become self sustaining? The US run external deficits and capital flows from surplus countries financed these deficits. The trade surplus countries kept their exchange rates low relative to the dollar which helped sustain the deficit/surplus configurations. The capital inflows kept long term US interest rates low and made for a robust GDP growth boosting investment, consumption, and imports. Foreign funds aided in the asset price boom. The rise in asset prices led to an increase in consumer wealth, which further stimulated U.S. consumption spending and imports, and thereby helped sustain the trade deficit.

The US economy and other major economies experienced impressive growth rates with the advent of the information technology in the 1990s with major stock market wealth build up. After the collapse of the so called dot com bubble, the US economy slowed down in 2000 and entered a recession in 2001. To combat the recession, the US FED reduced interest rates sharply in 2000-2001. Figure 2 presents US short term interest rates (effective federal funds rate) adjusted for inflation. The figure indicates that real short term interest rates were in the negative range in 2002-2005. Lower target interest rates made by the FED contributed to the global flow of funds in making mortgages more affordable and home prices rose sharply as the demand for homes exploded. With wealth build up, there was a consumption boom and the United States and saving rate declined sharply.

The trade surplus countries expanded their production base, exports and foreign exchange reserves. They also experienced major increases in their saving rates that were not matched by investment rates, a result most evident after 2002. For example, emerging and developing economies saving investment balance went from a deficit of 0.8 percent of GDP in 1994-2001 to a surplus of 1.2 % in 2002 rising steadily thereafter and reaching a peak of 4.8 % of GDP in 2006 (IMF 2008, Table A16). The most dramatic rise in external lending occurred in the Middle East with a saving investment surplus of 21 % of GDP in 2006. The dramatic rise in the saving rates –the so called “saving glut” (Bernanke (2005) - was not confined to the developing world or the Middle East as Germany, Japan, China, and Commonwealth of Independent States all had external surpluses and were net lenders to the rest of the world. The recipient of these savings was primarily the US, even though the UK, Italy, Spain, Australia, and to some extent, France also were net borrowers in the 2002-2007 period (Bernanke 2005, IMF 2008).

While investment rates have fallen in Japan and Europe in response to their weak economic growth, US investment opportunities remained healthy. The US saving rate on the other hand, fell to an all time low. The personal saving rate in the US steadily declined after 1980 reaching an all time low of -2.7 percent in August 2005 and remained near zero percent until April 2008⁴. This was due to high levels of household borrowing which kept current consumption levels high. Even though the fall in the trade weighted

value of the US dollar between March 2002- July 2008 could curb some of the current account deficits and the incipient capital flows into the US, some emerging markets (notably China, Hong Kong, Malaysia, and oil exporting Persian Gulf countries) fixed or managed their currencies against the US dollar at exchange rates that were conducive to substantial current account surpluses in these countries. The rise in international reserves in the same countries financed large current account deficits in the US and to some extent in some European countries and Australia.

The fast growth and global integration of high-saving economies created a shortage of adequately safe assets. The result was massive financial flows into the US which has contributed to low long term interest rates. Combined with the effects of loose monetary policy which contributed to low short term interest rates, the latter has been dubbed a “conundrum”. Caballero, Farhi and Gourinchas (2008) explain this conundrum in terms of comparative advantage of the US financial intermediation. With foreign demand for safe assets soaring, the US financial industry scrambled to find ways to satisfy the appetite for “credit enhanced” securities. However, international capital flow statistics show that emerging and developing economies have continued to attract private capital inflows every year between 1997 and 2008. For example, net private capital inflows into emerging and developing economies amounted to \$73.5 billion in 2001 increasing to \$617.5 billion in 2007. The current account surplus in emerging and developing economies rose from \$93.3 billion in 2001 to \$741.5 billion in 2007 (IMF 2009, Table A13). The substantial current account surpluses along with private capital inflows added to the massive accumulation of official foreign exchange reserves in these countries. Central banks in these surplus countries mostly invested in US government and agency securities, which raised the prices of safe assets in the US, bringing their yield to historical lows. In this low yield environment, the financial industry made extra strides to increase returns on investments by intensifying risk taking. Given the role of the central banks in surplus countries in channeling the flows into the U.S., global imbalances played a key role in the current crisis.

With low interest rates, mortgage lenders followed lax standards in approving mortgages and optimism fueled speculation in the housing market. As a result, the

nonprime mortgage market consisting of near prime, subprime (loans that do not meet prime underwriting guidelines such as full documentation, certain income, and credit score thresholds) and Alt-A loans (alternative documentation loans that holds borrowers with good credit to different approval standards than traditional loans) experienced explosive growth in the 2001-2006; see Figure 3. This explosive growth was aided by mortgage market innovations (“originate to distribute”) and specifically, the creation of private label mortgage backed securities that do not carry any guarantees by Government Sponsored Enterprises (GSE). The pressure to attain high returns increased the appetite for mortgage backed securities which caused a sharp increase in the nonprime share of the mortgage market. While fewer than 10 percent of outstanding mortgages were nonprime in 2001, this category accounted for 34 percent of all mortgage originations during 2006, which is the peak of the housing market (Emmons 2008). Moreover securitization in the subprime market increased from 54 percent in 2001 to 75 percent in 2006 (Demyanyk and Van Hemert 2009). After adjusting for borrower characteristics, loan characteristics, and macroeconomic conditions Demyanyk and Van Hemert (2009) show that loan quality in the subprime market as measured by loan performance deteriorated dramatically for six years prior to the crisis.

Mortgage securitization entails pooling of mortgages and issuing assets backed by the cash flows of the mortgages. Mortgage backed securities (MBS) are created when holders of mortgages form a pool of mortgages and sell shares in that pool. Then, cash flows from the pool are passed through to the ultimate investor. With *credit enhancements* and standardization, an MBS can be expected to be more liquid than an individual mortgages since pooling reduces risk. Mortgage backed securities originating in the U.S. were sold to investors around the world. Many investors assumed these securities were backed by the full faith of the US government as GSEs, the Federal National Mortgage Association (Fannie Mae) and Federal Home Loan Mortgage Corporation (and Freddie Mac) were chartered by Congress (Eisenbeis, Franme and Wall 2007). This allowed Fannie Mae and Freddie Mac to be highly leveraged and borrow massive amounts of funds against the mortgages they held as collateral. On the other hand, high leverage was not confined to Fannie Mae and Freddie Mac as individuals and

financial institutions increased their debt levels to unprecedented levels. Figure 3 shows that the debt income ratio of households exceeded 1 by 2006. Dynan and Kohn (2007) show that the increase in household debt in the United States is partially attributable to the effects of financial innovations which relaxed constraints on the ability of households to borrow and reach desired consumption levels.

With widespread declines in underwriting standards, low interest rates and little lending oversight by investors, the demand for housing soared in the US and a boom in house construction followed. House prices increased dramatically relative to GDP as can be seen in Figure 4. The figure shows that U.S. house prices peaked in mid 2006 and began to fall thereafter as housing inventory exceeded demand precipitating decline in house values. Figure 5 shows that the house price increase was too much to be justified by the house price/rent ratio, the equivalent to the Price-earning (P/E) ratio in the financial literature. Borrowers with adjustable rate mortgages faced problems as they could not refinance their mortgages. In the meantime, delinquencies and foreclosures increased particularly in the nonprime market as falling home prices left borrowers owing more on mortgages than their properties were worth. Figure 6 shows that the greatest increase in foreclosures occurred in the subprime adjustable rate mortgages. Slowing U.S. personal income growth and rise in mortgage rates exacerbated the problem causing mortgage-backed securities to decline in value and resulting in large financial losses for U.S. and international investors holding mortgage-backed securities. These losses sparked widespread uncertainty and loss of confidence and investors became wary of bearing risks. Before long, mortgage backed securities became so unreliable that they were not being bought or sold and turned into so called “toxic assets.” Because of their complexity, the value of these assets could not be assessed: trading in these assets ceased to exist and investors retreated to the safety of U.S. Treasury securities. This made it difficult for lenders to assess their own exposure and that of potential borrowers to bad debt. As Bordo (2008) emphasized, the problem compounding the pricing of these assets is that securities based on a pool of assets are difficult to assess because the quality of individual components of the pool varies greatly. Unless each component constituting the pool is individually assessed, no clear-cut price of the securities can be established.

The “originate to distribute” lending model entailed well known principal/agent problems as loan originators sought to maximize short term gains and did not bear the brunt of the risks. Investors relied on ratings agencies instead of exercising due diligence. Rating agencies used backward valuation methods, grossly underestimating risks. As financial losses continued to increase, investor fear and uncertainty intensified during 2008. Finally the crisis reached a boiling point in September 2008 when the U.S. Federal Housing Finance Agency (FHFA) decided to put two GSEs, Fannie Mae and Freddie Mac, into government conservatorship. Then US Federal Reserve provided a two-year \$85 billion emergency loan to an insurer of mortgage backed securities, the American International Group (AIG), when the investment bank Lehman Brothers filed for bankruptcy. After the collapse of Lehman Brothers, lending among banks and other financial firms fell sharply and the risk premium as measured by the TED spread shot up to unprecedented levels.

Since financial institutions had difficulty borrowing from the secondary markets, they had to sell assets to raise funds and improve their balance sheets. This led to ‘fire sale externalities’ (Kashyap, Rajan, and Stein, 2008) with substantial discounts in bonds and a collapse of stock markets. All the problems were compounded by excessive leverage and financial globalization. Given the exposure of foreign financial institutions’ balance sheets to US toxic assets, particularly in advanced economies, the financial crisis quickly spread throughout the world.

The crisis had far reaching consequences. Flight to quality increased demand for Treasury securities at the expense of municipal bonds and corporate bonds. Institutional investors (hedge funds & property and casualty insurance companies) deserted municipal and corporate bonds to raise capital which raised borrowing costs for individuals, businesses and local governments. The crisis reduced the credit rating of municipal bond insurers because they also insured mortgage backed securities. As bond insurers suffered losses and experienced reduced credit ratings, the bonds they insured were downgraded raising their interest rates and hence borrowing costs. This put additional strains to an already constrained credit market.

3. The Current Crisis in a Historical Perspective

To put the current crisis into proper historical perspective, we compare to previous crises of modern times and try to gain insights into the scope, duration and severity of the crisis. Since the crisis is ongoing, any assessment of duration, by nature, is preliminary. Figure 7 updates Bordo (2008)'s spread between the Baa corporate bond rate and the Ten year Treasury Composite bond rate from January 1925 through September 2009. As Bordo (2008) emphasizes, the spread represents, among other things, an indicator of credit risk in the general economy and financial instability reflecting asymmetric information (Mishkin 1991); as such, elevated readings in the indicator point to an increased level of perceived risk in the market, as investors move to the safety of US Treasury securities. Moreover, the peaks of the spread roughly correspond to the troughs of the business cycle as the spread measures credit cycles.

Judging from the corporate bond Treasury yield spread, it is evident that the current cycle is comparable only to those recorded in the aftermath of the great depression. Particularly in the most recent credit cycle, the spread started to inch up precisely at the onset of the subprime crisis in July 2007 moving from 1.65 percent in the same month to a peak of 6.1 percent in December 2008. While it started to move down gradually, it is still at 2.9 percent as of September 2009. In a comprehensive study of business cycle characteristics, Claessens, Kose and Terrones (2008) find that recessions associated with credit crunch and an equity price busts are more severe: they last longer on average, have larger output losses, and tend to have an international dimension. Moreover, the authors find that recessions accompanied with acute credit crunches or house price collapse last only a quarter longer on average but entail three times greater output losses than recessions without a financial stress. Reinhart and Rogoff (2008a) also find that recessions associated with a stress to the financial system are overly costly in terms of output losses. In the worst case episodes involving crises in Finland, Japan,

Norway, Spain and Sweden, Reinhart and Rogoff (2008a) find that the drop in annual output growth is over 5 percent with a growth slowdown below trend that lasts more than three years.

Another recent study that links financial market troubles to severe economic conditions is Barro and Ursua (2009). Using long-term data for 25 countries up to 2006, Barro and Ursua (2006) show that stock market crashes (multi-year real returns of -25 percent or less) figure prominently in depressions (multi-year macroeconomic declines of 10 percent or more). Following a stock-market crash, the probability of a minor depression (macroeconomic decline of at least 10 percent) is 30 percent and of a major depression (at least 25 percent) is 11 percent.

3.1. Trade-offs between growth rates prior the crisis and the depth of the crisis

An interesting question is whether there has been a tradeoff between growth rates in advanced economies prior the crisis and the depth of the crisis. Table 1 gives the growth rates of advanced economies between 1996-2008 and the International Monetary Fund's projected growth rates for 2009 and 2010. It is evident that many advanced economies recorded notable growth rates prior to the crisis: particularly in the 5 years prior to the crisis (2002-2006), the average growth rate has been about 3 percent per year. The countries that recorded above average growth are the US, Spain, Finland, Greece, Ireland, Luxembourg, Canada, Korea, Australia, Taiwan, Hong Kong, Israel, Singapore, New Zealand, Cyprus, and Iceland. The slow growth countries were Germany, France, Italy, Netherlands, Belgium, Austria, Portugal, Japan, UK, Sweden, Switzerland, Denmark, and Norway. Did the countries with the most dynamic financial sectors experience robust growth prior to the crisis and is there a correlation between growth prior to the crisis and the depth of the crisis? In order to address whether there has been a tradeoff between growth rates in advanced economies prior the crisis and the depth of the crisis, we regress cross country average growth rates during the crisis on average growth rates in the 5 year period prior to the crisis in advanced economies:

$$G_{y08-10} = -0.56 - 0.166 G_{y02-06} + \text{error}; R^2 = 2.85 \%, \\ (0.59) \quad (0.187)$$

where G_{y08-10} is the average growth rate in advanced economies in 2008-2010 based on IMF's projections for 2009 and 2010; G_{y02-06} is the average growth in the 2002-2006 period and the standard error is in parenthesis. While preliminary, these results show that there is a weak relationship between growth prior to the crisis and the depth of the crisis as indicated by the negative coefficient on the average growth prior to the crisis. However, the relationship is weak at best and is not statistically significant.

3.2. *The Incidence of Risk and the Evolution of the Unit Price of Risk*

What makes the current crisis unique is the increase in stock market volatility unmatched since the great depression. In order to document the conditional volatility as a measure of the incidence of risk, we consider long term daily data on the Dow Jones Industrial Average from January 4, 1915 through April 28, 2009⁵. Following usual identification procedures, we find that a Lagrange Multiplier test confirm the presence of ARCH errors. Based on the autocorrelation function of the stock market return series and the squared residuals, the best candidate for a univariate model of the daily⁶ percentage change in stock returns is an MA(1) process, with ARCH(1) errors:

$$r_t = b_0 + b_1 \varepsilon_{t-1} + \varepsilon_t \quad (\text{mean equation}) \quad (1)$$

and

$$h_t = a_0 + a_1(\varepsilon_{t-1})^2 \quad (\text{conditional variance}) \quad (2)$$

where $\varepsilon_t = v_t \sqrt{h_t}$ and $E(v_t) = 0$ and $\text{Var}(v_t) = 1$; $r_t = \ln(\text{DJ}_t - \text{DJ}_{t-1})$ and DJ is the daily closing value of the Dow Jones Industrial Average. As an alternative, we consider an ARCH-M specification of Engle, Lilien, and Robins (1987) such that the mean return equation is modified as follows:

$$r_t = b_0 + b_1 \varepsilon_{t-1} + \delta h_t + \varepsilon_t \quad (1')$$

This specification allows the mean return process to depend on its conditional variance where the coefficient δ has the interpretation of being the *unit price* of risk. A higher conditional variance of returns can be expected to increase the compensation necessary to

induce investors to hold a risky asset, such as common stock. We estimate the two models in (1)–(2) and (1')–(2) over the entire sample. To evaluate the goodness of fit, we compute modified versions of Akaike Information criterion (AIC) and Schwarz Bayesian Criterion (SBC) as $AIC = -\ln L + 2n$ and $SBC = -\ln L + n \ln(T)$ where n is the total number of parameters in each model and T is the number of observations. Both AIC and SBC pick the ARCH-M model in (1')–(2) over the conventional ARCH model in (1)–(2). Table 2 presents parameters of the model estimated over the full sample and over the onset of major recessions. We define the onset of a major recession from the trough of an NBER business cycle to the peak of the following cycle. When two or more cycles follow each other within less than six years, we extend the sample to include the previous business cycle(s). Accordingly, we focus on the onset of the following major episodes of the business cycle in the U.S.: the onset of the Great Depression, 07.01.1921–08.01.1929; the oil crises of the 1970s, 11.01.1970–01.01.1980; onset of the technology bubble, 03.01.1991–03.01.2001; and onset of the subprime crisis, 11.01.2001–12.01.2007. This allows for the evaluation of the changes in the compensation for risk prior to major crises.

Table 1 indicates that with few exceptions the coefficients of the mean equation are statistically significant and are of the expected sign. Particularly the estimates of the unit price of risk, δ , as a measure of the compensation for risk are positive and significant except for the oil crises of the 1970s. Specifically, investors demand a higher compensation for risk taking and the higher the risk, the greater the compensation. Note that in comparison to the onset of the great depression and the technology bubble of the 1990s, there is no major difference in the unit price of risk in the onset to the recent subprime crisis. The point estimate for unit price of risk prior to the subprime crisis is 27.01, which is comparable to the price of risk prior to the great depression (25.83), and the price at the onset of the technology bubble (24.14). The evidence regarding this measure of risk taking does not implicate the decrease in the compensation for risk as a major culprit in the onset of the subprime crisis. Of course, this is just a measure of risk in the stock market and does not account for default risks, illiquidity risks, interest rate risks, hidden tail risks, or rare event risks; alternative measures may very well indicate a role for the decline in the compensation for risk in the run up to the recent subprime crisis. Finally, the unit price of risk over the full sample period is only 1.45, pointing to

the fact that the price of risk over high risk and low risk periods average out leading to a relatively low compensation for risk.

The historical incidence of risk as measured by the standard deviation of conditional volatility over the entire sample is given in Figure 8. The figure highlights important characteristics of the stock market after the recent subprime crisis: except for a single spike corresponding to the 1987 stock market crash, the recent conditional volatility is unmatched since the market turmoil surrounding the great depression.

4. The Role of Global Imbalances in the Current Crisis

There has been a sharp debate surrounding the sustainability of global imbalances, particularly as they relate to persistent recent US current account deficits. Some have viewed the global imbalances as a reflection of market forces particularly since the US dollar is used as an international reserve currency. Accordingly, the U.S. balance of payments deficits do not pose a problem in that the rest of the world voluntarily holds dollars because of their valuable service flow (liquidity), hence deficits are demand determined. The U.S. is in a unique position since the U.S. dollar is an international medium of exchange. Serrano (2003) argues that the US Federal Reserve enjoys a distinct advantage in determining the interest rate of the dollar as U.S. debt has unmatched liquidity. Thus the US operates under a “floating dollar standard” where the U.S. economy is free of balance of payments constraints typical of other countries.

The global saving glut hypothesis we alluded to above also views the global imbalances as direct results of increased savings and current account surpluses in developing and emerging economies. In these economies, export driven growth has led to higher incomes. In the absence of properly functioning credit markets and social security systems, people save due to precautionary motives. Combined with the governments’ own high saving rate and the export driven development strategy that focuses on undervalued currency in emerging economies, a high national saving becomes a natural self sustaining condition generating low real interest rates, and expanded demand in advanced countries and growth in emerging markets. If the source of global imbalances is the global saving glut, then US domestic policy cannot bring about a smooth adjustment

to the problem since all this is taking place at a time of unusually low interest rates in the US (the interest rate conundrum). If instead, the root cause of the imbalances were low US saving rates, then one would observe high interest rates in the US; Clarida (2005). Reflecting a widely held view, Clarida concludes that because i) the US dollar is an international reserve currency, ii) the comparative advantage of U.S. financial markets, iii) the credibility of U.S. monetary policy, the United States is destined to run structural international capital inflows, and thus a structural current account deficit. According to this view, the US current account deficit should narrow over time in an orderly fashion.

Another major argument discounting the imminent threats posed by global imbalances focuses on the tendency of US investments abroad to earn a higher rate of return than US foreign liabilities; Gourinchas and Rey (2007). Accordingly, US net foreign liabilities rise less quickly than US current account deficits and viewed in this fashion, the resulting debt is small and is inexpensive to service. Despite the relatively lower rates of returns in the United States, Forbes (2007) summarizes the possible factors why foreign investors might prefer investing in the United States: more sophisticated, liquid and efficient U.S. financial markets; corporate governance, accounting standards and transparency in the United States; low information costs relative to other economies; the reserve status of the U.S. dollar; the diversification benefits; and/or location advantages.

Finally there are those who view the current account adjustment within the context of the resurgence of an implicit Bretton Woods System. The large current account surplus in many emerging markets, matched by current account deficits chiefly in the US but also in a number of advanced economies has been dubbed Bretton Woods II (also called global co-dependency theory) in a series of papers by Dooley, Folkerts-Landau, and Garber (2003, 2004, 2008), henceforth DFG. According to this view, China and other Asian emerging markets are willing to finance US current account deficits regardless of whether it is sustainable or not. The reason is that these countries are emulating the Japanese export led growth, driven by artificially low exchange rates where the export sector is the locus of learning and productivity spillovers. This strategy makes the country more appealing for foreign direct investment and private capital flows. Indeed

many Asian and emerging economies have followed an export driven development strategy and managed their exchange rates so as to promote and/or maintain export competitiveness. As such, these surplus countries particularly Japan and China have been accumulating massive amount of dollar-denominated assets mainly in the form of U.S. Treasury securities. Even if there is a risk that a fall in the value of the US dollar will make these countries incur a capital loss, DFG point out that by holding a large sum of US Treasury securities, these countries are providing a collateral against the risk of confiscation of US multinational investments in among other places, China; see, Dooley, Folkerts-Landau (2004).

The global co-dependency view is consistent with couple of observed facts. First, as we stated above, foreign central banks and not private investors have been providing the funds to finance US current account deficits. Second, emerging market economies themselves have been receiving foreign direct investment and net private capital flows. As Eichengreen (2008) points out, this view also capable of explaining the bond market “conundrum” since foreign central banks are the marginal purchasers of U.S. Treasury securities and U.S. current account deficits coexist with low long term US interest rates.

Portes (2009) and Lane (2009) disagree with DFG on the reasons for official reserve accumulation by emerging markets. They argue that surpluses are intended to build up precautionary reserves. Particularly after the Asian crisis, many emerging Asian economies purposefully pursued policies that were conducive to the accumulation of foreign exchange reserves in order to deal with ‘sudden stops’ in capital inflows and perhaps outflow of capital by domestic savers. Moreover, policy-makers in the developed countries and international agencies encouraged this policy. This has far reaching implications: if emerging markets are accumulating reserves that pay abnormally low yields so as to thwart sudden capital flight, and are effectively subsidizing advanced economies, then the resulting global allocation of capital is indeed suboptimal.

Others have argued that global imbalances may lead to a sudden stop in the flow of funds to deficit countries, particularly the United States, and spark a sharp decline in the value of the U.S. dollar. Roubini and Setser (2005) questioned the sustainability of

global imbalances and the efforts to limit dollar appreciation against some Asian currencies notably the Chinese renminbi, arguing that the scale of the financing required is increasing faster than the willingness of the world's central banks to build up their dollar reserves. They argued that Bretton Woods II international monetary system was unstable and predicted that there was a meaningful risk the system would collapse before the end of 2006. Essentially surplus countries, by financing US current account deficits and purchasing dollar assets are subsidizing low interest rates in the US which facilitates the expansion of US consumption and employment in interest-sensitive sectors at the expense of investment in the production of tradables. The adjustments ultimately required to bring the US trade deficit down will be more painful. Moreover, Roubini and Setser (2005) contend that the classical specie-flow mechanism will be at work: the enormous reserve growth required to sustain the Bretton Woods II system will be hard to fully sterilize, particularly in China, which will increase the money supply and domestic inflation, in addition to fueling a lending boom and asset bubble that will weaken financial markets further. Finally, surplus countries that accumulate dollar reserves run the risk of substantial capital losses as the dollar starts to depreciate. Obstfeld and Rogoff (2007) also questioned the sustainability of U.S. current account imbalances and suggested that a large depreciation of the dollar was indeed very likely.

Cline (2005) argued the current account deficit in the US was no longer benign as it had been in the 1990s when it was financing high investment instead of high consumption and large government budget deficits. Cline calls for a new Plaza agreement similar to the 1985 Plaza Agreement that ended an overvalued US dollar or a Smithsonian type agreement like that of 1971 under the auspices of the G-20 group of industrial and emerging-market economies. The United States would commit to eliminate fiscal deficits in few years. The objective would be the real appreciation of currencies (especially those of East Asian currencies including the Japanese yen) and a commitment to refrain from accumulating dollar reserves until a target depreciation of the dollar (for example 20 percent) is achieved. All that is needed is for surplus countries to refrain from intervening in the foreign exchange markets. If this is not possible, as a second best alternative, Cline suggests that the United States should seriously consider

imposing countervailing duties against countries that subsidize their exports by keeping their currencies artificially undervalued.

In fact many authors who expected an imminent economic crisis stemming from global imbalances did so based on the usual scenario: a sudden stop of capital flows into the US precipitating a currency crisis followed up by exorbitant interest rate hikes that would choke off economic activity, possibly defaults and a debt crisis. The fact that a hard landing with a foreign exchange crisis did not occur⁷ does not mean global imbalances are likely to disappear from the radar screen. In fact a program called “Multilateral Consultation on Global Imbalances” was initiated in 2006 under the auspices of the IMF to deal with global imbalances. The program brought policymakers from major governments of countries/regions involved in the imbalances. It was agreed that major policy changes are needed to redistribute spending patterns so as to mitigate risks to the international system. The program basically called for deficit countries to take steps to increase national savings and for surplus countries to boost domestic aggregate demand and allow exchange rate appreciation; the program began on June 5, 2006 (See IMF 2007 for details). Before any measure could bear fruit, the crisis came and spread worldwide.

There is an emerging consensus that global macroeconomic imbalances have contributed to this crisis at least indirectly. As we emphasised above, with these imbalances the US was flooded with large foreign capital and a period of low interest rates followed. As a result, long term interest rates showed a secular decline as did mortgage rates. Figure 9 shows the 30-year conventional fixed mortgage rate, the 10-year US Treasury constant maturity yield and US current account deficits. The figure clearly shows the general trend of large current account deficits (foreign accumulation of claims against the US) and the general decline of the long term yield and the mortgage rate.

Faruqee and Lee (2009) show that not only the size of global imbalances has increased but also their dispersion. These pervasive imbalances played a significant role in the so called great moderation: By increasing global liquidity they contributed to low volatilities, lower and more stable inflation and low interest rates [Portes (2009)]. As a

result, this environment fostered a build up of leverage that fed the real estate bubble in the United States and other advanced economies [IMF (2009)]. Indeed the US house price index tracks a global imbalances indicator very well (the ratio of absolute value of global current account balances to global GDP)⁸ Moreover, Aizenman and Jinjark (2008) confirm that global imbalances are associated with a sizable real appreciation of real estate prices in general and the relationship is robust to the presence of other conditioning variables such as the real interest rate, GDP growth, and inflation. While ideally such imbalances lead to efficient allocation of global resources, in a more realistic second best environment Aizenman and Jinjark argue that capital inflows may amplify the costs of distortions. This should not mean a country has to turn its back to capital flows but rather greater financial globalization calls for being vigilant against moral hazard and other pre-existing domestic frictions.

Figure 10 is suggestive in that the period of easy money mentioned above in Figure 2 combined with global capital flows made a very dangerous mix: low interest rates intensified the “search for yield” that led to the creation of complex asset backed securities. Pension funds and insurance companies were willing to buy these securities so long as the rating agencies gave them certifications that passed these institutions’ rating thresholds. The system was self sustaining so long as securities could be pledged as collateral to raise more funds. However, with delinquencies and foreclosures, the complex securities became highly illiquid. Illiquidity in the housing market created information risk, which coupled with complexity risk, destroyed liquidity for asset backed securities in financial markets [Kashyap, Rajan, and Steen (2008)].

The competition for yield also gave way to poor risk management practices that did not price risk properly and the financial system was interconnected in ways that amplified systemic risk. The propagation of the crisis took place via holdings of US assets in highly leveraged Swiss, German, French, and British financial institutions; these tended to hold mortgage backed securities that carried no implicit US government guarantees, whereas official holdings of emerging market institutions consisted mainly of GSE securities [IMF (2009)].

The financial crisis has to some extent helped in reducing global current account imbalances due to increased savings and improvements in the terms of trade in deficit countries, even though there are still substantial imbalances remaining. Whether these imbalances should be addressed is open to debate. Even though the word "imbalances" itself implies a degree of undesirability; there is no theoretical or historical case against running deficits or surpluses. Indeed as Hunt (2008) emphasizes, economic history is replete with periods where global savings have flowed from one region to another, resulting in sizable current account imbalances. Examples of such periods include the classical Gold Standard period where the core industrial economies of Britain, France and Germany bankrolled the development of resource rich countries such as Australia, Argentina, Canada, New Zealand and even the United States. What is peculiar about these examples is that capital flew from regions where the marginal productivity of capital was low to countries or regions where such productivity is presumably higher. Such capital flows are clearly optimal in that they lead to a more efficient allocation of global capital. Moreover, the unraveling of the underlying imbalances was not disruptive.

By contrast, it is useful to recount a brief narrative of other notable global episodes of imbalances that were followed by painful periods of adjustment. After the oil shocks of the 1970s financial institutions of advanced countries were flush with funds notably those that were recycled from oil exporting countries. These funds were lent to developing countries, particularly in Latin America, at adjustable interest rates. After a global recession in early 1980s that reduced exports, many developing countries' export earnings fell. Combined with a strong dollar that increased the value of debt in domestic currencies (the so-called "original sin" problem), higher interest rates, capital flight, and depleted foreign exchange reserves, many Latin American countries including Mexico, Brazil, Venezuela, Argentina, and Chile declared they were not able to repay their debt.

Reinhart and Rogoff (2008b) confirm what many suspect with regards to debt crises such as the Latin American debt crisis: global economic factors, including commodity prices and centre country interest rates, play a major role in precipitating these types of sovereign debt crises. Moreover, countries that are the loci of large capital inflows are at high risk of having a debt crisis. Historically defaults on debt, currency

crashes, inflation, and banking crises are associated with large capital movements. However, Kose et al. (2009) provide a more nuanced view of global capital movements: In a comprehensive study of capital flows, they conclude that there are thresholds below which a complete opening of the capital account can impair the realization of any benefits which would make a country more vulnerable to sudden stops of capital flows. These economic environment thresholds refer to stable macroeconomic policies, sufficiently strong financial and other institutions, regulation and governance.

The Latin American debt crisis was followed by another notable episode where global capital movements led to speculative attacks on a number of emerging market currencies in Asia. Until the Asian financial crisis, many Asian countries recorded impressive economic growth with low inflation, macroeconomic stability, openness, strong fiscal position, high saving rate, and a thriving export sector. At the core of this crisis were the large-scale foreign capital inflows into financial systems that became vulnerable to panic, reflecting sudden reversals of market confidence. Moreover, because most of the economic activity in those countries supported by the capital inflows was highly productive, the loss of economic activity resulting from the sudden reversal in capital flows was enormous, which, in turn, forced the economies into sharp downturns. This crisis also hit the most rapidly growing economies in the world, and prompted the largest financial bailouts in history. It was the most severe financial crisis to hit the developing world since the 1982 debt crisis and one of the least anticipated financial crises (Chancheroenchai, Dibooglu, Mathur 2005). After the Asian crisis, many emerging economies particularly those in Asia, built war chests of foreign exchange reserves in order to insure themselves against the sudden stop of capital flight. These countries emerged from the crisis building their export sector that generated surpluses on the current account balance that fed the following cycle of boom and bust. These current account balances then contributed to the most recent economic crisis and any reform or regulatory solution with regards to capital requirements, risk management, leverage, transparency, disclosures, credit ratings, or insurance will be inadequate by itself. Thus, any global moves to reform the financial sector should be complemented by reforms to remedy problems posed by global imbalances.

Some authors have suggested various steps to deal with global imbalances to complement financial reforms as such [e.g., Portes (2009); Lane (2009)], and in light of the foregoing discussion, it worthwhile to enumerate some sensible measures here:

- Focus on financial development in emerging markets so that domestic savings can support a sizable domestic investment without too much reliance on short term foreign capital;
- Expand international institutional financing including that of the IMF so that countries do not have to accumulate excessive foreign exchange reserves for precautionary purposes;
- Improve international risk sharing: eliminate or reduce the problem of the original sin; allow emerging markets to borrow in their own currencies;
- Allow for state contingent instruments such as GDP-indexed bonds or global commodity price indexed bonds;
- Develop domestic social insurance, health, disability, and unemployment insurance so that people do not have to over save for precautionary purposes.
- Undertake long term reforms with respect to property rights, transparency, governance and improve macroeconomic stability so that the thresholds for productive international capital flows are met;
- For surplus countries, promote domestic demand policies that are appropriate for the domestic productive capacity of the economy in question;
- Promote regional integration and currency unions to eliminate some exchange rates and currency speculation all together;
- Limit leverage for systemically important financial institutions and/or require them to pay premiums to the fiscal authority; make sure that their size is not too big for the fiscal authority to deal with in case of insolvency.

6. Concluding Remarks

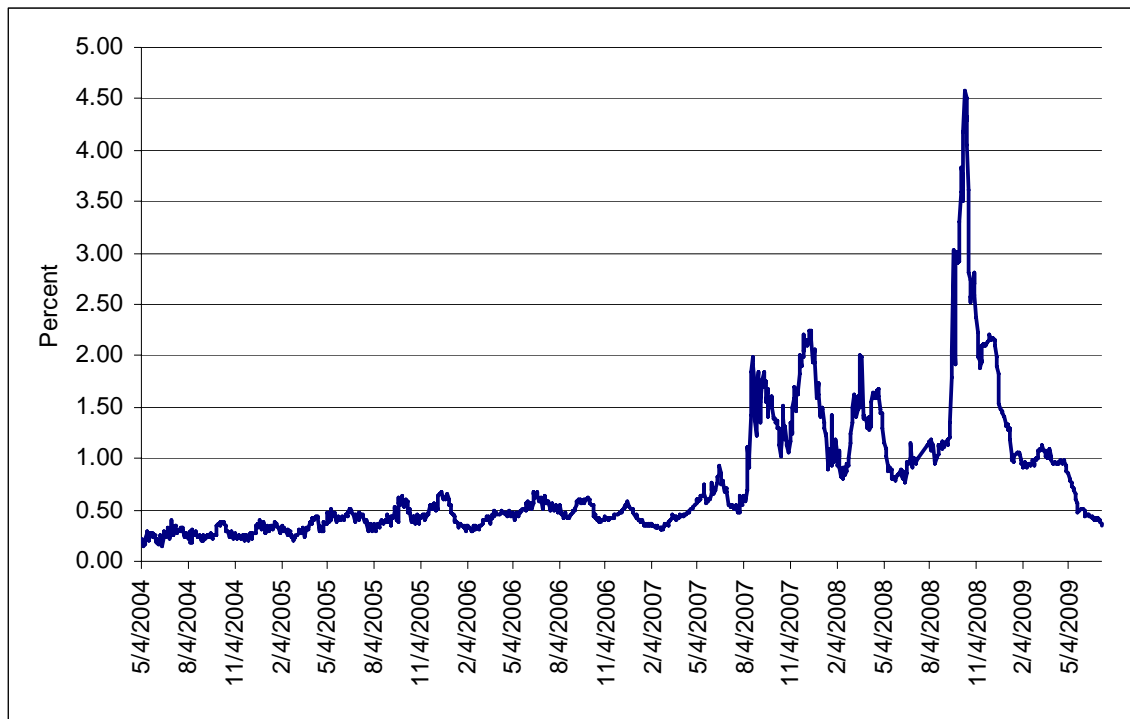
A stable financial system –one that is not prone to systemic risk- is the backbone of a robust economy. The recent 2007-2009 crisis has proved that the financial system was not able to withstand the stresses that came about with an increase in the size and

dispersion of global imbalances and the associated capital flows. After the Asian crisis, some emerging economies along with oil exporters amassed substantial official foreign exchange reserves. Central banks and sovereign wealth funds in these surplus countries channeled these funds to advanced economies but particularly to the US buying US government and agency securities, which raised the prices of safe assets in the US, bringing their yield to historical lows. In this low yield environment, the financial industry made extra strides to increase returns on investments by taking on various financial innovations (securitization, “originate to distribute”) to expose many financial institutions to systemic risk. The environment was also conducive to well documented principal-agent problems, moral hazard, and various incentive compatibility issues. Combined with leverage, these problems acted to amplify risk taking particularly in real estate related investments. The system was self sustaining so long as financial institutions were able to raise funds. However when slowing personal income growth and increase in interest rates increased delinquencies and foreclosures in the real estate market in the US, the complex securities became highly illiquid. Illiquidity in the housing market created information risk, which coupled with complexity risk, destroyed liquidity for asset backed securities in financial markets. Because of the interconnectedness in the global financial system, the crisis spread quickly and is producing the largest global downturns in recent memory.

In this paper we give a brief description of the origin of the crisis followed by an evaluation of the crisis within a historical context. We estimate the historical incidence of risk and present some evidence regarding the evolution of the unit price of risk in the stock market. Our results show that at least in the stock market, the unit price of risk is comparable to the onset of other notable recessions in the last century including the great depression. We then discuss global imbalances and how they may have been at the heart of the current crisis. Any sensible approach at financial reform must be complemented with addressing issues related to global imbalances and include remedies for allocating global financial resources such that they are used where they are most productive. As it is global financial resources are flowing the “wrong way”; providing environments where

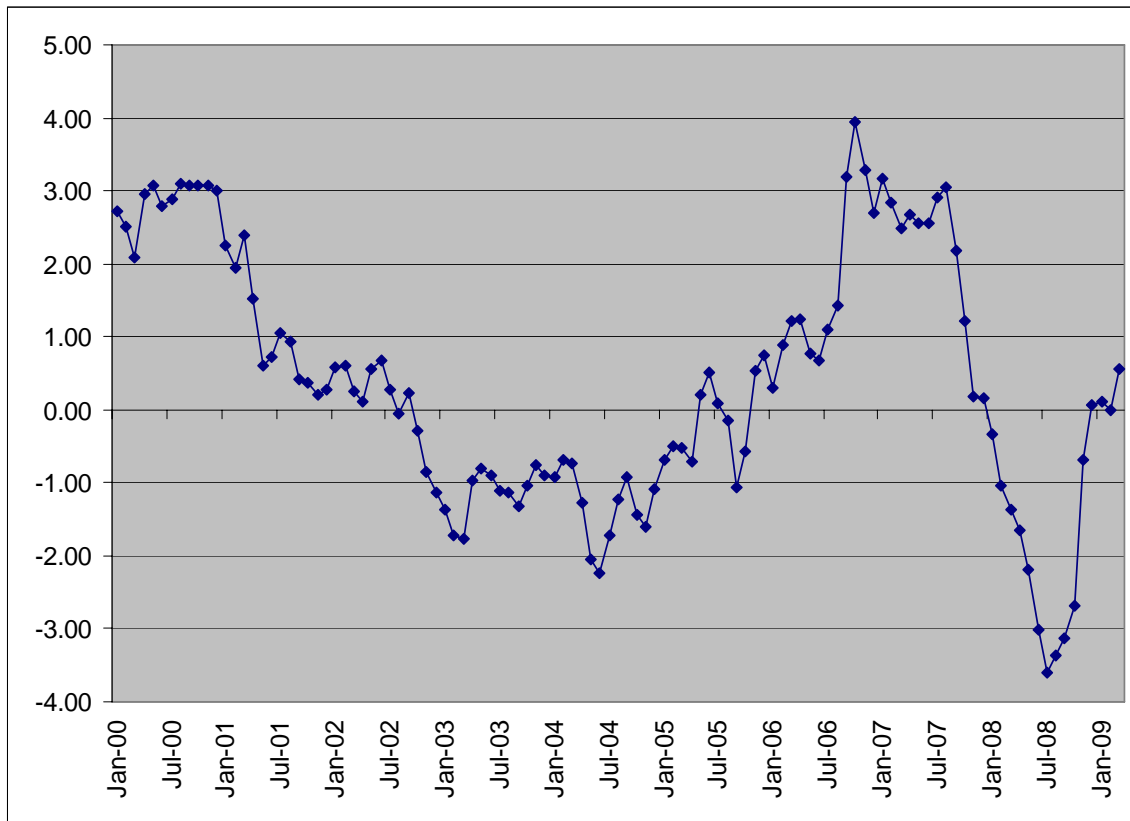
they can flow the right way must be a priority for international institutions and policymakers.

Figure 1. TED Spread, May 2004-July 2009



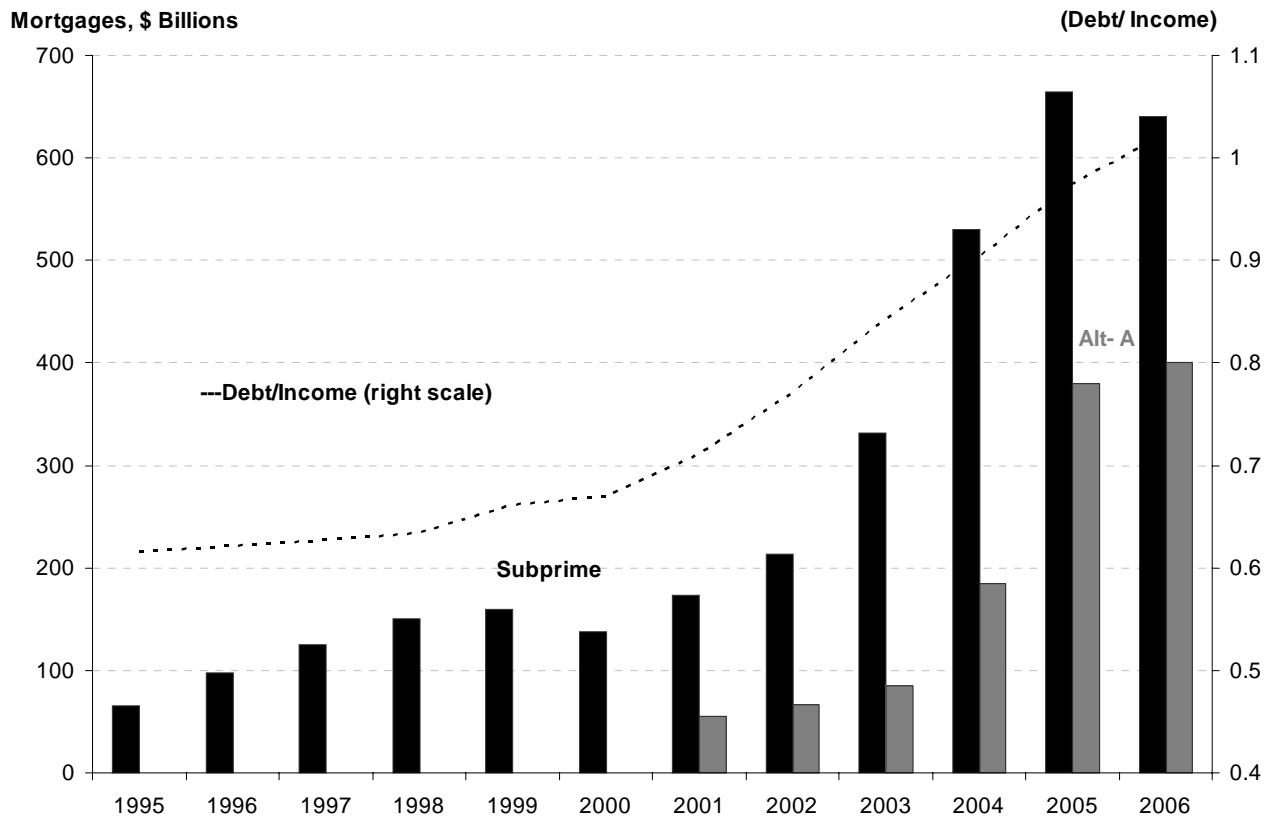
Source: 3 Month US Dollar LIBOR is from Moneycafe.com and the 3 month T-Bill rate is from the Federal Reserve Bank of St Louis, FRED Database.

Figure 2. Effective US Federal Funds Rate Adjusted for Year to Year CPI Inflation



Source: Federal Reserve bank of St Louis, FRED Database

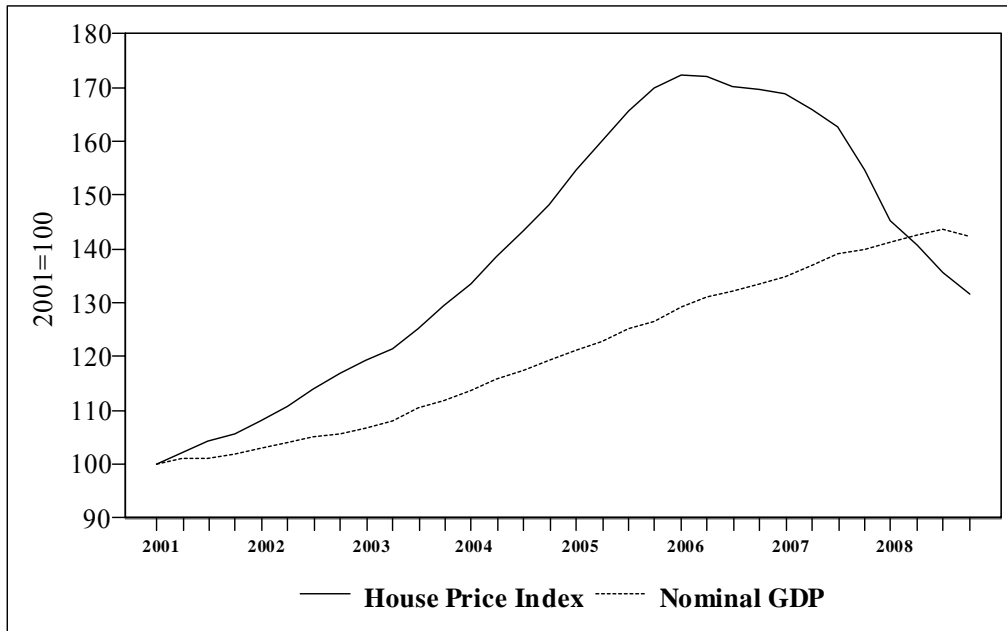
Figure 3. Non Prime Mortgages and Debt-Income Ratio in the U.S.



Source: David Wheelock (2008). "Dealing With Financial Turmoil: The Fed's Response", Federal Reserve Bank of St Louis.

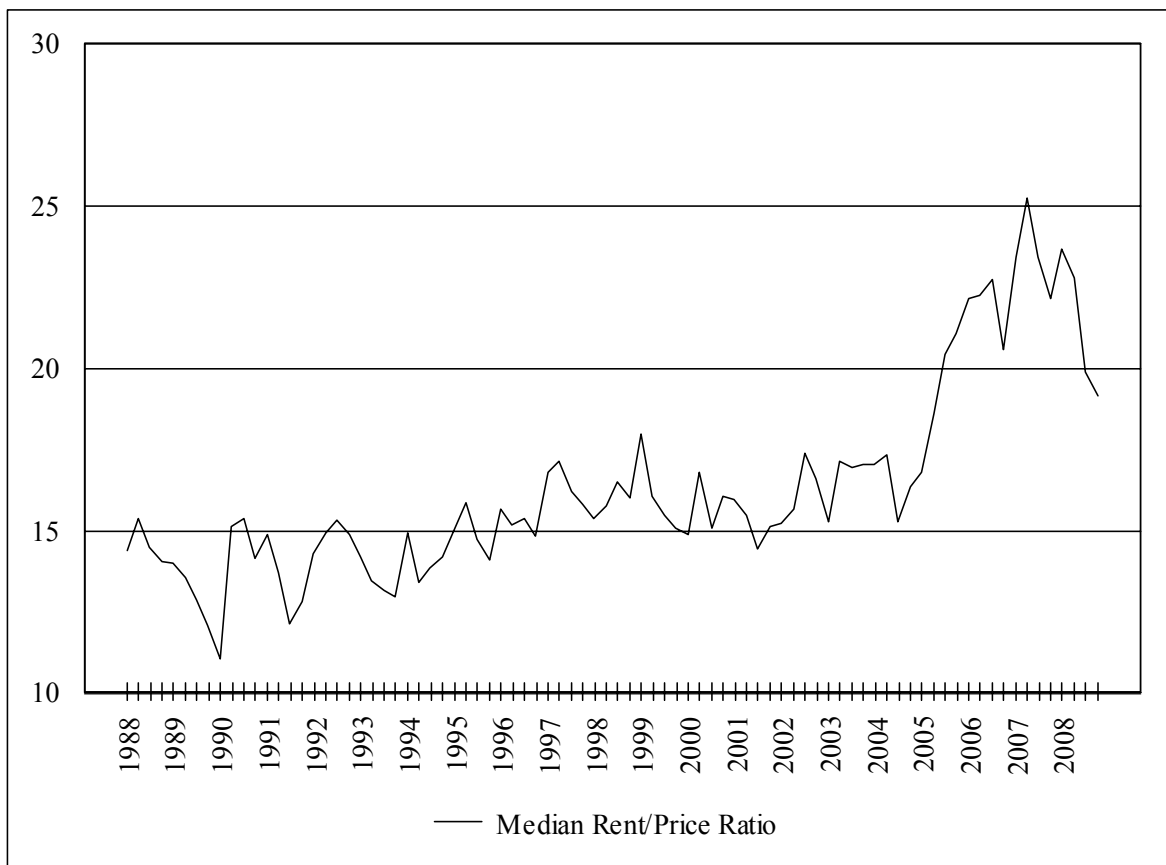
http://research.stlouisfed.org/conferences/prof/2008/Wheelock_Professors_Conf_11_6_2_008v2.ppt

Figure 4. U.S. House Price Index and GDP Growth, 2001-2008



Source: Standard and Poors Case-Shiller House Price Index (McGrawHill) GDP (St Louis FED)

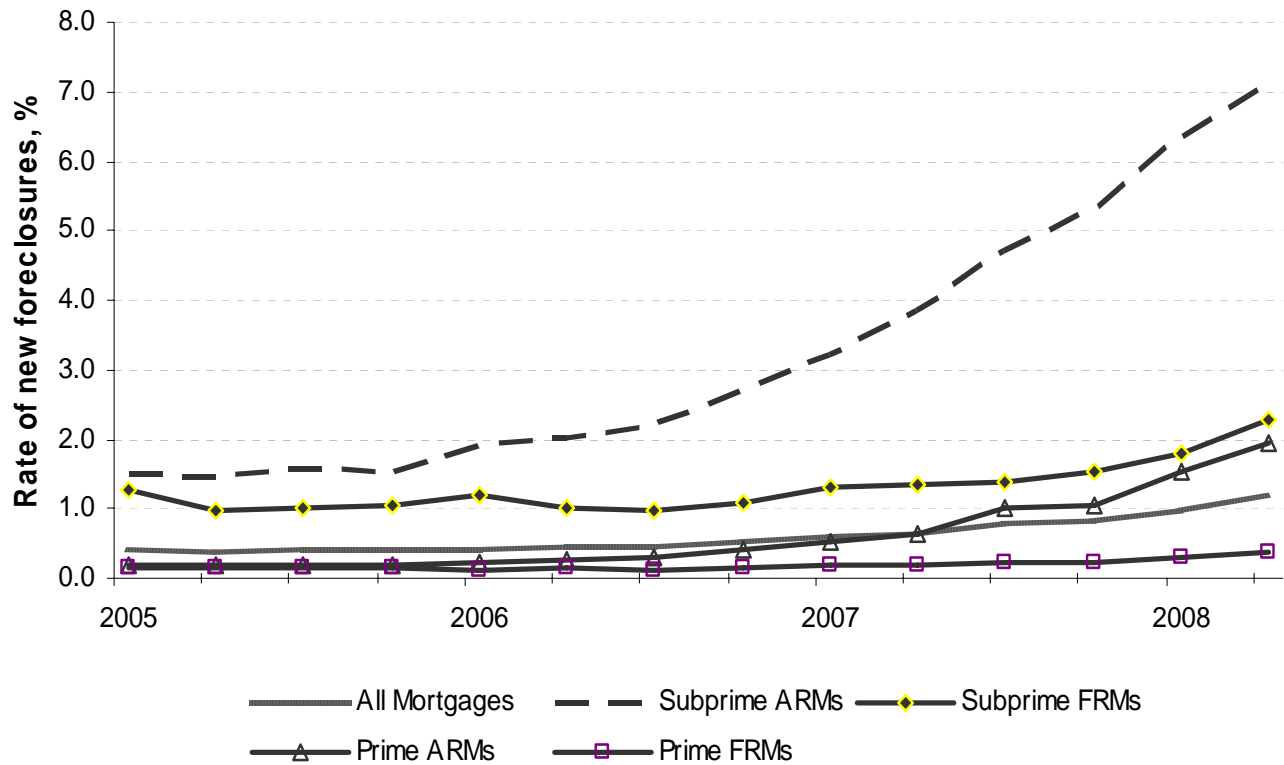
Figure 5. U.S. Median House Price to Rent Ratio in the U.S.



Note: Median house price divided by annual rent.

Source: Current Population Survey/Housing Vacancy Survey, Bureau of the Census, Washington, DC 20233

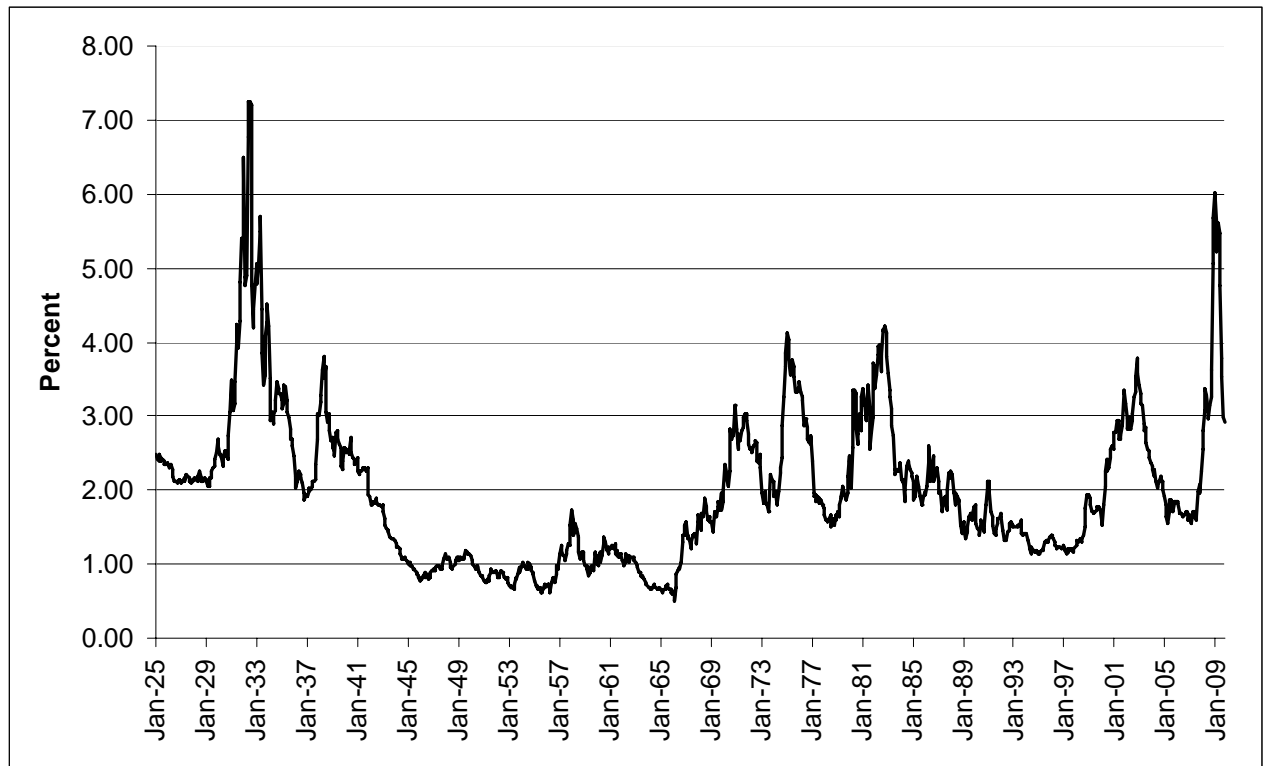
Figure 6. U.S. Foreclosure Rates by Loan Type



Source: David Wheelock (2008). "Dealing With Financial Turmoil: The Fed's Response", Federal Reserve Bank of St Louis.

http://research.stlouisfed.org/conferences/prof/2008/Wheelock_Professors_Conf_11_6_2_008v2.ppt

Figure 7. The Spread between Baa Grade Corporate Bonds and Treasury Composite Yield over 10 Years, January 1925-September 2009



Source: Federal Reserve Board, St Louis FED FFRED Database.

Note: Treasury discontinued the Composite Yield over 10 Years on June 30 2000. The 10 year constant-yield Treasury bond yield is substituted thereafter.

Figure 8. Conditional Volatility of the Stock Market in a Historical Perspective

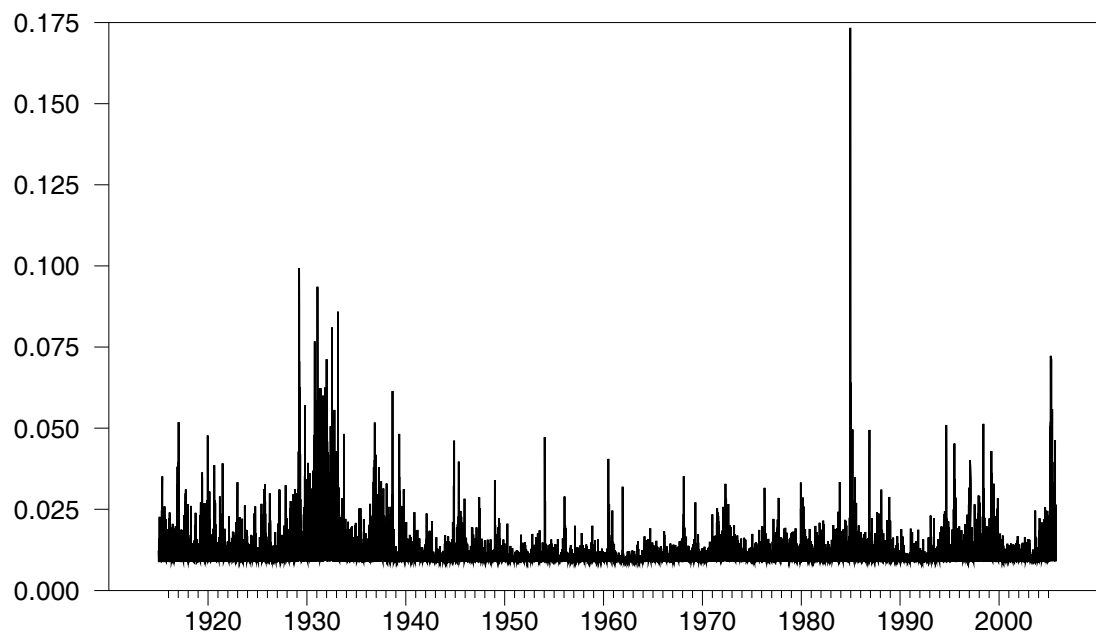
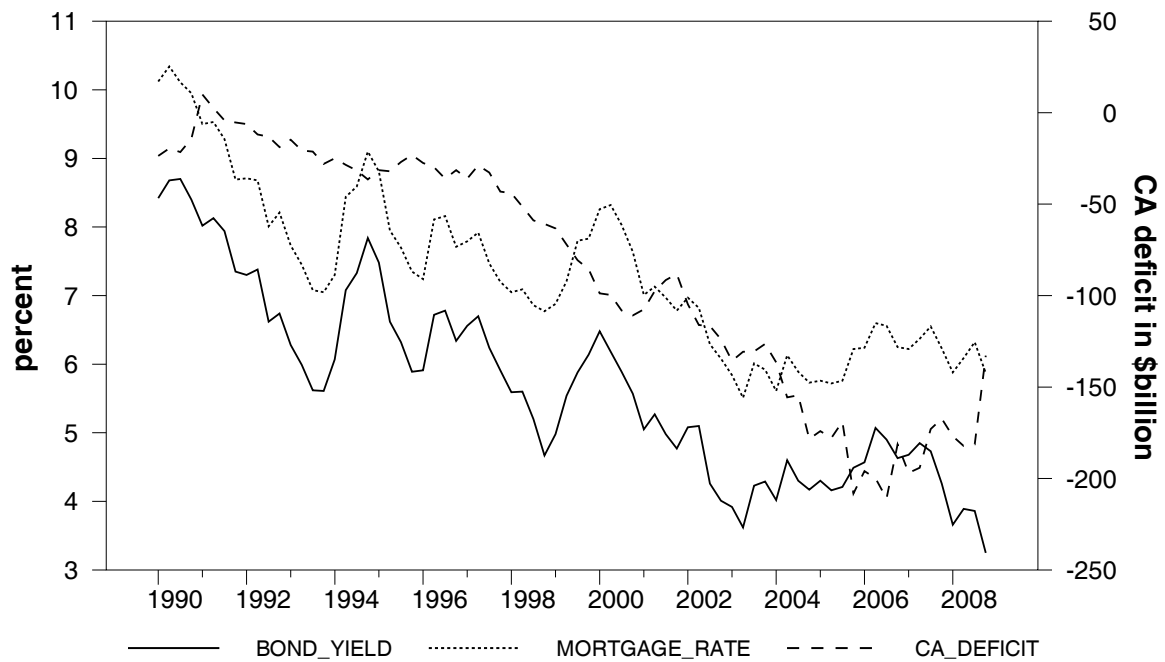
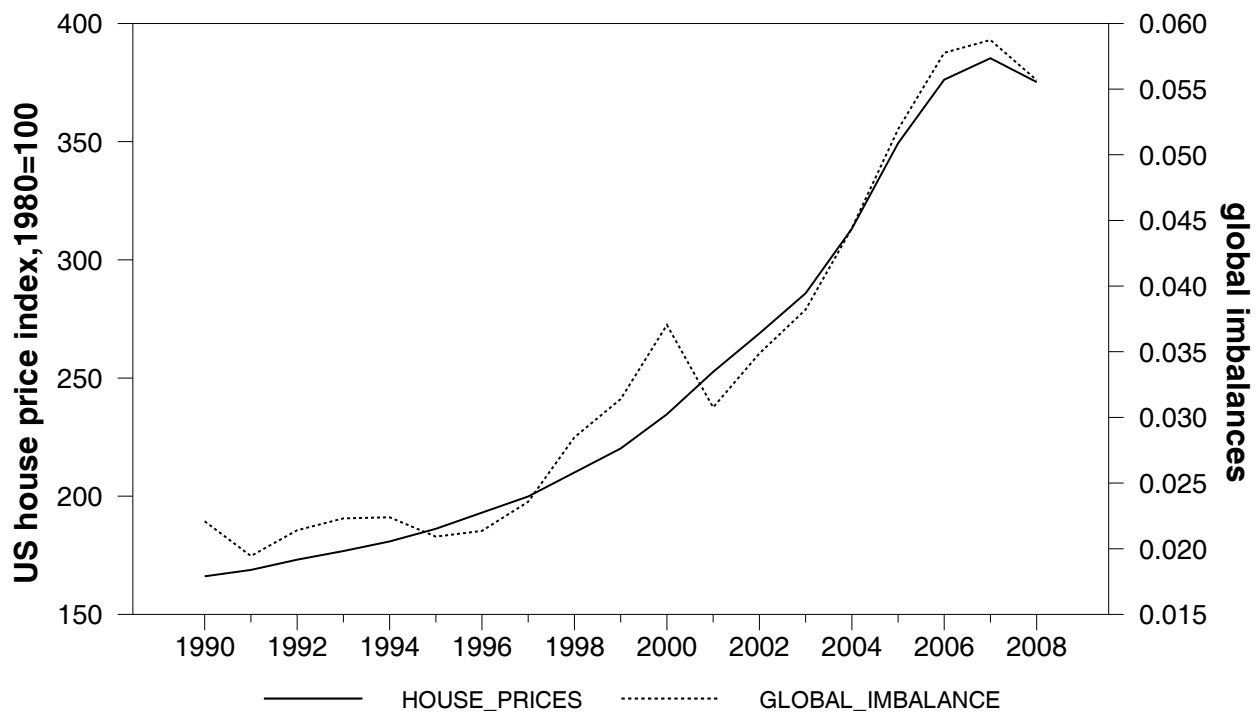


Figure 9. US Current account deficit (external borrowing), the Yield on the 10-year Treasury Note and the 30-year Conventional Fixed Mortgage Rate



Source: Federal Reserve Bank of St Louis, FRED Database.

Figure 10. US House Price Index and Global Imbalances



Source: US House Price Index, Federal Housing Finance Agency; Global Imbalances (absolute value of current account balances as a percent of world GDP) are from IMF (2008). The 2008 figure is from IMF (2009).

Table 1. Annual GDP Growth Rates in Advanced Economies

| | 1986– 1995 | 1996 | 1997 | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 ^a | 2010 ^a | 2002– 2006 | 2008– 2010 |
|----------------|---------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------------------|-------------------|---------------|---------------|
| United States | 2.9 | 3.7 | 4.5 | 4.2 | 4.4 | 3.7 | 0.8 | 1.9 | 3 | 3.9 | 3.2 | 2.8 | 2 | 1.1 | -2.8 | 0.0 | 3.0 | -0.6 |
| Germany | 2.7 | 0.8 | 1.4 | 2 | 2 | 2.9 | 0.8 | 0.1 | -0.1 | 1.2 | 0.9 | 3 | 2.5 | 1.3 | -5.6 | -1.0 | 1.3 | -1.8 |
| France | 2.1 | 1 | 1.9 | 3.6 | 3.2 | 4.2 | 2.1 | 1.1 | 0.5 | 2 | 1.2 | 2.2 | 2.1 | 0.7 | -3 | 0.4 | 1.4 | -0.6 |
| Italy | 2.1 | 1.1 | 2 | 1.8 | 1.7 | 3 | 1.8 | 0.4 | 0.3 | 1.1 | 1.9 | 1.8 | 1.6 | -1.0 | -4.4 | -0.4 | 1.1 | -2.4 |
| Spain | 3 | 2.4 | 4 | 4.3 | 4.2 | 4.4 | 2.8 | 2.2 | 2.5 | 3.1 | 3.4 | 3.9 | 3.7 | 1.2 | -3 | -0.7 | 3.0 | -0.8 |
| Netherlands | 2.7 | 3 | 3.8 | 4.3 | 4 | 3.5 | 1.4 | 0.6 | -0.9 | 2 | 1.5 | 3.4 | 3.5 | 2 | -4.8 | -0.7 | 1.9 | -1.2 |
| Belgium | 2.3 | 0.9 | 3.7 | 2.1 | 3.2 | 3.7 | 0.7 | 0.7 | 1.1 | 2.4 | 1.5 | 2.9 | 2.6 | 1.1 | -3.8 | 0.3 | 1.7 | -0.8 |
| Austria | 2.5 | 2 | 1.6 | 3.9 | 2.7 | 3.4 | 0.8 | 1.4 | 0.7 | 2.4 | 2 | 3.4 | 3.1 | 1.8 | -3 | 0.2 | 2.0 | -0.3 |
| Finland | 1.1 | 3.9 | 6.3 | 5 | 3.4 | 5.1 | 1.1 | 2.3 | 2 | 3.5 | 2.9 | 4.9 | 4.2 | 0.9 | -5.2 | -1.2 | 3.1 | -1.8 |
| Greece | 1.2 | 2.4 | 3.6 | 3.4 | 3.4 | 4.4 | 4 | 3.9 | 4.3 | 4.7 | 3.7 | 4.2 | 4 | 2.9 | -0.2 | -0.6 | 4.2 | 0.7 |
| Portugal | 4 | 3.5 | 4 | 4.6 | 3.8 | 3.4 | 1.6 | 0.4 | -1.2 | 1.2 | 0.4 | 1.4 | 1.9 | 0 | -4.1 | -0.5 | 0.9 | -1.5 |
| Ireland | 4.4 | 8.1 | 10.8 | 8.9 | 11.1 | 9.9 | 6 | 6.1 | 3.7 | 4.3 | 5.5 | 5.7 | 6 | -2.3 | -8 | -3.0 | 5.1 | -5.5 |
| Luxembourg | 6.2 | 3.3 | 8.3 | 6.9 | 7.8 | 9 | 1.3 | 1.7 | 2.1 | 4.2 | 4 | 6.1 | 5.2 | 0.7 | -4.8 | -0.2 | 3.6 | -1.4 |
| Japan | 3.1 | 3.5 | 1.8 | -1.2 | 0.2 | 2.8 | 0.4 | -0.3 | 2.5 | 2.3 | 2.6 | 2.4 | 2.4 | -0.6 | -6.2 | 0.5 | 2.5 | -2.9 |
| United Kingdom | 2.5 | 2.8 | 3.3 | 3.1 | 2.9 | 3.9 | 2.3 | 1.8 | 2.2 | 3.3 | 1.9 | 2.8 | 3 | 0.7 | -4.1 | -0.4 | 2.4 | -1.3 |
| Canada | 2.3 | 1.6 | 4.2 | 4.1 | 5.5 | 5.2 | 1.8 | 3.4 | 2 | 3.3 | 2.9 | 3.1 | 2.7 | 0.5 | -2.5 | 1.2 | 2.9 | -0.3 |
| Korea | 8.5 | 7 | 4.7 | -6.9 | 9.5 | 8.5 | 3.8 | 7 | 3.1 | 4.7 | 4 | 5.1 | 5.1 | 2.2 | -4 | 1.5 | 4.8 | -0.1 |
| Australia | 3.1 | 4.3 | 3.9 | 5.2 | 4.3 | 3.2 | 2.5 | 3.8 | 3 | 3.5 | 2.5 | 2.7 | 4 | 2.1 | -1.4 | 0.6 | 3.1 | 0.4 |
| Taiwan | 8.1 | 6.1 | 6.7 | 4.6 | 5.4 | 5.9 | -2.2 | 3.6 | 3.3 | 6.1 | 4.1 | 4.9 | 5.7 | 0.1 | -7.5 | 0.0 | 4.4 | -2.5 |
| Sweden | 1.6 | 1.3 | 2.4 | 3.6 | 4.6 | 4.3 | 0.9 | 2.1 | 1.6 | 3.7 | 2.7 | 4.1 | 2.6 | -0.2 | -4.3 | 0.2 | 2.8 | -2.1 |
| Switzerland | 1.4 | 0.5 | 1.9 | 2.8 | 1.3 | 3.7 | 1 | 0.2 | -0.5 | 2.1 | 1.9 | 3.4 | 3.3 | 1.6 | -3 | -0.3 | 1.9 | -0.6 |
| Hong Kong | 6.6 | 4.3 | 5.1 | -5.0 | 3.4 | 10.2 | 0.5 | 1.9 | 3.2 | 8.6 | 7.3 | 7 | 6.4 | 2.5 | -4.5 | 0.5 | 5.6 | -0.5 |
| Denmark | 1.6 | 2.5 | 3 | 2.5 | 2.6 | 2.8 | 1.6 | 1 | 0.5 | 1.9 | 3.2 | 3.9 | 1.6 | -1.1 | -4 | 0.4 | 2.1 | -1.8 |
| Norway | 2.8 | 5.3 | 5.2 | 2.6 | 2.1 | 2.8 | 2.7 | 1.4 | 0.4 | 3.1 | 2.3 | 2.5 | 3.1 | 2 | -1.7 | 0.3 | 1.9 | 0.2 |
| Israel | 5.4 | 4.6 | 3.5 | 3.7 | 2.5 | 8 | -0.9 | -0.7 | 1.3 | 4.8 | 5.2 | 5.2 | 5.4 | 3.9 | -1.7 | 0.3 | 4.1 | 0.8 |
| Singapore | 8.8 | 8.1 | 8.6 | -0.9 | 6.9 | 9.7 | -1.9 | 2.2 | 1.1 | 8.7 | 6.4 | 8.2 | 7.8 | 1.1 | -10 | -0.1 | 5.3 | -3.0 |
| New Zealand | 2.5 | 4 | 2 | -0.1 | 4 | 3.8 | 2.6 | 4.3 | 3.4 | 4.4 | 2.3 | 1.9 | 3.2 | 0.3 | -2 | 0.5 | 3.3 | -0.4 |
| Cyprus | 5.7 | 1.9 | 2.3 | 4.8 | 4.7 | 5 | 4 | 2 | 2 | 3.9 | 3.7 | 4 | 4.4 | 3.7 | 0.3 | 2.1 | 3.1 | 2.0 |
| Iceland | 1.7 | 5.2 | 4.7 | 5.6 | 4.2 | 5.6 | 2.7 | -0.5 | 4 | 8.2 | 5.5 | 4.4 | 5.5 | 0.3 | -11 | -0.2 | 5.5 | -3.5 |

Notes: ^a Based on IMF projections.

Source: International Monetary Fund, *World Economic Outlook*, various issue

Table2. Estimates of ARCH-M coefficients and the Evolution of the Unit Price of Risk

| | Full Sample | Onset of Great Depression | Oil Crises of 1970s | Onset of the Tech Bubble | Onset of the Subprime Crisis |
|----------|------------------------|---------------------------------|------------------------|-----------------------------|------------------------------------|
| b_0 | 0.00023*** (3.16) | -0.00163 (-1.46) | -0.00056 (-0.60) | -0.0011** (-2.32) | -0.00211** (-2.16) |
| b_1 | 0.0725*** (8.95) | -0.053** (-1.96) | 0.224*** (9.00) | 0.052** (2.15) | -0.082*** (-2.49) |
| δ | 1.45*** (7.83) | 25.83** (2.32) | 10.09 (0.83) | 24.14*** (4.28) | 27.01*** (2.47) |
| a_0 | 0.000081*** (74.72) | 0.000086*** (23.70) | 0.000065*** (24.80) | 0.000064*** (26.27) | 0.000075*** (22.34) |
| a_1 | 0.462*** (29.41) | 0.167*** (4.81) | 0.196*** (6.17) | 0.254*** (7.59) | 0.217*** (6.25) |

Notes: Data periods are as follows: Full sample, 1.04.1915-04.28.2009; Onset of Great Depression, 07.01.1921-08.01.1929; Oil Crises of 1970s, 11.01.1970-01.01.1980; Onset of the Technology Bubble, 03.01.1991-03.01.2001; Onset of the Subprime Crisis, 11.01.2001-12.01.2007. T-statistics are in parentheses. (**) indicates significance at 5 percent; (***) significance at 1 percent.

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ENDNOTES

¹ See, International Chamber of Commerce (2008).

² See, Stock and Watson (2002) and Blanchard and Simon (2001). Some argue that the decline in volatility is in no small measure due to the backward valuation methods and risk assessments that increased lending to hedge funds and made banks complacent about their own risk profiles. See Gillian Tett “Volatility returns with a vengeance,” Financial Times, FT.com, October 27, 2008.

³ As late as July 19, 2007 appearing before the Senate Banking Committee, FED Chairman Ben Bernanke predicted that the cost of sub-prime crisis would be in the order of \$100 billion. See, Times Online, July 19, 2007, <http://business.timesonline.co.uk>.

⁴ See the FRED database of the Federal Reserve Bank of St Louis, series PSAVERT, available at <http://research.stlouisfed.org/fred2/series/PSAVERT?cid=112>

⁵ Data from January 4, 1915 through October 1, 1928 is from Ohio State University Fisher College of Business web site while the rest of the data is from <http://finance.yahoo.com>.

⁶ Since the stock market is closed on weekends and holidays and some other occasions when trading is halted, this is necessarily an approximation. We assume trading takes place continuously and substitute the previous closing price when data are missing.

⁷ To the contrary, demand for US government securities surged after September 2008 due to a flight to safety, yields have dropped dramatically and the US dollar appreciated as a result.

⁸ A simple regression of the percentage change in the house price index in the US on the change in absolute current account balances to global GDP ratio as a measure of global imbalances confirms a significant relationship (t-statistics in parentheses). $\Delta \text{house price} = 0.36 + 5.26$
(0.006) (1.59)

$\Delta \text{Global imbalances} + \text{error}; R^2 = 39\%$.