

Stages of the 2007/2008 Global Financial Crisis: Is There a Wandering Asset-Price Bubble?

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Abstract

This study identifies five distinctive stages of the current global financial crisis: the meltdown of the subprime mortgage market; spillovers into broader credit market; the liquidity crisis epitomized by the fallout of Northern Rock, Bear Stearns and Lehman Brothers with counterparty risk effects on other financial institutions; the commodity price bubble, and the ultimate demise of investment banking in the U.S. The study argues that the severity of the crisis is influenced strongly by changeable allocations of global savings coupled with excessive credit creation, which lead to over-pricing of varied types of assets. The study calls such process a “wandering asset-price bubble”. Unstable allocations elevate market, credit and liquidity risks. Monetary policy responses aimed at stabilizing financial markets are proposed.

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I. Introduction

The global financial crisis of 2007 and 2008 is a complex and multifaceted process. Its underlying causes shall be attributed to the prevalent excess liquidity or, using the Federal Reserve Chairman Ben Bernanke's term, to the 'savings glut' in global financial markets, as well as to the un-orderly proliferation of subprime mortgages in the United States, coupled with inadequate asset/liability and risk management practices of financial institutions. Its systemic complexity and far-reaching spillover effects into a wide-range of credit areas, global financial markets, commodity markets and real economy make this crisis seemingly more different and more multifarious than the previous financial crisis episodes.

Proliferation of this crisis can be explained in terms of changeable allocations of the global savings that have become increasingly illiquid¹. As these allocations move across various asset types, they generate disorderly asset-price bubbles. We call this process a "wandering asset-price bubble". Accordingly, this crisis has gone through five distinctive stages. First, it began with the housing bubble in the U.S. that was increasingly inflated by subprime and near prime (so called Alt-A) mortgage lending². Second, it spread into other types of assets and affected not only mortgage companies and specialized investment banks, but also universal banks. Third, it induced the global liquidity crisis accompanied by a massive pullout of liabilities from the most severely exposed banks, i.e. Northern Rock, Bear Stearns and, later, Lehman Brothers, triggering anxiety about possible credit contagion from counterparty risk on the global scale. Fourth, the collapse of structured investment products, mainly collateralized debt obligations (CDOs), shifted the global liquidity allocations into commodity futures market causing bubble effects in this area as well. Fifth, it reached a zenith in September 2008 with massive shifts of funds into risk-free

¹ The size of global savings is best captured by the total value of international managed assets companies (pension funds, mutual funds, insurance funds, official reserves, sovereign wealth funds, hedge funds and private equity) estimated by the International Monetary Fund to have reached \$76 trillion at the end of 2007. Total liquidity attributable to unregulated, more risk-prone sovereign wealth funds, hedge funds and private equity reached \$9 trillion, the changeable allocations of which inflated various asset bubbles.

² Subprime mortgages are those made to the least credit-worthy applicants i.e. with low credit scores and uncertain income prospects; near-prime or Alt-A mortgages are loans approved without proper documentation or proof of income.

securities, as Lehman Brothers filed for bankruptcy protection and US investment banking system faced its ultimate demise.

The key factors contributing to the decline of the housing market and the subprime mortgage market in the U.S. are examined in Section II. The five distinctive stages of the crisis are identified in Section III. Possible theoretical explanations of the current crisis are discussed in Section IV. Interactions between different financial risk categories during the course of this crisis are analyzed in Section V. Policy recommendations at the micro-level, i.e. for financial institutions are presented in Section VI. They are followed by recommendations at the macro-level, i.e. for regulatory agencies and monetary authorities in Section VII, which also evaluates critically the actual actions of central banks aimed at containing the crisis and mitigating the resulting risks to global financial stability. A synthesis of main findings and arguments of the paper, as well as suggestions for further research are provided in Section VIII.

II. Origins of the Current Financial Crisis

The deep roots of the current crisis can be traced back to the capital outflows from many emerging markets in the aftermath of the 1997/98 Asian and Russian financial crises and the correspondent liquidity buildup in the countries with growing current account surpluses. Although such a far-sighted analysis would be reasonable, the aim of this study is to emphasize the more immediate and direct contributing factors and triggers of the current crisis.

This crisis has stemmed from an idiosyncratic combination of macroeconomic processes and micro-level institutional factors, all prevalent before the outbreak of the crisis in 2007. The macroeconomic contributors to the crisis include: monetary expansion in the U.S., large capital inflows to U.S. securities market (mainly government bond market) from high-savings countries, the U.S. housing boom and the mounting indebtedness of U.S. households. The institutional characteristics encompass: rapidly growing asset securitization coupled with financial innovations i.e. development of new structured financial products, the emergence of hedge funds as well as conduits and structured investment vehicles (SIVs); flawed credit risk assessment and asset valuation models; inadequate financial supervisory and regulatory frameworks.

The monetary expansion in the U.S. was based on the supposition that the unprecedented productivity growth of the late 1990s and early 2000s (induced by the

technological progress) was not matched by wage and costs adjustments. It was, therefore, non-inflationary. The monetary expansion contributed to higher net interest margins for banks. The cost of funding for banks based on the federal funds rate was considerably below the thirty-year mortgage rate at that time (see Figure 3). With the U.S. Federal Reserve (Fed) returning to a tighter policy stance in mid 2004, the profit margins of banks were subsequently reduced. In order to sustain long-term lending activity in the presence of the booming housing market, banks resorted to financial innovations.

Prior to 2006, the housing market in the United States enjoyed a long period of steady expansion, largely aided by securitization of mortgages as well as the emergence of new, structured financial products. The increasingly risky mortgages were turned into complex derivative securities and sold off to raise funds for new lending. Among the characteristics of the U.S. housing market boom is a strong increase in new privately-owned housing starts from the monthly level of 798 thousand units in the beginning of 1991 to the peak of 2,273 thousand in January 2006 (Figure 1). Concurrently, the number of new single-family houses sold rose from 401 thousands in January 1991 to 1,389 thousands in May 2005. Evidently, constructions of new homes continued to grow during the May 2005 – January 2006 period, but the actual purchases of new homes declined. Since their respective peak levels until June 2008, both the housing starts and the sales of new homes have dwindled approximately by half (Figure 1). Similarly, the existing home sales have declined from their monthly-average close to 7.1 million units in 2005 to 4.8 million in June 2008 (based on the National Association of Realtors data).

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Further insights are derived from the analysis of the actual ratio of new housing starts to new houses sold, along with its Hodrick-Prescott trend and the cyclical component shown in Figure 2. The declining pattern of this ratio between 1990 and 2005 indicates a faster growth of demand for new homes relative to their supply, which contributed to rising prices of new constructions. However, the trend has been markedly reversed since 2005, implying a downward pressure on prices. The cyclical component shows increasing tendency in 2005, which stems from rising interest rates, including residential mortgage rates.

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Evidently, the housing boom coincided with expansionary monetary policy of the Fed. The policy-makers kept the benchmark federal funds rate at 1.0 percent from July 2003 until July 2004, as shown in Figure 3. Then, under the new leadership of Mr. Bernanke, the Fed began a tightening cycle increasing the fed funds rate steadily, to 5.25 percent as of January 2007. The benchmark rate was maintained at that level until July 2007, the eve of the outbreak of the subprime mortgage crisis. Since then, the rate has been reduced to the current level of 2.0 percent in several steps. It has become evident that during the 2001–2005 period the Fed created excessive liquidity, which in turn became a strong contributing factor to indiscriminate proliferation of credit and to the subsequent global liquidity crisis.

Experiencing a very low cost of funding during the bountiful liquidity period, financial institutions enjoyed high profit margins on mortgage loans, since the spread of mortgage rates over the fed funds rates was considerably wide (Figure 3). The cheap money and the housing boom encouraged banks to engage in more risky lending practices. The mortgage lending base now widened to include subprime borrowers and the lending tactics became more aggressive by offering either initial low interest rates (so called ‘teaser rates’) or payment options (option ARMs). On a wide-spread scale, the standard credit approval criteria based on maximum levels of total debt service (TDS) ratios for mortgage borrowers were either violated or ignored. The default risk was no longer a concern since mortgage originators had no intention of retaining the loans on their balance sheets. Hence, the unprecedented expansion of high-risk non-traditional mortgage loans took place. Higher volume of lending activities was supported by complex securitization of mortgages. The resulting collateralized debt obligations (CDOs)³ were sold providing funds for new loans, thus increasing banks’ fee income (from origination fees). In the meantime, the share of subprime and Alt-A in total newly-originated securitized mortgages reached 40 percent in 2006 while it was merely 9 percent in 2001 (Tilton, 2007). This rush to

³ In their abbreviated definition, CDOs are broad structured credit instruments derived from pools of underlying assets such as loans, corporate bonds, asset-backed securities or mortgage-backed securities. These assets are divided into tranches with varying credit risk: senior tranches (AAA-rated), mezzanine tranches (AA to BB-rated), and unrated equity tranches (also referred to as ‘toxic waste’). In addition to involving fixed-income assets, CDOs can also be constructed on the basis of credit default swaps (synthetic CDOs) or on the basis of CDO tranche itself (CDOs-squared). Junior tranches offer higher interest rates to investor to compensate for higher credit risk.

high risk mortgage loans has been unprecedented, considering the fact that in 2006 subprime loans constituted merely 14 percent of total outstanding U.S. mortgages, near-prime only 6 percent while the traditional prime loans prevailed with the 80 percent share (DiMartino and Duca, 2007).

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Such surge in non-prime mortgage loans would not be possible if not for the ability of banks to transfer default risk to market investors who bought CDOs. These complex financial instruments were attractive to investors, because they offered higher rate of return than other marketable securities with similar credit ratings, particularly given the low interest rate environment. Their proliferation has been significant over the past several years, as shown in Figure 4. Quarterly issuance of global CDOs reached a peak of \$186.5 billion in the 1st quarter of 2007. Since then, it has nearly collapsed, scoring merely \$11.7 billion in the 1st quarter of 2008. Their total annual issuance was the highest in 2006 reaching \$551.7 billion, and it declined to \$502.3 billion in 2007. As we have learned from the troubled banks, they viewed CDOs as credit-risk instruments insulated from market-risk. Therefore, they incorrectly assumed that, even in the case of elevated market risk, CDOs positions could be easily adjusted or liquidated, especially if they carried investment-grade credit ratings. Figure 4 shows also the breakdown of new CDOs issuance by currency denomination, in U.S. dollars and euros. It is worth noting that their issuance in euros began declining already in the 2nd quarter of 2007, that is, before the outbreak of the subprime mortgage crisis, while at the same time their dollar denominated issuance was still on the rise. At that time, the ECB demonstrated stronger commitment to containing inflation expectations than the Fed did. These different policies resulted in the appreciation of the euro against the dollar reducing effective yield margins on euro-denominated CDOs.

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The short-lived success of CDOs was made possible by the expansion of global savings. International investors were eager to purchase these high-yielding structured products since yields on U.S. Treasury bonds, were considerably lower. In fact, a prior heavy demand for the long-term U.S Treasury bonds in the first half of the present decade contributed to the inverted U.S. Treasury yield curve.

Consequently, the plentiful global liquidity in the hands of managed investment funds was re-allocated into high-yielding CDOs, which initially offered attractive returns. However, these structured products entailed significant asymmetric information. For investors, the information asymmetry came in the form of the adverse selection problem, i.e. before their purchase, investors believed that CDOs carried a relatively low risk due to their narrow spreads over risk-free securities. In a one-year retrospect of the financial crisis, one may conclude that these spreads did not nearly compensate for the de facto high default and liquidity risks associated with these structured products stemming from the non-performance of their underlying assets, such as subprime mortgages. The de facto risks associated with these complex derivatives with option-like characteristics have been grossly underestimated by credit rating agencies.

Surge of mortgage originations to low-income borrowers in the environment of rising home prices contributed to higher debt burden of U.S. households. As shown in Figure 5, the share of mortgage repayments in total household debt service was very high in the early 1990s. After reaching 90 percent in 1992, it declined steadily to the lowest level of 72 percent in 2002 but afterwards increased to the recent levels exceeding 80 percent. The latest increase was driven initially by high property values and subsequently by higher mortgage rates. Larger and increasingly expensive mortgages are a serious contributing factor to a sharp increase in the ratio of household debt to disposable income that exceeded unity in 2001. After the period of steady climbing, the U.S. household debt exceeded disposable income by one-third in 2006 and remained at that level in 2007. Thus evidently, the borrowing capacity of U.S. households eroded gradually and the default risk of the household sector (the largest contributor to the U.S. GDP) became a serious, grossly underestimated problem. The mounting indebtedness of U.S. households became a crucial, yet neglected indicator of the upcoming financial crisis. Moreover, mortgage default rate increased in 2006 and 2007 due to rising interest rates, thus undermining the collateral base of CDOs. Therefore, the warning signs were already apparent in 2006 and any assumptions about, a further growth of mortgages, property values, and bank profit margins from mortgage loans and CDOs had to be irrational.

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In sum, the subprime mortgage crisis has been a result of a specific plot of macroeconomic conditions and microeconomic systemic failures. The macroeconomic triggers of the crisis include the global savings glut and the excessive

liquidity created by the Fed as well as some other central banks. This liquidity was augmented by excessive credit creation stemming from banks securitization of assets. The low yields on risk-free government bonds increased investors demand for higher yielding CDOs. The microeconomic flaws include proliferation of subprime mortgage loans accompanied by ubiquitous violations of standard TDS safety benchmarks, unrecognized information asymmetry for investors in CDOs that perhaps concealed the risk of mortgage default, the mistakes of the rating agencies in the credit assessment of these securities, and, what will be discussed below, excessive leverage of banks.

III. Distinctive Stages of the Crisis

The macro- and microeconomic triggers of the subprime mortgage crisis along with the systemic flaws in risk assessment and management were clearly overlooked prior to the outset of the present financial crisis. With the Fed's return to the policy tightening cycle (see Figure 3), interest rate spread of CDOs over government securities narrowed, gradually eroding attractiveness of these derivatives to global investors. At the same time, interest rates on adjustable rate mortgages (ARMs) reset higher, leading to a dramatic increase in defaults and foreclosure activities. Foreclosures on housing properties in the U.S. rose by nearly 1.3 million in 2007, up 79 percent from 2006; 43 percent of all 2007 foreclosures were associated with subprime ARMs. As a result, lending activity in the mortgage market declined sharply. The troubles in the housing market rippled into money markets in which banks and other financial institutions raise short-term funds. In response, banks hoarded cash and withdrew credit from each other, which elevated LIBOR rates (Figure 6a) and resulted in credit tightening. This credit crunch signified a widespread erosion of trust. The increased cost of funding and in some cases downgrades of financial institutions also restricted the ability of conduits and structured investment vehicles (SIVs) to issue asset-backed commercial paper⁴. By September 2007 the asset-backed commercial paper market became completely illiquid. As funding dried up and the value of SIVs assets tumbled with falling US housing prices, some of the SIVs became insolvent (for instance Cheyne or Victoria Finance). As a

⁴ Conduits and SIVs are funds sponsored by banks and investment firms that borrow short-term money by issuing commercial paper (at rates close to LIBOR) and use the proceeds to invest in long-term high-yielding asset-backed securities or CDOs. If the values of long-term securities bought by SIVs fall below the values of short-term securities sold by them, their solvency is at risk.

result, the banks found it increasingly difficult to dispose off some of their risky mortgages⁵.

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In essence, tensions on the inter-bank lending market, thus also the intensity of the financial crisis can be best captured by the time series distribution of the spread between the LIBOR and the risk-free yields on U.S. government securities with corresponding maturities. Figures 6a and 6b show the TED (Treasury over Eurodollars) spread captured by the difference between the 3-month LIBOR over the 3-month U.S. Treasury bill yield. Figure 6a shows its time path for a one-year period following the outbreak of the subprime mortgage crisis and Figure 6b for a one-year period ending December 9, 2008. Increasing spreads denote elevated counterparty risk and reluctance of banks to lend funds to each other. Over the one-year period displayed in Figure 6a, the TED spread shows at least three major jumps.

The first jump coincides with the outbreak of the subprime mortgage crisis on August 17, 2007, in response to the collapse of two hedge funds owned by Bear Stearns, which both had vast exposure to mortgage-backed securities. At the same time, three European investment funds were unable to price assets linked to subprime mortgages due to sudden illiquidity in these markets (DiMartin, Duca, Rosenblum, 2007). The funds in question froze redemptions, which induced panicky reactions in the broader markets. On August 20, 2007 the TED spread jumped to 240 basis points (bps) - the level that was previously experienced only during the 1987 stock market crash. The subsequent liquidity injection by the Fed helped reduce the TED spread to around 100 bps in October 2007. In addition, the spread was brought down by the initial write-offs by banks of losses, but on subprime loans only.

The second jump took place in December 2007, when it became apparent that the financial crisis was reverberating across other credit areas and a wide range of financial institutions. On December 11, 2007 the TED spread hit 221 bps. The steep lowering of the federal funds rate by the Fed (see Fig. 3) during the December 2007 - February 2008 period did not halt spreading of the crisis. It became apparent that the

⁵ While investment grade CDOs were relatively easy to sell, in order to distribute mezzanine and particularly the equity tranches banks had to rely on hedge funds, conduits and SIVs. These distribution methods that were primary engines of the excessive credit creation are no longer available as most of the structured vehicles have failed. The last SIV, Sigma Finance, was shut down on October 2, 2008.

elevated market and credit risks were translating into liquidity and counterparty risks. The effects of this transmission were most severe for the institutions with vast exposure to subprime mortgage market; particularly those that had failed to raise capital and reduce excessive leverage. The proliferation of credit risk entailed expansion of credit default swaps (CDS) i.e. the unfunded derivatives, while the funded derivatives such as CDOs were declining⁶. The sharp increase in counterparty risk resulted in extensive losses by large dealers of derivatives, most notably, Bear Stearns.

Hence, the third TED spread takeoff. The losses in mortgage derivative market and the elevated counterparty risk induced severe liquidity problems for banks. In particular, they triggered a massive run on Bear Stearns liabilities on March 13 and 14 of 2008. In these two days, its liabilities fell by USD 17 billion⁷. The fallout of Bear Stearns elevated the TED spread to 204 bps on March 19, 2008.

In hindsight, the three distinctive leaps in the TED spread were caused by different, increasingly complex factors. Their intricacy reflects broadening of the scope and the spillover effects of the subprime mortgage crisis into other credit categories and global financial institutions. These three idiosyncratic outbursts allow for identification of the initial stages of the financial crisis, with capital re-allocation into commodity futures marking the next stage.

The fourth stage of the crisis, i.e. the commodity futures bubble began to emerge at the beginning of 2008. After the global investors incurred huge losses on CDOs and other derivatives, as well as on stocks of financial institutions, they switched some of their funds into commodity futures recognizing that the futures markets were in a normal backwardation position⁸. This was in fact the case of a number of commodity futures markets, most notably, the crude oil futures market. It seems that

⁶ The total notional value of CDS increased from USD 10 trillions in June 2005 to 62 trillion at the end of 2007.

⁷ The key contributors to the run on Bear Stearns included: Renaissance Technologies Corp. - a hedge fund that withdrew 5 billion dollars of cash, Rabobank and ING - each of them pulled out 500 million of loan commitments.

⁸ 'Normal backwardation' in futures markets takes place when the price of commodity for future delivery is below the expected spot price. Recognizing that the futures price must converge to the expected spot price, speculators take 'net long' positions anticipating the futures price to increase. The adverse situation is 'contango' markets, where the expected spot price is below the futures price. In this case, speculators find incentives to sell futures, thus bringing their futures prices down to the expected spot price.

investors and speculators found strong incentives to purchase futures contracts, and their actions drove up futures prices to a high expected spot price. As a result, NYMEX oil futures prices nearly doubled from USD 75 per barrel in the beginning of October 2007 to their peak of USD 147 on July 11, 2008 (Figure 7)⁹. Since then, the oil futures markets have been in a contango situation, providing disincentives to investing in commodity futures thus contributing to declining tendency of futures prices.

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The elevated market risk coupled with deepening liquidity problems in the global banking sector led to the fifth stage of the crisis, i.e. the banking liquidity freeze and the investors' flight-to-safety. At that stage, the asset bubble shifted to U.S. Treasuries and, to some extent, gold. The gradual deterioration of liquidity in the global banking sector, accompanied by a paralysis of the commercial paper market reached a peak on September 29, 2008. On that day, the U.S. House of Representatives rejected the initial version of the financial institutions' bailout plan sponsored by the Treasury Secretary Henry Paulson. In response, the stock market plunged (the Dow Jones Industrial Average fell by 778 points) and the market volatility VIX index jumped sharply to the unprecedented level of 47¹⁰. The elevated market risk prompted investors to shift assets into U.S. treasuries, the yields on which fell sharply across their entire maturity structure. Correspondingly, U.S. dollar appreciated against major currencies and gold prices rose by 3.3 percent (to USD 912 per ounce). Counterparty risk in the banking sector as proxied by the TED spread reached new apex of 464 bps on October 10, 2008 (Figure 6b). In spite of the Congressional approval of the revised bailout package at the beginning of October, concerns about the credit squeeze and the impact of the commercial paper market freeze on the real economy did not prevent a further, deeper flight-to-safety by investors.

⁹ Valuable insights on the current escalation in expected spot prices of crude oil are provided by Brown, Virmani and Alm (2008). They attribute this increase to escalating demand expectations and to the U.S. dollar depreciation. In addition, Stevans and Sessions (2008) show empirically that the real price of oil today is strongly determined by long-term futures contracts that are inherently speculative.

¹⁰ VIX – Chicago Board Options Exchange volatility index is an implied 30-day forward volatility of S&P 500 index options. In general terms, it measures market expectations of volatility for the next one-month period.

Thus in retrospect, the five distinctive stages of the ongoing financial crisis can be identified:

1. the outbreak of the subprime mortgage crisis
2. the proliferation of credit risk, along with the broadening of losses of financial institutions
3. the eruption of liquidity crisis highlighted by the run on Bear Stearns, with the spread of contagion effects on other investment banks with similar portfolio characteristics (most notably, Lehman Brothers)
4. the commodity price bubble
5. the ultimate freeze of credit markets accompanied by the massive flight to safety by investors.

The heterogeneous roots and the complex sequence of the current crisis pose a major challenge to synthesizing of its underlying causes and global repercussions. It is, however, crucial to assume that the global savings glut persists, and the allocations of global managed assets are changing in response to market signals and the dynamics of systemic risk. The over-extended debt of U.S. households (Figure 5) has engendered a gradual decline in real consumer spending, triggering a slowdown of the U.S. economy and the correction of the housing market (Figures 1 and 2). Without doubt, the monetary policy expansion at the late stage of Mr. Alan Greenspan era reduced the cost of funding for banks to near- or even below-zero in real terms invoking undisciplined lending practices, additionally spurred by the rise in credit derivative securities. Credit derivatives were widely believed to be liquid and non-risky. Their optimistic outlook stemmed from their upbeat assessment in the IMF Global Financial Stability Reports (consistent from 2004 until April 2007), as well as in the buoyant reports of various credit rating and supervisory agencies. In the aftermath of the outbreak of the crisis, the implicit low credit risk and safety of global financial markets, instruments and institutions proved to be illusive.

In such a fragile environment, assessing systemic risk and credit quality across many asset classes is fraught with difficulty for banks, credit rating agencies and investors. The asymmetric information and collective risks associated with various asset-backed securities have proven to be more significant than previously assumed. Following the collapse of subprime mortgages, investors and firms have been transferring their vast capital across various asset classes. Proliferation of market risk and credit risk switched the investors' preferences away from CDOs into commodity futures and, later, gold and Treasury securities.

These observations lead us to the argument of persistency of *the 'wandering asset-price bubble'* defined as uncontrollable and unwarranted upward movement in prices or over-valuation of various asset classes attributable to the continuous reallocation of international liquidity. During the course of the present crisis, various assets have experienced a price bubble at different times, as their current prices have significantly exceeded the value of future income streams that would be received by owning these assets to maturity. We argue that the current credit crisis was originated by the emergence of this liquidity coupled with excessive credit creation and its somewhat disorderly allocations across various unregulated markets and structured financial products. Until 2007, global financial markets enjoyed a somewhat subdued risk environment with falling credit spreads, low interest rates, low market volatility and the absence of defaults in credit instruments. Both the high-savings economies and the Fed's accommodative monetary policy contributed to the extraordinary creation of investment capital in recent years, which in turn fed the bubble wandering between credit, housing, derivatives and, more recently, commodity futures markets. In this environment, default risk has been migrating from subprime mortgage market to credit cards, consumer loans, student loans and private equity firms leveraged loans markets. Unfortunately, the recent liquidity injections by the Fed and other central banks aimed at rescuing and recapitalizing troubled banks are likely to exacerbate the potential asset price bubble problem in the future. Although a large portion of the commodity futures bubble was eventually unloaded by the end of August 2008, the problem of the wandering asset-price bubble still persists as other assets might become temporarily overpriced due to changeable allocations of international liquidity.

Regardless which asset classes are affected by the asset-price bubble, they are always subject to excessive volatility of their prices. It can be therefore argued that the episodes of surging capital investments lead to increasing leptokurtosis of the time-series distribution of prices of the underlying securities. Thus under tranquil market conditions, volatility of prices of these securities is likely to be well-contained, but under turbulent markets such volatility will be exacerbated. If risk analysts apply assessment methods that are based on a normal instead of a leptokurtic data distribution of security prices, they are likely to seriously underestimate risk of investing in volatile securities, particularly at turbulent market times. In hindsight, the wandering asset-price bubble and the over-valuation of various types of securities have made the risk assessment methods that assume a normal data distribution highly inaccurate.

IV. Plausible Theoretical Foundations

The analysis of factors contributing to the current crisis allows for identification of some theoretical underpinnings that explain the special features of this crisis that differentiate it from previous financial crises episodes. A useful conceptual background for this crisis can be found in the following theorems.

1. *The standard Keynesian liquidity preference theory.* It seems that the important role played in this crisis by CDOs and other complex structured financial vehicles engenders extension of the liquidity preference theory of investments from its traditional reference to the term structure of the bond yield curve and the tradeoffs between bonds and stocks into the liquidity advantage of these new securities in relation to ‘plain-vanilla’ securities¹¹. These new complex securities have emerged on the scale that has not been witnessed before.
2. *Asymmetric information and mispricing of risk.* A distinctive feature of this crisis is the disproportionate asymmetric information facing investors’ decisions. Financial innovations, especially in the form of new structured products, have lengthened the distance between borrowers of mortgages and investors in mortgage-backed securities perhaps concealing the risk of default. Also, the yield spread on CDOs and other structured investment products over risk-free securities did not compensate for the de facto default risk of these esoteric securities. This has entailed a serious adverse selection problem for investors.
3. *Ponzi finance theory of financial fragility.* This approach is connected with the business cycle. Optimistic outlook for a growing economy induces financial investors to engage in speculative financing. Investors believe their profits will eventually exceed the cost of borrowed funds, thus they borrow money often without guarantees of positive investment returns. Lenders provide them with funds, even if they foresee repayment problems, expecting the borrowers to obtain additional financing elsewhere. Such Ponzi financing leads to excessive leverage of investors and to proliferation of credit risk thus affecting credit formation. When the economy stops growing and some major investment firms actually default, crediting by lenders may suddenly freeze, causing a snowballing effect on further defaults. The Ponzi financing approach has been a cornerstone of Hyman Minsky’s theory of financial fragility (Minsky, 2008; Wray, 2008).

¹¹ ‘Plain-vanilla’ securities are those based on guaranteed reimbursement of the principal with the return not linked to derivatives.

4. *Herding behavior of investors (in the presence of global savings glut).* Investment in CDOs and other complex derivatives during this crisis has been accompanied by herding behavior of investors, which theoretical foundations are prescribed by Scharfstein and Stein (1992). Considering the magnitude of the CDOs bubble, the scale of herding has been unprecedented. Based on scattered information from financial analysts, speculation and herding have been manifested mainly by unregulated managed funds. Their actions have escaped regulatory restrictions and statutory disclosure rules brought forth by the Sarbanes-Oxley Act of 2002.
5. *Flaws of investment- and 'originate-and-distribute'- banking models.* Theoretical explanations of the stages of this crisis also include a timely debate about the optimal banking model that would be most resilient to various types of risk. As the crisis had initially affected the investment banks with most exposure to subprime mortgage derivative securities, the universal banking model was perceived as more resilient than investment and regional banking models. Among others, Buiter (2007) concludes that the universal banks have a wider variety of assets than the investment banks, which allows them to spread credit risk across a broader range of asset categories. These claims are confirmed by the ultimate demise of U.S. investment banking in September 2008. As Lehman Brothers filed for bankruptcy and Merrill Lynch was acquired by Bank of America, the last two independent investment banks, Goldman Sachs and Morgan Stanley sought and were granted a bank holding company status by the Fed. The debate over superiority of universal banking is not over, however, as large universal banks such as Societe General, UBS, ING-Barings, Wachovia¹², Credit Suisse and others also incurred large losses stemming from their vast exposure to risky mortgages and derivative securities. Therefore, the traditional 'originate and hold' model of banking¹³ may return as viable. This model was broken by the securitization of mortgages by Fannie Mae and Freddie Mac and evaporated with explosion of CDOs (Buiter, 2007). The subsequent banking model commonly prescribed as an 'originate and distribute' scheme is based on the practice of banks lending long, structuring loans into securities, and transferring the debt out of their balance sheets to market investors. This model has a range of complex characteristics, some of which having a destabilizing impact on financial markets and institutions (Mizen, 2008). Among them is the gap between the high credit risk of borrowers, in particular subprime mortgage borrowers, and the perceived

¹² Wachovia avoided a near collapse in September 2008 by merging with Wells Fargo&Co

¹³ Within the traditional scheme of operations, banks engaged in lending long and keeping their debt on their books, thus refraining from its securitization.

low risk of CDOs. Another feature is the information asymmetry among mortgage borrowers, banks, investment firms and investors, which increases the gap between the de facto and the estimated risk of underlying assets (mortgages).

6. *Influence of shadow banking.* There is some validity to the argument that the current financial crisis has been induced mainly by the shadow banking system created over the past 20 years outside of greater banks' regulations (Roubini, 2008). The system includes investment banks, hedge funds, private equity groups, SIVs and conduits, monolines, money market funds and non-bank mortgage lenders. These unregulated institutions and structures have emerged on the basis of excessive risk-taking and played a major role in excessive credit creation. Yet, their risk positions and leverage could not be sheltered by deposit insurance or by a direct access to central banks' lender-of last resort liquidity. During the course of the present crisis, they have been exposed to enormous liquidity risk since their liabilities are predominantly short-term while assets are mainly long-term and illiquid. This asset/liability mismatch results from their extensive use of structured products. The shadow banking system has recently imploded as investors have recognized the risks involved.

Adding to the analysis of the roots and the outcomes of the ongoing crisis, we attempt to explain its proliferation in terms of the 'wandering asset-price bubble'. It is however debatable to what extent central bank interventions (liquidity injections or bail-outs of financial institutions) can subdue the bubble, and to what extent the disproportionate, herding behavior of investors can exacerbate it.

V. Transmission of Risks and Repercussions of the Credit Squeeze

The wandering asset-price bubble has generated serious distortions or dislocations in interest rates or effective yields among various money and capital market instruments. Prior to the August 2007 outbreak of the crisis, the fed funds and other short-term interest rates were rising faster than long-term rates (Figure 3), leading to the flattening of the U.S. Treasury yield curve. At the same time, the yields on CDOs were above the U.S. Government bond yields. With the progression of the crisis, the term spread on U.S. treasuries has widened, wiping out risk premiums on CDOs. These changeable movements have contributed to misalignments in pricing of various types of mortgage loans. Since variable mortgage rates normally follow LIBOR or other short-to-medium bond rates, while fixed mortgage rates are priced on the basis on long-term yields, the benchmark linkages in pricing of different types of mortgages

have been somewhat broken. This situation has exacerbated the overall credit risk since risk premiums on all securities have generally rose due to their unstable and unpredictable path.

The crisis has also raised volatility of equity securities, thus contributing to propagation of market risk. This can be illustrated by an increase in the market risk VIX index. Its average daily score from the beginning of January 2007 to the end of July 2007 was 13.3, but it increased to 23.3 during the August 2007 – March 2008 period and jumped to its new pick of 89.5 on October 24, 2008. The elevated market risk has dampened capital inflows to global equity markets.

An important factor in the proliferation and transmission of risk was the opening of the mortgage financing to nonprime borrowers coupled with the ability of banks to package subprime and Alt-A mortgages into marketable securities. The two step process was applied. First, banks adopted credit-scoring models of borrowers (originally applied in the auto loan market) in order to charge them risk-based interest rates. Second, banks employed structured financial instruments that allowed them to instantly transfer out the default risk associated with nonprime mortgages (DiMartino, Duca and Rosenblum, 2007).

The securitization of mortgage loans has been applied since 1980s when prime mortgages were being rolled into mortgage-backed securities and sold to other financial institutions/investors. However, securitization of nonprime loans was more complex. It involved slicing the mortgage-backed securities into several tranches according to their risk level and then pooling the appropriate tranches into CDOs. In quintessence, CDOs were originally devised as effective default risk-mitigating instruments. As mortgage originating banks were eager to pass the burden of default onto investors in order to raise cash for new lending, investment banks desired more securitization deals so they had new products to sell. Since selling the below investment-grade CDOs was more problematic, hedge funds, conduits and SIVs were invented.

The severe liquidity crisis sparked by the U.S. housing market slump hurt the formerly-sound but now increasingly-fragile financial institutions as credit risk became elevated by a larger number and variety of under-performing assets. These institutions have become vulnerable to a net drain (net cash outflow) or a potential run on their liabilities, which are symptoms of a higher liquidity risk. In the second half of 2007, they were trying to avert it by either selling off some of their risky assets (to SIVs among others), by borrowing from other financial institutions, or by raising more capital. Those with a vast exposure to CDOs found this task increasingly difficult. The liquidity indexes of the majority of banks were reduced by decreasing

values of CDOs; the banks with the largest exposure to mortgage-backed securities were hurt the most. The explicit manifestations of the escalating liquidity risk were runs, i.e. massive liability withdrawals, on Northern Rock in the United Kingdom (Mizen, 2008) and on Bear Stearns in the United States.

The impact of the ongoing crisis on the exchange rate risk is somewhat ambiguous. There is mixed evidence in support of the claim that the crisis has exacerbated exchange rate risk. For instance, the average daily standard deviation of the euro in U.S.D. terms was 0.076 in the January 1, 2003 – August 16, 2007 period. Since the outbreak of the crisis on August 17, 2007 until August 6, 2008 the standard deviation actually declined to 0.069. The coefficient of variation for the same periods also fell from 0.061 to 0.046. However, the linear trend depreciation of the dollar against the euro accelerated considerably - the daily trend coefficient increased from 0.012 to 0.062 U.S. cents per euro¹⁴. Thus in sum, the crisis has incited dollar depreciation, but not volatility.

On the basis of the above analysis, the earlier-identified stages of the crisis can be reconciled with the prevalent intensity of respective risks. It appears that the first stage (the outbreak of the subprime mortgage crisis) was accompanied by the surge in default risk. The second stage (spillovers into other credit areas) affected mainly the credit risk. The dominant risk factor during the third stage was the liquidity risk (the deepening liquidity crisis). The fourth stage of the ‘great escape’ of capital into commodity futures might have exacerbated the exchange rate risk. The final stage, i.e. the flight-to-safety at the end of September 2008, engenders a mix of market, liquidity, credit and default risks, and it has been accompanied by a freeze of credit and commercial paper markets. A significant proliferation of counterparty risk (Figures 6a and 6b) accompanied all stages. In all, this crisis induced by heterogeneous factors seems to reverberate across various risk categories, which makes identifying and mitigating specific risk it particularly difficult. However, this reasoning might be over-simplified and it needs to be tested thoroughly once more complete information and data become available.

In all, the scope of proliferation of various types of risk, as well as their causal interactions have been almost impossible to ascertain and even more so to predict. Under such mayhem, effective management of financial risk has been seriously impaired. This has posed a challenge for banks to rework their risk assessment models and management practices.

¹⁴ Own calculations based on Bundesbank data.

VI. Challenges for Banks

The difficulties of banks to manage various classes of risk during the ongoing financial crisis have renewed debates over a most resilient model of banking. It seems that a universal banking model is emerging as a winner. As discussed in Section IV, universal banks are those offering a wide range of commercial and investment lending activities; their balance sheets encompass diverse earnings streams and they raise funds in both wholesale and retail markets. The crisis has proven a necessity for banks to diversify their balance sheets. The crisis hit the investment banks first, as they had operated with highly concentrated, over-leveraged balance sheets and had to rely only on wholesale markets for funding, i.e. they could not accept retail deposits. Prior to the crisis, they enjoyed extraordinary profits from asset securitization and their own hedge funds activities. Many investment banks focused on asset securitization and hedge fund activities following the lead of Goldman Sachs that had a reputation of the strongest and the most innovative institution¹⁵. Thus others including Merrill Lynch – a traditional retail broker, as well as Lehman Brothers and Bear Stearns – known experts in fixed income securities centered their activities on complex asset-backed derivative securities. As we now know, this strategy has proven to be unsound.

Another unanticipated result of the current crisis is the painful impact of various types of credit risk amplifiers, i.e. factors that contribute to the larger de facto risk of certain asset categories as well as to magnified losses during periods of financial distress. These amplifiers include:

1. Inability to rely on mark-to-market valuation in the presence of elevated market risk
2. Flawed algorithms for mark-to-model valuation due to increasing instability of model parameters
3. Excessive leverage
4. Unexpected increases in counterparty risk, as reflected by jumps in LIBOR rates that have an incapacitating impact on inter-bank credit market.

The amplifiers of gains or losses from assets pose a serious challenge for financial institutions in light of the ongoing crisis. The first amplifier, i.e. unreliability

¹⁵ Goldman Sachs seems to be weathering the current crisis more effectively than its competitors. It has a better liquidity and debt-maturity position than the others. At the end of the second quarter of 2008, it held 90 billion dollars of cash and liquid assets and its debt had an average maturity of eight years.

of mark-to-market valuation in times of financial distress stems from the number of factors. Chief among them is sudden change in marketability of assets. As the financial crisis progressed, we saw a very large number of mortgages derivative securities (not only subprime or Alt-A, but also prime related) becoming uncovered, thus un-marketable.¹⁶ They could no longer be marked-to-market, thus had to be valued only on the mark-to-model basis. This process has spread wider than anticipated. As a result, it has spurred reclassification of a large number of previously marketable mortgage-backed securities into the Level 3 asset category.

Classification of assets into three levels based on their valuation method was introduced by FAS 157 in November 2007¹⁷. Although these new accounting standards went into effect as of the beginning of 2008, major U.S. banks, in their anticipation, began classifying and reporting their assets by three levels already in 2007. Based on Bloomberg estimation, the total value of Level 3 assets among U.S. banks reached USD 500 billion at the end of the 1st quarter of 2008. It does not seem feasible that such exorbitant holdings of risky, in part toxic assets can be easily dealt with, through either writedowns or the Fed bailout. The dangerous propagation of Level 3 assets is shown in Table 1.

..... insert Table 1 around here

The data in Table 1 show that holdings of Level 3 assets are greater among the investment banks than at J.P.Morgan/Chase – a universal bank. Their growth between 3rd quarter of 2007 and 1st quarter of 2008 was most pronounced at banks that were

¹⁶ As the housing prices decline so does the values of a mortgage which results in higher debt-to-equity ratios of a borrower. When this ratio exceeds unity, the mortgage borrower faces a negative equity situation, i.e. the nominal value of his mortgage exceeds the underlying property value. This makes mortgage uncovered, which negatively affects marketability of its derivative security.

¹⁷ According to FAS 157, Level 1 assets have observable market prices, thus can be marked-to-market. Level 2 are assets that are not marketable are marked-to-model with observable inputs (for instance, interest rate swaps, which components are linked to observable yields on Treasuries). Level 3 are non-marketable assets that are marked-to-model with unobservable inputs. Their valuation is based on arbitrary management assumptions. In addition to mortgage-related assets, Level 3 category may include also other securities backed by credit card receivables, loans linked to leverage buyouts as well as asset-backed commercial paper.

either unable (Bear Stearns) or unwilling (Merrill Lynch) to raise capital. As indicated above, their proliferation arises mainly from declining home values and uncovered position of mortgage-backed securities. Presumably, re-classification of assets into Level 3 might raise the prospects of a bailout. By the same token, any future return of toxic assets to Level 1 category may have a positive effect on the executive bonus situation. In any case, re-classification of assets into Level 3 category decreases banks' transparency.

In addition to non-marketability of assets, the difficulties of mark-to-market valuation stem from the elevated volatility of asset prices in response to the higher market risk. Under such conditions, losses from riskier assets are amplified, which triggers a perpetual, self-reinforcing spiral of unwinding investments and a further downfall of asset prices.

If assets fall into the Level 3 category and markets remain continuously volatile, management assumptions and algorithms for their valuation are imperiled. The widely-used method of value-at-risk (VaR) does not really take into consideration leptokurtosis, or prevalence of long-tailed distribution of risk at turbulent times. Hence the amplifying effect of VaR, as periods of high volatility lift up VaR sending a signal to sell, which in turn further exacerbates volatility.

Perhaps the most serious amplifier of gains and losses is the excessive leverage. In general terms, a sharp decline in asset values cuts deep into equity and entails margin calls from lenders. This reaction prevails regardless of the source of high leverage, i.e. excessive liquidity, high debt, or elevated exposure to CDOs - all of which posing serious problems during the current financial crisis. Excessive liquidity arises when banks use short-term borrowings (mainly through SIVs) and invest in higher-yielding long-term assets. Such credit creation took place prior to the outbreak of the crisis when asset prices were rising, helping banks to leverage additional borrowings. The vast exposure to CDOs is also a serious amplifier of losses, since their escalation can be caused by only a small decline in the value of their underlying assets (Craig, 2008).

The current crisis has been in fact accompanied by a swelling leverage, as shown in Table 2. The asset-to-equity ratios for investment banks increased sharply between during the 2005-2007 period. The (now-gone) Bear Stearns as well as Morgan Stanley have reached the highest ratios, while Goldman Sachs has scored its lowest, most comfortable level¹⁸. In all, such high leverage functions as a dangerous

¹⁸ The highly leveraged balance sheet was the key factor contributing to the loss of investors' confidence and to the run on Bear Stearns in March 2008. At the end of November 2007, the company

amplifier of losses during the period of declining asset prices and higher market risk, which makes de-leveraging an urgent task for the bankers at the present time.

..... insert Table 2 around here

The last amplifier, i.e. unpredictable jumps in LIBOR that obfuscate counterparty risk may result in a standstill or freeze of interbank credit. This was in fact the result of the three surges in LIBOR and TED spread shown in Figures 6a and 6b, which had an incapacitating effect on the interbank credit market contributing to bank losses.

Recognizing the dangers of amplified losses at the time of financial distress, the surviving investment banks (now bank holding companies) and other affected financial institutions are facing mounting tasks to revise their asset and liability as well as risk management strategies and tactics. Some valuable conclusions from the ongoing discussions in the international banking community on this broad topic area are articulated in the July 2008 Report of the Institute of International Finance (IIF, 2008). The Report emphasizes improvements in risk management as a highest priority for banks. It recommends assessing the bank's risk profile in relation to risks that are prevalent across all business activities. Other valuable suggestions for banks include employing all available risk assessment methods instead of relying on a single methodology and assigning ultimate responsibility for risk assessment with senior management. The IIF Report also emphasizes the need to monitor sensitivity of providers of market liquidity to asset quality and credibility of ratings for structured vehicles – the sensitivity that has been grossly underestimated by banks during this financial crisis. The IIF has established global financial Market Monitoring Group (MMG) for the purpose of such monitoring. Ultimately, these efforts should lead to global standardization and harmonization of market definitions and structures. Among other valuable suggestions, the Report calls for due diligence process to ensure integrity of all stages in the originate-to-distribute banking.

A number of other micro-level institutional improvements in bank management can be derived from the current crisis. Chief among them is a more holistic approach to risk management emphasizing overall balance of risks, not just

had USD28 billion in Level 3 assets in comparison to its USD12 billion in equity. Both the large exposure to CDOs and the failure to raise capital since the collapse of two of its hedge funds in August 2007 contributed to Bear's excessive leverage.

the credit risk associated with individual assets. Risk management shall be viewed as a team effort thus individual portfolio managers shall bear responsibility for the company-level balance of risks. Stress testing methods, i.e. an analysis of ‘go-wrong’ scenarios and their possible outcomes shall be employed with caution, as the crisis has proven that too many of these scenarios may be implausible under turbulent market conditions. It seems also that most banks may stick to ‘plain-vanilla’ debt securities, at least until more compelling methods of risk assessment for complex structured products are developed.

The above discussed selected, but presumably crucial dilemmas facing banks in light of the current financial crisis will likely lead to major adjustments in the banking sector. Specifically, since the universal banking model has proven to be more resilient, one may expect a new wave of consolidation within the financial sector. Some of Level 3 assets may eventually become marketable again. Nevertheless, the collapse of CDOs and some of the more esoteric derivatives seems to be permanent as investors have probably learned their lessons about the de facto risks embedded in these complex securities. One may also hope for a better transparency of balance sheets of banks as the practice of transferring out risk by employing conduits and SIVs has vanished.

VII. Regulatory and Monetary Policy Responses – A Critical Evaluation

Valuable suggestions have emerged from the current financial crisis for regulators and policy-makers. It seems that the regulatory focus should be on restraining structured financing such as conduits or SIVs. Any off balance sheet financing should be subject of rigorous regulatory and supervisory scrutiny in terms of their minimum capital holdings and transparency (Schiller, 2008).

Even more important lesson for the regulators is the recognition of close linkages and inseparability between different types of risk. Credit-, default-, interest rate-, liquidity-, exchange rate- and counterparty risks are all integrated. Again, a more comprehensive, holistic institutional approach to risk should be promoted by regulators and required from supervised financial institutions. The crisis has shown that the models of dissecting risk into various classes in an attempt to transfer it to market investors were easier to devise in theory than to implement in practice, as they have not always adequately captured all de facto risks embedded in such process. A further, more integrated approach to modeling risk is crucial for advancing financial research.

The crisis seems also to underpin the importance of further elaboration and specification of capital adequacy standards. In terms of Basel II guidelines, it seems important to stick to the discipline of Pillar 1 (minimum capital requirements), while at the same time to expand the scope of both Pillar 2 (the supervisory review process) and Pillar 3 (enhanced disclosure). Within Pillar 2, it seems imperative to require banks to improve internal procedures for assessing the institutional risk profile and to set up more elaborate guidelines for liquidity risk. The enhanced disclosure practices within Pillar 3 will likely require financial institutions to publish special reports on their financial stability. More work needs to be done also in the areas of developing standardized risk-assessment scorecards for individual credits, particularly mortgages, as well as standardized central clearing contracts on CDS. Along these efforts, it is imperative not to squander CDS as they are crucial for mitigating default risk.

Valuable lessons from this crisis should be drawn by fiscal and monetary policy-makers. At the present time, the U.S. and the European monetary authorities seem rather desperate to bail-out the financial institutions that have been hit hardest by the crisis. In October 2008, the U.S. Congress has approved a \$700 billion TARP (Troubled Asset Relief Program) sponsored by the Treasury Secretary Henry Paulson. In November, 2008 the \$250 billion of TARP funding has been allocated for bank equity infusion in the form of preferred stock issued under the program and purchased by the U.S. Treasury¹⁹. Subsequent funding may be used for outright purchases or guarantees of troubled mortgage-related and possibly other assets (Bernanke, 2008). The first method may be superior, as it improves capital adequacy of banks (lifting the Tier I capital to risk-weighted asset ratio above the presently-preferred safety margin of 10 percent), while giving them an option to devise other methods of dealing with troubled assets. Moreover, the Fed has used a range of actions to ameliorate the current financial problems, including increased quantity of term funds auctioned to banks, temporary lending facility to purchase high-quality asset-backed commercial paper from money market funds, and currency swap lines with other central banks. Furthermore, the FDIC raised the limit on banks deposits that it guarantees to \$250,000 per depositor per bank. European monetary authorities have designated even larger funds to restore financial stability, mainly through bank deposit guarantees and short-term loans to banks. As of mid-October 2008, the rescue packages of the eurozone amount to \$1,370 billion and the United Kingdom \$680 billion. Although these efforts of global financial authorities provide a temporary relief to troubled financial markets and institutions, they do not constitute a

¹⁹ The equity injection scheme was pioneered by Sweden in its bank recapitalization program of 1992 (Ingves and Lind, 1996)

comprehensive, systemic resolution of this crisis. The need for a comprehensive reform of the current system for supervising and regulating financial institutions and markets on a global basis, as advocated by Kaufman (1999) is valid now more than ever.

Government bail-outs shall be exercised with extreme caution and implemented preferably through a fiscal stimulus, not through cash injections by a central bank. Vast liquidity infusions are likely to hamper price stability thus subsequently hurt central bank's credibility. They also may be perceived as implicit guarantees for high-risk operations of banks in the future. As argued above, credit risk at investment banks tends to follow a leptokurtic, long-tailed time distribution. Hence, many banks that are over-leveraged and rely heavily on wholesale funding are experiencing amplified losses. Similarly, their gains are likely to be compounded at better market periods. If these banks are bailed-out at hard times, does it also mean that their profits should be taxed more at good times? Both of these extreme solutions are unwarranted. In principle, there might be some legitimacy in a government wanting to preserve one of the largest institutions in the country's banking system if significant counterparty risk exists.

Once the stability of financial markets is regained (VIX, TED spread and other market and counterparty risk indicators return to historically-stable levels), central banks will be well-advised to direct their tactical efforts toward managing the 'wandering asset-price bubble' so that capital inflows to specific securities will not endanger price stability or hinder economic growth. One shall assume that the bubble is here to stay, it cannot burst with taxes or other restrictions on capital inflows – it is simply too large. A prudent mix of regulations and monetary policy strategies can channel this capital into productive investments without inflationary consequences and harmful effects on real economy²⁰.

Further implications for monetary policy include a need to devise a prudent post-crisis strategy. A viable monetary policy option seems to be flexible, forward-looking inflation targeting. Flexible inflation targeting denotes achieving a mix of inflation and alternative macro-economic policy targets, such as narrowing the output gap, lowering unemployment or stabilizing the exchange rate. The forward-looking or forecast-based approach to inflation targeting allows for smoothing nominal

²⁰ Tong and Wie (2008) show empirically the scope and the transmission of harmful spillover effects of the current crisis into the real economy. These negative effects are transmitted through two channels: the declining real consumer demand and, more importantly, the liquidity constraint on non-financial firms.

indexation (Svensson, 1999; Woodford, 2007). It is therefore likely to reduce volatility or risks associated with key policy variables, such as exchange rates, interest rates, or inflation forecasts. Such monetary policy regime is viable for both, highly developed and emerging market economies although some of the latter cannot target domestic inflation forecasts only. For example, the new members of the EU currently converging to the euro, are well advised to target differentials between the domestic and the eurozone inflation forecasts (Orlowski, 2008b)²¹.

A crucial for a successful implementation of inflation targeting is the appropriate choice of the inflation target. It seems prudent for all central banks to specify the target in terms of headline, rather than core inflation. The fourth stage of the current crisis, i.e. capital inflows to commodity futures, has led to the wider gap between headline and core inflation (Orlowski, 2008a). The wider gap for the U.S. is shown in Figure 8. Headline inflation seems to be a bigger problem at the present time and it is likely to pass-through onto other measures of inflation in the near future. The Fed already tried to enact an implicit target for core inflation based on personal consumption expenditures (PCE). Chairman Bernanke in his February 17, 2007 Congressional Testimony disclosed the core PCE inflation target for the end of June 2008 in the range of 1.75-2.00 percent. However, the necessary liquidity injections in response to the current financial crisis have curtailed the Fed plans for embracing inflation targeting. If such policy plans are restored in the future, headline rather than core inflation should be a basis for specification of the inflation target. After all, nominal indexation of wages, prices and interest rates is routinely adjusted to headline rather than core inflation.

At this juncture it is too early to identify all valuable lessons from the current crisis for policy-makers since the crisis has not been resolved. Nevertheless, coordinated efforts and mutual exchanges of views between researchers and practitioners at all types of financial institutions are both urgent and crucial for drawing lessons and devising prudent micro- and macro-level policies.

VIII. Concluding Remarks – General Lessons from the Crisis

²¹ Incorporating the stable currency area's inflation forecast variable in the converging economy's central bank target or reaction function will likely result in absorption of lower market risk and inflation risk environments.

The ongoing turmoil in global financial markets that has begun as the subprime mortgage crisis in the U.S. has reverberated across a variety of credit markets, instruments and financial institutions. It is a multifaceted phenomenon that has a broadening scope. It has led to the collapse of CDOs and other esoteric derivatives as well as their distribution vehicles such as SIVs. More recently, it has elevated commodity future and spot prices. We argue that it moves and spreads with the changeable allocations of global savings in the form of disorderly ‘wandering asset-price bubble’. The emergence of a bubble should have sent a signal to policy-makers for corrective actions. Instead, the permissive regulatory and supervisory frameworks, a scholastic rather than practical financial engineering and asymmetric information about new investment products have made this crisis so unexpected and so deep.

Several lessons can be drawn from this crisis. Chief among them is the claim that this crisis can be explained by a set of carefully chosen fundamentals that can predict its future path. This set should include the current critical level of household debt (Figure 5) that has reached the threshold for extending any further credit. Clearly, the default risk of the household sector - the largest contributor to the U.S. GDP has reached a zenith and has been grossly underestimated.

Another important lesson is that the existing risk assessment methods have proven to be imperfect. This crisis implies that complex credit derivatives, such as CDOs, entail significant asymmetric information. The de facto risks associated with many structured products turned out to be much larger than the estimated risks. Correspondingly, their yield margins over risk-free bonds did not compensate for their de facto credit risk.

The next lesson pertains to systemic foundations of global banking. The universal banking and the traditional ‘originate-and-hold’ models have emerged as winners over specialized financial institutions and the ‘originate-and-distribute’ banking. Moreover, unregulated investment vehicles, such as hedge funds, structured financing schemes such as SIVs and conduits, have exacerbated market risk and contributed to dramatic dislocations of the ‘wandering asset-price bubble’. They have had a profound impact on excessive credit creation through their high leverage. Spillover effects from market risk into credit and liquidity risks have had a paralyzing impact on the credit freeze (particularly at the end of September 2008) and may still hamper the growth of the global real economy.

There are also lessons for policy-makers and regulators. At this juncture, the U.S. Treasury, the Fed and other central banks seem to be overwhelmingly concerned about managing the supply of credit, paying little attention to the demand for credit. While the initial version of TARP emphasized urgency of eliminating toxic assets

from banks, the first stage of its implementation was based, perhaps correctly, on equity injections. In the meantime, although most of structures financing vehicles have collapsed, hedge funds still need to be regulated since their activities contribute to excessive market volatility. Among important lessons from this crisis is the need to change risk assessment process and methodology by applying a more holistic approach of incorporating interactions between various types of risk.

There are some macroeconomic policy implications as well. Policy-makers will be well-advised to discontinue the present, somewhat un-orderly and un-systematic efforts to recapitalize ailing banks. They need to devise prudent policies to cushion damaging systemic repercussions of the wandering asset-price bubble caused by changeable allocations of global savings. Among other solutions, a forward-looking or forecast-based inflation targeting in the U.S. accompanied by a policy of stronger dollar are likely to reduce inflationary effects of the current liquidity injections and rising commodity futures prices. In general terms, it would not be prudent for policy-makers to discourage capital inflows. Instead they should focus their regulatory and strategic policy efforts on re-directing the 'wandering asset-price bubble' to pro-growth investments.

The final impact of the current financial crisis on the global real economy still remains to be seen. A further downfall of credit will likely hamper the real economy going forward.

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Table 1: Ratio of Level 3 assets to equity.

	2007 3 rd quarter	2008 1 st quarter
Morgan Stanley	2.51	2.35
Goldman Sachs	1.85	1.92
Lehman Brothers	1.59	1.71
Bear Stearns	1.54	3.13
Citigroup	1.05	1.17
Merrill Lynch	0.38	1.30
J.P Morgan/Chase	0.30	0.58

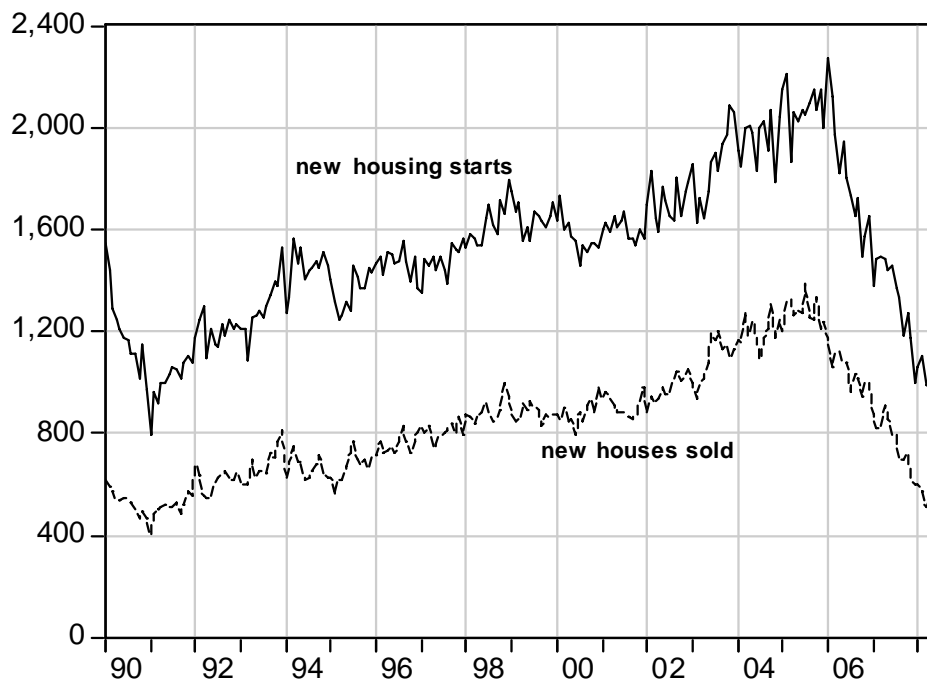
Source: Own compilation based on Bloomberg data and bank earnings reports.

Table 2: Expanding leverage: asset-to-equity ratios

	2005	2007
Bear Stearns	26	33
Morgan Stanley	31	33
Lehman Brothers	25	31
Merrill Lynch	18	28
Goldman Sachs	25	27

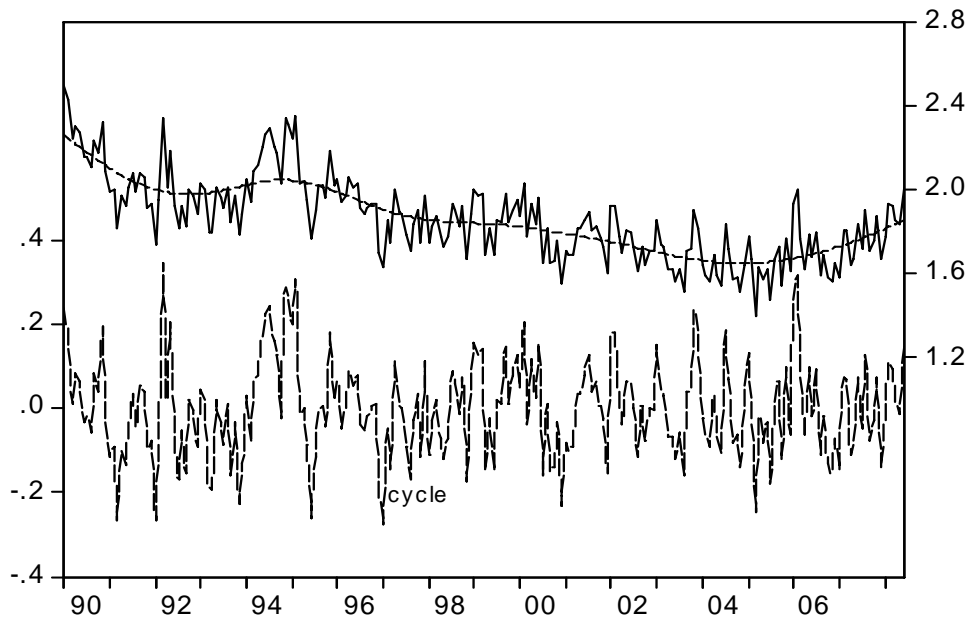
Source: Own compilation from banks' earnings reports.

Figure 1: Total new privately-owned housing starts and new one-family houses sold in the U.S (in '000). January 1990 – June 2008 series.



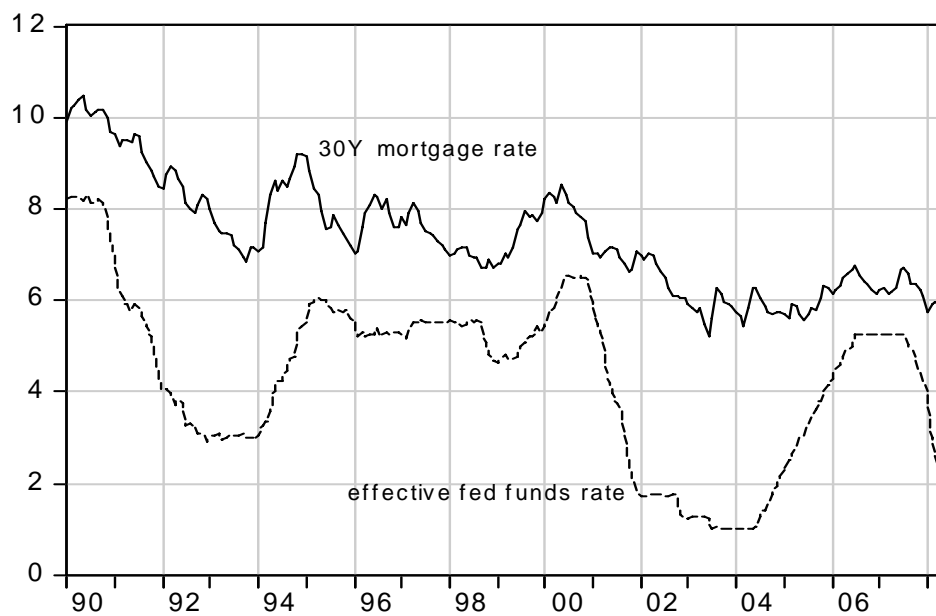
Data source: Federal Reserve Bank of St. Louis – FRED.

Figure 2: The ratio of new housing starts to new houses sold in the U.S., with Hodrick-Prescott trend (upper lines, right scale) and the cyclical component (lower line, left scale). January 1990 – June 2008 series.



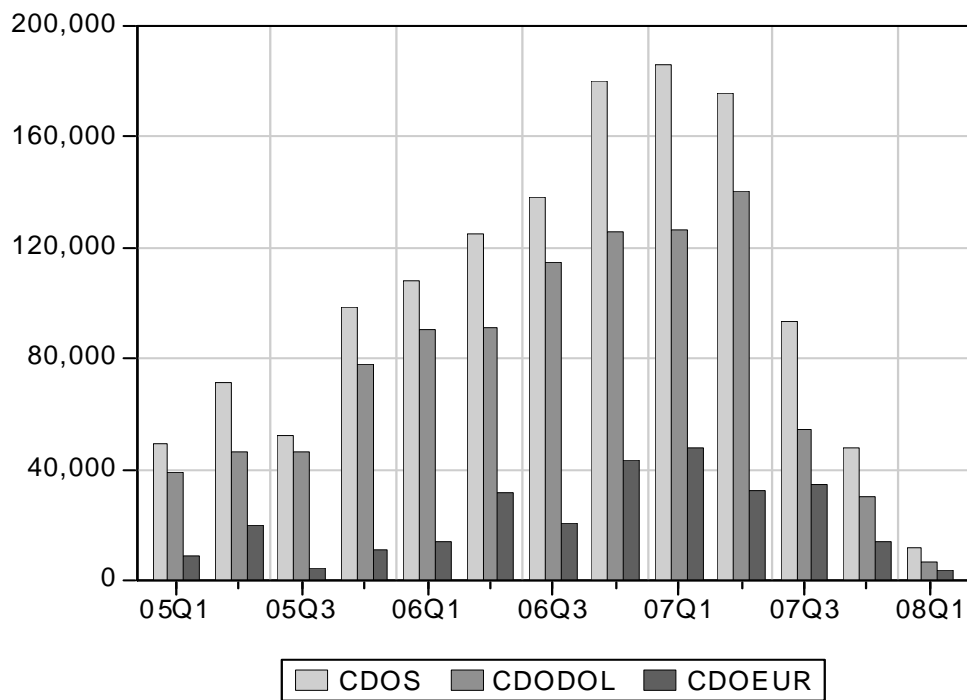
Data source: Federal Reserve Bank of St. Louis – FRED.

Figure 3: The 30-year conventional mortgage rate and the effective federal funds rate. January 1990 – June 2008 series.



Data Source: Federal Reserve Bank of St. Louis – FRED.

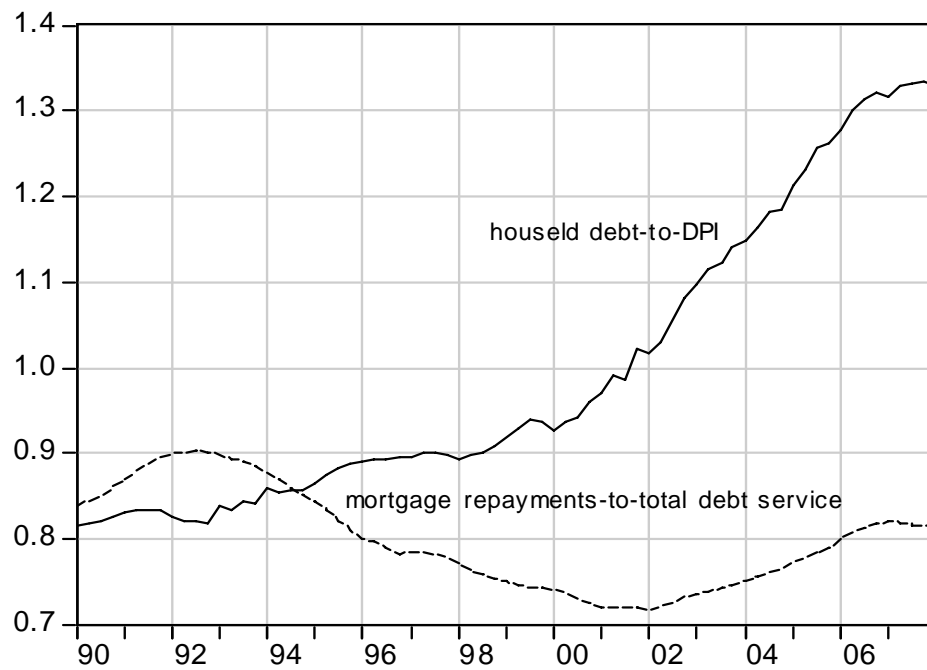
Figure 4: Global CDO market issuance. Quarterly series 2005Q1 – 2008Q1.



Notes: CDOS = total issuance in USD million, CDODOL = USD issues, CDOEUR = EUR issues.

Data Source: Securities Industry and Financial Market Association (SIFMA)

Figure 5: Total outstanding debt as a share of disposable income, and the share of mortgage debt service payments in total debt service payments for U.S. households. Quarterly series: 1990Q1-2008Q1.



Source: own compilation based on the Federal Reserve Board data.

Figure 6a: TED spread (3M LIBOR minus 3M T-bill rate). Daily data for one-year period ending August 4, 2008

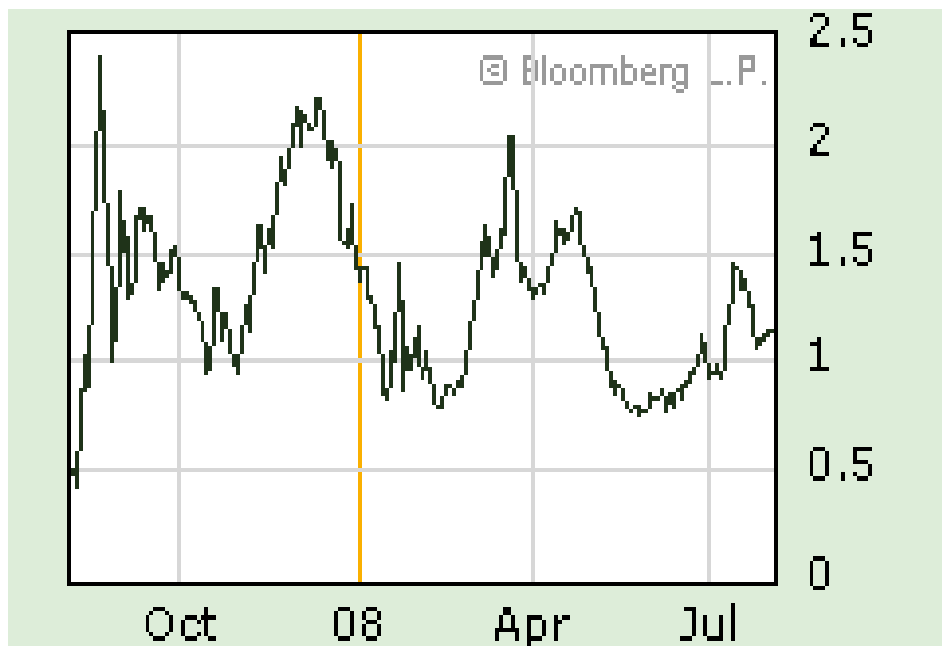


Figure 6b: TED spread (3M LIBOR minus 3M T-bill rate). Daily data for one-year period ending December 9, 2008



Source: Bloomberg

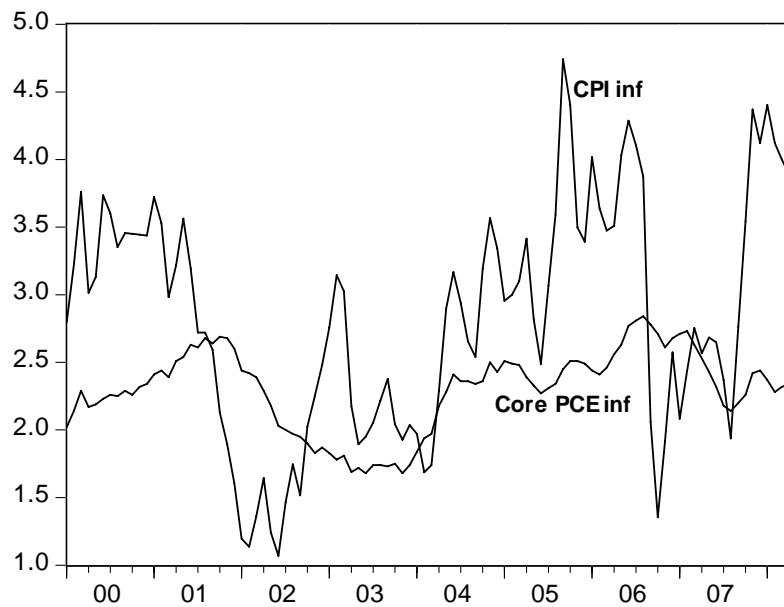
Figure 7: Light crude oil futures prices (NYMEX).

One-year series ending August 5, 2008.



Source: Wall Street Journal Data Center.

Figure 8: CPI and trimmed-mean Core PCE inflation rates in the United States.
January 2000 – April 2008 sample period, year-on-year data.



Data Source: Federal Reserve Bank of Dallas and Federal Reserve Bank of St. Louis.

Please note:

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The Editor