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Research Report

Stages of the ongoing global financial crisis: Is there a wandering asset-price bubble?

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CASE Network Studies & Analyses

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

Lucjan T. Orlowski

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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 with contagion effects on other financial institutions, the commodity price bubble, and the ultimate demise of investment banking in the U.S. Monetary policy responses aimed at stabilizing financial markets are proposed. The study argues that the severity of the crisis is influenced strongly by changeable allocations of global savings, which lead to over-pricing of varied types of assets. The study calls such process a “wandering asset-price bubble”. Unstable allocations have elevated market, credit and liquidity risks. Since its original outbreak induced by the demise of the subprime mortgage market and the mortgage-backed securities in the U.S., the crisis has reverberated across other credit areas, structured financial products and global financial institutions.

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 terms used by the Federal Reserve Chairman Ben Bernanke, 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, real economy and commodity markets make this crisis seemingly more different and more multifarious than the financial crisis episodes of recent years.

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 types assets, they have produced disorderly asset-price bubbles. We call this process a "wandering asset-price bubble". Accordingly, this crisis has experienced five distinctive stages. First, it began from the housing bubble in the U.S. that was increasingly inflated by indiscriminate mortgage loans to subprime and near prime (so called Alt-A) mortgage borrowers². 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 affected banks, i.e. Northern Rock and Bear Stearns, and triggered anxiety about possible contagion effects on the global scale. Fourth, the collapse of structured investment products derived from the affected underlying assets, mainly collateralized debt obligations (CDOs), shifted the global liquidity into commodity futures causing some bubble effects in this area as well. Fifth, it reached a zenith at the end of September 2008 with massive shifts of funds into risk-free securities, coupled with the ultimate demise of the investment banking system in the U.S.

The key factors contributing to the decline of the housing market and the subprime mortgages 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 presented 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. Section VIII synthesizes the main findings and arguments of the paper, and provides suggestions for further research.

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 inflate various asset bubbles.

² Subprime mortgage borrowers are the least credit-worthy applicants with low credit scores and uncertain income prospects, near-prime are those who qualify for credit but are unable to document their income fully or to provide traditional down-payments.

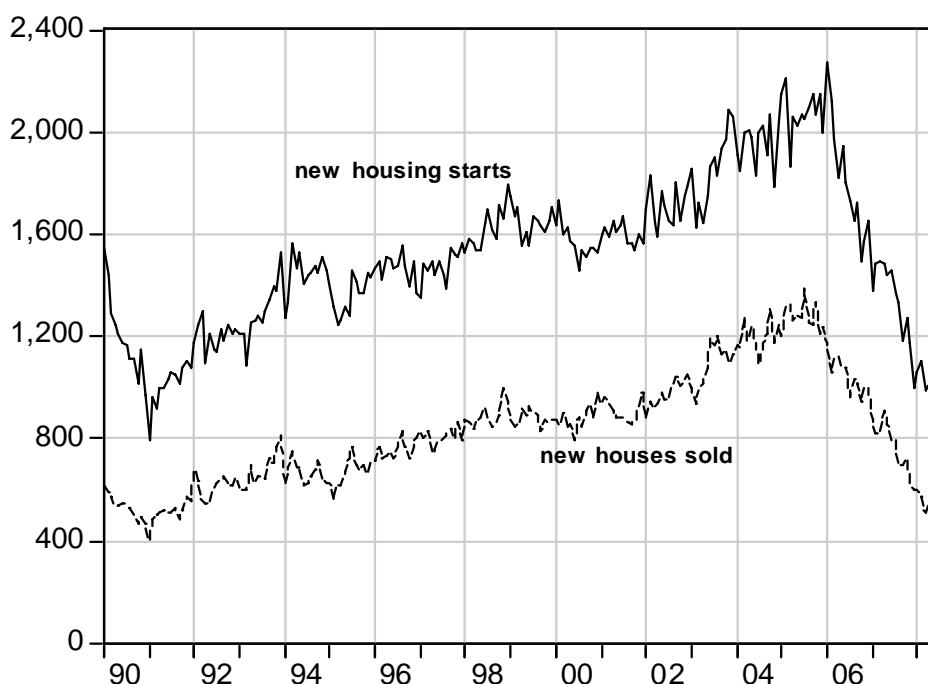
II. Origins of the Current Financial Crisis

The deep roots of the current crisis can be traced way back into 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 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 crisis outbreak in 2007. The macroeconomic contributors to the crisis include: monetary expansion in the U.S., large capital inflows to U.S. securities (mainly government bonds) from high-savings countries, the U.S. housing boom and mounting indebtedness of U.S. households. The institutional characteristics encompass: developments of new structured finance products, emergence of hedge funds as well as other conduits and financial vehicles, and flawed credit risk assessment and asset valuation models.

The monetary expansion in the U.S. was based on the supposition that the unprecedented productivity growth 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 high profits, i.e. net interest margins for banks. As shown in Figure 1, the cost of funding for banks based on the federal funds rate was considerably below the thirty-year mortgage rate at that time. 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 were more prone to resort to securitization of increasingly risky mortgages.

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



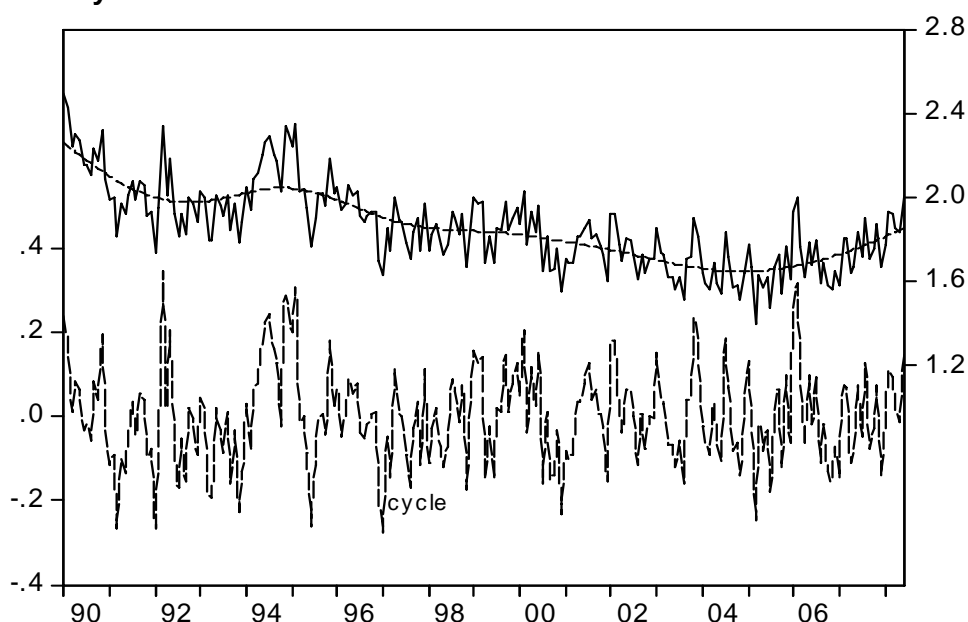
Source: Federal Reserve Bank of St. Louis – FRED.

Prior to 2006, the housing market in the United States enjoyed a long period of steady expansion, which has been largely secured by new, structured financial products. Several characteristics of the U.S. housing market boom can be highlighted. Among them is the 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 one-family houses sold rose from 401 thousands in January 1991 to 1,389 thousands in May 2005. Thus evidently, construction 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 too approximately by half (Figure 1). Similarly, the existing home sales have also 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).

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. But 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.

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



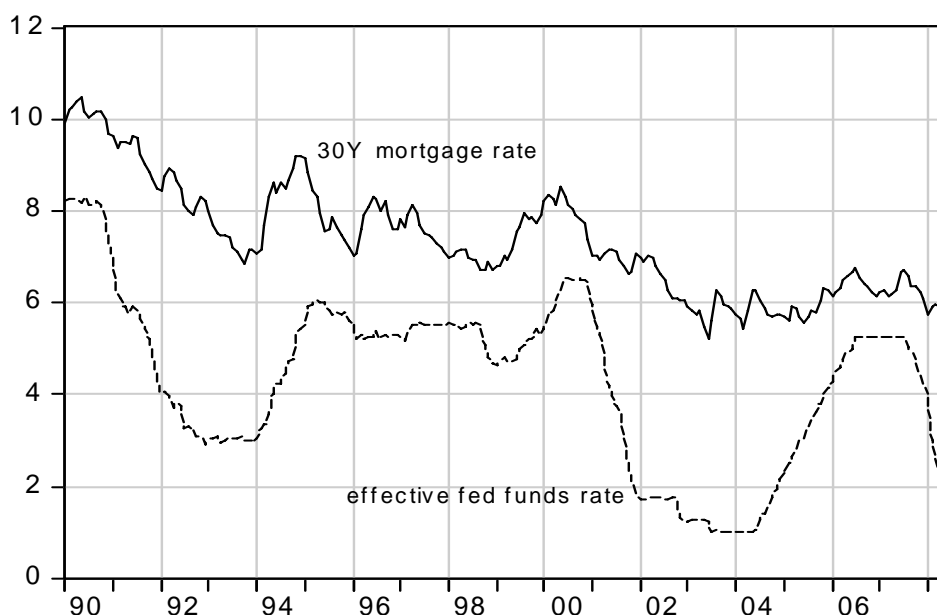
Source: Federal Reserve Bank of St. Louis – FRED.

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 in January 2007. The benchmark rate was maintained at that level until July 2007, on 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 the Fed created excessive liquidity during the 2001 – 2005 period, which in turn became a strong contributing factor to indiscriminate proliferation of credit and to the subsequent global financial crisis.

Experiencing a very low cost of funding during the bountiful liquidity period, the financial institutions enjoyed high profit margins by generating mortgage loans, since the mortgage rates were considerably higher than the fed funds rate, as shown in Figure 3. The tighter policy stance of the Fed in the following period reduced bank profits on traditional prime mortgages, i.e. those granted to borrowers with good credit, guaranteed repayments and fully-documented income. Under this scenario, the banks and mortgage brokers found very strong incentives to sustain their lending activities by reaching out to more risky borrowers with large mortgages at adjustable interest rates. Mortgage brokers in a somewhat unethical manner reached out to low-income, higher-risk borrowers by offering them initially low (so called 'teaser') rates, knowing that the borrowers could no longer afford to repay their mortgages after increases in interest rates in the subsequent periods. On a wide-spread scale, the standard credit criteria based on maximum levels of total debt service (TDS) ratios for mortgage borrowers were extensively violated. Hence, the unprecedented expan-

sion of high-risk non-traditional mortgage loans took place. More mortgages were extended to the least credit-worthy applicants with low credit scores and uncertain income prospects, i.e. to subprime borrowers; as well as to the applicants who qualified for credit but were not able to document their incomes fully or to provide traditional down-payments, i.e. to near-prime or, the so-called Alt-A borrowers. 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 high risk mortgage loans has been unprecedented, considering the fact that subprime loans constitute merely 14 percent of total outstanding U.S. mortgages, while the traditional prime loans prevail with 80 percent share in total mortgages, with 6 percent falling into the near-prime category (DiMartino and Duca, 2007).

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



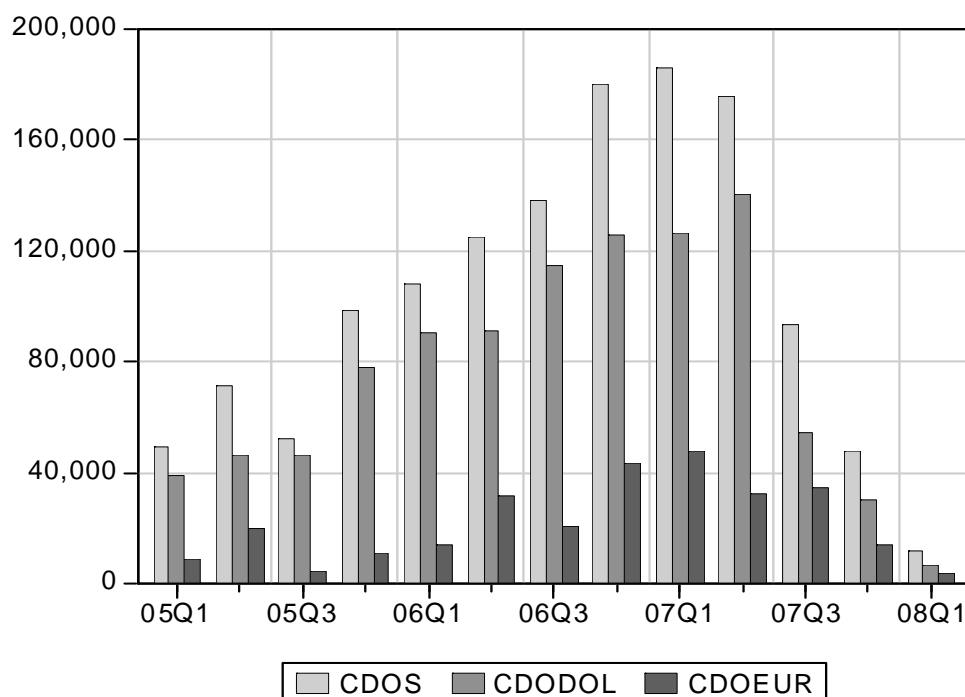
Source: Federal Reserve Bank of St. Louis – FRED.

The surge in non-prime mortgage loans was spurred by the confidence of originating banks in their ability to measure default risk accurately by employing standard quantitative models. The risk associated with these underlying securities was subsequently transferred to market investors in the form of residential mortgage-backed securities (RMBS) and their common derivatives such as collateralized debt obligations (CDOs)³. These complex financial instruments have been differentiated by their riskiness and sold to market investors. They have allowed investors to choose assets with a precise risk profile. Through their applications, banks have managed to make liquid and marketable some of the underlying risky, illiquid and non-marketable assets. 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, their risk management departments viewed CDOs as credit-risk and not market-risk instruments. Therefore, they customarily, yet incorrectly assumed that, in case of elevated market risk, CDO positions could be easily adjusted or liquidated, especially due to the fact that many of these risky derivatives were over-rated at AAA or AA levels by the rating agencies. Figure

³ In their abbreviated definition, CDOs are structured credit products backed by pools of other assets, with cash flows assigned to varying credit risk tranches: senior AAA-rated, mezzanine AA to BB-rated, and equity (unrated) tranche. Cash flows are going first to the lowest risk tranche. In exchange for purchasing CDOs, third-party investors receive a claim on the mortgage asset and related cash flows, which becomes collateral in the case of default. Forms of CDOs include: a cashflow CDO where underlying credit risks are bonds or loans held by the issuer, a synthetic CDO with the exposure to risk insured by the credit default swap (CDS), and CDOs-squared where each underlying risk is itself a CDO tranche.

4 shows also denomination of CDOs in U.S. dollars and in 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 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 led to the euro appreciation against the dollar that reduced effective yield margins on euro-denominated CDOs.

Figure 4: Global CDO market issuance; quarterly series 2005Q1 – 2008Q1



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

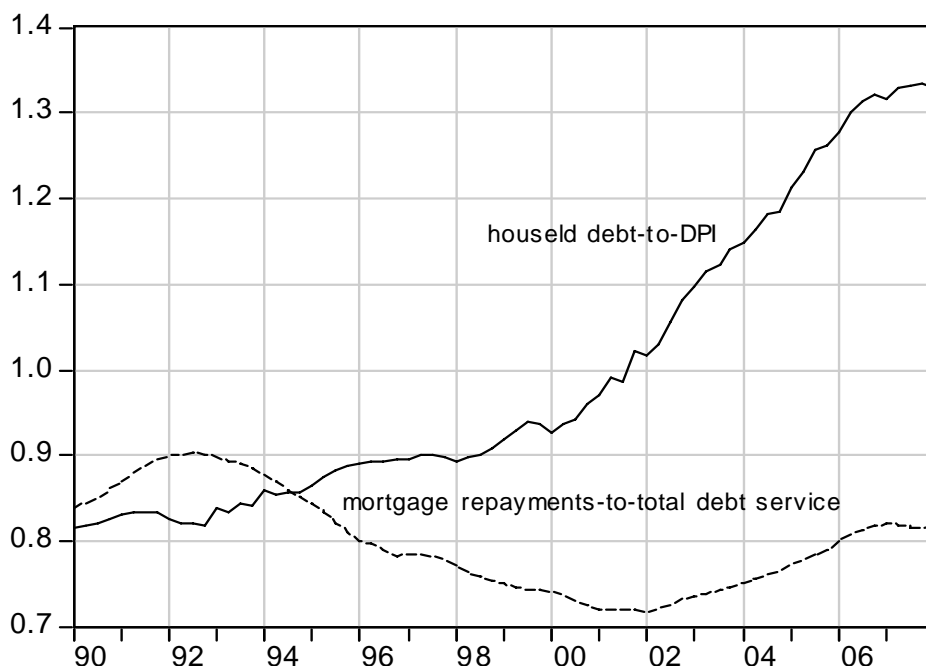
Source: Securities Industry and Financial Market Association (SIFMA).

The short-lived success of CDOs was made possible due to the expansion of global savings. International investors were eager to purchase these high-yielding structured products since yields on lower risk fixed income securities, such as U.S. Treasury bonds, were considerably lower. The yields on U.S. treasuries were depressed by the heavy demand for the U.S. long-term bonds in the first half of the present decade, which contributed to the inverted the 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 savvy investors attractive returns. However, these structured products entailed significant asymmetric information. For investors, the information asymmetry was in the form of the adverse selection problem, i.e. before their purchase, investors believed in a relatively low risk embedded in their yield margins above risk-free securities, such as government bonds. In a one-year retrospect of the financial crisis, one may conclude that these margins did not nearly compensate for the de facto default and liquidity risks associated with these structured products and stemming from the non-performance of the underlying assets, such as the subprime mortgages. In recent years CDOs were a useful tool of financial innovation for reducing risks associated with traditional debt funding. They have been applied to securitization of not only mortgages, but other debt instruments. They have been also an important source of funding for leveraged corporate buy-outs. Yet, CDOs have been oversold to market investors and the de facto risks associated with these complex derivatives with option-like characteristics have been grossly underestimated by the rating agencies.

The rising home prices along with the surge of mortgages originated to low-income borrowers and their securitization have imposed a serious burden on 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 reaching the level of 90 percent in 1992. Since then, it declined steadily to the lowest level of 72 percent in 2002, but driven initially by high property values and subsequently by higher mortgage

rates, it has increased to the recent levels exceeding 80 percent. 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; but after the period of steady climbing, the U.S. household debt exceeded disposable income by one-third. 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 was a crucial, yet neglected indicator of the upcoming financial crisis. Moreover, rising interest rates in 2006 and 2007 increased failures of repayments of mortgages, thus also undermined the collateral base of CDOs. In consequence, a further growth of mortgages, property values, bank profit margins from mortgage loans, and CDOs could not be rationally assumed already in 2006.

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.

In sum, the subprime mortgage crisis has been an unavoidable result of a specific plot of macroeconomic conditions and microeconomic systemic failures. The macroeconomic triggers of the crisis include the global savings glut, the excessive liquidity created by the Fed and some other central banks, and low yields on risk-free government bonds inducing attractiveness of higher yielding CDOs. The microeconomic flaws include unrecognized information asymmetry for investors in CDOs and other asset-backed securities (ABS), mistakes of the rating agencies in the assessment of risk associated with these securities, proliferation of subprime mortgage loans accompanied by ubiquitous violations of standard TDS safety benchmarks 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 credit rating and risk management had to be recognized at some point. With the return of the Fed to the policy tightening cycle (see Figure 3), interest margins between CDOs and government securities narrowed, gradually eroding attractiveness of these derivative securities to global investors. At the same time, adjustable rate mortgages (ARM) interest rates reset higher, leading to a dramatic increase in defaults and foreclosure activity. Foreclosures on housing properties in the U.S. rose by nearly 1.3 million in 2007, up 79 percent from 2006. As high as 43 percent

of the 2007 foreclosures were associated with subprime ARMs. As a result, lending activity in the mortgage market fell sharply. The troubles in the housing market rippled into the wholesale markets in which banks raise short-term finance. In response, banks hoarded cash and withdrew credit from others, which elevated LIBOR rates. In essence, this was a sign of a wide-spread erosion of trust. Correspondingly, more expensive funds in capital markets and in some cases downgrades of financial institutions by risk rating agencies restricted the ability of conduits and structured investment vehicles (SIVs) to issue asset-backed commercial paper at short maturities⁴. These conduits and SIVs have been sponsored by investment banks. In retrospect, the outbreak of the subprime mortgage crisis lifted the LIBOR rates well-above risk-free interest rates (Figure 6) making some of the SIVs (for instance Cheyne or Victoria Finance) insolvent. As a result, the banks found it increasingly difficult to transfer some of their risky mortgages and mortgage-backed securities to SIVs.

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



Source: Bloomberg.

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 LIBOR and risk-free corresponding maturity government securities yields. Figure 6 shows the TED (Treasury over Eurodollars) spread captured by the difference between of 3-month LIBOR over 3-month U.S. Treasury bill yields, for a one-year period following the outbreak of the subprime mortgage crisis. Increasing spreads denote elevated counter-party risk, or reluctance of banks to lend funds to each other. Over the one-year period displayed on the graph, the TED spread shows at least three major jumps.

The first one 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 (Di-Martin, Duca, Rosenblum, 2007). The funds in question froze redemptions, which induced panicky reactions in the broader markets. On August 20, 2007 the TED jumped to 240 basis points (bps) - the level that was previously experienced only during the 1987 market crash. The subsequent liquidity injection by the Fed helped reduce the TED spread to around 100 bps in October 2007. In

⁴ SIVs are funds that borrow money typically by issuing commercial paper at rates close to LIBOR and lend this money to banks by buying bonds at higher interest rates. The bonds purchased by SIVs have included securities backed by mortgage, credit cards and other credit instruments. If values of long-term securities bought by SIVs fall below the values of short-term securities sold by them, their solvency is at risk.

addition, the spread was brought down by the initial write-offs by banks of losses, but on subprime loans only.

The second outbreak took place in December 2007, when it became apparent that the financial crisis was spreading into 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 elevated market and credit risks were spreading over liquidity risk and the effects of this transmission were most severe at the most vulnerable institutions with vast exposure to CDOs, particularly those that had failed to raise capital and reduce excessive leverage. The proliferation of credit risk entailed expansion of credit default swaps (CDS) as credit risk hedging unfunded derivatives, while the funded derivatives such as CDOs were declining⁵. The sharp increase in counterparty risk resulted in extensive losses of large dealers of derivatives, most notably, of Bear Stearns.

Hence, the third TED spread takeoff. The elevated counterparty risk and losses of derivative dealers induced severe liquidity problems at 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 17 billion dollars⁶. The Bear Stearns fallout 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 defining 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 many of the futures markets were in a normal backwardation position⁷. This was in fact the case of a number of commodity futures markets, most notably, of the crude oil futures market. It seems that 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 75 dollars per barrel in the beginning of October 2007 to their peak of 147 on July 11, 2008 (Figure 7)⁸. Since then, the oil futures markets have been in a contango situation, providing disincentives to invest in commodity futures thus contributing to declining tendency of futures prices.

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 flight-to-safety of investors. At that stage, the asset bubble shifted into U.S. treasuries and, to some extent, to 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 (Dow Jones Industrial Average fell by 778 points) and the market volatility VIX index jumped sharply to the unprecedented level of 47⁹. The elevated market risk induced investors to shift assets into U.S. treasuries,

⁵ The total notional value of CDS increased from 10 trillion dollars in June 2005 to 62 trillion at the end of 2007.

⁶ 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.

⁷ 'Normal backwardation' in futures markets takes place when the expected spot price is above the futures 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 prices down to the expected spot price.

⁸ 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.

⁹ 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.

the yields of 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 912 dollars per ounce). Counter-party risk in the banking sector proxied by the TED spread reached new apex of 332 bps. 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.

Figure 7: Light crude oil futures prices (NYMEX). One-year series ending August 5, 2008



Source: Wall Street Journal Data Center.

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 risk highlighted by the run on Bear Stearns, with the spread of contagion effects on other investment banks with similar portfolio characteristics (most notably, on Lehman Brothers);
4. The commodity price bubble;
5. The massive flight to safety of investment funds.

The heterogeneous roots and the complex sequence of the current crisis make it challenging to synthesize its underlying causes and global repercussions. It is, however, crucial to assume that the global savings glut persists, but 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, thus also a slowdown of the U.S. economy and the correction of the housing market (Figures 1 and 2). At the same time, 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. These conditions invoked undisciplined lending practices, additionally spurred by the rise in credit derivatives. Moreover, the 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 (subsequently from 2004 until April 2007), as well as in the upbeat reports of various credit rating and supervisory agencies. In the aftermath of the outbreak of the crisis, the implicit low 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 loan classes is fraught with difficulty for banks, credit rating agencies and investors. The asymmetric information and systemic risks associated with various asset-backed securities have proven to be more significant than previously assumed. In response, the international investors and managed-asset companies have been transferring their vast capital across various asset classes. Before 2007, residential property, mortgage-backed securities and CDOs were popular investment venues. Following the collapse of subprime mortgages, alternative market or 'plain-vanilla' securities

were preferred. Proliferation of market risk and credit risk switched the investors' preferences into commodity futures and, later, to gold and Treasury securities.

These observations lead us to the argument of persistency of the '*wandering asset-price bubble*' defined as a bubble 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 bubble situation at different times, as their current prices have significantly exceeded the value of future incomes 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 and its somewhat disorderly allocations across various unregulated markets and structured financial products. Until 2007, global financial markets enjoyed a 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 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 mortgages to credit cards, consumer loans, student loans and leveraged loans issued by private equity firms. Unfortunately, the recent liquidity injections by the Fed and other central banks aimed at rescuing, 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 of its actual placement among various asset classes or securities, an asset bubble always engenders excessive volatility of their prices. It can be therefore also argued that the episodes of surging capital investments lead to increasing leptokurtosis of the time-series distribution of prices of the underlying securities. Therefore, 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 the factors contributing to the current crisis allows for identification of the some theoretical underpinnings that explain the special features of this crisis that make it unique in comparison to the 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' securities¹⁰. 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. The new asset-backed securities have widened the distance between borrowers of mortgages and investors in mortgage-backed securities. Also, yield margins 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 outperform interest on borrowed funds, thus they borrow money often without guarantees of positive returns. Lenders provide them with funds,

¹⁰ 'Plain-vanilla' securities are those based on guaranteed reimbursement of the principal with the return not linked to derivatives.

even if they foresee reayment problems, expecting the borrowers to obtain additional financing elsewhere. Such Ponzi financing leads to excessive leverage of investors and to accumulation of credit risk. When the economy stops growing and some major investment firms actually default, crediting by lenders may suddenly freeze, causing a snow-balling effect on further defaults. The Ponzi financing approach has been a cornerstone of Hyman Minsky's theory of financial fragility (Minsky, 2008; Wray, 2008).

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 at the stages of this crisis seem also to focus on the timely debate about the optimal banking model that is most resilient to various types of risk. As the crisis initially affected investment banks as originators of mortgage-backed securities, the universal banking model emerged as more resilient than investment and regional banking. Among others, Buiter (2007) concludes that universal banks have a wider variety of assets than 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. By the end of September 2008, Lehman Brothers went into bankruptcy without a bailout, Merrill Lynch got acquired by Citigroup, and Goldman Sachs along with Morgan Stanley were granted rights to form bank holding companies. More recently, however, large universal banks such as Societe General, UBS, ING-Barings, Wachovia, Credit Suisse and others also have shown large losses stemming from their vast exposure to risky mortgages and derivative securities. Therefore, the debate over superiority of universal banking is not over. Moreover, the evolution of credit derivatives and structured finance, particularly the securitization of mortgages by Fannie Mae and Freddie Mac, has also broken the traditional 'originate and hold' model of banking (Buiter, 2007). Within the traditional scheme of operations, banks engaged in lending long and keeping their debt on their books, thus refraining from its securitization. This new banking genre is commonly prescribed as an 'originate and distribute' scheme based on the practice of banks lending long, but instead of keeping their debt on their books, the banks structure it into new securities, thus instantaneously transfer the debt to market investors. The new 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 risk of credit borrowers, in particular subprime mortgage borrowers, and the perceived low risk of CDOs. Another feature is the information asymmetry between mortgage borrowers, dealers, banks 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 (Roubini, 2008). The system includes investment banks, hedge funds, private equity funds, SIVs, monolines, money market funds and various conduits. These unregulated institutions have emerged on the basis of excessive risk-taking. Yet, their risk positions and excessive leverage are not sheltered by deposit insurance or by a direct access to central banks' liquidity lending. 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 credit derivatives. The shadow banking system has recently imploded as investors have recognized low-quality and high risk of its assets, its illiquidity and asset/liability maturity mismatch.

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 whether the bubble is more persistent, being occasionally subdued by central bank interventions in the form of liquidity injections or bail-outs of financial institutions, or it is more unbalanced due to disproportionate, herding behavior of investors.

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 outbreak of the crisis in August 2007, the fed funds rate and other short-term rates were rising in relation to long-term rates (Figure 3), leading also to flattening of the U.S. Treasury yield curve. At the same time, effective yields on CDOs were still outperforming U.S. government bond yields. With the progression of the crisis, the term spread on U.S. treasuries has widened again and interest positive margins on CDOs have been wiped out. 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 bond yields, the linkages in pricing of different types of mortgages have been somewhat broken. This situation has exacerbated the overall credit risk since risk margins on all securities have generally raised due to their unstable and unpredictable path.

The crisis has also raised volatility of equities, thus contributed 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 13.25, but it increased to 23.25 during the August 2007 – March 2008 period and jumped to 47 on September 29. The elevated market risk has resulted in a slowdown in capital inflows to global equity markets.

An important factor in the proliferation and transmission of risk was the securitization of subprime mortgages. The new practice of assessing and securitizing risk of such borrowers emerged in the first half of the current decade. The new method relied on a two-step process: assessment and pricing of credit risk, and securitization of default risk of subprime and Alt-A borrowers (DiMartino, Duca and Rosenblum, 2007). Accordingly, lenders first sorted out mortgage applicants by their creditworthiness by applying credit-scoring models (initially adopted from the auto loan market). They subsequently charged borrowers with appropriate risk-based interest. But the problem of default risk remained unresolved. At that juncture, financial innovation came to the rescue; loan repayments were divided into different risk classes, and then consolidated in appropriate classes or tranches into CDOs. In hindsight, CDOs were originally devised as an effective and prudent vehicle of securitizing default risk. They would probably maintain their soundness if not the overblown appetite of global investment funds for these new structured products, stemming from their attractive yield margins over U.S. and other sovereign bonds. A rhetorical question can be asked whether their original intent unscathed by speculative investments would be preserved if the U.S. monetary policy were tighter prior to 2005. In quintessence, CDOs were originally devised as effective default risk-mitigating vehicles.

There has been also a severe liquidity crisis sparked by the U.S. housing market slump. The formerly-sound but now increasingly-fragile financial institutions have been hurt by a larger number and variety of under-performing assets thus by the elevated credit risk. These institutions have become vulnerable to a net drain (net cash outflow) or to a potential run on their liabilities, which are symptoms of a higher liquidity risk. They were trying to avert it by selling off some of their risky assets (to SIVs among others), by borrowing assets from other financial institutions or by raising more capital in the second half of 2007. Those with a vast exposure to CDOs found it increasingly difficult to employ these techniques. The liquidity indexes of the majority of banks were reduced by decreasing values of CDOs and 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 the crisis has exacerbated exchange rate risk. For instance, the average daily standard deviation of the euro in U.S. dollar 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 euro¹¹. 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. In all, this crisis induced by heterogeneous factors seems to reverberate across various risk categories, which makes it particularly difficult to identify and to mitigate. However, this reasoning might be over-simplified and it needs to be tested thoroughly once more complete information and data are 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.

VI. Challenges for Banks

The difficulties of banks to manage of 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. 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 sources of earnings so that losses in one area can be offset with gains in other functional areas. More specifically, the crisis has hit mainly the broker-dealer investment banks as they have operated with highly concentrated, over-leveraged balance sheets and have relied only on wholesale markets for funding. Prior to the crisis, they enjoyed extraordinary gains from asset securitization and their own hedge fund activities, but this crisis made these areas most vulnerable. Furthermore, many investment banks moved to asset securitization and hedge fund operation activities trying to mimic Goldman Sachs as the strongest and the most innovative institution¹². The drive to follow the investment banking leader included Merrill Lynch – a traditional retail broker, as well as Lehman Brothers and Bear Stearns – known experts in fixed income securities. Their switch toward complex asset-backed securities has proven to be strategically 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 larger de facto risk of certain asset categories as well as 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 counter-party risk, as reflected by jumps in LIBOR rates that have an incapacitating impact on inter-bank credit market.

The amplifiers of gains of losses from assets pose a serious challenge for financial institutions in light of the ongoing crisis. The first of them, i.e. unreliability of mark-to-market valuation stems from the number of factors. Chief among them is non-marketability of an increasing number of assets. Progression of the financial crisis has made uncovered, or un-marketable a very large number of mortgages (not only subprime or Alt-A, but also prime) and mortgage-backed securities. Declining housing prices have contributed to higher debt-to-equity ratios. When this ratio exceeds unity, the mortgage borrowers face a negative equity situation, i.e. the nominal value of their mort-

¹¹ Own calculations based on Bundesbank data.

¹² It is not surprising that Goldman Sachs has weathered 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.

gage being higher than the property value. When this happens, the mortgages become uncovered and the related securities are no longer marketable. They can be no longer marked-to-market, thus can be valued only on the mark-to-model basis. This process has been spread wider than previously anticipated. Increasing number of mortgage-backed securities has become unmarketable and has fallen effectively to the Level 3 asset category.

Classification of assets into three levels based on their valuation method was introduced by FAS 157 in November 2007¹³. The new standards require U.S. banks to report assets falling into each category from the beginning of 2008. However, anticipating the new accounting rules, the major U.S. banks began classifying and reporting their assets in this way already in 2007. The dangerous propagation of Level 3 assets is shown in Table 1. Based on Bloomberg estimation, the total value of Level 3 assets among U.S. banks reached 500 billion dollars at the end of the 1st quarter of 2008. Such exorbitant holdings of risky, in part toxic assets cannot be easily erased, either through writedowns or especially through the Fed bailout. The Fed does not have sufficient funds available for their purchase and, candidly speaking, should not hastily and indiscriminately engage in their cleanup. To put it simply, the bankers' mishaps should not be a subject to a social bailout.

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.

The data in Table 1 show that holdings of Level 3 assets are greater among the Big 5 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 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. However, according to some unofficial reports, re-classification of assets into Level 3 might have been also deliberate in order to inflate the need for potential bailouts. Bank executives might have also additional incentives to build up these assets because their return into market trading at some point in the future followed by re-classification into the Level 1 category is likely to result in special bonuses for them. Moreover, re-classification of some of the most 'toxic' assets into the Level 3 category allows hiding them, which certainly 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, or augmented, 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 are 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, thus send a signal to sell, which in turn exacerbates volatility further.

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.

¹³ According to FAS 157, assets in Level 1 are those that have observable market prices, thus can be marked-to-market. Level 2 are assets that are not marketable and 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. Not only mortgage-related assets, but also other complex derivatives, credit card receivables, loans linked to leverage buyouts and asset-backed commercial paper fall into the Level 3 category.

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 rely too much on wholesale markets to borrow short-term (mainly from SIVs) and to invest in higher-yield long-term assets. Creation of debt took place prior to the outbreak of the crisis when asset prices were rising and the banks borrowed funds to take advantage of their upward trend. The vast exposure to CDOs is also a serious amplifier of losses, since it takes only a small decline in their value to escalate losses on 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 all Big 5 Wall Street 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 level¹⁴. In all, such high leverage functions as a dangerous 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.

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.

The last amplifier, i.e. unpredictable jumps in LIBOR that obfuscate counter-party 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 Figure 6, which had an incapacitating impact on the interbank credit market and generated bank losses.

Recognizing the dangers of amplified losses at the time of financial distress, the leading investment banks are now 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 have been recently 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 not relying on a single risk methodology but using all available methods for this purpose, 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 global financial Market Monitoring Group (MMG) is established by the IIF for this purpose. 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 the credit risk associated with individual assets. Risk management shall be viewed as a team effort thus portfolio managers shall be compensated for 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

¹⁴ 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 had 28 billion dollars of Level 3 assets in comparison to its 12 billion 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.

these scenarios may be implausible under turbulent market conditions. It seems also that most of the banks will stick to 'plain-vanilla' debt securities, at least until more compelling methods of risk assessment for complex structured products are developed.

The above discussion of selected, presumably most crucial dilemmas of banks in response to the current financial crisis will likely result in major adjustment in the banking sector. Specifically, since the universal banking model has proven to be more resilient, one may expect a new wave of mergers or acquisitions of commercial banks by better-capitalized investment banks once their write-downs are completed and some of their Level 3 assets become marketable again. Moreover, the collapse of CDOs and some of the more esoteric derivatives seems to be permanent as investors have probably learned their lessons about asymmetric information and de facto risks embedded in these complex securities. One may also expect a better transparency of balance sheets of banks as their practice of risk transferring to SIVs will fall under the scrutiny of regulators.

VII. Regulatory and Monetary Policy Responses – A Critical Evaluation

Valuable suggestions have emerged from the current financial crisis for regulators and monetary policy-makers. It seems that the regulatory focus should be on restraining SIVs. They are in essence off balance sheet vehicles created by many major investment banks to facilitate securitization of risky assets. SIVs are nothing more than balance sheet gimmicks that allow banks to shave off risky assets from their balance sheets, thus also to meet the regulatory minimum limits on their capital. As Buiter (2007) correctly points out, SIVs have little or no capital, no transparency and opaque governance. Without doubt, they should be a subject of a more rigorous regulatory 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-, and exchange rate-risk 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 of risk into various tranches were easier to devise in theory than to implement in practice, as they have not always adequately captured all de facto risks embedded in the underlying assets. 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) 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 monetary policy-makers. At the present time the U.S. and European monetary authorities seem rather desperate to bail-out the financial institutions that have been hit hard by the crisis. The U.S. Congress has approved a \$700 billion TARP (Troubled Asset Relief Program) sponsored by the Treasury Secretary Henry Paulson. The final version of TARP will be implemented mainly through equity injection¹⁵ (i.e. purchases of preferred stock of banks in exchange for capital) and on outright purchases or guarantees of troubled mortgage-related and possibly other assets (Bernanke, 2008). The first method is clearly superior, as it provides capital to banks, improving their solvency (lifting the Tier I capital to risk-weighted asset ratio above the presently-preferred safety margin of 10 percent), while forcing them to devise other methods of dealing with troubled assets. The Fed has also used a range of other actions to

¹⁵ The equity injection scheme was piloted by Sweden in its bank recapitalization program of 1992 (Ingves and Lind, 1996)

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. 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. These efforts of global financial authorities provide a temporary relief to troubled financial markets and institutions and restore liquidity in credit markets; they do not constitute a comprehensive, systemic resolution of this crisis.

However, such government bail-outs shall be exercised with extreme caution and implemented preferably through a fiscal stimulus, not through cash injections from a central bank. Vast liquidity injections are likely to hamper price stability thus subsequently hurt central bank's credibility. They also provide implicit guarantees for high-risk operations of banks in the future. As argued above, credit risk at specialized 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. Yet, their gains will be probably magnified at better market periods as well. 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 for a government to preserve one of the largest institutions in the country's banking system, since the collapse of one may drag down others as well. It is because large partner banks are entangled through various interest rate swap contracts.

After stabilizing financial markets through liquidity infusions, the Fed and other central banks will be well-advised to direct their tactical efforts toward managing the 'wandering asset-price bubble' i.e. the savings glut, so that capital inflows to specific securities will not endanger price stability and will not hinder economic growth. One shall assume that the bubble is here to stay, it cannot be bursted 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 economy¹⁶.

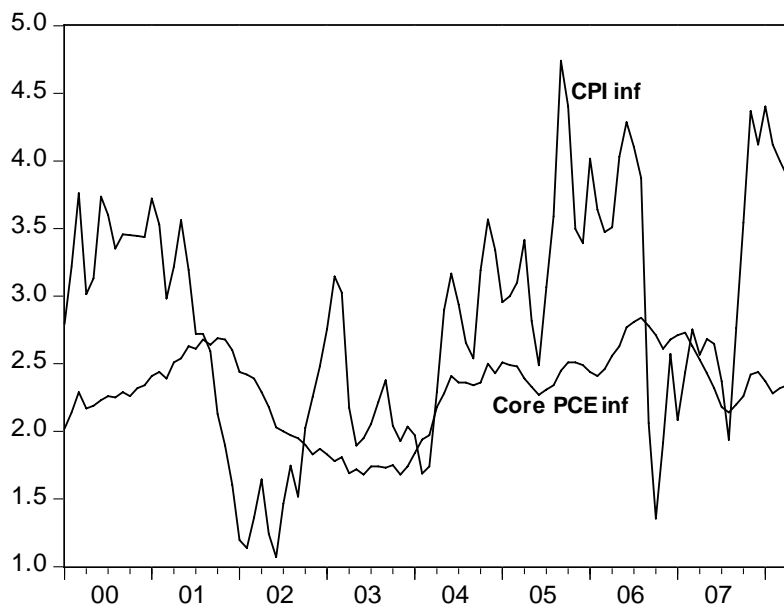
Once the rescue and bail-out programs engender stability in financial markets (lowering VIX, TED spread and other market and counter-party risk indicators to historically-stable levels), it seems prudent to reinforce commitment of the Fed and other central banks to flexible, forward-looking inflation 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 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. Emerging market economies, or in particular, the recently admitted EU members undergoing convergence to the euro, cannot target domestic inflation forecasts only. They will be well-advised to target differentials between domestic and the key underlying currency area, i.e. the eurozone, inflation forecasts. Such policy framework for the euro-candidates is proposed by Orlowski (2008b) and prescribed as 'relative inflation-forecast targeting'. 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 environment in these open, intrinsically volatile economies.

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 late 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. However, the Fed 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. But

¹⁶ 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.

large liquidity injections in response to the current financial crisis have curtailed the Fed plans for embracing inflation targeting. However, if such policy plans are restored in the future, headline rather than core inflation should be a basis for specification of inflation targets. After all, nominal indexation of wages, prices and interest rates is routinely adjusted to headline rather than core inflation.

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



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

At this juncture it is too early to identify all valuable lessons from the current crisis for policy-makers since the crisis is still evolving. Nevertheless, coordinated efforts and mutual exchanges of views between researchers and practitioners at all types of 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

The ongoing turmoil in financial markets that has begun as the subprime mortgage crisis has reverberated across a variety of credit markets, instruments and financial institutions. It is a multi-faceted phenomenon that has a broadening scope. It began from the collapse of the subprime mortgages in the U.S., but it gradually affected other credit areas. It has led to the collapse of CDOs and other esoteric derivatives. More recently, it has elevated commodity future and spot prices. We argue that it moves and spreads with the changeable allocations of global savings, i.e. the disorderly 'wandering asset-price bubble'. Ideally, this liquidity should be invested in stocks and bonds so that it will not have destabilizing effects on inflation and global financial markets. But lax regulations, scholastic rather than practical financial engineering and asymmetric information about current and expected prices of underlying assets and structured financial products have made this crisis so deep and so unexpected.

Several lessons can be drawn from this crisis. Chief among them is the claim that a set of fundamentals that is carefully chosen does matter for explaining this crisis and predicting its future path. This set should include the current critical level of household debt (Figure 5) that has reached the threshold beyond which further credit could be extended only to high-risk borrowers. 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. 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 the de facto credit risk associated with these products.

The next lesson pertains to systemic foundations of global banking. A universal banking as well as the traditional 'originate-and-hold' scheme have emerged as winners over specialized financial institutions and the 'originate-and-distribute' banking. Moreover, unregulated investment vehicles, such as hedge funds, have exacerbated market risk and have contributed to dramatic dislocations of the 'wandering asset-price bubble'. Spillover effects from market risk into credit and liquidity risks have had a paralyzing impact on the credit freeze (at the end of September 2008) and may still hamper the global real economy growth.

Regulatory agencies are also learning from this crisis. 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, its final version correctly focuses on equity injections. At the same time, unregulated non-transparent investment vehicles are still enjoying a free ride from the regulators, shifting assets between various categories, elevating market risk and, ultimately, jeopardizing economic growth.

Among important lessons from this crisis is the need to change risk assessment by applying a more holistic approach 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 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 discourage capital inflows, but they should focus their regulatory and strategic policy efforts aimed at re-directing the 'wandering bubble' to socially productive 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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