Derivatives, Risk-Return and Subprime

Sixth Colloquium

edited by
Paolo Savona
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Organizing and Scientific Committee:
Paolo Savona, Iftekhar Hasan, Cristiano Zazzara

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contributions by
Yuliya Demyanyk, Gerald P. Dwyer Jr., Bill B. Francis, Giuseppe Guarino
Iftekhar Hasan, William C. Hunter, Wenying Jiangli, Kose John
Rainer Masera, Giancarlo Mazzoni, Giuseppe Morbidelli
Fariborz Moshirian, Chiara Oldani, Henri Pagès, Matt Pritsker
Fabrizio Saccomanni, Paolo Savona, Chung-Hua Shen, Jouko Vilmunen
Paul Wachtel, Haizhi Wang, Cristiano Zazzara
# Index

<table>
<thead>
<tr>
<th>Editors’ Preface</th>
<th>p. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory Remarks</td>
<td></td>
</tr>
<tr>
<td>Fabrizio Saccomanni</td>
<td>p. 7</td>
</tr>
<tr>
<td>Giuseppe Morbidelli</td>
<td>p. 11</td>
</tr>
<tr>
<td>FIRST PAPER</td>
<td></td>
</tr>
<tr>
<td>CENTRAL BANKING FOR THE 21\textsuperscript{ST} CENTURY: IS THERE SOMETHING NEW UNDER THE SUN?</td>
<td></td>
</tr>
<tr>
<td>Paul Wachtel</td>
<td>p. 19</td>
</tr>
<tr>
<td>Comments and Observations</td>
<td></td>
</tr>
<tr>
<td>William C. Hunter</td>
<td>p. 47</td>
</tr>
<tr>
<td>SECOND PAPER</td>
<td></td>
</tr>
<tr>
<td>THE IMPACTS OF MORTGAGE SECURITIZATION ON BANK PERFORMANCE</td>
<td>p. 55</td>
</tr>
<tr>
<td>Wenying Jiangli</td>
<td></td>
</tr>
<tr>
<td>Matt Pritsker</td>
<td></td>
</tr>
<tr>
<td>Comments and Observations</td>
<td></td>
</tr>
<tr>
<td>Jouko Vilmunen</td>
<td>p. 75</td>
</tr>
<tr>
<td>Comments and Observations</td>
<td></td>
</tr>
<tr>
<td>Kose John</td>
<td>p. 81</td>
</tr>
</tbody>
</table>

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THIRD PAPER
EXIT STRATEGY: THE ROLE OF A SHORT LOAN LIFE IN THE SUBPRIME CRISIS
Yuliya Demyanyk ................................................................. p. 85

Comments and Observations
Henri Pagès ................................................................. p. 113

FOURTH PAPER
SOVEREIGN WEALTH FUNDS AND SUBPRIME CREDIT PROBLEMS
Fariborz Moshirian ................................................................. p. 119

Comments and Observations
Gerald P. Dwyer Jr. ................................................................. p. 145

FIFTH PAPER
SUBPRIME CREDITS OR SUBPRIME POLICIES?
THE DERIVATIVES CONUNDRUM
Paolo Savona
Chiara Oldani
Rainer Masera
Giancarlo Mazzoni ................................................................. p. 149

Comments and Observations
Bill B. Francis ................................................................. p. 209

SIXTH PAPER
SECURITIZATION AND WEALTH EFFECTS
Bill B. Francis
Iftekhar Hasan
Haizhi Wang
Cristiano Zazzara ................................................................. p. 223

Comments and Observations
Chung-Hua Shen ................................................................. p. 251

REMARKS
Giuseppe Guarino ................................................................. p. 257
Editors’ Preface

Foreword

For the 6th year in a row we met to honour the memories of Dr. Guido Carli and Prof. Alberto Predieri. This time, in Lucca, we discussed the issues related to the contagion of global markets originated in the subprime mortgage credits.

Once again, the twofold meeting purposes was met: 1. to exchange friendly and openly our points of view, through the discussion of original pieces of scientific research; 2. to provide the public opinion with a clear explanation of the implication of financial developments, and the impact on the economy.

The excellent group of scholars we invited this year prepared papers, memos and comments, which converged on the common viewpoint that public authorities and private players pushed too much for the creation of financial securities, losing any contact with the effective market risks. The result is a change in central bank behaviour (Paul Wachtel), bank management (Wenying Jiangli and Matt Pritsker), and a strengthening of Sovereign Wealth Fund role (Fariborz Moshirian). The crisis was inside the transmission mechanism of the bubble, has been financed by credit (Yuliya Demyanyk), and the relationship between securitization and wealth has played a prominent role (Bill B. Francis, Iftekhar Hasan, Haizhi Wang, and Cristiano Zazzara). We confirmed the result of the previous Colloquium on the difficulty to forecast these developments by means of econometric modelling and research, while the need to heavily rely on the intuition of students and policy makers, i.e. “metaeconomics”, is by-passing economics!

A large part of the success of the meeting is due to Iftekhar Hasan and Cristiano Zazzara, who took care of the scientific organization, and to Monica Degl’Innocenti, who managed the entire organization in a very excellent way, and made possible the printing of these proceedings in a very short period of time.

Associazione Guido Carli
Fondazione Cesifin Alberto Predieri
Editors of the Journal of Financial Stability
First of all, I would like to warmly welcome all participants at this Sixth Colloquium on “Derivatives, Risk-return and Subprime”, also on behalf of the President of the Associazione Guido Carli, Governor Mario Draghi. We would like to compliment the organizers – the Carli Association and the Fondazione Cesifin Alberto Predieri, in cooperation with the Journal of Financial Stability – for having chosen themes of great analytical and practical relevance and for having brought together such a distinguished group of speakers and such a large audience in the magnificent setting of the city of Lucca.

For the Guido Carli Association the organization of this Colloquium is part of a broad range of activities carried out under the leadership of Professor Paolo Savona, the Association’s scientific advisor. Conferences like today’s, research initiatives, scientific publications, and scholarship grants are all elements in a broader design, inspired by Guido Carli when he was Governor of the Bank of Italy. He considered essential for the Bank to promote the dialogue between academic economists and central bankers on key policy issues. To implement Carli’s vision is certainly the best and most appropriate way for the Association to honour his memory.

For these reasons, Governor Draghi and myself deeply regret to have been unable to be here with you today to participate in what promises to be a very stimulating scientific and intellectual debate. Unfortunately, the current situation of acute tension in the international markets and financial system implies a constant monitoring by the institutions participating in the international network of central banks and supervisory authorities both within the Eurosystem and among the G-7.

The severity of the current crisis is also clearly reflected in the topics analysed by the various papers that will be presented at this Conference.

I do not pretend to address the full implications of the present situation in these short introductory remarks, but a few considerations may be appropriate.
INTRODUCTORY REMARKS

While the basic ingredient of every financial crisis is the system’s tendency to build up risks over a protracted period of time and to shed risky positions abruptly, it must also be acknowledged that what distinguishes the latest episodes from those of the past is the leveraging of such positions made possible by financial innovation. What is more, financial leverage produces unwelcome effects upon the real economy not only during the retrenchment phase, as one would normally expect, but even during upswings, with considerable distortions in the relative prices of different types of assets.

The recognition of the key role played by financial leverage in the recent crisis – including through innovative products involving high complexity and high risks – led the Financial Stability Forum, under the chairmanship of Governor Draghi, to identify three key issues that must be tackled jointly by the private sector and the public authorities to produce a system that is both less crisis-prone and more robust. This means, in short, a financial system in which intermediaries have a stronger capital base, less leverage and where a more effective regulation is established to foster transparency, adequate risk management and sound practices.

The specific measures proposed by the FSF to achieve these objectives are well known, but it is worthwhile noting that several of them are already in course of implementation and many other actions have been undertaken by the private sector to complement these public-sector initiatives in a truly cooperative spirit. Important interventions have also been undertaken by the US government to counter severe threats to the financial system.

Central banks have also been confronted by new challenges as they have been required to provide, under stress conditions, huge amounts of liquidity – with innovative instruments and procedures – to operators in the money markets. This has been crucial for ensuring the operation of the financial markets in general. At the same time, central banks have been careful to signal that a more active presence in the money market to ease liquidity during the turmoil would not be misconstrued as a sign of a weakened commitment to price stability. On both counts, the experience of the main central banks would appear to have been positive. In particular, the Eurosystem has managed to accommodate banks’ greater demand for liquidity without jeopardizing the goal of keeping inflationary expectations consistent with price stability in the medium term.
As Governor Draghi noted in a recent speech in Berlin: “The crisis we are facing is one of the most severe and complex of our times. The challenges will be substantial: restore price stability that would support growth, and ensure that the needed adjustments in bank and households balance sheets and in internal and external macroeconomic imbalances take place in an orderly manner. This will require action on the monetary, fiscal, and regulatory front. It will also require decisive action by the private sector to repair balance sheets, strengthen corporate governance, and improve the functioning of markets”.

I would like to conclude by wishing to all participants a fruitful dialogue, hoping that today’s Colloquium will provide useful insights on how the crisis developed and concrete indications for its resolution.
Derivatives, subprime and the surroundings. This is the subject of our meeting. It is a financial theme, indeed a theme of finance at the edge, even of risk finance. It is an issue about which much has been written and said, and about which much more will continue to be written and said. Undoubtedly, due to shortcomings in the law and/or the shortcomings of men, derivatives, or better their creation and spread, have caused endless difficulties and disagreements and above all, as today's commentary shows, real economic-financial disasters, in their turn matrices of a negative spiral which one cannot see an end to.

The reasons for, and effects of the rapid growth in the market of credit derivatives were clearly outlined in the final considerations of the Governor of the Bank of Italy, 31 May 2001; which I believe constitute a reference point for all. Also, because they present a series of solutions designed to overcome or at least temper the crisis situation, a little turbulent to say the least, one might even venture, ruinous. They take up again the recommendations of the Financial Stability Forum in its recent report and propose as primary solutions the rapid adoption of the new prudential criteria of Basel II, with an increase in capital requirements, in particular for structured finance.

But I won't go into these issues as I am, after all, a professor of Administrative law. If Governor Draghi were present, I could say that the only qualification I have to speak is that I was once a Faculty colleague of his for 10 years and, moreover, of the same generation. I did sit beside him through the long and tedious monthly Faculty meetings, but I can assure you that we never spoke about derivatives or the like, but rather of research posts or book resources or the acquisition of new spaces for both ourselves and our collaborators.

And really mine is solely a welcome address. Precisely in that spirit of typical greeting, I cannot help but remember that financial trading was born in Lucca, or that Lucca was one of the original places of choice for this kind of activity. I am reminded of this by our very austere venue, which is at the same time both alluring and revealing of the rich past that went into its making, and also by the series of monuments, palaces,
churches and oratorios which accompanied you on the short journey from your hotels to this lecture hall. I believe that they might even have moved your souls a little.

Certainly, when one starts to discuss the birthplace (for example of the first Parliament, the first truly independent judge or to remain closer to our theme, the first bank), controversy and uncertainty abounds, almost as when it comes to identifying the ports of call that Ulysses made.

The fact remains that, up until the XII century, Lucca was one of the most well-developed and lively Italian cities, indeed European cities, in promoting the circulation of money not only at a local level, but also at a national and international level.

The Lucchese merchants were indeed among the first to attend the fairs of Champagne and Flanders from the XII century, to take part in trade with Southern Italy, to operate in a vast and constant way in the square of Genoa and so through out the Mediterranean. They were the first to regularly visit the centres of Provence and Languedoc and to take the lead in the new markets of the day, such as the England of Henry III and the Kingdom of Sicily following the Anjou conquest. In addition to trade in silk, where they were the undisputed leaders in its production for centuries, and many other products, such as wool, leather, cereals, cheeses, salted goods, oil, wine and precious metals, the Lucchese also widely practised trade in money, both through currency exchange, deposits and interest loans. More generally, they had an important activity of Financial trading with the secular aristocracy, the high clergy, in the Roman curia and some European courts, in particular the English and Anjou. The origins of such activities are traceable in the manual exchange, practiced by local campsores, in the shade of the San Martino’s Cathedral. Under protection and jurisdiction they carried out exchange operations – at least from the beginning of the XII century – as an interesting inscription from 1111 shows, placed under the portico of the Cathedral. The importance of this inscription is not only in the early activities of the activities of the market and the exchange, which took place under the Cathedral, but especially in witnessing the institutional protection that the Bishop and his court guaranteed to the foreign merchants and to the square’s frequenters. It was the highest ecclesiastical authority of the diocese that ensured the transparency and honesty of the commercial operatives’ and financers’ transactions. “... nec furtum nec treccamentum facere
..” reads the stone. The inscription is, therefore, also representative of a solid presence and efficient commercial jurisdiction (as guaranteed by the Episcopal authority) aimed at ensuring the regular course of trade and the activities of the market. But above all it should be remembered that the exchange operations were accompanied by additional contracts, primarily insurance against the risks of travel, for which there is talk of a Lucchese precedent, but also with provisions establishing rates of interest: distance exchange in fact gave the merchants the opportunity of circumventing the usual church prohibitions on usury. In addition, the payments were not in cash, but with coupon payment, by means of a formal promise, with guarantee of a rate and with underlying interest: hence the bill of exchange; while the letter of exchange was in essence a precursor to the banker’s cheque.

The birthplace, the presence of an authoritative jurisdiction, the stratification of refined rules (sanctioned as merchant code at Guinigiano in 1406, which was the example for each lex mercatoria of the era), the capacity and the imagination to create what today one would call financial products, led to the bankers, tax collectors, entrepreneurs and merchants playing an important role in the economic history of France, Flanders and England. It anticipated a habitus and a journey towards new shores, in search of new initiatives which still today characterise the Lucchese community. William II used to swear oaths by “sanctum vultum de Lucca” and a distinguished Belgian historian (E. Pirenne) said that the Lucchese bankers can undisputedly boast of having started the science of finance in the West, as their fellow Renaissance countrymen had led the way towards Humanism.

The proof of having both a commercial and a financial aptitude is given indirectly by Dante, who defined the Lucchese as barterers. It is known that Dante didn’t go easy when launching his invectives (I would say anathemas) at the Tuscan cities, Lucca included (which had given him hospitality and the love of a gentlewoman, Gentucca Morla): apart from Florence, the subject of multiple curses, Pisa was defined as the “disgrace of nations”, Arezzo was inhabited by snarling curs, Siena by “vain People“ and Pistoia should have been burnt to the ground.

So then, in this context, the definition of barterers also suggests (albeit from a negative perspective) their particular ability to trade. Even if, after the effect of political, economic and social events which it is not
possible to retrace, this primacy has been on the decline, as seen in the example given by the restricted circle of optimates (the so-called good men) enrolled in the Golden Book of the city (only those who had the right to administer the City: a real and true oligarchical Republic). Even after this, those prerequisites which every good merchant and citizen must have, have never disappeared: defence of tradition and at the same time the search for the new, industriousness, devotion to sacrifice, propensity for thrift and saving, as great as was the effort required to make an earning. Indeed, these prerequisites, determining economic independence, are those which allowed for the continuation of a long political independence (up to 1847 or more precisely until January 1799 when Napoleon’s army entered Lucca) and with this the defence of their own identity (of which the thick, solid city walls bear witness).

In essence, here one can find, and one has always found, a flair for company risk taking, risk to produce and to trade, but not as an end in itself; on the contrary, to invest and build.

Certainly times have changed: globalisation, technological potential, the extremism of financial techniques and the interconnections between the markets. They have meant that the financial market of our day is increasingly condensing elements of structural complexity, and of products resulting from innovative engineering activities, each inventive and directed towards satisfying the sophisticated needs of institutional financial operators. These results are for the most part obtained from the use of derivative financial instruments which include options and swaps in different forms and with different underlying. The transactions in derivatives generate complicated structures whose average life lengthens day by day in a world where, however, uncertainty becomes a factor.

The cyclical crises of the various markets has often shown the ineffectiveness of most of the forecasts that the financial institutions have made, and on which they have based their investment decisions and market operations. At the same time the derivative risks not only from the transactions themselves, but particularly from the globalisation of the market that generates a high and complicated intertwining of relationships between the financial brokers, increase at a fast pace.

How does one react? How many tools are there to reduce this risk? Present today there are well-known experts from some very renowned universities and highly prestigious financial and credit institutions.
Certainly there won’t be a lack of useful pointers, for all levels. I can say in passing though that there are hypothetical legislative instruments, monetary policy instruments and supervisory instruments. However I do not want, nor could I, invade the specialized fields of our speakers and discussants.

What I feel sure of however, is that domestic remedies are not required here, but those on a world level, because of the network of interrelations which tie us all together.

Not only. Techniques with different characteristics for regulating are required. We have too many laws, recommendations, directives and self-regulatory codes. And when the subject is too detailed and all pervasive, uninhibited operators move like mice in the cheese.

I am not saying that we need to return to XII tables, but we must focus on a few provisions which address the crucial points and in particular what is in my opinion the mother of all crisis situations: conflict of interest.

Perhaps until we arrive at - as proposed a long time ago by Guido Rossi – the express prohibition, or at least, a draconian style control of the movement of all or almost all those products that today the inexperienced saver is invited to buy more or less in good faith - but in the face of such complex financial market offers, almost all of us are inexperienced-. These have real risks that the good sense of the past, that of the Lucchese merchants, would lead one to avoid a priori.
Sixth Colloquium
Central banks have a venerable history that starts in the late 17th century with the establishment of the Swedish Riksbank and the Bank of England. However, the modern notion of central banking did not begin to emerge until late in the 19th century when central banks began to proliferate. The Bank of Italy was established in 1893 and the American Federal Reserve System in 1914. The spread of central banking to virtually every political jurisdiction is a 20th century phenomenon. Moreover, as the 20th century drew to close, students of central banking seemed to have settled on a clear consensus concerning the role of central banks. But, consensus among economists is often fickle and as soon as the 21st century opened the consensus began to fall apart.

The aim of this essay is to explain the 20th century consensus and analyze how it fell apart in the first decade of the 21st century. To begin, what was the consensus? On the micro side, the importance of clearly defined and fairly applied bank regulation is a sine qua non of good central banking. This was not always obvious and for a time in the post war period, the emphasis among central bankers was on macro goals and micro banking issues were forgotten. The early post transition experiences in Central and Eastern Europe, as well as the Asian crisis, gave clear proof to the importance of regulatory structures. In many transition countries (see Bonin, Hasan and Wachtel, 2009), banking crises occurred soon after the establishment of private banking systems and central banks because the bank regulators did not have the authority or expertise to function adequately.

* A preliminary version of this paper was presented to the 2nd Center for International Banking, Insurance and Finance Conference, University of Groningen, May 26-27, 2008.

1 The banking crises in Asia in the 1990s caught the IMF by surprise. The fund was staffed with macro economic analysts and it did not have the organizational capability to respond to bank regulatory issues.
On the macro side, the 20th century ended with a widely shared understanding of how a central bank should use either an exchange rate or short term interest rate instrument to target the inflation rate. The mid 20th century debates between the Keynesians and monetarists concerning the role of monetary policy petered out towards the end the century.

Just a few years ago, it seemed unnecessary to ask what central banks were supposed to do. Inflation targeting and transparent regulation of banks were the answers. But events since the summer of 2007 have turned the consensus on its head. Surely, most observers would now agree that a fresh look at what central banks can and should be doing is worth undertaking.

We start with a closer look at the old 20th century consensus. We will then look at the 21st century challenges to the consensus and ask whether something new is really going on. I will suggest that there are four distinct features of the current crisis that distinguish it from the past and that will define 21st century central banking.

The 20th century consensus

The 20th century consensus is really a late in the century development. Banking and central banking around the world in the middle of the century was quite different. In the early post war period central banks were often given a broad macroeconomic mandate that might include income distribution and unemployment in addition to price stability. Inflation was tolerated or even viewed as a benign consequence of efforts to attain other goals. The universal acceptance of the primacy of a price stability objective only emerged late in the century. Further, at mid century an independent banking sector was the exception rather than the role in both developed and less developed countries. Government ownership or control of banks was common. And the central bank was often an arm of the government finance ministry (see Cukierman, 2007) and frequently served as a government development bank as well. An independent central bank with clear macro objectives and a role in maintaining the soundness of the banking sector without political interference only emerged late in the century. However, thinking changed rapidly in the last few decades of the 20th century and the consensus view spread rapidly around the world.
In this section, we will take a closer look at the late 20\textsuperscript{th} century consensus. In addition, we will point out some weaknesses in the strength of the consensus.

First, on the micro side, the central bank is the lender of last resort (LLR) to depository institutions. That is it prevents runs on individual banks by a willingness to provide liquidity against collateral to solvent institutions. In this way the central bank protects the banking system against systemic crisis.

This role was first articulated by Walter Bagehot. It is interesting to note that Bagehot discussion in \textit{Lombard Street} (1873) is a little different than the received 20\textsuperscript{th} century wisdom. His description of the lender is bolder and broader than the typical 20\textsuperscript{th} century central bank conception of the LLR. He does not limit the LLR function to depository institutions. Bagehot advocates almost limitless lending to any market or institution attacked by panic or the potential for panic. Bagehot specifies that this lending be at high interest rates but that had more to do with stemming gold (capital) outflows than imposing a penalty on borrowers. The difference between Bagehot and the 20\textsuperscript{th} century central banking consensus is prescient. We will see later that the central bank response to the 21\textsuperscript{st} century crisis is a turn back to Bagehot’s 19\textsuperscript{th} century formulation.

The emphasis on the LLR role of the central bank raises some concerns about the 20\textsuperscript{th} century consensus that are often not addressed.

The LLR function has an important corollary which was often overlooked. There is a moral hazard presented by the expressed willingness of the CB to provide liquidity to banks that have no where else to go. So to avoid the moral hazard, the LLR function necessarily implies a regulatory and supervisory function as well. This link is an obvious one – if the LLR function is akin to a line of credit then it has to come with strings attached – covenants caveats and the ability to measure credit risk. Thus, the LLR should have a banker’s concern with its customers which means that there is an inherent link between the LLR and bank regulation and supervision.

The 20\textsuperscript{th} century consensus often forgot that the LLR is a banking function. The emphasis on the macro stability role of central banks led some countries to separate bank regulation entirely from the central bank. The best known example of this is the UK where a broad financial sector regulatory agency, the Financial Services Authority, was
established in June 1998. Michael Foot (2006), one of the original FSA managing directors said that:

There was also a concern within the Central Bank that the split [taking the bank regulatory staff out of the Bank of England] would make it more difficult in future for the Bank to play its role of Lender of Last Resort. Hitherto, it had committed its balance sheet on the basis of knowledge provided by its own staff as to the likelihood of that money being recovered. (Foot, 2006, Parag. 18)

The assumption was that the memo of understanding governing the relationship between the lender and the supervisor would adequately address the coordination problems. Needless to say the strict separation is being reexamined in the light of the Northern Rock experience. Writing in the light of the current crisis, Stanley Fischer (2008), Governor of the Bank of Israel, noted that:

...it is essential for the central bank to be very closely involved in the supervision of the financial institutions. This is the present situation in nearly all countries, with the central banks bearing the responsibility for the economy's financial stability, and having the unique capacity of being able to inject liquidity into the financial markets as necessary, and of being able to act as the “lender of last resort” in a financial crisis. ... The need for a very close connection between the central bank and the supervision of banks features in an important report issued in April this year by the Financial Stability Forum (FSF) entitled “Enhancing Market and Institutional Resilience”. The conclusion in the report – stressing the need for central bank involvement in the supervision of banks and other financial institutions with similar impact on financial stability – receives strong support from the current crisis. (Fischer, 2008)

There has been much discussion concerning the independence and organization of banking supervision (e.g. Quintyn and Taylor, 2004) and there is agreement that no particular model dominates. However, the inherent relationship between lending and supervision was often overlooked. It was not so clear a few years ago but it is now that the LLR is a banking function as well as being a source of liquidity. Separation of the LLR function from the supervisory role is problematic because

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2 There is another notable example of the complete separation of bank supervision from the central bank – the Euro area. Bank supervision is nationally based while the ECB is responsible for lending. This is a result of the historical evolution of the Euro and has yet to be tested by any serious Euro area banking crises.

3 Northern Rock is a large UK building society that experienced losses as a consequence of the US subprime mortgage crisis. There was a run on the bank in September 2007 and the bank was nationalized in February 2008.
lending involves credit risk and credit risk warrants monitoring or, in this instance, supervision.

There is another aspect of the 20th century consensus concerning the LLR that bears a closer look. The 20th century view of the central bank LLR function was defined earlier as the provision of liquidity to individual banking institutions. This belies an important aspect of modern banking. Money markets are well developed and there are ample sources of liquidity. Even many emerging market economies have both a Treasury bill market and an inter bank market. Thus, the LLR function as the consensus views it may be superfluous. It is hard to imagine an individual bank with adequate collateral that cannot sell assets or borrow in existing markets.

A bank that requests a loan from the central bank is probably experiencing something more serious than a liquidity problem. In all likelihood it signals solvency problems or systemic issues in the banking system or some other reason why the markets for liquidity stop functioning. Thus the 20th century consensus view of the LLR may be an anachronism. However, as we will see later, the 21st century crisis in the US, UK and the Euro area, at least in its early stages, was a liquidity crisis of a different type. We will have more to say about the 21st century role of the LLR.

Second, we turn now to the 20th century consensus regarding the macro role of central banks. There are two aspects of macro monetary policy to examine. First, macro theory shows how monetary policy affects the economy with a model of the transmission mechanism. Second, central bankers choose the goals, targets and instruments for the implementation of monetary policy. In both instances, early 20th century debates gave way to a widely accepted late 20th century consensus.

Early macroeconomic theory discussions bounced from a Keynesian view that belittled the efficacy of monetary policy to a monetarist view that placed all policy making bets on the money supply. Late in the century, a consensus emerged in the form of a broad transmission mechanism that relates monetary policy to the economy. Monetary policy actions impact economic activity in the short run and monetary policy is responsible for maintaining long run price stability.

4 The one area where he finds a lack of consensus is the policy response to deflation as experienced in Japan. The Japanese problem was an area where micro and macro concerns intersect which will be a focal point of our discussion of the 21st century challenges to consensus.
Goodfriend (2007) discusses the elements of the consensus\textsuperscript{4}.

Similarly, there was considerable controversy in the mid 20\textsuperscript{th} century concerning the goals, targets and instruments of monetary policy. However, the different views seemed to melt away in the last decade of the century as central banks began to recognize the primary importance of price stability. Although U.S. law gives the Fed other goals, the central bank clearly emphasizes price stability. It became fashionable around the world to make price stability the explicit goal of central banks through inflation targeting (Bernanke and Mishkin, 1997 and Truman, 2003). More than 20 countries now have a formal procedure for inflation targeting and many others do so implicitly. With remarkable consistency, a short term inter bank interest rate (or something very close to it) is the operating target of choice and the inflation rate itself (sometimes explicitly sometimes not) is the intermediate target of choice as central banks pursue price stability.

The macro consensus was not without its bumps. Although the primacy of price stability is well established, there are different opinions concerning the cyclical stabilization role of monetary policy. Similarly, inflation targeting emphasizes an explicit and clear statement and transparent policy but it need not preclude a response to cyclical fluctuations.

Inflation targeting is still rather new\textsuperscript{5} and there are differences in opinion about what price index to target. There is no consensus about the choice of target which could be the overall inflation rate in consumer prices or a core inflation rate with energy and food prices stripped out. Furthermore, how should the target be influenced by indicators of future inflation such as commodity price inflation or surveys or other inflation forecasts? Finally, should inflation targets include a role for asset price inflation? These questions received little attention during the 1990s as inflation targeting was enthusiastically supported. However, the recent financial crisis provides reason to examine the questions again. The increase in housing prices, an example of asset price inflation, contributed to the crisis. Moreover, commodity price inflation has made managing the crisis more difficult. We will return to these questions later on.

There is one little noticed aspect of the late 20\textsuperscript{th} century macro consensus which is troubling. It does not concern the macroeconomic

\textsuperscript{5} New Zealand was the first explicit adopter of inflation targets, in 1989.
relationships themselves; the mid century wars between the Keynesians and the monetarists are long over. Nor does it involve the implementation of monetary policy. There is a hint to this problem in the very structure of our discussion; in the 20th century we looked at macro monetary policy and micro financial structure issues as separate concerns.

Typically, macro discussions viewed monetary policy to be independent of the micro concerns of the central bank. The macro policy discussions presume that there is a smoothly operating banking and financial system that provides a consistent and unchanging framework for the transmission of monetary policy to the economy. A profound and important early 21st century lesson is that this cannot be taken for granted.

There may be a strong and sound 20th century consensus concerning the role of central banks. However, it only works when it works. The 21st century, in its infancy, has presented some new realities that challenge the consensus.

The late 20th century had its share of financial crises even in developed countries. However, we tended to examine systemic banking crises as the consequence of a specific regulatory failure or even more simply, a failure to regulate. Two prominent examples come to mind. First, the post privatization Mexican banking crisis of the mid 1990s (see Gil Diaz, 1998) occurred because privatization of banks in 1991-92 was accompanied by financial sector liberalization and the failure to put regulatory structures in place. The banks had every incentive to lend vigorously (the new owners paid dearly for the banks) although credit departments had little expertise. Similarly, the capabilities of bank supervisors had atrophied after a decade of state ownership. The liberalization eliminated requirements that banks hold Treasury securities but failed to put in place a system of reserve requirements for the banks. Even without corrupt behavior, the structure invited poor judgment and allowed for little oversight.

The US Savings and Loan crisis can be characterized in similar terms. It began with a macro shock as high short term interest rates made the S&Ls (traditional holders of mortgages in the old days of the 1980s when mortgages were by and large long term, fixed rate, and unsecuritized) unprofitable. The regulators (with the cooperation of an over eager Congress) took one step after another to relax regulatory constraints and supervisory oversight in order to give these banks profit making opportunities. Regulatory forbearance and legislative changes
were used to help right the losses from maturity mismatch inherent in the structure of these institutions. The approach created moral hazards which led to misguided expansion, some corruption and a massive crisis as eager bankers responded to the incentives.

Both the Mexican and US crises are viewed as the result of poor judgments in changing regulatory policy. Lessons were learned from these mistakes and the 20th century consensus was unscathed. The crises that emerged in the 21st century might be more of the same. Mistakes are made and lessons will be learned. As the Biblical prophet Ecclesiastes said:

“What has been is what will be, and what has been done is what will be done; there is nothing new under the sun.”

Or is the 21st century really different? The second part of this essay provides an answer to this question. Although the crisis looks like many of its predecessors, there are important challenges to the central banking consensus. Some changes have already been made, on the fly, in response to crisis but additional changes that require careful development and legislative action will take some time.

The 21st century crisis

The story of the banking crisis of the 21st century begins in early 2006 when the US housing market began to slow down. Housing starts and sales began to decline and prices stopped increasing. This slowdown was viewed by macroeconomists as a positive development that would keep the economy from overheating. Some small signs of financial trouble appeared in early 2007. The second largest subprime mortgage lender in the US, Century Financial Corporation, filed for bankruptcy and there were announcements of losses by subprime mortgage units of banks and by hedge funds that had to revalue asset backed securities. The financial crisis leaped ferociously into the headlines in early August 2007 when credit spreads widened dramatically.

On August 9, 2007 BNP Paribas froze redemptions on three of its investment funds because it could not value the assets backed by US subprime mortgages. This was an important step because it signaled the extent to which large banks and not only risk seeking hedge funds faced problems with mortgage assets and it demonstrated the international scope of the problems. Suddenly and dramatically, ‘money markets seized up.’ That is, market participants were reluctant to conduct transactions and interest rate spreads widened in certain key markets rapidly to
magnitudes rarely or never seen before.

The spread between asset backed and nonfinancial corporate commercial paper in the US is historically very small. For AA rated, 30 day paper the premium on asset backed paper averaged 6 basis points (bp) in June and July 2007 and never exceeded 10 bp. It was 13 bps on August 8, 2007 and 51 bps just five days later. The spread averaged 54 bps in August and 84 bp in September 2007. Markets calmed down in the fall (the average spread was 35bp in October and 46 in November). However, further market concerns increased it to 145 bp average for December. Even with all of the efforts to ‘calm’ the markets, the average spread in the first two weeks of June 2008 was still 52 bp.

Similarly, the TED spreads demonstrated the international dimension of the crisis. Bloomberg data for the spread between 3 month LIBOR and 3 month US Treasury rates are shown below. Historically the spread is usually less than 50 bp. On August 8, 2008 it was 44 bp and on August 20 it peaked at 240bp. It has stayed above 75bps since that time.

The speed with which this market liquidity crisis emerged was striking and central banks in the US and Europe responded immediately (see Borio, 2008). The first of a series of central bank efforts to restore liquidity to money markets occurred on August 9, 2007. The ECB injected €95 billion of overnight funds and the Fed injected $38 billion.

\[\text{The spikes in LIBOR rates may overstate the situation since there has been some criticism of the way in which daily LIBOR is calculated.}\]
with an extraordinary auction of funds.

The Fed soon began to loosen monetary policy. On August 17 it reduced the discount rate by 50 bp and announced the availability of term financing for up to 30 days. The target for the Fed funds rate was reduced by 50 bp in mid September. The clear willingness of central banks to intervene muted the sense of imminent crisis but the financial news over the fall months was not good. Major financial institutions announced write downs of assets and losses. There were major reorganizations of firms notably involving off balance sheet activity through so-called Structured Investment Vehicles. Efforts to raise additional capital were announced by Citigroup and UBS among others.

In the UK, there was a run on a major mortgage lender, Northern Rock, which culminated with emergency loans from the Bank of England on September 13. The central bank took further steps in October when it guaranteed the bank’s deposits. Efforts to turn the business around or find a buyer were unsuccessful and Northern Rock was effectively nationalized in February 2008.

The spikes in interest rates during the summer were attributed to illiquidity and increased perceptions of counter party risk. That is, financial firms were hoarding cash. As noted, spreads narrowed in the fall, although they remained far above historical norms, as central banks added liquidity to the market. Towards the end of the year, spreads began to widen again. The spread between AA rated asset backed and nonfinancial corporate commercial paper in the US was wider in December than it had been earlier on. Further, the spread between US Treasury and agency securities which was typically around 20 bps doubled in August and doubled again in December. The widening spreads in December seemed to reflect concern about credit risk rather than just liquidity.

The Federal Reserve responded on December 12 by introducing a new lending facility, the Term Auction Facility and increasing swap lines with other central banks. Throughout the fall, US banks were reluctant to make use of the discount window so the Fed introduced this new procedure in order to remove the stigma of borrowing and to provide funds for longer periods of time. The first auction was for $20 billion and the amounts were increased through the spring of 2008, reaching $150 billion.

Over the first few months of 2008, new information indicated that losses in the US mortgage market were increasing. In mid-March, Bear
Paul Wachtel

Stearns, a major US investment bank with large mortgage exposures faced bankruptcy. In a move unprecedented in modern times, the Fed used its emergency authority to make a loan directly to this non-bank financial institution and then arranged for it to be taken over by JP Morgan Chase. This bail out of an investment bank has been criticized for the moral hazard it introduces. Although, the shareholders were virtually wiped out, the Fed and the Treasury arranged financing of the take over which exposes them to credit risk on the Bear Stearns portfolio of mortgage backed assets.

At the same time, the Fed introduced two new lending facilities. First, the Term Securities Lending Facility announced on March 11, 2008, provided for loans of treasury securities to the primary dealers. Second, the Primary Dealer Credit Facility utilized the Fed’s emergency authority in a historically unprecedented manner to lend directly to the dealers against a wide range of collateral including corporate securities and mortgage backed securities. The primary dealers in treasury securities are not banks; they are investment banks and broker dealer firms. These new facility provided liquidity to the dealer and investment bank community in the wake of the Bear Stearns bankruptcy.

Extensive lending by the Fed has altered its balance sheet dramatically. In mid 2007, the Fed held almost $800 billion in Treasury securities. A year later, the amount was reduced by about $250 billion due to the new credit facilities. The composition of the balance sheet is important because the Fed now faces significant credit risks on its portfolio.

The next major development in the US markets involved the government sponsored mortgage enterprises, FNMA and FHLMC. Although these institutions were founded as government agencies with the task of providing liquidity to the mortgage market, they have been private corporations for many years. They do enjoy access to emergency borrowing from the Treasury which has always been interpreted as an implicit government guarantee that has enabled them to fund their activities at favorable interest rates. They expanded rapidly in recent years and were heavily exposed to various sub prime mortgage instruments with increasingly high foreclosure rates. As their stock prices declined, it became difficult for the firms to raise more capital. The government made its guarantee of the GSEs explicit on July 13, 2008 when the Secretary of Treasury, Henry Paulson, announced a joint Fed Treasury plan to provide lending to FNMA and FHLMC if needed.
As the summer of 2008 ended, the sense of financial sector crisis or the fear of imminent melt down of financial markets seemed to have abated. Interest at the Lucca symposium in mid-September 2008 turned to the longer term implications of the crisis. However, the calm was misleading. The very week of the symposium, the US government declined to support Lehman Brothers which immediately filed for bankruptcy and by the end of week the Treasury Secretary asked Congress for far reaching and poorly specified powers to buy assets from financial institutions and support them directly. The 21st century crisis entered a new and more serious phase in the week that this paper was presented.

In a few weeks, we discovered that governments in the major capitalist economies were willing to take over financial firms and impose state ownership even when the fiscal costs are substantial. We do yet know what this will do the structure of the industry nor do know whether the inadequacies of the capital allocation mechanisms in the US will have long term consequences for growth? And, finally, we do not know what changes in regulatory structure will emerge from all of this?

Although the story of the crisis is not over, we will turn to the features of both the crisis and the responses so far that mark the start of 21st century as very different from its predecessor.

New things under the sun: 21st century challenges to central banks

The world economy is in the midst of a serious financial crisis that will reduce economic activity globally. However, our interest here is not the ups and downs of the world economy but the unique features of this episode. We identify four features of the crisis that distinguish it from its 20th century predecessors. Something new is going on – in fact there are at least four new things under the sun.

1. Crisis in markets. The 20th century LLR is designed for institutions in crisis while the current crisis appeared in markets rather than institutions. As a result, the Federal Reserve responded to the situation by innovating on the fly because its LLR function was not geared to a world wide market crisis. Traditionally, the LLR serves solvent institutions in need of funds to continue business operations that cannot liquidate assets quickly enough. In the last year we have seen instead that the markets where liquidity is usually traded or obtained have stopped functioning at critical times.
Banks were unwilling to lend to one another even over short periods reflecting an enormous desire to stay liquid and increasing fears of counterparty risks. This was a market problem that created problems for all participants. In the absence of a smoothly operating LLR function that could gradually fill the gaps, these fears snow balled and a virtual panic ensued.

In a speech on May 13, 2008 Bernanke indicated that the 20th century model was not good enough:

However, it became abundantly clear that this traditional framework for liquidity provision was not up to addressing the recent strains in short-term funding markets. In particular, the efficacy of the discount window has been limited by the reluctance of depository institutions to use the window as a source of funding. The “stigma” associated with the discount window, which if anything intensifies during periods of crisis, arises primarily from banks’ concerns that market participants will draw adverse inferences about their financial condition if their borrowing from the Federal Reserve were to become known.

The liquidity crisis of 2007 was not a liquidity crisis faced by institutions. Thus, it is no wonder that banks did not go beyond the stigma and approach the discount window. Instead there was an illiquidity of markets and, as Bernanke says, “the traditional framework was not up to addressing the recent strains in short-term funding markets.” The Fed’s policy innovations since December 2007 – TAF, PDCF, TSLF – are revolutionary. They redefine the LLR function for the 21st century profoundly. The Fed has extended the term of its lending, the amount of credit made available, the collateral accepted and the institutions eligible to participate. Lending through the discount window will never be the same again.

It appears that the crisis caught the Fed by surprise. Although there was some institutional weakness in the US – a few hedge funds and a few non bank mortgage lenders closed -- the depository institutions with a link to the central bank were not in trouble. Thus, there was no traditional LLR role to play. The very efficiency and depth of modern money markets masked the emerging difficulties. But, the spillovers from the credit risk premiums in money markets were severely underestimated. We cannot fault the Fed and other central banks from reacting earlier to market problems because there were no signals of market problems in advance.

In the 20th century central banking consensus, the LLR function was available as a response to institutions in crisis. That is, there is a
set of privileged institutions that have access to central bank lending for liquidity needs. Here is how the US Federal Reserve Board of Governors web site describes it:

The discount rate is the interest rate charged to commercial banks and other depository institutions on loans they receive from their regional Federal Reserve Bank’s lending facility—the discount window..... All discount window loans are fully secured.

It is no wonder that there is very little borrowing through this facility. In the US, the discount window – the hallmark of central banking - atrophied from lack of use. From 1990 to last summer monthly average borrowings were never as much as $1 billion. In the first six months of 2007 (as the crisis percolated beneath the surface), the average was $111 million. And even as the markets ‘seized’ borrowing was $272 m in July, $975m in August and only $1567m in September. The stigma about going to the discount window is very strong. The Fed lends through the discount window when banks come and ask. With market liquidity drying up, one would think that banks would come and ask7. Banks seemed to prefer crisis to the stigma of going to the Fed.

The first new lending facility introduced in December 2007, the Term Auction Facility, was aimed at overcoming the stigma and providing liquidity to markets (see Armantier, Krieger and MacAndrews, 2008). It allowed institutions to bid on loans from the Fed and to offer a broad range of collateral. Thus, institutions could post collateral which might be illiquid and hard to value. No borrower would be allocated more than 10 per cent of the total amount offered at the auction. Thus, institutions with specific liquidity needs could obtain funds without any stigma attached. The facility tried to pump funds directly to the places where the interbank market was not functioning well. Further support for the market was provided by foreign exchange swaps arranged between the Fed and both the ECB and the Swiss National Bank. This provided dollar liquidity for non-US banks.

The new element here is that the central banks were responding to a market liquidity crisis and not to individual institutions. The facilities introduced in the spring offered liquidity to non-bank institutions as well. It seems that the 21st century central bank will be less focused on the depository institutions and will pay more attention to market

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7 The Fed has been aware of this very strong stigma for some time. Several efforts were made in the last decade to lessen the stigma and ease and encourage access to the window. Bank behavior did not change noticeably.
conditions. Bagehot, writing in 1873, seemed to support this approach. As noted earlier, his view of the LLR function was much broader than that of the central banks of the 20th century. In regard to a “domestic drain” (demand for cash or liquidity) he wrote:

In opposition to what might be at first sight supposed, the best way for the bank or banks, who have the custody of the bank reserves to deal with a drain arising from internal discredit, is to lend freely. The first instinct of everyone is to the contrary...But every banker knows that this is not the way to diminish discredit. This discredit means, ‘an opinion that you have not got any money,’ and to dissipate that opinion, you must, if possible, show that you have money: you must employ it for the public benefit.

He advocated the aggressive and free use of reserves as the way to manage a panic. I think that Bagehot would have supported the Fed’s innovative lending to markets.

We have already noted that a lending function entails an ability to scrutinize the borrower. Thus, central bank lending to non bank market participants should go hand in hand with supervisory authority over these institutions. In the next section we will develop further reasons for central bank regulatory authority over non bank financial institutions.

Critical liquidity markets are likely to have many participants in addition to the banks and other financial institutions. They could be financial institutions that the central bank does not or cannot supervise and foreign institutions. Thus, there might be a renewed interest in the direct regulation of these markets.

Market regulation has been out of favor for some years but it is not new. In the 1930s there was a perception (no longer widely held) that market abuses were responsible for the macroeconomic collapse. Abuses in the stock market were thought to be the cause of the depression. As a result, extensive market regulation was enacted. The SEC was created and regulation of stock issuance, registration, market operations and trading was introduced. Market regulation, at least for equities, was a hallmark of the 20th century. However, there was a tendency to move a way from such rules based oversight and in favor of principles based regulations. However, recent experience may breathe new life into rules.

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8 For example, the British Bankers Association (“Principles, not rules, key to regulation,” April 2007) reports that “Principles based regulation is the key to the future success of international markets according to over 50 senior representatives from the British and Swiss financial services industries.”

http://www.bba.org.uk/bba/jsp/polopoly.jsp?d=145&a=9936&artpage=all
based regulation for market activity and instruments. For example, more transparent rules for international interbank lending or trading of derivatives may have moderated the increases in spreads noted above. Similarly, standardization of mortgage contracts and information about borrowers may have muted the subprime mortgage crisis. Of course, it is unclear whether new rules for the issuance or registration and standardization of complex traded securities and rules for markets where trading occurs will be enacted. A shift in approach to more rules based regulation would require new legislation and international coordination. In March 2008, the US Treasury released a “Blueprint for Financial Regulatory Reform” which includes a hodgepodge of specific and general recommendations. In several places it hints at stronger market rules. For example, it calls for enhancements to the oversight of mortgage origination. Importantly, it calls for legislation that would merge the SEC and the CFTC in order to enhance regulation of securities and derivative markets. Investment companies and advisors would be subject to self regulation based on principles but the ultimate effect of these changes would be to extend regulatory rules to instruments that were previously free of oversight. The response of central banks in 2007 to the market crisis has a further important feature. The central banks began lending directly to non-bank financial institutions. They did so because systemic risks in markets and institutions necessitated such lending. But, these innovative responses to crisis have far reaching implications. The second new thing in 21st century central banking is nonbank systemic risks. 2. Systemic risks in new places. Banks are still a source of systemic risks which requires special attention, but banks are no longer the only possible source of such risks. The Fed has acknowledged this with its new lending facilities and its intervention into the Bear Stearns situation. In testimony to Congress, Bernanke (April 2008) said: ...on March 13, Bear Stearns advised the Federal Reserve and other government agencies that its liquidity position had significantly deteriorated and that it would have to file for bankruptcy the next day unless alternative sources of funds became available. This news raised difficult questions of public policy. Normally, the market sorts out which companies survive and which fail, and that is as it should be. However, the issues raised here extended well beyond the fate of one company. Our financial system is extremely complex and interconnected, and Bear Stearns participated
extensively in a range of critical markets. The sudden failure of Bear Stearns likely would have led to a chaotic unwinding of positions in those markets and could have severely shaken confidence. The company’s failure could also have cast doubt on the financial positions of some of Bear Stearns’ thousands of counterparties and perhaps of companies with similar businesses. Given the exceptional pressures on the global economy and financial system, the damage caused by a default by Bear Stearns could have been severe and extremely difficult to contain.

One cannot imagine a clearer statement that the Fed felt that systemic risks warranted its intervention. But, Bear Stearns was not a bank and was not subject to any formal Federal Reserve regulatory oversight.

The 21st century central banks have acknowledged that systemic risks warranting their attention can come from non bank financial institutions. A question that will be debated for a long time is how far along the continuum of financial institutions does the potential for systemic risk go? Traditionally, banks are a potential source because their principal liabilities are transactions deposits. Interestingly, the biggest liability on the balance sheet of Goldman Sachs is overnight borrowing. It seems that the Fed has just acknowledged that there is not much difference between banks and investment banks. Explicit recognition of this might lead to profound changes in regulation. So the next new thing is that the central banks need to respond to and eventually regulate the potential for systemic risks from non-bank institutions.

Much of the financial regulation in the US has its origins in Depression era legislation. Among the best known enactments of that period was the Glass Steagall Act that separated commercial banking and investment banking businesses by restricting the activities of banks. The pendulum of bank regulation began to swing in the opposite direction in the 1980s and culminated with the Gramm-Leach-Bliley Act in 1999 that virtually eliminated the restrictions on bank activities. The only remaining restriction on the activities of investment banks is that they cannot issue deposits.

9 Events since the symposia have overtaken these comments. The remaining large US investment banks have converted to bank holding companies (e.g. Morgan Stanley and Goldman Sachs) or been purchased by banks (Merill Lynch). Thus, investment banking regulation and bank regulation have converged.

10 The motivation for this legislation was the widely held view that the activities of the banks in the equity markets were responsible for the market crash, a view that is completely discredited now.
The consolidated activities of large banks and investment banking organizations can be quite similar. The table below compares the balance sheets of two trillion-dollar financial conglomerates – Bank America and Goldman Sachs\(^{11}\). For sure, there are differences in the balance sheets. BA is still a traditional bank with lending and deposits the biggest balance sheet entries. The investment bank is more active in the securities business and, obviously, has non-deposit forms of financing. However, both institutions make extensive use of collateralized purchases and sales in the money markets. Further, much of the financing of both institutions is short term. There is a major difference in the balance sheets that is due to regulatory impact. Goldman Sachs as a securities firm is not subject to the same capital requirements as Bank America. Its capital asset ratio is 3.8%, less than half of that of the Bank America.

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<tr>
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<th>Goldman Sachs</th>
<th>Bank America</th>
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<tr>
<td><strong>End 2007 data</strong></td>
<td>% of total firm assets</td>
<td></td>
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<tr>
<td><strong>ASSETS</strong></td>
<td></td>
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<tr>
<td>Cash</td>
<td>1.1</td>
<td>3.8</td>
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<tr>
<td>Securities</td>
<td>51.1</td>
<td>25.0</td>
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<tr>
<td>Loans &amp; receivables</td>
<td>13.2</td>
<td>51.3</td>
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<tr>
<td>Collateralized (e.g. RPs)</td>
<td>32.4</td>
<td>10.9</td>
</tr>
<tr>
<td>Other</td>
<td>2.2</td>
<td>9.0</td>
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<tr>
<td><strong>LIABILITIES</strong></td>
<td></td>
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<tr>
<td>Deposits or unsecured short term borrowing</td>
<td>7.8</td>
<td>60.4</td>
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<tr>
<td>Collateralized (e.g. RPs)</td>
<td>22.6</td>
<td>12.8</td>
</tr>
<tr>
<td>Other borrowing</td>
<td>62.3</td>
<td>13.8</td>
</tr>
<tr>
<td>Other liabilities</td>
<td>3.5</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>CAPITAL</strong></td>
<td>3.8</td>
<td>8.4</td>
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A comparison of the annual reports indicates broad similarities in the activities and investments of these two institutions. The business models

\(^{11}\) The data are for the end of 2007 and were collected from Goldman's 10K and BA's call report. There are broad differences in accounting and reporting for these forms so the comparison is suggestive.
may differ but in the end we are looking at two financial conglomerates. They offer the same potential for introducing systemic risks. And, their capital adequacy and examination by regulators should be based on the riskiness of their balance sheets rather than their legal status.

The comparison of capital ratios invites the following question? Are the differences in the structure, activity and risks in commercial banks and investment banks or securities firms sufficiently different to warrant such large differences in capital holding? Bankers would argue that they are over regulated and hold too much capital. In fact, the full implementation of Basle II might lead to lower capital requirements for large banks and that is one of the reasons why its implementation has been delayed in the US. Prior to 2006, investment banks and non bank financial institutions in the US had been increasing their leverage ratios.

Our second new thing is that there are important non bank institutions that will be increasingly the concern of central banks. How this will manifest itself in regulatory changes is impossible to say. Of course, the broad risk based regulatory blanket of Basle II includes such institutions. However, it remains to be seen whether legislation and regulators will continue to accept the vast differences in leverage ratios between investment banks and commercial bank holding companies which otherwise appear to be very similar. In the light of developments since September, a better question to ask is whether and capital regulation for non-bank financial activities will be strengthened.

The March 2008 US Treasury proposals mentioned earlier includes many things that had been under discussion earlier but had been given significant impetus by current events. Many of the proposals involve efforts to simplify and rationalize the American financial regulatory structure but several proposals are clear and important statements that the 21st century is already very different. First, the report acknowledges that the Fed should be able to lend to non-depository institutions and therefore calls for giving the Fed access to information about its potential loan customers. Second, as mentioned already, the report calls for a complete revamping of market regulation by combining the SEC and the CFTC and suggesting new ways of rule making for financial markets. Third, it calls for an enhanced role of the central bank as an overall market stability regulator.

The Treasury blueprint recognizes that rule making for markets needs to be revamped and that a central bank is responsible for monitoring systemic risks across the financial system (see Jaffee and
Systemic risks can occur in new and unpredictable places and the central bank and other regulators need to both look for the risks and be prepared to deal with them.

3. Crisis with regulation. In the previous section, we discussed systemic risks arising from institutions other than the traditional depository institutions. A related issue is that crises can arise even when there is a thoroughly structured and responsible regulator.

The US crisis stems from a rapid increase in housing prices which might be termed an asset price bubble. Interestingly, the run up of house prices in the US was not extraordinary if we compare it to experiences in other developed countries (e.g. Australia, UK). The American ‘bubble’ was driven by very low interest rates in the post 2001 era; perhaps monetary policy was too loose for too long. But loose monetary policy and asset price inflation are not unusual. However, some of the institutional features of the housing boom led to unusual developments.

The expansion of the housing sector relied on institutional and instrument innovations that took place largely outside of the regulated financial sector. That is, the development of new mortgage instruments, the marketing of existing instruments and the securitization of these instruments fed the bubble. It can reasonably be argued that the regulatory oversight of these new instruments and markets has been inadequate. Specifically, the mortgage brokers issued new varieties of sub prime mortgages with relaxed lending standards. The issuers of sub prime mortgages were virtually unregulated companies that sold the mortgages to banks and investment banks that eagerly repackaged them into complex securities. This ‘originate to distribute’ model was new and attractive because every step – issuance, sale, packaging, MBS sales, etc. – generated fees and revenues for the participants. At the same time, these instruments did not stay on the balance sheets of regulated institutions – so, the regulators never really looked (see Calomiris 2008). The mortgage brokers are largely unregulated as is the securitization activities of banks and other financial institutions. The problems that ensued emerged outside of the areas mandated to

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12 Between 1987 and 2006 the number of mortgage brokers increased from 7000 to 53000 and their share of mortgage originations went from 20 to 58% (see James Barth, 2008).

13 The late Ed Gramlich who was serving on the Board of Governors did raise questions about mortgage developments publicly and within the Fed but he was pretty much ignored as a liberal nay sayer. See Gramlich (2007).
regulators. However, that would be a weak excuse. If the Fed, the SEC, etc wanted to articulate an opinion – its force would have been felt. They did not do so\textsuperscript{13}.

But, what if the regulators had looked? Would they have seen the accumulation of risks or would they have reacted in the same way as the private sector credit risk managers. By using past experience for rating extra marginal shifts in behavior, the most sophisticated credit risk approaches simply failed. The US credit ratings agencies will spend a long time rationalizing this failure.

Another dimension of this phenomenon is seen in the US mortgage markets where the government sponsored enterprises, FNMA and FHLMC, are flirting with insolvency. These institutions are subject to regulation and even have their own dedicated regulator, the Office of Federal Housing Enterprise Oversight, OFHEO. Financial crisis can occur in the presence of reliable regulatory structures. In the past, crisis in the presence of regulation occurred because the regulators purposely look away. This was the case in Japan in the 90s and in the US in the 80s when regulatory forbearance served to intensify the problems. That is the regulators chose to withhold action in order to allow the institutions to self correct and grow out of their difficulties. In the 21\textsuperscript{st} century we see crises emerging in the presence of active regulation – crisis with regulation.

There are other examples of crises with reliable regulatory structures in place, in Scandinavia albeit just before the 21\textsuperscript{st} century. The Scandinavian banking crises of the 1990s were overshadowed by emerging markets crises a few years later; they are not as flashy or dramatic. They are good examples of the phenomenon, massive banking crisis in countries with good regulatory structures. Lars Jonung (2008) summarized the story:

The three ...Nordic countries opened their capital accounts fully first at the end of the 1980s.
Financial liberalization affected the incentives of lenders and borrowers in a fundamental way. Bank lending could now be expanded without any binding regulatory restrictions. Banks entered into a fierce competition for market shares.
A lending boom started, channeling credit to the asset markets, mainly to the real estate and stock markets, causing rising asset prices ... Asset prices grew more rapidly than consumer prices. Rising asset prices formed the basis for rising collateral values, further fuelling credit expansion in a cumulative process.
The private sector, previously strongly rationed in the credit market, used the growth of asset prices as collateral for absorbing more debt. As lending from banks
and other financial institutions in national and foreign currencies, in particular for property purchases, increased, the volume of bank loans as a percentage of GDP rose markedly....

In this process, the rate of inflation and inflation expectations increased further. Real after-tax interest rates .... were negative.... The financial system experienced a period of extreme expansion....

The macroeconomic outcome was a strong boom...

At this point in time, policy-makers did not perceive the risks inherent in the process of financial integration. Initially they were unwilling to change either monetary or fiscal policy. Monetary policy was confined to safeguarding the pegged exchange rate.... Fiscal policy remained expansionary at this stage.

In Jonung’s description regulatory malfeasance does not play a role. However, liberalization led to a removal of constraints on the banking sector and a credit boom. And if he has to lay the blame, he places it at the foot of macro policy makers for not realizing that monetary and fiscal policies were too expansionary. The growth in credit was not hidden. We can guess how contemporaneous observers would have looked at it prior to the crisis. They would have started with the observation that the Scandinavian financial systems were rather shallow. The ratio of credit to GDP in the mid 1980s was between 30 and 40%, rather low for highly developed countries. Financial liberalization and concomitant deepening of financial markets would have been viewed as an important engine of economic growth. Similarly, American observers, including Alan Greenspan, looked to the expansion of the mortgage market as the key to extending the American dream of home ownership.

The current American experience with mortgage markets and the earlier Scandinavian crisis show that the presence of responsible regulation is not a guarantee that crisis can be avoided. Innovation by financial institutions and lags in understanding its implications make it hard to avoid crises altogether. Perhaps for this reason, the Treasury reform proposal calls for the establishment of the Fed as an overall financial market stability regulator. However, it is not clear how the Fed would react prospectively to new crisis prone areas or whether it would mop up the mess when a crisis occurs.

The Scandinavian experience of the 1990s offers suggests an additional lesson for the 21st century central bank. That is, micro and macro policies are closely tied together which is the last new thing we will describe.
4. Micro macro linkages. The late 20th century infatuation with inflation targeting might put blinders on macro policy makers. They seem to have forgotten those earlier 20th century monetarist lessons about the quantity of money and credit. It might not be necessary to monitor monetary aggregates in order to maintain an anti-inflationary monetary policy. Inflation targeting does the job. However, that does mean that credit expansion does not matter. Maybe not the rate of growth of monetary aggregates in the old monetarist sense but how rapidly financial deepening is taking place is a valid concern for monetary policy. Credit expansion, even without any inflationary indications, can have other implication.

The conclusion that banking crises can happen in developed countries with sound and reliable regulatory structures has implications for the role of central banks when bubbles occur. There was a flurry of literature a few years ago asking whether central banks should prick bubbles (see the references in Mishkin, 2008). I won’t review the pros and cons here but the general conclusion was that it is too dangerous a route to follow. No one is particularly able to see a bubble in the making and efforts to prick them run the risk of destabilizing the macro economy and responding to false signals.

Greenspan was clear in his approach to bubbles – let them burst of their own accord and then use monetary policy to protect the banking system and the economy from the fallout (see Blinder and Reis). Blinder calls this the mop up after approach and it worked well after the 1987 market crash, after 9/11 and after the tech bubble burst in 2001-02. A lesson – apparently unlearned by the Fed – from Scandinavia is that the mop up after approach can not always be counted on to mitigate the effects of a big bubble bursting.

Other central banks are concerned with this macro-micro link. The central bank of Croatia has successfully controlled the inflation rate for several years (the 2001-07 average annual inflation rate was 2.7%). However a continuing credit boom has them constantly fretting (money and credit aggregates have grown as much as 15 to 20% in the last few years). Is Croatia experiencing a salubrious financial deepening or embarking on a dangerous bubble (see Kraft and Jankov)? They worry constantly; do no know how to tell the difference nor what to do if they conclude that it is a bubble.

It is no longer fashionable to monitor credit aggregates in the US but it is worthwhile to ask whether a credit boom played a role in
the ongoing crisis. Bank credit growth in the US in the 5 years ending August 2007 was 9.3% per year. Growth over the last three calendar years 2005-07 was 10.4, 11.0 and 10.2%, respectively. These figures suggest that the US experienced a credit boom in recent years which might have contributed to the weakening of credit standards and of financial institutions.

This observation raises important questions about monetary policy in the 21st century. The 20th century consensus was that inflation should be the sole concern of the central bank policy makers. The Federal Reserve sometimes seemed embarrassed that its legislative mandate includes maximal employment as well as stable prices. The dual mandate was one of the reasons why formally adopting inflation targets was unlikely. In contrast, the much younger central bank, the ECB, faced no ambiguity. The primary objective of the ECB is to maintain price stability. Nevertheless, both central banks acknowledge that they play a role in maintaining financial stability although these concerns are viewed as being independent of monetary policy.

The challenge that central banks face is that monetary policy actions have an effect on financial stability. That is a credit boom might have cumulative effects on stability without having any evidentiary effect on inflation. If this is so then macro monetary policy should be affected by stability indicators in addition to inflation indicators. Central banks have hardly begun to understand the relationship between macro policy and their micro concern with financial stability. Asset prices, including the prices of equities and houses, and credit booms are all affected by monetary policy and all have implications for financial sector stability. However, how and when central banks should respond to these phenomena is largely unknown. In fact, it is more common to argue that central bankers should not respond to such things. However, if in the 21st century, the link between financial stability and macro policy strengthens, then central banks will have to begin thinking about the issue.

More new things? The liquidity crisis of 2007-8 has broadened into a solvency crisis in financial institutions around the world as asset prices continued to fall dramatically. As a result there are additional chapters of this paper to write. The responses to insolvency – buying assets, recapitalizing institutions – have never been tried in sophisticated financial markets like the US and Europe. They are now being tried in
this second phase of the 21st century crisis. It will take some time and another symposium to weigh the merits of different approaches. History may provide some help but 20th century central bankers never seemed to think very much about the optimal response to systemic solvency crises. They surely need something new under the sun.

**Conclusion**

The first financial crisis of the 21st century jumped into view a little more than a year ago. And central banking has changed profoundly as a result. The central bank responses of the last few months are irreversible and central banking will not be the same again. At the same time, the changes in the policy environment are far from over. The evolution of regulatory structures and the outlook towards non banks and markets will continue unfolding well after the crisis passes. Both changes in attitudes about the role of regulation and specific legislative action are unlikely to occur rapidly and might not altogether. However, this analysis of the new elements implies that such change should occur.

We have seen that there are four new things, and maybe more, under the sun that will make the 21st century central banking consensus different:

1. Crises occur in markets rather than individual institutions
2. Systemic risks arise in new places
3. Innovation means that crisis can occur in the presence of sound regulation
4. Macroeconomic policy has implications for financial stability.

A 21st century consensus is likely to emerge that responds to these new realities. It will also include some lessons, not yet written, about the response to systemic insolvency.

But, as the crisis passes, innovation in the financial industry guarantees that new instruments and markets and problems will pop up outside of the grasp of the new consensus. Bubbles and excesses will appear in places that were not previously imagined. Just like in the 20th century, the central banking consensus will lag innovation. And, perhaps, the Biblical prophet was right and there really is nothing new under the sun after all.
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Introduction

Let me begin by congratulating the organizing committee composed of: Paolo Savona Iftekhar Hasan, and Cristiano Zazzara and the sponsors: Associazione Guido Carli and Fondazione Cesifin “Alberto Predieri” and the Journal of Financial Stability for putting together this interesting and important Sixth Colloquium on “Derivatives, Risk-Return and Subprime”. It is obvious that this is a very timely topic, perhaps the topic of the decade given to potential of the ongoing crisis to spread across the globe.

It is always a pleasure to discuss and comment on papers written by Professor Paul Wachtel. His papers can be characterized as being thoughtful, clearly written, and focused on an important problem or issue of the day. This particular paper, “Central Banking for the 21st Century: Is there something new under the sun?” is consistent with these Wachtel characteristics. The paper is clearly focused on an important topic and is exceptionally timely given the ongoing developments in global financial markets. The central focus of the paper is the evolution of the lender of last resort function of the central bank. In times of financial stress this lender of last resort role is arguably the most important function of the central bank given that it is intimately and directly connected to issues related to financial stability. In light of recent and ongoing events in global financial markets and the unusual responses of central bankers to these developments, the question of how this lender of last resort should be structured and executed will be the subject of policy debates for years to come.
Traditional Functions of Central Banks and the Issue of Financial Stability

Central banks in different countries perform many key functions including:

- Operating and assuring the smooth functioning of the payments system,

- Managing the macroeconomic performance of the aggregate economy, usually towards objectives such as price stability, sustainable economic growth, low unemployment, or a stable value of the currency in foreign exchange markets, among others, and

- Maintaining the safety and soundness of the banking through supervisory and regulatory responsibilities, and

- Standing ready to serve as a lender of last resort for troubled financial institutions and more recently the financial system as a whole.

Traditionally, the lender of last resort function has been exercised through the provision of liquidity to individual banks using the discount window or similar mechanisms or by injections of liquidity into the entire system via open market operations in the case of widespread financial crises (for example the injection of liquidity by the Federal Reserve System and other central banks during the 1998 Russian default and the failure of Long Term Capital during the fall of 1998). As Professor Wachtel points out in his paper, the 20th century lender of last resort function focused on and was designed to address crises of solvency or illiquidity in individual financial institutions, most notable commercial banks, who until very recently (in most countries) were under the direct supervision of the central bank. As I have argued elsewhere, this arrangement was very important since it gave the central bank access to the details about the banks’ financial conditions - essentially inside information - that allowed the central bank through its examinations to distinguish between issues of solvency and temporary illiquidity in times of financial stress. In some sense, this was an assessment that the
market could not as easily perform on a contemporaneous or real time basis due to the opaqueness of bank operations and financial dealings. This of course helped the central bank assess the credit worthiness of banks and the value of the collateral that might be pledged at the discount window.

This structure of the lender of last resort function made perfect sense since systemic crises almost always originated in the banking sector. As Professor Wachtel notes in his paper, we have more recently seen a trend towards the separation of the supervisory function away from the central bank to independent supervisory authorities in many countries, e.g., the Financial Services Authority (FSA) in the United Kingdom. I believe that this trend combined with innovations and changes in financial institutions, instruments, and markets during the latter part of the 20th century essentially made much of the design and operations of the traditional lender of last resort function impotent—and if not impotent then certainly less effective in dealing with the financial crises and systemic risks and threats associated with the 21st century. Professor Wachtel expresses a similar view in his paper. Hence, we are in agreement. A simple listing of some of the changes that have undermined the effectiveness of the central bank in dealing with financial crises would include:

- The separation of the supervisory function from the central bank (as noted above)

- The creation of new innovative financial instruments via financial engineering and their propagation outside the traditional banking system that allowed systemic risks to originate in institutions not under the direct supervisory control or oversight of the central bank

- The lack of transparency (and opaqueness) of the financial positions of the counterparties to complex financial transactions, and

- The extent to which counterparty balance sheets are interconnected and unbooked losses are carried at inaccurate valuations.
In such a world (as exists today) it is easy agree with the general conclusion expressed by Professor Wachtel - that the traditional lender of last resort function can not fully cope with the challenge posed by recent innovations in financial instruments, institutions, and markets. In addition, I agree with Wachtel's assessment that the way in which macroeconomic policy has evolved during the latter part of the 20th century - to the consensus view that price stability should be the primary if not the single goal of monetary policy and central bank operations - can also be problematical. That is, such a myopic view has the potential to lead to a situation where the central bank fails to recognize that its price stability policies have significant implications for financial stability.

What Went Wrong?

At this point, I would like to give a slightly different perspective on what went wrong in the financial system at the beginning of the 21st century. This perspective will lead to conclusions that are similar in nature to those reached in Professor Wachtel's paper. Regarding the origins of the crisis, first there was the issue of excessive liquidity in the economic and financial system. One might assert that it all began with the liquidity injections associated with events such as the century date change (Y2K) or the 2001 recession in the U.S. And many would claim that the U.S. Federal Reserve kept its federal funds target rate too low for too long and thus lay the blame for the current crisis squarely at the feet of the Federal Reserve for seeding what some have labeled the Greenspan bubble (in housing prices).

There is little doubt, as Friedman taught us, that excessive monetary growth leads to inflation in the long run. However, to the extent that we did have excessive money growth or excessive liquidity in the markets in first few years of the 21st century, the result or outcome was asset price inflation (housing prices) rather than consumer price inflation. Perhaps the Greenspan Fed believed too strongly in the elevated levels of productivity growth generated in the U.S. by innovations in information processing technology and new business models. After all, the Fed was able to allow the economy to grow at above what was thought to be its potential based on older estimates of trend
productivity growth without significant consumer price inflation. With such good performance on the consumer price inflation front maybe the central bank took its eye off the ball in terms of asset price inflation and its probable/eventual impact on the real economy once the bubble burst. I think that Professor Wachtel was making this point in his discussion of the risks associated with central banks focusing only on price stability as their mandate and ignoring the implications of their monetary policy actions for financial stability. However, as a member of the Greenspan Fed from 1988 until the end of 2003, I must caution commentators not to simply lay the blame for the crisis at the feet of the Fed for running excessively easy monetary policy. This would be too simplistic.

During the early part of this decade, several other potent factors were either at play or were beginning to develop and had a significant role in the performance of the U.S. and world economy and the growth in the housing market. Included among these factors were:

1. a huge saving glut in developing and emerging market economies that ran large surpluses - the world capital stock almost tripled from 2001 to 2005

2. these surpluses and savings were channeled into dollar assets, pushing down intermediate and longer term interest rates in the U.S. even as the Fed tried to raise interest rates

3. the continued growth in the market presence of Fannie Mae and Freddie Mac fueled by a congressional mandate (and a cozy relationship undoubted aided by campaign contributions) to stimulate the development of the U.S. housing market - this growth combined with low mortgage rates fueled the demand for housing in the U.S.

4. investors on a global developed an insatiable appetite for extra yield afforded by dollar based assets, especially those connected to housing

5. a classical feedback loop developed - given the low interest rates, expanded growth in housing, and the demand for extra yield, innovative investment bankers and financial engineers
who were paid handsomely to create higher yielding mortgage related structured products (CDOs, CLOs, etc.)

6. at the same time commercial banks stepped up their housing related lending with low documentation loans and other new mortgage products commonly categorized as subprime, sometimes at predatory rates to uninformed borrowers.... widespread securitization allowed these loans to be originated but sold off into the secondary market

7. and brokers outside the banking system were paid handsomely for originating and selling packaged and poorly conceived loans in the secondary market with the help of Fannie and Freddie

8. the incentives in the financial system were misaligned and led to the excessive creation of housing related paper and derivatives written on this paper

9. rating agencies and insurers also played a role in the process since investment bankers and other players needed access (for a fee) to the proper ratings required to design and sell their innovative products

All of these factors, and more, were elements of what - with hindsight - must be considered elements making up the perfect financial storm.

Securitization, Trading, and the New Culture of Finance

Looking back over the early years of the decade, the acceleration of securitization most certainly played a significant role in the ongoing systemic crisis. The sale of securities from credit pools reached record levels around 2005 as banks transferred to their trading books assets that were too costly (i.e., the 8 percent capital charge) to carry on their credit books. For the most part, the transferred securities were illiquid and essentially private placements. As Alan Greenspan has noted, this trend towards structured credit in the cheapest way possible to
avoid capital requirements was perhaps the most massive and blatant regulatory arbitrage ever.

In this environment, “too interconnected to fail” (e.g., Bear Stearns and AIG) attained equal status with “too big to fail” (e.g., Fannie and Freddie). During the build up to the perfect storm, the entire fabric of the financial system shifted from one where bank commercial lending was traditionally central to one where securities trading became dominant. Today roughly two-thirds of capital flows go through fiduciaries, i.e., those institutions that act as managers, custodians, brokers, dealers, administrators, or trustees while credit banks, the dominant financial force until the 1980s, have become marginalized. With the shift in the focus to securities trading, warehousing, swapping interest payments, insuring against default, lending securities, arbitrage, valuation (or perhaps lack of valuation), and massive use of nonbank leverage, traditional bank lending is no longer at the center of the finance industry. This movement away from traditional bank lending has allowed systemic risks to originate outside the banking system and at the same time made the system more fragile since central banks may no longer have the advantage of direct supervising and overseeing these nonbank activities. This is why our regulatory tools, based primarily on the old credit model have proved so ineffective in this new environment.

**Conclusion**

In the end, I think that Professor Wachtel is essentially correct in his broad assessment of the evolution of central banking from the 20th century to the 21st century. The lender of last resort model needs to adapt to the new reality....and it has as the actions of the Federal Reserve and other central banks have shown in the last few days: the Fed has loaned freely and the U.S. Treasury has stepped in to provide needed financial backstopping for institutions and the system more generally. As Professor Wachtel states, the central banking (at least in the U.S.) has taken a step back to the future by essentially following the dictates of Walter Bagehot as described in his book *Lombard Street*. To paraphrase Bagehot, in times of financial crisis the central bank should lend freely at a penalty rate on good collateral. In the current environment, I believe that the U.S. Federal Reserve is acting appropriately by lending quite freely (opening its Discount Window to nonbanks) and lending on nontraditional collateral at penalty rates.
SECOND PAPER
THE IMPACTS OF MORTGAGE SECURITIZATION ON BANK PERFORMANCE

Wenying Jiangli
Vice President, Risk Analytics State Street Corporation, Boston

Matt Pritsker
Federal Reserve Board

Abstract

We use data from 2001-2007 to assess the impact of mortgage securitization on the insolvency risk, profitability, and leverage ratios of US bank holding companies. Using instrumental variable estimation techniques, we find that banks use mortgage securitization to reduce insolvency risk and increase leverage. We also find that securitization techniques increase bank profitability. Our results suggest that securitization techniques have played a positive role. This suggests that the current turmoil in mortgage securitization markets is related to recent excesses in those markets, and that securitization activity will resume after those excesses are cleared up.

Keywords: Banking, Securitization

JEL Classification: G21, G32
I. Introduction

Asset securitizations have been an important and expanding part of banking since the early 1990s. By the end of 2006, the outstanding amount of asset backed securities (ABS) stood at $US 2.1 trillion and global total issuance of CDOs (collateralized debt obligations) reached $US 550 billion (SIFMA, 2008). Since then, the ABS market has dried up due to the recent credit crisis; many banks have faced near zero demand for some of their securitized assets, and banks have reported huge loan write downs, and many banks face increased insolvency risk (www.securitization.net).

The mortgage securitization market experienced a similar pattern. At the beginning of 2007 $180 billion of mortgages were securitized by month, while by August 2008, monthly mortgage securitization had dropped to $102 billion (SIFMA). Additionally, since July 2007, subprime mortgage securitization has virtually dried up.

Given the growth of the markets for securitization, and their recent collapse, it is important to understand how securitization activities, particularly mortgage securitization, affect the banking sector. In this paper, we help to address this question by using pre-crisis bank holding company data from 2001 to Q2 2007 to empirically quantify the impact of mortgage securitization on banks’ insolvency risk, profitability, and leverage.

Securitization is a set of procedures which helps the bank fund and then transfer some of the risks of a selected pool of loans. For example, in a balance sheet CDO, the bank funds a pool loans that would have traditionally been held on balance sheet, by instead selling them to an off-balance sheet special purpose vehicle (SPV). The SPV funds the loan purchases by issuing ABS whose cashflows are linked to the pool’s performance. The ABS are often tranched into risk classes that vary in their credit ratings. The most risky tranche (often the equity tranche) receives no rating at all. Banks often retain a tranche or provide other guarantees to the SPV to signal asset quality or an intent to monitor the borrowers.

Securitization has the potential to significantly impact banks’ insolvency risk, leverage, and profitability. Securitization affects the bank’s insolvency risk because it transfers some of the risk of a pool of loans to investors in the SPV, thus transforming the distribution of the asset side of a bank’s balance sheet. This can reduce or increase insolvency risk depending on which tranches the bank optimally chooses to sell, and which it chooses to retain [Jiangli, Pritsker, Raupach (2007); Krahnen
Securitization also affects insolvency risk and leverage because it will alter the bank’s optimal liability structure [Leland, (2007)]. Additionally securitization may increase insolvency risk if banks engage in regulatory capital arbitrage, which involves apparently transferring risk off balance sheet, while actually retaining the risk through implicit agreement to buy back its nonperforming loans.

Securitization can affect the bank’s expected profit in two ways. The direct effect increases expected profits by expanding banks investment opportunities. However, securitization could lower profits indirectly if its widespread use increases competition in loan origination [Instefjord (2005)], or if it leads to a deterioration in the quality of the loan pool [Parlour and Plantin (2007)], Duffee and Zhou (2001)], or if those who invest in ABS are not cognizant of the possible risks.

Our empirical analysis takes into account that securitization is an endogenous decision of the bank. To control for endogeneity, we use a bank’s size as an instrument for its securitization decision. A set of analyses including semi-parametric regression is used to justify our choice of size as an instrument. We condition on size in univariate comparisons of banks that do and do not use securitization, and we use size as an instrument in multi-variate regressions. Using both analyses we find that securitization reduces insolvency risk and increases leverage ratios. The results on profitability were mixed: securitization statistically improved profitability using the univariate but not the multivariate analysis. The results hold over a set of robustness checks including propensity score matching techniques which creates a matching sample of non-securitizers whose properties are compared with those of securitizers.

Our paper is most closely related to the empirical literature on why banks use securitization, and how securitization affects banks risk profile. The most consistent finding on banks reason for using securitization is that it reduces banks funding constraints, and thus increases the supply of credit [Hirtle (2007), Cebenoyan and Strahan (2004), Goderis et al. (2007)]; moreover securitization is not for regulatory capital arbitrage [Martin-Oliver and Saurina (2007), et al. (2004), Calomiris and Mason (2003)].

There is a small literature on how securitization affects banks risk profiles. Franke and Krahnen (2005), using an event study, find that securitization increases bank’s systematic risk, as measured by market beta. Dionne and Harchaoui (2003), find securitization increases banks’
insolvency risk, as measured by banks ratio of regulatory capital to risk weighted assets. A complicating factor in all such analyses is that banks risk profiles may affect their decision to use securitization [Minton et al (2004); Bannier and Hansel (2007)] and this needs to be accounted for as part of the analysis.

Our paper makes three contributions to the empirical literature. First, we find that securitizers tend to be large banks that fund a relatively small fraction of their lending with deposits. This is consistent with securitization serving as an alternative funding source when banks begin to outgrow their base of deposits. Second, we employ a new measure of insolvency risk, a bank’s time deposit premium which is the interest rate spread between its uninsured and insured time deposits. Because the time deposit premium is a forward looking and market determined measure of ex-ante risk, we believe it improves on risk measures such as capital ratios that are based on accounting data. We also believe that interest-rate spreads are a better measure of insolvency risk than the beta measures that have been used in event studies because beta measures covariance, which is a second moment measure or risk, whereas insolvency risk is more related to higher order moments and tail events.

Our other contributions are more methodological. We believe we are the first paper to use size differences among relatively large banks as an instrument to control for the endogeneity of securitization. This approach will help us to produce more concise estimates of how securitization affects bank insolvency, capital structure, and overall profitability.

The remainder of the paper contains four sections. Section II describes our data; section III studies how banks are affected if they have to retain securitized assets on balance sheet; section IV contains the instrumental variable analysis; section V describes our robustness checks; a final section concludes.

II. Data

Our data on securitization comes from FR Y9-C US bank holding company (BHC) data from the second quarter of 2001 to the second quarter of 2007. This allows us to study the effects of securitization on a consolidated basis that nets out securitization activities that might occur between two banks within the same BHC. The mortgage securitization
data is from the schedule HC-S which covers the 1-4 Family Residential Mortgage Loans (Mortgage). Securitized mortgages are recorded by their outstanding principal balance of assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements. It should be noted that the data distinguish between outright loan sales, and sales for the purposes of securitization. We only focus on the latter.

For a variety of reasons, many BHCs that use securitization, do not use it in all quarters. For our purposes, a BHC is a mortgage securitizer if securitizes mortgage in any quarter. There is a total of 2231 BHCs, but only 147 BHCs securitize mortgages. Even though the total number of banks that securitize mortgages is small, nevertheless, mortgage securitizers are important since they represent 67% of US BHC assets.

As a preliminary, in Table 1, we compare BHCs that securitize mortgage with those that do not along a number of dimensions, including their size, their credit risk, profitability and leverage [Also see Table 3 of Jiangli and Pritsker (2008)]. To perform the comparisons, we compute time-series averages of the relevant variables for each BHC and then use the time-series averages in all subsequent analysis.

The most robust difference between mortgage securitizers and non-securitizers of any asset types is that securitizers are significantly larger than non-securitizers where size is measured as the natural logarithm of on balance sheet assets. In addition securitizers have larger loans/deposits than non-securitizers suggesting that securitizers tend to be large banks that have outgrown their ability to raise inexpensive deposits as a source of funding. Consistent with specialization in financial intermediation, securitizers also hold a much higher average percentage of the type of loan they securitize on their balance sheets than do non-securitizers.

To study risk profiles, we use three measures of risk. The first is the time deposit premium, which is the difference between the interest rates on small (< $100,000) insured time deposits and large (> $100,000) uninsured time deposits. The time deposit premium is a good measure of the banks insolvency, or tail risk because uninsured time deposits have risk-sensitive pricing [Gilbert, Meyer and Vaughan (2002)]. The time deposit premium has some caveats: For example, some above US$100,000

1 Jiangli and Pritsker (2008) also consider other types of securitized assets, Home Equity Lines, Commercial and Industrial loans, Credit Card, Auto, and Other Consumer Loans
time deposits may be insured if they are held in joint accounts, but US BHC data do not provide information on whether accounts are joint. Additionally, we do not have any information on the maturity and liquidity of the time deposits. Our second and third risk measures are the loan loss provision rate and banks charge-off ratio. Both of these are measures of the expected loss rate of the bank’s portfolio.

A raw comparison of the risk measures shows securitizers have a lower time deposit premium than non-securitizers, but the differences are often statistically insignificant. Further analysis suggests this is because of very noisy time-deposit premia among small non-securitizers. For the measures of expected loss, our results are stronger. We find, with a few exceptions, that both the provision and charge off ratios are statistically and economically significantly higher for securitizers than non-securitizers.

Securitizers are also more profitable than non-securitizers, whether profits are measured by return on equity (ROE), or return on assets (not shown). In addition, we found that securitizers tend to have higher leverage. However, the raw comparisons for profit and leverage are statistically insignificant. We believe that the statistical insignificance is partially driven by noise that varies with bank size, and that comparing banks of comparable size is a more meaningful comparison. We revisit this issue below.

III. Instrumental variables estimation

Our IV approach is motivated by the empirical observation that large banks are more likely to use securitization [Karaoglu (2005), Bannier and Hansel (2006), and Martin-Oliver and Saurina (2007)], presumably because those banks can overcome the fixed costs of setting up a securitization program, and because large banks may have investment opportunities that outstrip their ability to raise funds via deposits. Currently, our analysis only focuses on mortgage securitizers because it is the most important and widespread. Additionally, when banks securitize multiple types of assets, as many do, our methodology cannot identify which type of securitization generates our results.
A. Size as a valid instrument

To establish that bank size is a valid instrument we need to show that size is related to bank’s decision to securitize, but is not otherwise related to differences in the performance of banks that do and do not use securitization. To study the relation between size and securitization, we sorted our BHC sample into seven size-buckets based on the quantiles of \( \text{Ln(Assets)} \), with size increasing with bucket number (Table 2). The data show that the likelihood of being a securitizer strongly and nonlinearly increases with size, moving from 1% securitizers in bucket 1 to 10% in bucket 5, and then jumping to 41% in bucket 6, and 100% in bucket 7.

Securitization is clearly related to BHC size. To motivate the use of size as an instrument, we also need to establish that size is unrelated to performance except through its affect on whether a bank uses securitization. It is not technically possible to verify this claim without making some form of over-identifying restriction. The restriction that we propose is that other than through securitization, beyond an estimable threshold, size has a linear effect on performance among large banks. Under this restriction, if beyond a threshold size has no effect on performance among large banks that do not use securitization (the coefficient relating size to performance is zero), then this could be interpreted as evidence that if large securitizers are different from large non-securitizers, then it is primarily driven by securitization, and not by size differences.

It is possible to test whether size is related to performance among non-securitizers beyond a threshold. To do so, we estimated linear and semi-parametric variants of the regressions in equation (1) in which all variables other than bank size enter linearly, while bank size is allowed to enter either linearly or semi-parametrically via the unspecified function \( G[\text{Ln(Assets)}] \):\

\[
Y = \beta_0 + \beta_1 \frac{\text{Mort}}{\text{Loans}} + \beta_2 \frac{\text{HEL}}{\text{Loans}} + \beta_3 \frac{\text{C \& I}}{\text{Loans}} + \beta_4 \frac{\text{CredCard}}{\text{Loans}} + \beta_5 \frac{\text{Other}}{\text{Loans}} + \beta_6 Z + G[\text{Ln(Assets)}] + \epsilon
\]

Where \( Y \) is the measure of performance which can be time deposit premium, ROE and leverage ratio. \( \text{Mort} \) (mortgage), \( \text{HEL} \) (home equity
loans), C&I (commercial and industrial loans), CreditCard (credit card) and Other (other loans) are the on-balance sheet loan amount. Z is a vector that includes other controls, such as loan quality measured by the delinquency loan ratio, and the interest rate on insured deposits.

This equation can be more compactly written as:

\[ Y_i = X_i \beta + G[\ln(\text{Assets}_i)] + \epsilon_i, \quad i = 1, \ldots, N \]

Our linear specification estimated equation (1) using subsamples that truncate an expanding sample of small banks from the analysis. The results [see Jiangli and Pritsker (2008)] show that beyond a threshold of small banks, size is unrelated to performance differences among large banks.

To verify that our linear regression results are not due to the choice of linear functional form, we next approximated the function G[.] semi-parametrically using a cubic spline. Our principal results [Jiangli and Pritsker (2008)] is that beyond the smallest banks, increases in size alone do not appreciably alter nonsecuritizers performance. This is verified by the flatness of the G[.] function for non-securitizing banks with \( \ln(\text{Assets}) > 14.58 \) (not shown), which correspond to size buckets 5 and 6 for the non-securitizers.

**B. Univariate and multivariate size analysis**

Our analysis suggests that size is a valid instrument for identifying the effects of securitization on bank performance, especially when studying banks in groups 5, 6, and 7. We use size in two ways. First, we performed univariate analysis in which we compared securitizers and non-securitizers within and across size buckets. The within bucket results are mostly insignificant due to small numbers of securitizers in each bucket. The ideal comparison across buckets is between non-securitizers in bucket 5 and securitizers in buckets 6 and 7 because the fraction of securitizers jumps between 5 and 6, but hopefully other bank characteristics that may be correlated with size do not. The ideal comparison shows that securitizers have lower insolvency risk, a higher ROE and leverage ratio than non-securitizers (Table 3).
Table 4 reports our multivariate IV regressions. Size is used to instrument for securitization in a first stage OLS and then second-stage regressions are estimated using predicted values for securitization. For comparison purposes we also run un-instrumented OLS regressions of performance on securitization. All regressions use data only from size groups 5, 6 and 7, because our analysis suggests size is a valid instrument for those size groups. Our securitization variable is \textit{mortsec}, which is an indicator for whether the BHC is a mortgage securitizer. To save space, the uninstrumented regressions only report the coefficient for \textit{mortsec}. In the first stage OLS (not shown) size is positive and significantly correlated with \textit{mortsec}. This is not surprising given the strong relationship between size and securitization in Table 3.

In the case of insolvency risk, the IV and OLS regressions produce significantly negative coefficients on \textit{mortsec}. Our reported IV point estimates suggest securitization reduces the time deposit premium by 350 basis points. Across different second-stage models (not shown), securitization reduces the time deposit premium by 50bps to 380bps. These reductions are economically substantial and statistically significant.

The IV results on bank profitability fail to detect a statistically significant relationship between mortgage securitization and bank profitability as measured by ROE. This is different from our finding in the univariate analysis, and we suspect part of the difference in the results may be because the multivariate analysis requires coefficient identification for more variables, some of which may be correlated with our instrumented securitization measure. The results for leverage are positive and statistically different from zero. Across multiple specifications (not shown), securitizing mortgages increase leverage ratios by 1.5% to 4.6%.

In sum, our univariate and multi-variate results for mortgages suggest that securitization reduces insolvency risk and borrowing costs by lowering the time-deposit premium. Additionally, securitization allows the bank to increase leverage, which helps the bank economize on costly equity capital. Our results for profitability are weaker, with only the univariate results suggesting that securitization increases profitability.
IV. Robustness checks

We performed a series of robustness checks to verify our results from section III. In section III equation (1), we dropped the three measures of loan quality, and replaced insured (uninsured) deposit rates by total interest expense on insured (uninsured) deposits divided by total insured (uninsured) deposits; our results still hold. We also used a propensity score technique to compare mortgage securitizers and non-securitizers, and our results still hold (not reported).

One question is whether our finding that securitization reduces time deposit premia is due to securitization or due to (other) scale economies in risk-taking [Hughes, Mester and Moon (2001)]. Disentangling these possibilities will be difficult since securitization is itself an important source of scale economies in risk-taking. Nevertheless, our analysis partially controls for these scale effects since we compare securitizers and non-securitizers that are similar in size. This also automatically control for other sources of endogenous risk-taking that are related to size. Additionally, most researchers find that scale economies disappear once bank asset sizes reach about $10 billion [see the survey by Amel et al (2004)], which is about the size of banks in group 5 in our sample. This suggests that scale economies from non-securitization activities are essentially exhausted for groups 5, 6, and 7, which are the banks where most of our analysis is focused.

As a final robustness check to our results, we use the sample which contains the top bank holding companies only. Using this sample eliminates the inconsistency in estimation arising from that we treat two BHCs as independent observation, while they actually belong to a same top holding company. The number of the top holding companies is 2113. The results based on the top BHCs are almost identical to the original BHC sample.

V. Conclusion

Using bank holding company data from 2001-2007, we have conducted an empirical analysis of the effect that mortgage securitization has on BHCs. Our analysis focused on mortgage securitizations. Our approaches compare the average performance of large banks that securitize with banks of comparable size that do not. We also used instrumental variable regression in which we use bank size as an instrument for
securitization since beyond very small banks, bank size has little effect on our performance measures, but has a significant effect on the likelihood that banks securitize. Using different approaches, our results present a fairly consistent picture in the case of mortgage securitizers. We find that mortgage securitization reduces bank insolvency risk, increases bank leverage and increase bank’s profitability.

Our overall results suggest a very positive role for mortgage securitization. This raises the question of how to interpret our results in light of the current turmoil in credit markets in general, and mortgage markets in particular. Our interpretation is that the high profitability, high leverage, and low insolvency risk that are associated with securitization in our analysis are reflective of a positive history of past experience with securitization in banking. Additionally, the relatively low time deposit premiums of securitizers suggests that the current turmoil in credit markets was not anticipated by uninsured depositors because it was not reflective of historical experience, but is instead reflective of recent excesses in mortgage and securitization markets. These excesses are documented in Ashcraft and Schuermann (2007), Dell Arricia et al (2007), and Mian and Sufi (2007). If our interpretation is correct, then we predict that because of the positive effects that we estimate for securitization, securitization activity will pick-up again once the current problems in credit markets are cleared up. Only time will tell if our prediction is correct.
References


Table 1
Comparison of securitizers and non-securitizers

<table>
<thead>
<tr>
<th></th>
<th>Non-Securitizers</th>
<th></th>
<th></th>
<th>Securitizers</th>
<th></th>
<th></th>
<th>p-values</th>
<th>% difference of means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortgage</td>
<td>N</td>
<td>Mean</td>
<td>Std De</td>
<td>N</td>
<td>Mean</td>
<td>Std De</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln(Assets)</td>
<td>2084</td>
<td>12.9131</td>
<td>0.9971</td>
<td>147</td>
<td>15.1113</td>
<td>2.4762</td>
<td>&lt;.0001</td>
<td>15.7%</td>
</tr>
<tr>
<td>Loans/Assets</td>
<td>2084</td>
<td>0.6673</td>
<td>0.1298</td>
<td>147</td>
<td>0.6436</td>
<td>0.1291</td>
<td>0.0329</td>
<td>-3.6%</td>
</tr>
<tr>
<td>Mortgage/Loans</td>
<td>2084</td>
<td>0.2436</td>
<td>0.1572</td>
<td>147</td>
<td>0.2764</td>
<td>0.1381</td>
<td>0.0138</td>
<td>12.6%</td>
</tr>
<tr>
<td>Provision ratio</td>
<td>2084</td>
<td>0.0021</td>
<td>0.0046</td>
<td>147</td>
<td>0.0025</td>
<td>0.0021</td>
<td>0.3968</td>
<td>14.1%</td>
</tr>
<tr>
<td>NoAcc+Chargeoff/Loans</td>
<td>2084</td>
<td>0.0085</td>
<td>0.0112</td>
<td>147</td>
<td>0.0108</td>
<td>0.0103</td>
<td>0.0137</td>
<td>24.2%</td>
</tr>
<tr>
<td>Time deposit premium</td>
<td>2082</td>
<td>0.0268</td>
<td>0.0366</td>
<td>147</td>
<td>0.0226</td>
<td>0.0377</td>
<td>0.1836</td>
<td>-16.8%</td>
</tr>
<tr>
<td>ROE</td>
<td>2084</td>
<td>0.1040</td>
<td>0.0587</td>
<td>147</td>
<td>0.1126</td>
<td>0.0559</td>
<td>0.0836</td>
<td>8.0%</td>
</tr>
<tr>
<td>Leverage ratio</td>
<td>2084</td>
<td>0.9041</td>
<td>0.0371</td>
<td>147</td>
<td>0.9083</td>
<td>0.0219</td>
<td>0.1777</td>
<td>0.5%</td>
</tr>
<tr>
<td>Loans/Deposits</td>
<td>2084</td>
<td>0.8484</td>
<td>0.3444</td>
<td>147</td>
<td>0.9732</td>
<td>0.4474</td>
<td>&lt;.0001</td>
<td>13.7%</td>
</tr>
</tbody>
</table>

Notes: All variables in column “Mean” (“Std. Dev”) are the cross sectional mean (Standard deviation) of the individual BHC time series average. Ln(Assets) is the natural logarithm of assets in thousand of U.S. dollars. Provision ratio is the total provision divided by total loans. NoAcc+Chargeoff is the sum of nonaccrual and charge-off loans over total loans. Rate on deposit is the interest expense on deposit divided by total deposit. Time deposit premium is the spread between the rate on large (above US$100,000) and small (below US$100,000) time deposits. ROE is the income before tax and extraordinary item and other adjustments divided by average equity. Leverage ratio is the total liabilities over assets. Column “p-values” report statistical difference between the means of securitizers and non-securitizers. % difference of means is the difference of securitizers’ and non-securitizers’ mean over 0.5 times the sum of securitizers’ and non-securitizers’ mean.
Table 2
Distribution of Ln(Assets) among BHCs that hold Mortgages

<table>
<thead>
<tr>
<th>A. Raw Distribution of Ln (Assets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantiles</td>
</tr>
<tr>
<td>Ln(Assets)</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Std. Dev</td>
</tr>
<tr>
<td>Obs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Distribution of Ln(assets) by Size Buckets.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket</td>
</tr>
<tr>
<td>Fraction of securitizers</td>
</tr>
<tr>
<td># non-securitizers</td>
</tr>
<tr>
<td># securitizers</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Notes: For all of the bank holding companies in our sample that hold mortages, the table reports the distribution of bank size measured by Ln (Assets) (Panel A). Panel B decomposes the banks into seven size buckets, with bank size increasing with bucket number. Panel B shows that the fraction of securitizers increases with size, and jumps significantly between buckets 5 and 6, suggesting that size is highly correlated among the very largest banks.
Table 3
Comparison of banks that do and do not securitize within and across bank size buckets

<table>
<thead>
<tr>
<th>Variable</th>
<th>Size 1-5 non-sec</th>
<th>Size 2-5 non-sec</th>
<th>Size 3-5 Non-sec</th>
<th>Size 4-5 Non-sec</th>
<th>Size 5 non-sec</th>
<th>Size 6 &amp; 7 sec</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision ratio</td>
<td>0.0021</td>
<td>0.028**</td>
<td>0.0022</td>
<td>0.065*</td>
<td>0.0021</td>
<td>0.026**</td>
<td>0.0022</td>
</tr>
<tr>
<td>Time depo premium</td>
<td>0.0271</td>
<td>&lt;.000***</td>
<td>0.0263</td>
<td>&lt;.000***</td>
<td>0.0236</td>
<td>&lt;.000***</td>
<td>0.0204</td>
</tr>
<tr>
<td>ROE</td>
<td>0.1036</td>
<td>0.001***</td>
<td>0.1050</td>
<td>&lt;.000***</td>
<td>0.1046</td>
<td>&lt;.000***</td>
<td>0.1066</td>
</tr>
<tr>
<td>Leverage ratio</td>
<td>0.9044</td>
<td>0.306</td>
<td>0.9049</td>
<td>0.369</td>
<td>0.9051</td>
<td>0.379</td>
<td>0.9026</td>
</tr>
<tr>
<td>Obs</td>
<td>2039</td>
<td>1483</td>
<td>944</td>
<td>414</td>
<td>100</td>
<td>59</td>
<td></td>
</tr>
</tbody>
</table>

*** Indicates statistical significance at the 1% level, ** indicates statistical significance at the 5% level, and * indicates statistical significance at the 10% level.

Notes: The means of each grouping of non-securitizers to the left of size bucket 5 (non-sec) are compared to the mean of securitizers in buckets 6 and 7. For example, non-securitizers in size buckets 1-5 have a lower mean provision rate than securitizers in buckets 6 and 7, with a p-value of 0.028. Groupings to the right of Size bucket 5 (non-sec) are compared with that group. For example, securitizers in buckets 6-7 have a higher provision rate than non-securitizers in bucket 5, with a p-value of 0.001.
Table 4
Instrumental variables estimates
Time deposit premium, ROE, and Leverage

<table>
<thead>
<tr>
<th>A: size 5,6,7 IV</th>
<th>Time-depo Primium</th>
<th>ROE</th>
<th>Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>mortsec</td>
<td>-0.035</td>
<td>0.009</td>
<td>0.030</td>
</tr>
<tr>
<td></td>
<td>(3.81)***</td>
<td>(0.56)</td>
<td>(2.02)**</td>
</tr>
<tr>
<td>Mortgage/Loans</td>
<td>0.095</td>
<td>0.030</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>(5.48)***</td>
<td>(0.77)</td>
<td>(1.22)</td>
</tr>
<tr>
<td>Hel/Loans</td>
<td>0.209</td>
<td>0.093</td>
<td>-0.179</td>
</tr>
<tr>
<td></td>
<td>(2.76)***</td>
<td>(0.87)</td>
<td>(1.33)</td>
</tr>
<tr>
<td>C&amp;I/Loans</td>
<td>-0.089</td>
<td>-0.038</td>
<td>0.030</td>
</tr>
<tr>
<td></td>
<td>(3.35)***</td>
<td>(1.54)</td>
<td>(0.80)</td>
</tr>
<tr>
<td>Credit/Loans</td>
<td>0.015</td>
<td>0.357</td>
<td>-0.029</td>
</tr>
<tr>
<td></td>
<td>(0.36)</td>
<td>(2.29)**</td>
<td>(0.94)</td>
</tr>
<tr>
<td>Other/Loans</td>
<td>0.131</td>
<td>-0.036</td>
<td>-0.189</td>
</tr>
<tr>
<td></td>
<td>(3.22)***</td>
<td>(0.48)</td>
<td>(1.77)*</td>
</tr>
<tr>
<td>3m-pastdue/Loans</td>
<td>-1.472</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.98)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3m+pastdue/Loans</td>
<td>0.166</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NoAcc+Chargeoff/Loans</td>
<td>0.208</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.90)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loans/Assets</td>
<td>0.028</td>
<td>0.096</td>
<td>0.092</td>
</tr>
<tr>
<td></td>
<td>(1.24)</td>
<td>(1.94)**</td>
<td>(1.30)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.009</td>
<td>0.048</td>
<td>0.844</td>
</tr>
<tr>
<td></td>
<td>(0.45)</td>
<td>(1.06)</td>
<td>(17.76)***</td>
</tr>
<tr>
<td>Observations</td>
<td>225</td>
<td>226</td>
<td>226</td>
</tr>
<tr>
<td>R-square</td>
<td>0.33</td>
<td>0.13</td>
<td>0.17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B: Size 5, 6, 7 OLS</th>
<th>Time-depo Primium</th>
<th>ROE</th>
<th>Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortsec</td>
<td>-0.016</td>
<td>0.010</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>(2.88)***</td>
<td>(1.36)</td>
<td>(2.25)**</td>
</tr>
<tr>
<td>Observations</td>
<td>225</td>
<td>226</td>
<td>226</td>
</tr>
<tr>
<td>R-square</td>
<td>0.36</td>
<td>0.13</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Robust t-statistics in parentheses. *** Indicates statistical significance at the 1% level, ** indicates statistical significance at the 5% level, and * indicates statistical significance at the 10% level.

Notes: For banks in size buckets 5 - 7, the table presents results from instrumental variables estimation when bank’s time deposit premium, return on equity, and leverage are regressed on whether a bank is a mortgage securitizer. In all regressions, the instrumented variable is mortsec, which is equal to 1 if the bank is a mortgage securitizer. The coefficient of mortsec measures the effects of mortgage securitization among large banks.
Comments and Observations on the Paper by Wenying Jiangli and Matt Pritsker *The Impacts of Mortgage Securitization on Bank Performance*

**Jouko Vilmunen**
Director of Research, Central Bank of Finland

1. Introduction: Securitization - many benefits, many dangers

Let me starting by thanking the organizers for letting me comment this paper. It is a lovely paper and I truly enjoyed reading it. The paper takes up a number of very topical issues revolving around securitization. More specifically the paper focuses on the effects of securitization on banks’ profitability, insolvency risk and leverage. Being an empirical study, the paper uses a rich data set incorporating a relatively large number of variables at the level of bank holding companies. The empirical analysis involves an extensive econometric search for significant correlations which the authors nicely put in the context of the current financial turmoil to provide a perspective on it. Using standard econometric techniques, the authors are able to tease out statistically significant effects of securitization on banks’ profitability, insolvency risk and leverage. The authors go further from just reporting and discussing the econometric evidence by performing an interesting exercise on the likely effects of bringing securitized assets back to the banks’ balance sheets. Overall, the paper is well written, well structured and easy for the reader to follow from the first page to the last one. Also, the paper strengthens the view or preconception that securitization offers many benefits - diversification benefits, source of new and innovative financial instruments to mention a few - but also involves a number of dangers like reduced monitoring incentives and increased likelihood of banks assuming tail risks.

2. Observations on credit risk transfer (CRT) markets

In the rest of my discussion I will first write down some observations about credit risk transfer (CRT) markets before commenting the paper.
more closely. Concluding comments then follow my discussion. CRT markets have grown rapidly during the last ten or so years. One of the most important innovations in financial markets has been the development of credit derivative instruments that allow banks to more actively manage their loan portfolios than ever before. CRT may be deemed desirable as it allows risk diversification among different sectors of the financial system, or, more generally, across different sectors of the whole economy, that cannot be achieved in other ways. On the other hand, if CRT arises because of ill-designed regulation, it may not be desirable. In this case CRT is driven mainly by regulatory arbitrage that may provide strong incentives for agents to assume tail risks thus increasing the future likelihood of adverse systemic events. Of course, at this level of generality it is easy to argue that timely intervention by authorities as well as proper measures to correct for the underlying regulatory biases would undo action by agents that rest on wrong incentives. But in reality it is very difficult to e.g. ex ante identify genuine excess returns in the data for gross returns on risky investments and thus to argue that (particular) agents are enjoying returns (rents?) from investing in tail risks that have systemic implications.

Research on CRT activities and markets has demonstrated (e.g. Parlour-Plantin, 2005) that asymmetric information - so pervasive in financial markets, almost a defining characteristic of financial market relationships - can effectively close CRT markets. On the one hand, in originating and pricing loans, banks develop proprietary information the stock of which is further increased as banks obtain additional private information through monitoring the borrowers. Because of adverse selection, the existence of proprietary information may inhibit the marketability of the loans banks have granted to their borrower customers. On the other hand, bank capital is scarce and banks want to recycle their capital in the secondary markets. Liquidity is highly valued by banks and they may want to sell loans to take advantage of private investment opportunities elsewhere. Now, CRT markets may close - face liquidity dryout or fall into a liquidity black hole - if the adverse selection risk is sufficiently high so that it is commonly perceived that only bad assets are offered to trading in derivative markets. In such cases then all loans are illiquid for the very reason Akerlof’s (1970) analysis of lemons indicates. However, if the perceived probability that banks are selling assets because they have received profitable outside investment
opportunities and want to redeploy their capital is sufficiently high then there is pooling and CRT markets are liquid.

The main reason for bringing out these features of the CRT market should be kept in mind when drawing (policy) conclusions from the Jiangli - Pitsker paper. Similarly, I think we need take aboard research (e.g. Marsh, 2006) suggesting that active use of innovative CRT techniques adversely affect banks’ incentives to monitor its borrowers. Reduced monitoring effort tends to result in higher risk concentration as well as more correlated risks for banks, thus increasingly exposing them to insolvency risk. Furthermore, active shifting of risks off the balance sheet can potentially greatly contribute to making us (researchers, central bankers, supervisors etc.) less able to identify from market data genuine excess returns from (short-term) compensation for tail risks. There is also evidence (e.g. Coderis et al, 2007) indicating that securitization greatly increases banks’ target levels for loans, whereas the effects on actual loans tend to spread over time. This observation is particularly interesting once we take the potential general equilibrium effects seriously: there is the possibility of observing a lending boom fuelling aggregate demand boom as well as bubbly valuation paths. Needless to say, further research is required to make these conjectures stand on firmer grounds. But if anything, these concerns emphasize the role of financial supervision and raise the issue of the need for a reform of the current regulatory framework.

3. Econometric evidence on the effects of securitization

The paper is fundamentally an econometric search of economically and statistically significant effects of securitization on banks’ profitability, risk profile and leverage. It argues that a priori the effects of securitization on banks’ overall performance, measured along the three dimensions of profitability, insolvency risk and leverage, is ambiguous, so we need data to bear on the issue of signing the effects. In running through the econometric exercise, the paper uses three methods. First of all, the paper performs an interesting experiment on the likely effects of bringing securitized assets back to banks’ balance sheets. The second and third method recognizes the endogeneity to securitize and restricts the analysis to mortgage securitizers. More specifically, the second method uses univariate comparison between securitizers and non-securitizers, while
the third method introduces conditioning and compares performance between similar sized banks that do and do not securitize using multivariate instrumental variable (IV) approach. The empirical analysis measures risk as the interest rate spread between uninsured and insured deposits and profitability as return on equity. These measures are accompanied by leverage ratios to complete the set of measures to capture banks’ performance. The paper uses FR Y9-C US Bank Holding Company quarterly data from 2001.Q1 to 2007.Q2, which suggests that the data thus ends when interesting times in financial markets begin! The data have information on mortgage loans, home equity lines, commercial and industrial loans as well as credit card, auto and other consumer loans. What is of interest in itself is that in the data the number of BHCs that engage in securitization is relatively small: altogether 2231 bank observations, whereof 2046 are never-securitizers.

The econometrics on mortgage loan data appears to favour the following conclusions. First of all, securitization tends to reduce banks’ insolvency risk. Secondly, banks’ leverage seems to creep up for banks that securitize. Finally, securitization is apparently good news for banks’ profits. While the data on mortgage securitizers are pretty clear about these effects, the experiment on non-mortgage securitizers, where the idea is to return securitized assets back on banks’ balance sheets, provides a less consistent set of conclusions. One of the underlying reasons could effectively be the small number of securitizers, so that heterogeneity swamps all systematic patterns potentially observable in data sets with larger number of securitizers. This is of course pure speculation and I was hoping the authors had dug deeper into this matter. Anyway, one of my main critical points about the paper is that I do not find this experiment of returning securitized assets back on banks’ balance sheets convincing. The reason is that size matters and the set of non-securitizers also include non-trivial set of small banks, whose structure of the balance sheet is not representative of the larger banks. So, in a sense heterogeneity is not for the good here. Furthermore, in the case of the third approach mentioned above, the authors pursue a careful analysis of the validity of the size as an instrument and give the impression that they are safe with the null of a valid instrument. However, the R2s in the various first stage regressions - typically around 35 % - do suggest that caution should be exercised with this conclusion and that the problem of weak instruments may not be entirely rule out (see e.g. Stock et al., 2002).
A related point here is that size has often been used to instrument informational frictions in empirical models testing for the presence of informational asymmetries and moral hazard in economic relationships. The underlying idea is that large banks are transparent, small ones more opaque. The question in the present context is that what if securitization opportunities are open only for large banks, e.g. CRT markets are liquid only for larger banks because of them being perceived as less likely to be subject to these information frictions? If this is so, then CRT markets expand profitable business opportunities for only those banks that have already solved the more fundamental problems rising from asymmetric information. This observation brings us back to my original discussion on CRT markets.

Finally, I want to raise some minor points about the empirical analysis. First of all, the authors carefully motivate their reduced form approach to significance testing by alluding to a priori ambiguous theoretical effects of securitization on banks’ performance. True, but the limits of significance tests to gaining deeper understanding of the relationships underlying the data should be fully acknowledged. They are not always the most interesting ones and a more structural, theoretically motivated approach would, to my mind, force the data speak more. More specifically, some of the estimated signs of the coefficients on different loan categories are difficult to interpret as there is common theoretical structure to sustain them. Furthermore, on a more technical level, it is not clear whether the fact that loan shares sum to one is taken into account in the estimations. More substantially, the paper concludes that derivative markets will recover despite the current turmoil. But I would be more cautious in that e.g. as CRT markets are riddled with asymmetric information problems, a lot of good risk needs to be placed in the market for trading to sustain liquid markets (pooling). This particular feature may delay the recovery of current markets, as many see predominantly bad risk being available in the markets for some time to come. But again, this is speculation which does not in any way change the fact that I am very positive about the paper which incorporates a lot of information, runs interesting and thought-provoking experiments and is definitely worth reading.
References


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The Jiangli-Pritsker paper presents evidence that seems to suggest a positive role for securitizations. In general, the role of securitizations will be a function of (1) the private information of the intermediary about the individual loans in the pool as well as (2) the residual (symmetric information) uncertainty about the repayment outcomes of the loans. Let's call them Variance (1) and Variance (2). If Variance (1) is important, the financial intermediary is better off selling claims on the assets (loans) individually rather than as a pool. Pooling has an information destruction effect (see DeMarzo 2005) that worked to the disadvantage of the securitizing bank. On the other hand Variance (2) is important and it is not too highly correlated across the different loans in the pool, then pooling (the loans) and “tranching” may be optimal. Here the bank is able to use the diversification effect of pooling to create a low risk and liquid security. The bank is able to reduce insolvency risk and increase leverage. Instead of attributing the current turmoil entirely to “recent excesses” it may be useful for the authors to see whether there is a difference in the performance of these securitizations as a function of the relative importance of Variance (1) and Variance (2). In other words, the authors could use proxies for Variance (1) and Variance (2) and see whether a sharper interpretation of their results is possible.

Incentives and Financial Crises

In their very interesting paper, “How Markets and Analysts React to Loan Securitizations”, Hasan, Francis and Zazzara make an important connection between the availability of low-interest financing and risk-shifting incentives. They make a very important point. However,
I want to go one step further and add a cautionary note: the regularly used incentive structures provide incentives to undertake highly risk-shifting strategies even when low-interest financing is not available.

This can be considered the “dark side” of complete markets. On one hand, the availability of the new markets and instruments such as derivatives and credit swaps has made it possible for the firms to hedge specific risks (for example, commodity price, exchange rate and interest rate risks) at low transactions costs. On the other hand, the possibility of modifying the probability distribution of cash flows of the firm in specific custom-made ways at low cost opens up some important incentive problems. For example, the manager of a profit center in a firm, compensated by a conventional performance-based compensation contract, can modify the probability distribution of the cash flows of his profit center to “game” very closely his compensation contract. A bank, which is subject to regulatory supervision, can modify its cash flow structure to specifically “game” the rules of the particular regulatory regime in place. Although the presence of these incentive problems is not a new phenomenon, I will argue that the low cost customization of probability distributions using complex derivative positions has made it possible to implement strategies specifically designed to “game” compensation structures in place, at the same time evading detection by conventional audit mechanisms.

In my paper, John and John (2006), we show that with commonly-used incentive features in the compensation structure, managers have incentives to implement complex derivative strategies that lead to a slight reduction in default probabilities (or a slight increase in performance measures) with a high probability at the cost of allowing for the possibility of disaster states involving large losses, although with a very small probability. Such disaster states cause systemic instability (similar to the experience of Long-Term Capital Management in September 1998). There are countless strategies which can be implemented to “game” compensation structures and regulatory regimes in place, using derivatives. The detailed positions in the different instruments and the resulting pay-off structures are discussed in John and John (2006).

I provide below a simple characterization of the generic strategy which can be implemented by a profit center in a manufacturing firm or a
financial institution is as follows: hold appropriate derivative positions to synthesize an incremental cash flow distribution such that with 99.99% probability, it adds in a modest way to its earnings from the underlying activity, but with 0.01% probability, it causes large losses. The relative size of the modest increase and the large losses can be chosen such that the above strategy is a self-financing one. Moreover, since the large-loss state may not “occur” for a number of periods, the profit center can show superior performance for a number of periods prior to the realization of the large-loss outcome. Moreover since this is a self-financing strategy, it does not require any special low cost financing. The incentive structures that can generate such risk-shifting behavior are endemic.

References


Abstract

A mortgage contract of any type has three options: stay current, prepay, or default. The termination rates - either through prepayment and refinance or serious delinquency, foreclosure, and default - of subprime mortgages originated between 2001 and 2006 have been surprisingly similar across origination years: around 20, 50, and 80 percent, evaluated within one, two, and three years after origination, respectively. For loans originated during the highest house price appreciation years, the exit option was dominated by prepayments. When the housing market slowed down, defaults substituted for prepayments. Also, as the number of terminated subprime purchase-money loans significantly outweighed the number of first-time home buyers between 2001 and 2006, a single potentially positive aspect of subprime mortgages - an increase of homeownership in the U.S. - has most likely been overstated.
1. Introduction

The subprime mortgage market was booming for the first six years of this decade but collapsed in 2007\(^1\). At first, the collapse took the form of more than three times higher delinquency, foreclosure and default rates among subprime mortgage loans originated in 2006 and 2007 compared with earlier years, many within months of origination. In 2008, the market froze completely and was essentially dead.

Many explanations for the crisis have already been offered by researchers, policy makers and individuals: mortgage rate resets, fraud, poor underwriting, discrimination, the housing market slowdown, and deterioration of unobserved loan quality, to name a few.

The negative consequences of the market’s collapse are well known, and include foreclosures and defaults resulting in families losing their homes; impaired credit histories for subprime borrowers; vacant properties that corrode the values of surrounding homes and destabilize neighborhoods; bank failures; and an overall economic slowdown.

The benefits of the subprime lending boom are less obvious. Anecdotal evidence suggests that if one looks at the subprime market another way, easier mortgage financing might have promoted homeownership in the U.S. This “glass half-full” type of argument goes as follows: Even if default rates are about 20 percent - as they are for the most recent vintage of subprime mortgages - 80 percent of subprime borrowers still make their monthly payments. In this view, the financial innovation that spawned subprime lending promoted home ownership, and thus most borrowers benefitted because they most likely would not have qualified for a mortgage under prime terms.

This study analyzes whether - in the entire history of the booming subprime market - borrowers intended to keep their mortgages long enough to substantiate the homeownership argument outlined above. Surprisingly, almost every other loan exited the subprime market in one way or the other within the first two years after origination. Moreover,

\(^{1}\)There is no exact definition of a subprime mortgage, even at this date when there has been a massive subprime mortgage crisis. The term “subprime” can be used to describe certain characteristics of a borrower (such as a low credit score, previous history of delinquency or bankruptcy) or of a lender (specializing on high-cost lending, selling fewer loans to Government Sponsored Enterprizes, or of a security of which a loan can becomes a part of (most risky securities are subprime, less risky are prime, and those in between are Alt-A) or a mortgage type (such as 2/28 or 3/27 hybrid mortgage contract, a product generally not available in the prime market).
just 30 to 40 percent of all subprime loans in the analyzed sample were purchase-money. The remaining share belongs to borrowers who refinanced their existing homes and refinances do not contribute to an increase in homeownership. Among the purchase-money loans, more than 50 percent were terminated within two years after origination, and 80 percent were terminated within the first three years of life. The number of purchase-money loans terminated as a result of foreclosure or about to be terminated (seriously delinquent) within 24 months after origination is almost as large as the estimated number of new homeowners (first time home buyers) - about one million mortgages. This evidence suggests that the beneficial role of subprime lending might have been overstated.

The “exit” from a subprime mortgage can take two forms: prepayment and default. In this study, a mortgage loan is “prepaid” if a borrower has either prepaid or refinanced a mortgage loan within a certain period of time after the loan was originated. A mortgage loan is in “default” if a borrower has defaulted on the loan or has missed more than two mortgage payments, or the property is in the process of foreclosure or is real estate owned (i.e., is likely to default), within a certain period of time from origination. The terms “exit” and “termination” are used interchangeably in this paper.

Even though mortgage termination rates among all subprime loans originated in all years between 2001 and 2006 have been very stable - 50 percent when evaluated within the first two years after origination - the split between prepayment and default ratios has been changing over time.

As shown in Figure 1, for loans originated in 2002, 2003, and 2004, there were more than four times as many prepayments as defaults within the first two years of a loan’s life. By 2006 the shares of prepaid and defaulted loans within that two year life were almost equal. This study attempts to analyze empirically factors that are associated with a higher probability of prepayment, default, or the two options combined during the pre-crisis years as well as the entire subprime era.
EXIT STRATEGY: THE ROLE OF A SHORT LOAN LIFE IN THE SUBPRIME CRISIS

Figure 1
Termination of Subprime Loans within 24 Months of Origination, by Origination Year

Source: Author's calculations based on FirstAmerican CoreLogic Loan Performance, June 2008

Notes: All the loans used for this figure were securitized, originated as purchase-money or refinancing, are the first-lien mortgages, and have the borrowers and loan characteristics reported for them in the data. The data source: FirstAmerican CoreLogic Loan Performance, ABS Securities, loan-level data, July 2008.

For the empirical analysis a simple logit model is used, and the impact of a set of explanatory factors - such as borrower and loan characteristics and house price appreciation in the area surrounding the property - on a probability of either prepayment or default was analyzed. According to the estimated results, the main explanatory factors affecting the probability of subprime mortgage loans to prepay within two years after origination are: house price appreciation (pre-and post-origination); the presence of prepayment penalties associated with loan contracts; the resetting structure of mortgage rates (as with hybrid mortgages); and the combined loan-to-value ratio, which measures the amount of equity...
in the house. The main explanatory factors affecting the probability of a subprime mortgage loan to default within two years after origination are: the FICO credit score; the combined loan-to-value ratio; the mortgage rate; and post-origination house price appreciation. Note that the credit score only affects the likelihood of defaults, not prepayments, and pre-origination house price appreciation only affects prepayments, not defaults. Hybrid mortgages do tend to prepay and default more often than fixed-rate mortgages (see Demyanyk and Van Hemert (2008) for supporting evidence); however, ceteris paribus, the sole fact that a mortgage contract type is a hybrid is not a very strong predictor of defaults.

The factors listed above as having the biggest impact on prepayments and defaults were not substantially different in the pre-crisis years, with the exception of house price appreciation. This study formally considers each factor’s annual contribution to explaining either prepayments or defaults. For 2003 and 2004 vintage loans high house price appreciation is the main contributing factor for high prepayment rates. For 2005 and 2006 vintage loans low house price appreciation is the main contributor for the high default rates. Note, however, that being the largest contributing factor does not imply that house price appreciation is fully capable of explaining the magnitude of the crisis - symptoms of which are much higher default rates than those explained by housing market factors.

The structure of the paper is as follows. Section 2 provides a discussion of the subprime mortgage crisis, the debate concerning an increase in home ownership because of subprime innovations, and a summary of previous research on delinquency, foreclosure, default, prepayment and refinance options in the mortgage market. Section 3 presents an empirical analysis of prepayment and defaults, and the marginal effect of each explanatory factor is documented. An annual factor contribution is calculated to formally determine what factors are most responsible for the crisis. Section 4 concludes the article.

2. Subprime Mortgage Crisis

The boom in and subsequent collapse of the subprime mortgage market has drawn the attention of numerous researchers and policy makers. This section provides a literature review summarizing several academic and policy papers related to the analysis of the subprime mortgage delinquencies, defaults, and prepayments.
The analysis of delinquencies and foreclosures is not new to the economic literature. For example, Von Furstenberg and Green (1974) analyzed the determinants of mortgage delinquencies, as opposed to foreclosures and defaults, based on mortgages originated between 1961 and 1972. They confirm and reference findings published as early as 1969 and 1970 (by Von Furstenberg) that such factors as the loan-to-value ratio (or equity-to-value ratio) and income of the borrower, among others, are important determinants explaining mortgage default. Note, this result was known some three decades before subprime issues, before the `accepted' loan-to-values were found to be very large, and before so-called no-income, no-documentation, no-asset loans were introduced to the market.

In a more recent, but pre-crisis analysis, Cutts and Van Order (2005) suggest that several economic models can, in fact, explain the main characteristics of the subprime market. In particular, \option-based" models are consistent with pricing and loan characteristics of subprime mortgages (for example, improving a borrower's credit score gives a better option for refinancing); the “separating equilibrium” model is consistent with sorting borrowers into prime and subprime in the market through signaling mechanisms; and the “adverse-selection” models are consistent with a choice between the lower costs of the secondary market and the information advantages of the primary market. However, with the help of hindsight, we see that there are many issues that were and still are beyond fundamental and conventional economic modelling. For instance, Demyanyk (2008) show that the FICO credit scores failed to predict the subprime mortgage crisis, even though it is one of the most important determinants of serious delinquency and foreclosure in mortgage lending.\footnote{For a more detailed discussion of delinquency and foreclosure determinants, see Demyanyk and Van Hemert (2008).}

Pennington-Cross and Chomsisengphet (2007) studied a sample of subprime securitized loans - first-lien, fixed-rate, home-owner occupied, originated between 1996 and 2003. The authors notice that borrowers with subprime mortgages are more likely to cash-out refinance compared to those with prime mortgages.\footnote{A term `cash-out' refinance refers to a situation when a borrower refines an existing mortgage loan into a larger one, taking cash out. This, by definition, means that a borrower is extracting the equity from the house.} Moreover, subprime borrowers seem to be substituting mortgage debt for credit card debt and auto loans.
Yuliya Demyanyk

(they tend to refinance their mortgages when interest rates on credit cards and auto financing rise). Analyzing the performance of subprime loans, the authors observed that cash-out refinances tend to default and prepay less frequently than non-cash-out refinances. Demyanyk and Van Hemert (2008) observed that cash-out refinances tend to default less frequently even than purchase-money mortgages, albeit during a later period of time, between 2001 and 2007.

Demyanyk and Van Hemert (2008) were among the first who analyze the subprime mortgage crisis in great detail. Using loan-level data, they first showed that-contrary to popular belief - the subprime crisis of 2007 was not confined to a particular market segment-such as loans with mortgages rates scheduled to increase or no documentation loans. Instead, it was a (subprime) market-wide phenomenon. Second, they identified factors that are the most likely to be associated with a larger probability that a subprime mortgage loan would become seriously delinquent; these factors are: the FICO credit score, the combined loan-to-value ratio (CLTV), the mortgage interest rate, and house price appreciation between the period of loan origination and a loan performance-evaluation period. These factors are not sufficiently different in the crisis years (2006 and 2007) than in the earlier years, and thus do not entirely explain the crisis, its magnitude, and its timing.

Even house price appreciation is not able to explain - all by itself or in a combination with other factors, a phenomenon called risk layering - why the subprime crisis was so rapid and large.

Demyanyk and Van Hemert also showed that there was some non-measurable risk present in those mortgage contracts and that this risk was increasing over time. More specifically, they first adjusted mortgage performance for values of observable characteristics at origination (borrowers' credit scores, loan-to-value ratios, debt-to-income, etc.), loan characteristics (whether it is a fixed-rate mortgage or a hybrid, whether it is home-owner occupied, whether there is a prepayment penalty associated with a loan, etc.), and house price appreciation since origination. Second, they calculated the adjusted performance of the loans for all vintage/age combinations in their sample; this exercise revealed that the market has been worsening each year, monotonically and dramatically, since 2001. In other words, the crisis did not just emerge suddenly in 2007 or 2008 - it has been brewing for at least six consecutive years before.
Even though the finding described above is not readily observable by looking at the data - a statistical exercise is needed to see this deterioration of the subprime market - the authors show that securitizers, those who mostly dictated mortgage rates in the market, were at least to some extent aware of this gradual deterioration. The decline in loan quality was monotonic, but not equally spread among different types of borrowers. Over time, loans with high loan-to-value ratios had higher adjusted delinquency, foreclosure, and defaults rates. Securitizers started to link mortgage interest rates to loan-to-value ratios; obviously, they did not do so enough. Loan quality deteriorated while loan riskiness increased every year from 2001 to 2007. But the price of risk - the subprime-prime mark-up - in fact, declined. The combination of increasing loan riskiness and decreasing prices was not sustainable. In 2008, the market collapsed, and massive foreclosures, bank failures, and a credit crunch followed.

Haughwout, Peach, and Tracy (2008) took their analysis a step further and, building on the study done by Demyanyk and Van Hemert (2008), analyzed early defaults in subprime mortgages. Early default is defined as either delinquency (missed payments) for more than 60 days or foreclosure within the first year after origination. The authors confirm the finding of Demyanyk and Van Hemert that while credit/lending standards are important determinants of an early default, they are not capable of explaining the timing and the magnitude of a crisis in 2007 and 2008. They also confirm that, while a reverse in the trend of house prices is a very important determinant of increased delinquencies and foreclosures in the immediate pre-crisis years, there is still a large unexplained portion of increased serious delinquencies.

Keys, Mukherjee, Seru, and Vig (2008), on the other hand, found that lending standards in the subprime mortgage market did deteriorate. The main driving force of the deterioration was the securitization of those loans.

Mian and Sufi (2008) attempt to further identify the causes of the subprime default crisis. The authors claim that the increased supply of credit, perhaps due to securitization, in areas where there were more mortgage application rejections a decade before the crisis (in 1996), relative to areas with fewer rejections, led to rapid increases in house prices between 2001 and 2005. The increases in house prices, in turn, led to subsequent defaults between 2005 and 2007, when housing values started declining.
Gerardi, Shapiro, and Willen (2007), using a unique data set covering homeownership experience in Massachusetts between 1989 and 2007, found that homeownership that began with a subprime mortgage ended up in foreclosure 20 percent of the time; the number is about six times larger than a corresponding share of homeowners that began with prime mortgages. Also, one of the findings discovered by Foote, Gerardi, Goette, and Willen (2008), based on the same data set, was that almost half of residential foreclosures are concentrated in subprime mortgages, even if a subprime mortgage was a refinance of a prime loan.

Foote, Gerardi, and Willen (2008) argue that even though borrowers facing negative equity in their houses are more likely to default, they may not default in the absence of an idiosyncratic shock, such as illness, divorce, or the loss of a job. Also, a borrower needs to consider if the cost of default - a part of which is a cost of renting after the default - outweighs a potential (future) benefit in terms of home equity, should the home price increase in the future. In other words, negative equity is a necessary but not a sufficient condition for default.

Borrowers’ options to prepay or default on their mortgages have been analyzed in the context of the pricing mortgage contracts for decades. Deng, Quigley, and Van Order (2000) provide an extensive literature review describing earlier work on analysis of prepayment only, default only, and default and prepayment as joint options. The authors theoretically unify several economic models to analyze prepayment and default options considered by borrowers simultaneously, and empirically test it on a sample of fixed-rate, fully amortized loans originated between 1976 and 1983 and observed until the first quarter of 1992. All those loans were purchased by Freddie Mac. Even though the loans were made and their performance evaluated long before subprime issues emerged, the implications of this research are very important. The authors found evidence of the interdependence of the decisions to prepay (exercise the call option) and default (exercise the put option). Forecasts that ignore that interdependence can lead to serious errors in estimating the default risk. For a related analysis, see also Pennington-Cross and Chomsisengphet (2007).

**Was the U.S. Subprime Crisis of 2007 Unique?**

Demyanyk and Van Hemert (2008) show evidence that the 2007 subprime mortgage crisis in the U.S. seemed in many respects to be
following the type of classic lending boom-and-bust cycle documented by Dell'Ariccia, Igan, and Laeven (2008). First of all, there was a very sizeable boom in the subprime mortgage market. Depending on the definition of “subprime,” the market increased from three to seven times between 1998 and 2005 (see Mayer and Pence (2007) for the measures of the size and the increase of the subprime mortgage market based on HUD and LoanPerformance definitions). Second, there was a definite bust (collapse) of the market in 2007, reflected in high delinquency, foreclosure, and default rates. Moreover, a year later, in 2008, the subprime mortgage crisis spilled over into a much larger financial crisis and a global credit crunch. Third, the periods that preceded the collapse were associated with loosening underwriting standards and deteriorating loan quality, and increasing loan riskiness - not backed-up by an increasing price of this extra risk - the subprime-prime spread was actually declining over the boom period.

Increasing riskiness in the market together with the decreasing price of said risk leads to an unsustainable situation, which in turn, leads to a market collapse. Moreover, not only have Demyanyk and Van Hemert shown that the crisis followed a classic path known to policy makers and researchers in quite a few countries, they have also shown that we could have seen the crisis coming by at least the end of 2005. It is not clear, though, if we could have prevented it, even if we knew. Comparing the findings of Dell'Ariccia, Igan, and Laeven (2008) and Demyanyk and Van Hemert (2008), it appears the United States in 2007, Argentina in 1980, Chile in 1982, Sweden, Norway, and Finland in 1992, Mexico in 1994, Thailand, Indonesia, and Korea in 1997 all experienced the culmination of similar (lending) boom-bust scenarios, though in very different economic circumstances.

Reinhart and Rogoff (2008), analyzing macro indicators in the United States preceding the financial crisis of 2008 and 18 other post World War II banking crises in industrial countries, also found striking similarities among all of them. In particular, there are, first of all, similarities in the significant increases in housing prices before the financial crises commenced. Even more striking is evidence that the U.S. had a much higher growth rate in its house prices than the so-called “Big-Five” countries in their crises (Spain in 1977, Norway in 1987, Finland in 1991, Sweden in 1991, and Japan in 1992). Second, comparing the real rates of growth in equity market price indexes, there are again similarities among all the crisis countries before their
crises. Third, comparing the current account as a share of GDP, not only are there similarities, but the United States had deficits more severe than those of the other countries had before their crises, reaching more than six percent of GDP. The authors noted, however, that there is a lot of uncertainty associated with the still ongoing 2008-crisis in the United States; therefore, it is impossible to project the path of the crisis resolution based on the other countries’ previous experiences.

**Subprime Mortgages and Homeownership**

Jaffee (2008) summarized attempts to analyze what went wrong with the subprime market that could cause the crisis and what went right - potential benefits from subprime lending that might offset consequences of the subprime crisis. The author noted that the subprime mortgage market funded approximately five million home purchases between 2000 and 2006, with slightly more than one million loans going to first-time home buyers. He suggests that the subprime mortgage market had at least one benefit to the economy, and that was the increase in homeownership.

However, as shown in Figure 2, within the very first year after origination, between 15 and 25 percent of purchase-money mortgage loans - those that fund home purchases, not refinancing - were terminated for all origination years between 2001 and 2006. Within the first two years of origination, about 50 percent of all loans in the sample terminated, within the three years after origination, 80 percent of the loans were no longer current, i.e., exited the market in one way or another.\(^4\)

Taking all origination years in the sample together, and focusing only on first-lien, home purchase (purchase-money) mortgages that were securitized and for which the reliable data were provided, more than 600,000 loans were terminated within the very first year after origination.\(^5\) Within the first two years after origination, approximately 1.9 million loans were terminated. Among the terminated loans, slightly less than one million loans were seriously delinquent or in default; the remaining million loans were refinanced or prepaid. The data seem to

\(^4\) The shares for loans that entered the data set as refinances, as opposed to purchase-money are remarkably similar to those documented in Figure 2.

\(^5\) “Termination” is defined as either serious delinquency (more than 60 days past due payments, in foreclosure, real-estate-owned), default, prepayment or refinance.
suggest that the number of foreclosed homes alone, (with mortgages funding the home purchases) already exceeds the number of first-time home buyers. The number of prepaid and refinanced properties is less informative as the data do not allow one to trace the after-prepayment outcome of the mortgages. A refinanced loan can either be a new subprime loan and follow the original path described above - a borrower would either default or prepay again - or be a prime loan, which borrowers can also prepay or default upon. Given the degree of uncertainty on this issue, no inference based on the number of prepaid loans will be made in this article.

Figure 2
Termination of Subprime Purchase-Money Loans within 12, 24, and 36 Months of Origination, by Origination Year

Notes: All the loans used for this figure were securitized, originated as purchase-money, are the first-lien mortgages, and have the borrowers and loan characteristics reported for them in the data. The data source: FirstAmerican CoreLogic Loanperformance, ABS Securities, loan-level data, July 2008.
However, given that the shares of terminated loans for all vintages (origination years) in the sample are almost the same, subprime loans were hardly ever meant to last much longer than three years. Lenders must have known that these loans were temporary, i.e., it would be impossible to collect the interest rate payments during the entire loan term (usually 30 or 40 years). Therefore, there were prepayment penalties imposed, high interest rates and fees charged, and complicated loan modifications designed (the securitization structure is very complex, making individual loan modifications almost impossible).

Even if borrowers refinanced their initial subprime loans into more stable subprime or prime mortgages - those we observe in the data prior to prepayment or refinance, the 80 percent termination rate within the first three years after origination would indicate that the initial boom in subprime lending, at most, accelerated growth of homeownership, even if temporarily. In other words, as a hypothetical success example, if a borrower took out a subprime loan in 2001, say as a first-time home buyer, and then refinanced into a better loan in 2004, the same borrower most likely could have skipped the subprime step and become a first-time home buyer in 2004, starting with a more stable loan and avoiding high interest rate payments and prepayment penalties.

3. Loan Termination: Empirical Analysis

Analyzing the random sample of subprime securitized loans (between 2001 and 2006) as a cross-section, I estimate the following logit regression model.

\[ \Pr(Z) = \Phi(\beta'X), \]  

where \( Z \) is either prepayment, default, or exit - through either prepayment or default option - from a subprime mortgage loan after 24 months since origination; \( \Phi(x) = 1/(1 + \exp(-x)) \) is the logit function; \( x = \beta'X \); \( X \) is the vector of explanatory variables; and \( \beta \) is the vector of regression coefficients.

The explanatory factors used in the analysis are: the FICO credit score; a dummy variable indicating if full documentation was provided at origination; a dummy variable indicating if a prepayment penalty is present; the debt-to-income ratio (back-end); a dummy variable
indicating if a debt-to-income is not provided; the mortgage interest rate; a dummy variable indicating if a borrower is an investor; a dummy variable indicating if a mortgage was a refinance at origination; the origination amount; the combined loan-to-value ratio; a margin for hybrid loans; a dummy variable indicating if a mortgage is a hybrid; a dummy variable indicating if a mortgage is an ARM (non-hybrid); a dummy variable indicating if a mortgage is a balloon; post-origination house price appreciation (between loan origination and loan performance evaluation periods); and pre-origination house price appreciation (between two years prior to origination and the origination periods).

The choice of the period when to evaluate loan performance, within 24 months of origination, was mainly driven by two factors: a calculation of the FICO credit score and the popularity of hybrid mortgages in the sample. The FICO credit score, as with any other credit score, measures the creditworthiness of individuals or businesses. Lenders/securitizers use these scores to estimate how likely it is that borrowers eventually will be delinquent or in default. By design, the higher the score, the less likely it is that a borrower will miss payments or go into default on a loan within one or two years after the score has been calculated (Demyanyk (2008)). The prevalence of hybrid mortgages is also important. More than one-half of subprime securitized mortgage loans are ARMs, and almost all of them are so-called hybrid contract types, which means they carry a fixed rate for an initial period of time - usually two or three years - after which the rate resets. By starting the analysis at two (or three) years after origination, we eliminate the effect on these loans of mortgage rates resetting into mostly larger market-driven rate plus a margin (see Demyanyk and Gopalan (2007) for a more detailed description and definitions).

3.1. Data and Variable Definitions

Loan-level data used for the analysis are provided by the the First American CoreLogic LoanPerformance database; in the data set, loan, borrower, and property characteristics are provided for about one-half of all U.S. subprime mortgages. All loans in this data set have been securitized. According to the Mortgage Market Statistical Annual (2008), securitization rates are as follows: 60.7 percent (2001), 63.0 percent (2002), 67.5 percent (2003), 62.6 percent (2004), 67.7 percent (2005), 67.6 percent (2006), and 74.2 percent (2007), and 77.3 percent (six months
of 2008). Among all subprime mortgages, the portion securitized ranged from 54 percent in 2001 to 75 percent in 2006.

For the empirical analysis of this study, only first-lien subprime mortgages are used. The variables used in the analysis are described below.

**Prepayment:** a dummy variable that equals one if a borrower has either prepaid or refinanced a mortgage loan within the first two years of origination; the variable takes a value of zero otherwise.

**Default:** a dummy variable that equals one if: a borrower has either defaulted on a loan (foreclosure procedure was finalized) or missed more than two monthly mortgage payment; a property is in foreclosure or is real-estate owned (taken over by the lender) within the first two years after a loan was originated; the variable takes a value of zero otherwise.

**Termination:** a dummy variable that equals one if a borrower has either defaulted or prepaid the mortgage loan within the first two years of origination; the variable takes a value of zero otherwise.

**FICO Score:** the Fair, Isaac and Company (FICO) credit score at origination. The FICO score was recommended for use in mortgage lending by Fannie Mae and Freddie Mac in 1995 as a measure of borrowers’ creditworthiness. The higher the score, the less likely a borrower will default on a loan within about two years of loan origination. Given the nature of FICO scores, it is expected that a relationship will be found between borrowers’ scores and the incidence of default and foreclosure during the subprime mortgage crisis.

**Combined Loan-to-Value Ratio:** the combined mortgage values of all liens divided by the value of the house at loan origination.

**Debt-to-Income Ratio:** the back-end debt-to-income ratio; it is defined as total monthly debt payments divided by gross monthly income, at origination. A higher debt-to-income ratio, i.e., a higher degree of indebtedness, makes it harder for a borrower to make his or her monthly mortgage payment.

**Missing Debt-to-Income:** a dummy variable that equals one if the back-end debt-to-income ratio was not provided in the data (reported as zero); the variable takes a value of zero otherwise. In the data, approximately 30 percent of loans did not have the debt-to-income value reported.

**Cash-Out:** a dummy variable that equals one if the mortgage loan is a cash-out refinancing loan at origination and zero otherwise.
**Investor**: a dummy variable that equals one if the borrower is an investor and does not owner-occupy the property and zero otherwise.

**Documentation**: a dummy variable that equals one if full documentation on the loan is provided and zero otherwise.

**Prepayment Penalty**: a dummy variable that equals one if there is a prepayment penalty associated with a loan and zero otherwise.

**Mortgage Rate**: the initial interest rate as of the first payment date. A higher interest rate makes monthly mortgage payments larger and, therefore, can make it more difficult for a borrower to make timely monthly mortgage payments.

**Margin**: the margin for an adjustable-rate or hybrid mortgage over an index interest rate, usually the six-month LIBOR rate, applicable after the first interest rate reset. A higher margin can make the mortgage rate larger after the reset and, therefore, can make it harder for a borrower to make monthly mortgage payments.

**Product Type**: there are four major product types in the subprime mortgage market: fixed-rate mortgages (FRM), Hybrid Mortgages, adjustable-rate mortgages (ARM), and Balloons. Three dummy variables for the latter three types are included in the regression analysis; the magnitude of their impact needs to therefore be interpreted as the effect on the probability of prepayment, default, or exit relative to a FRM. The FRM is chosen as a benchmark because FRMs show the smallest expected and realized probability of default.

**Origination Amount**: Size of the mortgage loan. Loan size can be associated with a size of a monthly mortgage payment; the larger the loan, the larger the monthly payment, the harder it can be for borrowers to make those payments timely. Also, the loan size can be associated with a borrower’s creditworthiness. One may expect less risky borrowers getting larger loans. Which one of the two effects is dominating is an empirical question; it is addressed later in this study.

**Post-Origination House Price Appreciation**: the MSA-level house price appreciation from the time of loan origination to the moment when the performance of loans is being evaluated. Appreciation is measured as a ratio of the house price indexes reported by the Office of Federal Housing Enterprise Oversight (OFHEO) for the two corresponding periods.

**Pre-Origination House Price Appreciation**: the MSA-level house price appreciation two years before mortgage origination and origination period.
3.2. Explanatory Factors of Prepayment and Default

Prepayment
As shown in Table 1, column 1, within the first two years of origination, house price appreciation that occurred after origination has the largest impact on a probability of a loan to prepay or refinance. An increase in house price appreciation from its mean by one standard deviation is associated with a 13 percentage point increase in the likelihood that a loan will be prepaid, ceteris paribus. If houses in the area were appreciating two years prior to origination, a one standard deviation increase in appreciation is associated with a 7 percentage point increase in the likelihood to be prepaid.

Table 1
Impact of Individual Factors on the Probability of Prepayment, Default, or Escape within Two Years of Origination. Sample: 2001 - 2006

A mortgage loan is labeled as “prepaid” if a borrower has either prepaid or refinanced a mortgage loan within a certain period of time after a loan was originated. A mortgage loan is labeled as in “default” if a borrower has defaulted on a loan or has missed more than two mortgage payments, the property is in the process of foreclosure or is real estate owned (i.e., is likely to default), within 24 months after origination. The “exit” from a subprime mortgage is either prepayment or default. The reported results are the marginal effects of each variable calculated as follows: $MFEF_i = \Phi(\beta'X) - \Phi(\beta'X)$, where $Pr(Z) = \Phi(\beta'X)$, $Z$ is either prepayment (column 1), default (column 2), or exit (column 3) from a subprime mortgage loan 24 months since origination; $\Phi(x) = 1/(1 + \exp(-x))$ is the logit function; $x = \beta'X$; $X$ is the vector of explanatory variables; $3\beta_i$ is a standard deviation of variable $i$, and $\beta$ is the vector of regression coefficients.

<table>
<thead>
<tr>
<th>Explanatory Factor</th>
<th>Prepayment</th>
<th>Default</th>
<th>Escape</th>
</tr>
</thead>
<tbody>
<tr>
<td>FICO Credit Score</td>
<td>0.19**</td>
<td>-3.28***</td>
<td>-4.11***</td>
</tr>
<tr>
<td>If Full Documentation Provided (dummy)</td>
<td>0.38***</td>
<td>-1.31***</td>
<td>-1.21***</td>
</tr>
<tr>
<td>If Prepayment Penalty is Present (dummy)</td>
<td>-6.27***</td>
<td>0.65***</td>
<td>-5.29***</td>
</tr>
<tr>
<td>Debt-to-Income Ratio (back-end)</td>
<td>1.58***</td>
<td>1.28***</td>
<td>3.12***</td>
</tr>
<tr>
<td>If Debt-to-Income is not provided (dummy)</td>
<td>1.17***</td>
<td>1.01***</td>
<td>2.28***</td>
</tr>
<tr>
<td>Mortgage Rate</td>
<td>5.23***</td>
<td>2.27***</td>
<td>7.76***</td>
</tr>
<tr>
<td>If Investor (dummy)</td>
<td>-1.05***</td>
<td>0.93***</td>
<td>0.00</td>
</tr>
<tr>
<td>If a mortgage a refinance at origination (dummy)</td>
<td>2.68***</td>
<td>-1.06***</td>
<td>0.73***</td>
</tr>
<tr>
<td>Origination Amount</td>
<td>3.03***</td>
<td>0.75***</td>
<td>4.16***</td>
</tr>
<tr>
<td>Combined Loan-to-Value Ratio</td>
<td>-4.24***</td>
<td>4.34***</td>
<td>-0.89***</td>
</tr>
<tr>
<td>Margin for Hybrid Loans</td>
<td>0.46***</td>
<td>0.85***</td>
<td>2.26***</td>
</tr>
<tr>
<td>If a Hybrid (dummy)</td>
<td>5.53***</td>
<td>0.36***</td>
<td>4.30***</td>
</tr>
<tr>
<td>If an ARM (dummy)</td>
<td>1.60***</td>
<td>0.05</td>
<td>1.64***</td>
</tr>
<tr>
<td>If a Balloon (dummy)</td>
<td>0.72***</td>
<td>0.51***</td>
<td>1.48***</td>
</tr>
<tr>
<td>Post-Origination House Price Appreciation</td>
<td>13.28***</td>
<td>-4.29***</td>
<td>7.31***</td>
</tr>
<tr>
<td>Pre-origination House Price Appreciation</td>
<td>7.31***</td>
<td>-0.46***</td>
<td>6.39***</td>
</tr>
</tbody>
</table>
The prepayment penalty factor has its expected effect on the probability of prepayment - it decreases it. The presence of repayment penalty in a mortgage contract, decreases the likelihood of prepayment within the two years of origination by about 6 percent. Based on the evidence documented in Figure 2 - that the majority of subprime mortgage loans prepay regardless of the origination year at the very early stages - loan originators and securitizers must have been aware of this pattern. To compensate for the expected losses of interest payments - the payments borrowers never make if they prepay the loan before the end of the mortgage term - prepayment penalties were imposed on about 70 percent of subprime securitized mortgages.

Hybrid mortgages tend to prepay more often; all other factors being the same, if a loan is a hybrid and has a mortgage rate scheduled to reset in two or three years, it is associated with an increase in the probability of prepayment by about 5.5 percentage points.

The mortgage rate at origination plays an important role as well: the higher the rate, the higher the chance that a loan will be prepaid within its first two years. The marginal effect of the mortgage rate is approximately 5 percentage points.

If a mortgage was originated as a refinancing, it is more likely to refinance again after two years or less, compared to home purchase (purchase money) loans.

The smaller the downpayment at origination, the less likely a borrower is to prepay or refinance in two years of origination. In unfavorable economic circumstances, such as a housing market slowdown or job loss, ceteris paribus, one would expect a borrower to default on rather than refinance a mortgage with little equity.

The more expensive a property was at origination, the more likely there will be a refinancing/prepayment of the mortgage associated with it. A larger origination amount is associated with larger mortgage monthly payments. Among the possible reasons for greater incentives to refinance more expensive properties are a desire to lower monthly payments or a need extract cash to cope with the (larger) monthly payments.

Default

The marginal effects of individual factors on the probability of default (delinquency, foreclosure, REO, and default) are documented in column 2 of the Table 1. There are four major factors that seem to most affect the probability of default two years after origination: post-
origination house price appreciation, the FICO credit score, the combined loan-to-value ratio, and the mortgage interest rate. This finding is consistent with the results obtained by Demyanyk and Van Hemert (2008), who estimated the effects of those factors on the probability of serious delinquency one year after origination.

According to the estimates, one standard deviation increase in the FICO credit score, ceteris paribus, is associated with a decrease in a probability of default by 3.3 percentage points. Note that the credit score has almost no explanatory power for prepayment, but is a very important factor explaining defaults.

An one standard deviation increase in house value appreciation - measured at the MSA-level - is, according to the estimates, associated with a decrease in the likelihood of default by 4.3 percentage points; the effect is about three times smaller than the effect of this factor on prepayments and refinancing and is of opposite sign, as expected. The difference in the absolute values of the marginal effects reflects an asymmetry of an impact of the equity in the house on options taken by borrowers. An increase in appreciation results in a much larger increase in the probability of a prepayment compared to a decrease of the probability of default.

Pre-origination house price appreciation, even though it has an economically significant impact on prepayments, has almost no effect on defaults.

The combined loan-to-value ratio has an effect of the same order of magnitude on defaults as on prepayments, but of the opposite sign. Less equity in the house, or a larger loan-to-value ratio, is associated with an increased probability of default but decreased probability of prepayment. In both cases, the marginal effect is in the order of 4.3 percentage points.

The mortgage interest rate has a marginal effect on the probability of default of 2.3 percentage points; recall that in the case of refinancing it is about double that number. This evidence seems to indicate that a high mortgage rate gives incentives for borrowers to exercise any options available to them to exit the mortgage, through either prepayment or default.

Exit

analogous to the one used in the current study. However, a simpler approach has been undertaken here. Instead of a multinomial logit model (as in Pennington-Cross and Chomsisengphet (2007)) or hazard functions (as in Deng, Quigley, and Van Order (2000)), a simple logit function is being estimated in this study for each of the outcomes of a loan termination. In the analysis described above, prepayments and defaults have been analyzed separately. Column 3 of Table 1 reports the estimates of the logit regression with the `exit' being a dependent variable; that is each factor is being analyzed for its impact on either prepayment or default, combined.

According to the estimates, those factors that have a significant effect on either prepayment or default have a significant impact on both of these options combined. The only exception is a combined loan-to-value ratio, where the effects on prepayment and default cancel each other out in a joint regression.

3.3. Annual Factor Contribution to Explaining Prepayment and Default

Through the boom and the subsequent bust of the subprime mortgage era, almost every other subprime loan in the sample terminated their original mortgages via either prepayment or default.

The shares of prepayment and default among the terminated loans, however, varied by the vintage of those loans. For example, as shown in Figure 2, the largest rates of prepayment were observed for loans originated in 2002-2004, two years after origination. This section attempts to empirically answer the following question: What observable factors, individually or in a combination, are capable of explaining changes in prepayment and default ratios?

To measure how the values of each explanatory factor in different years contribute toward explaining the likelihood of a loan to either prepay or default, this study uses a method similar to the one developed by Demyanyk and Van Hemert (2008). Specifically, for each year $Y$ in the sample, an impact of each explanatory variable $i$ is calculated as the difference between the logit function $q_Y$ where, for one variable $i$, the overall mean was substituted by its mean value in year $Y$ (the values of all other variables remain at their overall mean values) and the logit function where all variables are at their overall mean values. More formally, the annual factor contribution $AFC_i^Y$ for each variable $i$
and year $Y$ is calculated by the Equation (2) below.

$$\text{AF}C_i^Y = \Phi(\beta'X_i + \beta_i(X_i^{yearY - X_i})) - \Phi(\beta'X)$$ (2)

As shown in Figure 2, within two years of origination, loans originated in 2001 had delinquency and default rates almost as high as loans originated in 2005. Column 1 of Table 2 reports the contribution of each factor for this origination year plus a prior and subsequent house price appreciation.

**Table 2**

Annual Factor Contribution for Default: 2001-2006

Annual Factor Contribution, $\text{AF}C_i^Y = \Phi(\beta'X_i + \beta_i(X_i^{yearY - X_i})) - \Phi(\beta'X)$ where for each year $Y$ in the sample, the impact of each explanatory variable $i$, listed in the first column of the table, is calculated as the difference between the logit function $\Phi$, where, for one variable $i$, the overall mean was substituted by its mean value in year $Y$ (the values of all other variables remain at their overall mean values) and the logit function where all variables are at their overall mean values. $P_T(Z) = \Phi(\beta'X)$, $Z$ is default of a subprime mortgage loan within 24 months since origination; $\Phi(x) = 1/(1+\exp(-x))$ is the logit function; $x = \beta'X$; $X$ is the vector of explanatory variables; $\beta$ is the vector of regression coefficients. A mortgage loan is labeled as in “default” if a borrower has defaulted on a loan or has missed more than two mortgage payments, property is in the process of foreclosure or is real estate owned (i.e., is likely to default).

<table>
<thead>
<tr>
<th>Explanatory Factor</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>FICO Credit Score</td>
<td>1.03</td>
<td>0.52</td>
<td>-0.15</td>
<td>-0.14</td>
<td>-0.32</td>
<td>-0.09</td>
</tr>
<tr>
<td>If Full Documentation Provided (dummy)</td>
<td>-0.31</td>
<td>-0.11</td>
<td>-0.03</td>
<td>0.02</td>
<td>0.10</td>
<td>0.13</td>
</tr>
<tr>
<td>If Prepayment Penalty is Present (dummy)</td>
<td>0.05</td>
<td>0.04</td>
<td>0.01</td>
<td>0.00</td>
<td>-0.01</td>
<td>-0.03</td>
</tr>
<tr>
<td>Debt-to-Income Ratio (back-end)</td>
<td>-0.18</td>
<td>-0.23</td>
<td>-0.02</td>
<td>0.06</td>
<td>-0.01</td>
<td>0.30</td>
</tr>
<tr>
<td>If Debt-to-Income is not provided (dummy)</td>
<td>0.10</td>
<td>0.17</td>
<td>-0.01</td>
<td>-0.06</td>
<td>0.03</td>
<td>-0.19</td>
</tr>
<tr>
<td>Mortgage Rate</td>
<td>2.77</td>
<td>1.07</td>
<td>-0.40</td>
<td>-0.87</td>
<td>-0.58</td>
<td>0.66</td>
</tr>
<tr>
<td>If Investor (dummy)</td>
<td>0.00</td>
<td>-0.00</td>
<td>-0.00</td>
<td>-0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>If a mortgage a refinance at origination (dummy)</td>
<td>-0.09</td>
<td>-0.05</td>
<td>-0.07</td>
<td>-0.03</td>
<td>0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>Origination Amount</td>
<td>-0.30</td>
<td>-0.20</td>
<td>-0.07</td>
<td>0.01</td>
<td>0.14</td>
<td>0.19</td>
</tr>
<tr>
<td>Combined Loan-to-Value Ratio</td>
<td>-0.96</td>
<td>-0.79</td>
<td>-0.31</td>
<td>0.10</td>
<td>0.46</td>
<td>0.69</td>
</tr>
<tr>
<td>Margin for Hybrid Loans</td>
<td>-0.17</td>
<td>0.01</td>
<td>-0.12</td>
<td>0.02</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>If a Hybrid (dummy)</td>
<td>-0.07</td>
<td>-0.01</td>
<td>-0.04</td>
<td>0.04</td>
<td>0.05</td>
<td>-0.08</td>
</tr>
<tr>
<td>If an ARM (dummy)</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.00</td>
<td>-0.00</td>
<td>0.00</td>
<td>-0.00</td>
</tr>
<tr>
<td>If a Balloon (dummy)</td>
<td>0.04</td>
<td>-0.06</td>
<td>-0.09</td>
<td>-0.11</td>
<td>-0.02</td>
<td>0.40</td>
</tr>
<tr>
<td>Post-Origination House Price Appreciation</td>
<td>2.07</td>
<td>-0.20</td>
<td>-3.00</td>
<td>-2.22</td>
<td>2.63</td>
<td>7.51</td>
</tr>
<tr>
<td>Pre-origination House Price Appreciation</td>
<td>0.23</td>
<td>0.22</td>
<td>0.22</td>
<td>0.05</td>
<td>-0.19</td>
<td>-0.20</td>
</tr>
</tbody>
</table>
As shown in Table 2, low FICO credit scores, high mortgage interest rates, and relatively low house price appreciation two years after origination contributed to high default rates for the 2001 vintage loans. The contribution from the mortgage rate remained in effect for the vintage 2002 loans, but was of a much smaller magnitude.

For loans originated in 2003 and 2004, only post-origination house price appreciation (fast and positive) contributed to low default rates; defaults were substituted by prepayment and refinancing options exercised by borrowers, as discussed below in greater details.

For loans originated in 2005 and 2006, again, the only factor contributed to higher default rates than those in all other years in the sample: post-origination house price appreciation (housing market slowdown when appreciation became negative, i.e. depreciation).

Note, however, that house price appreciation indeed was the most contributing factor to higher than average default rates. In 2005 and 2006 it contributed 2.6 and 7.5 percentage points, respectively, to the increase in the default rates. The default rates for 2005 and 2006 vintage are about 20-30 percent, much more than house price appreciation is explaining.

As shown in Table 3, column 1, the main contributing factor for high refinance rates within two years of origination for the 2001 vintage loans was a high mortgage interest rate; its value accounted to 6.3 percentage points of the average prepayment rate. Post- and pre-origination house price appreciation contributed to prepayment rates negatively, 4 and 3.4 percentage points, respectively. A somewhat important factor was the combined loan-to-value ratio prevailing in the market. In 2001 Its value at origination contributed to a 1.2 percentage points larger probability of prepayment two years later.
Table 3
Annual Factor Contribution for Prepayment: 2001-2006

Annual Factor Contribution, $AFC^Y_i = \Phi(\beta' X + \beta_i(X^\text{year}^Y - \bar{X}_i)) - \Phi(\beta' X)$, where for each year $Y$ in the sample, the impact of each explanatory variable $i$, listed in the first column of the table, is calculated as the difference between the logit function $\Phi$, where, for one variable $i$, the overall mean was substituted by its mean value in year $Y$ (the values of all other variables remain at their overall mean values) and the logit function where all variables are at their overall mean values. $\Pr(Z) = \Phi(\beta' X)$, $Z$ is prepayment of a subprime mortgage loan within 24 months since origination; $\Phi(x) = 1/(1 + \exp(-x))$ is the logit function; $x = \beta' X$; $X$ is the vector of explanatory variables; $\beta$ is the vector of regression coefficients. A mortgage loan is labeled as in “default” if a borrower has defaulted on a loan or has missed more than two mortgage payments, property is in the process of foreclosure or is real estate owned (i.e., is likely to default). A mortgage loan is labeled as “prepaid” if a borrower has either prepaid or refinanced a mortgage loan within 24 months of origination.

<table>
<thead>
<tr>
<th>Explanatory Factor</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>FICO Credit Score</td>
<td>-0.05</td>
<td>-0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>If Full Documentation Provided (dummy)</td>
<td>0.09</td>
<td>0.03</td>
<td>0.01</td>
<td>-0.00</td>
<td>-0.03</td>
<td>-0.03</td>
</tr>
<tr>
<td>If Prepayment Penalty is Present (dummy)</td>
<td>-0.53</td>
<td>-0.39</td>
<td>-0.14</td>
<td>-0.00</td>
<td>0.12</td>
<td>0.28</td>
</tr>
<tr>
<td>Debt-to-Income Ratio (back-end)</td>
<td>-0.25</td>
<td>-0.30</td>
<td>-0.03</td>
<td>0.08</td>
<td>-0.01</td>
<td>0.39</td>
</tr>
<tr>
<td>If Debt-to-Income is not provided (dummy)</td>
<td>0.12</td>
<td>0.20</td>
<td>-0.01</td>
<td>-0.07</td>
<td>0.04</td>
<td>-0.24</td>
</tr>
<tr>
<td>Mortgage Rate</td>
<td>6.26</td>
<td>2.57</td>
<td>-1.02</td>
<td>-2.24</td>
<td>-1.48</td>
<td>1.60</td>
</tr>
<tr>
<td>If Investor (dummy)</td>
<td>-0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.00</td>
<td>-0.00</td>
</tr>
<tr>
<td>If a mortgage a refinance at origination (dummy)</td>
<td>0.21</td>
<td>0.13</td>
<td>0.16</td>
<td>0.08</td>
<td>-0.13</td>
<td>-0.24</td>
</tr>
<tr>
<td>Origination Amount</td>
<td>-1.26</td>
<td>-0.82</td>
<td>-0.31</td>
<td>0.05</td>
<td>0.56</td>
<td>0.77</td>
</tr>
<tr>
<td>Combined Loan-to-Value Ratio</td>
<td>1.21</td>
<td>0.99</td>
<td>0.37</td>
<td>-0.12</td>
<td>-0.54</td>
<td>-0.79</td>
</tr>
<tr>
<td>Margin for Hybrid Loans</td>
<td>-0.09</td>
<td>0.01</td>
<td>-0.07</td>
<td>0.01</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>If a Hybrid (dummy)</td>
<td>-1.10</td>
<td>-0.19</td>
<td>-0.59</td>
<td>0.65</td>
<td>0.78</td>
<td>-1.28</td>
</tr>
<tr>
<td>If an ARM (dummy)</td>
<td>0.02</td>
<td>0.01</td>
<td>-0.04</td>
<td>-0.02</td>
<td>0.01</td>
<td>-0.00</td>
</tr>
<tr>
<td>If a Balloon (dummy)</td>
<td>0.05</td>
<td>-0.08</td>
<td>-0.14</td>
<td>-0.16</td>
<td>-0.02</td>
<td>0.57</td>
</tr>
<tr>
<td>Post-Origination House Price Appreciation</td>
<td>-4.12</td>
<td>0.45</td>
<td>8.32</td>
<td>5.79</td>
<td>-5.09</td>
<td>-11.66</td>
</tr>
<tr>
<td>Pre-origination House Price Appreciation</td>
<td>-3.39</td>
<td>-3.27</td>
<td>-3.30</td>
<td>-0.81</td>
<td>2.88</td>
<td>3.15</td>
</tr>
</tbody>
</table>

The value of the prevailing mortgage interest rate for the loans originated in 2002 was again the most important contributor to explaining prepayment rates; the impact, however, of this factor (as shown in column 2 of the Table) is much smaller compared to it effect on the loans originated in 2001. The contribution of post-origination house price appreciation is no longer there, compared to the 2001 vintage loans.
and the contribution of the CLTV has decreased.

For vintages 2003 and 2004, the primary contributing factor to high prepayment rates was the house price appreciation that had taken place between the origination period and the subsequent two years. For 2003 vintage loans, a diminishing factor was the pre-origination house price appreciation, that contributed to the prepayment rates negatively. For the 2004 vintage, the mortgage interest rate was also diminishing the prepayment incentives for subprime borrowers.

For vintages 2005 and 2006, the sole contributing factor for the prepayment and refinance rate, again, was house price appreciation. However, because the housing market slowdown resulted in a reverse trend in housing prices, the contribution was of the opposite sign compared to the earlier vintages. All else equal, pre-origination house price appreciation contributed positively, tending to increase refinance rates; however, the magnitude of the current, post-origination, housing values declined adn the lower refinance rates prevailed. In other words, the door to a refinance opportunity was closed with declining housing prices and refinancing were were largely taken over by by defaults in the termination rates of subprime mortgages.

4. Concluding Remarks

The subprime mortgage crisis of 2007 resulted in a massive wave of foreclosures. A large proportion of foreclosures and serious delinquencies in this wave consisted of mortgages originated in 2006 and 2007. This phenomenon is also known as early default. Much of the debate among researchers and policy makers involves causes, consequences and remedies for these early defaults and foreclosures. What was left unexplained, however, is the temporary nature of subprime loans. This study shows that loans originated in any year from 2001 to 2006 generally had a life of less than three years. In fact, almost half of these loans exited the market - through either prepayment or default - within the first two years of origination; about 80 percent of them did so within the first three years.

Even though mortgage termination rates have been remarkably similar for all origination years evaluated one, two, or three years after origination, the split between default and prepayment rates varied. There seems to be a J-shape in default rates calculated from 2001 to 2006 origination years. The trough of the pattern corresponds to the
years 2003 and 2004, when the housing market was booming. When default rates are small, refinancing rates are high. When the trend in the housing market reversed, refinancing became impossible and defaults took their place.

The evidence presented in this paper is consistent with Demyanyk and Van Hemert (2008), who explain that the crisis - the unusually high default rates among 2006 and 2007 vintage loans - did not occur because these loans were in some respects much worse than all loans originated earlier. Subprime mortgages were very risky all along; however, their true riskiness was hidden by rapid house price appreciation, allowing mortgage termination by refinancing/prepayment to take place. When prepayment became very costly (zero or negative equity in the house would increase closing costs of a refinancing), defaults took their place.

The results in this paper also suggest that subprime lending did not increase homeownership, as the number of defaults in a limited sample (the data used covers about 50 percent of all subprime mortgages) of the purchase-money mortgages is almost equal to the estimated number of first-time home buyers. Had the data for the rest of the market been available, the number of defaults would no doubt be even greater.

There are several questions that remain unanswered and may require further attention. First of all, the available data do not allow us to determine what happened to those loans that terminated but did not default (terminated through prepayment or refinancing). Mortgages originated as a refinance tend to refinance again within a couple of years after origination and they tend to default as well. If more comprehensive data become available, this may be an issue worth investigating from the perspective of the affects on homeownership policy discussion. Foote, Gerardi, Goette, and Willen (2008) raise the same question and explain the difficulty associated with answering it. Second, several studies indicate that the materialized risks associated with subprime mortgage lending had a nature beyond observable and measurable factors, such as the credit score, for example (Demyanyk and Van Hemert (2008) and Haughwout, Peach, and Tracy (2008)). We do not know much about this risk apart from it existing and increasing over time. More sophisticated models and more comprehensive data are needed to answer this question.
References


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delinquent mortgages: Bad credit or bad economy? Staff Report no. 341, Federal Reserve Bank of New York.


Comments and Observations on the Paper by Yuliya Demyanyk

Exit Strategy: The Role of a Short Loan Life in the Subprime Crisis

Henri Pagès
Banque de France

Understanding the Subprime Mortgage Crisis

Yuliya Demyanyk and Otto Van Hemert have produced a first-rate paper carefully documenting delinquency rates in the US securitized subprime market. Their analysis is based upon available empirical evidence from 2001 through 2007. I enjoyed reading the paper, especially since the unfolding global financial meltdown was providing me with a deep sense of its relevance for us today.

I found the paper topical, comprehensive and ambitious. First, the authors demonstrate the important point that, despite its apparent rise between 2003 and 2005, the subprime mortgage market was in fact hiding a continual deterioration in the underlying quality of loans, which in fact could have been detected long before the crisis erupted. Second, the loan-level database they use (about 7.5 millions loans) is enormous and covers 85 percent of all securitized and about half of all US subprime mortgages. I marvel at their being able to come to grips with the difficult problems presented by a random sample of one million. They mention, for example, that the data is of poor quality in the flexible hybrid segment. Third, they are looking for explanations of the crisis and to this effect bring their data to bear on existing models of lending cycles and banks’ underwriting standards. This is certainly a difficult task.

The paper provides many insights into the US subprime market and its main points are exposed with craftsmanship. Most importantly, the deterioration in “adjusted” delinquency rates, i.e., the residuals one obtains after rates have been purged of their usual determinants, is both monotonic and predictable. This is interpreted as a standard lending boom-bust cycle. Somewhat surprisingly, the poor performance is not confined to any particular segment, and robustness tests confirm that
it is uniform across the types, characteristics and purposes of mortgage loans. The higher deterioration associated with high LTV ratios only reinforces the importance of low house price appreciation among determinants of delinquencies. Finally, the evidence on risk premiums is consistent with the idea that investors are well aware of the risks but simply tend to disregard them in their quest for high yields.

Although I concur with the main thrust of the argument, I think there are a few caveats that make it only plausible and yet not certain. My first quibble has to do with the extent to which one should draw inferences from a model that is likely to be misspecified. The results can be viewed as a joint test of a deterioration hypothesis and a model of credit delinquencies. When you dig deeper in the econometrics, you find that correlation between delinquencies, non-stationarity in parameter estimates, trends in prediction errors altogether suggest that there might be alternative ways to tackle the issue.

I also wonder whether one could better disentangle demand effects (i.e., investors’ willingness to increase exposure to subprime MBSs, thereby causing deterioration in credit quality) from supply effects (i.e., originators’ decision to securitize subprime loans and buy credit protection, as a substitute for collateralization). After all, Wenying has just shown this morning that securitization could go hand in hand with lower insolvency risks (lower time deposit premiums). I believe that these demand and supply effects could be at the origin of a potential selectivity bias.

Finally, I’d like to suggest a change in the title. Yuliya and Otto claim to have written a paper on understanding the subprime mortgage crisis. But regarding the underlying causes of the crisis, what is specific about securitization as opposed to underwriting decisions? Is this an adverse selection problem, stemming from poor incentives to screen loans at origination, or rather a moral hazard problem, with poor incentives to monitor loans once they have been securitized? What about the recommended policy given our understanding? For these reasons I think the paper is really about measuring the subprime mortgage crisis. Here my quarrel is with the title, not the content.

1. Correlation issues

The paper isn’t quite explicit about the underlying distribution of delinquency “events,” and apparently treats them as independent
indicator variables. I assume the logit model is estimated under maximum likelihood, where the log-likelihood is simply the sum of the likelihood of independent binary variables. In models of multi-name credit, however, underlying assets are typically assumed to be correlated. This is indeed how CDO tranches are quoted in credit derivatives markets, where base correlations play the same role as implied volatilities from equity options.

To show this in the context of the present model one can use a one-factor model with logit copula. A delinquency event will be defined as \( \{Y_i > 0\} \) with

\[
Y_i = \beta' X_i + \rho v_t + \epsilon_i,
\]

where \( X_i \) stands for the independent variables in the paper, asset \( i \) belongs to year \( t \), \( v_t \) is a common factor, and \( \epsilon_i \) an idiosyncratic shock with the logit distribution. (The threshold is normalized to zero because \( X \) includes a constant.) It is easy to see that the conditional likelihood takes the form

\[
\Pr(event_i|v_t) = \Phi(\beta' X_i + \rho v_t)
\]

where \( v_t \) is the “vintage” factor inducing correlation among delinquencies in a given year.

How should the common vintage factor \( v_t \) be treated in the analysis? If it is reasonably quantified by some macroeconomic aggregate (such as the change in unemployment considered in the paper), one should obviously include it in the columns of \( X \). If it is an unobserved factor, the likelihood of the sample should be averaged across all possible states given the assumed factor distribution. In contrast, the paper takes an alternative view: the latent factor \( v_t \) is a vintage dummy (fixed as opposed to random effect) reflecting the underlying quality of the pool given banks’ underwriting standards at origination. The punch line of the interpretation is that (i) any relationship between loan quality and (say) unemployment is spurious, (i) a monotonically increasing \( v_t \) indicates a deterioration in loan quality and (iii) the vintage dummy \( v_t \) can be estimated at any time using information up to that time.

The paper offers three specifications. The first (baseline case) without vintage dummy produces the residuals which are then interpreted as “adjusted” delinquency rates. The other two include
a vintage dummy, first constrained to be a time trend and then unconstrained. Treating \( v \) as a fixed effect in these regressions implies that no correlation should be left among individual probability of delinquencies. What do the data say about the underlying correlation in a given year? Perhaps some kind of principal component analysis would give some hints. More importantly, the adjusted delinquency rate in the baseline case is associated with the error term \( \eta_i = \rho v_t + \epsilon_i \) which must be uncorrelated with the columns of \( X \). This naturally gives rise to Hausman-like specification tests. Results reported in Section 4 are a good case in point: the assumption of constant regression coefficients is strongly rejected across different periods and across different groups of loans. This casts some doubts about the chosen specification.

2. Selectivity bias

Evidence from mortgage rate equations (in level or in subprime-prime spreads) raises questions about whether credit risk was properly priced. The main themes are that securitizers were aware of the overall riskiness in the subprime market – as mortgage rates became more sensitive to LTV ratios – but that their appetite for debt couldn’t be curbed in light of the search for high yields – as shown by the downward trend in the spread prediction error. Securitization is an endogenous decision. The decision of originators who commit to lending and that of securitizers that dictate the mortgage rate are determined jointly. As a result, the characteristics of those who benefit from a securitized mortgage loan are likely to be different from those that do not. The paper concentrates on borrowers whose loans were securitized. Correcting for selectivity bias requires in principle a probit equation which distinguishes securitized from non-securitized debt. Ideally, one would want to create a set of observations that would match the spread equation in the paper – the demand by investors for exposure on subprime MBSs – with a corresponding selection equation – the supply of originators willing to securitize subprime mortgages. Following Heckman, such system can be identified by the non-linearity of the fitted probability and by the inclusion of independent variables in the selection equation that are not included in the spread equation. Although the current data doesn’t allow to do this, it should be recognized that the results so far may fail to be robust to the selectivity
bias. Consider for example a rise in the prime rate. Equation (7) in the paper shows that there is a shift in the spread equation, as default probability on subprime loans is affected. (The direction and magnitude of the shift will of course depend on the unreported $\beta_1$.) But there may be a shift in the securitization share also, as a higher prime rate may lock the bank into higher fixed-rate mortgage rates. Whether or not the spread prediction error will maintain its downward trend in this setting is less clear.

3. Causes of the subprime crisis

If the paper successfully links the deterioration of quality in the subprime market to the classic lending boom-bust cycle, the link with the literature quoted is loose. Dell'Ariccia and Marquez (JF, 2006) for example show that when the mass of unknown borrowers reach a critical point, banks are better off not collateralizing loans. This is interpreted as a reduction in asymmetries across banks. But there is no theory of how information asymmetries change over time. Although the data is broadly consistent with Dell'Ariccia and Marquez, it cannot be considered as a direct test of the implications of their model. The case is somewhat more problematic with Ruckes (RFS, 2004). Ruckes’ model starts from the premise that average default probabilities decline as the economic outlook improves. The latter improved in the first period of the sample, yet the performance of mortgage loans continued to deteriorate. Berger and Udell (JFI, 2004) have attrition in the ranks of loan officers. This is clearly an aspect that is overlooked in the analysis. The paper has in fact little to say about existing theories of the lending boom-bust cycle.

Finally one would expect that a paper highlighting the causes of the subprime crisis would somehow help looking for a cure. For example, on whom does the paper put the blame for the disease, and what should be done about it? Should one focus on the originators of subprime loans with loosening underwriting standards? Or securitizers who package them into opaque marketable securities? Or investors showing insatiable appetite for risk, to say nothing about policy makers or central banks? Let me at this stage point out another plausible (admittedly non substantiated) interpretation. There isn’t any deterioration of underwriting standards at play. Rather, the problem lies in the poor monitoring of outstanding loans. Banks monitor only if their payoff under monitoring exceeds the private benefits of shirking. But actual
securitization contracts such as CDOs may not be incentive-compatible. The equity tranche they hold becomes ineffective once it is exhausted, and the fees they collect help them partake in the recoveries even when the delinquency rates are high.

In sum, Yuliya and Otto have written a very stimulating paper. They provide clear evidence based on new and comprehensive data that the rise and fall of subprime mortgage market masked a continual and predictable deterioration in loan performance. Their finding is quite consistent with the standard lending boom-bust scenario, although I find not quite compelling whether the deterioration was indeed the reflection of loosening underwriting standards, of poor monitoring once mortgages were in place, of industrial organization at work (e.g., competition), of poor macroeconomic management or an ill-designed regulatory framework. In any event, the paper provides the right empirical backdrop against which more accurate theories of delegated monitoring of risky and imperfectly correlated loans might unravel the true story behind the current dramatic developments.
Abstract

This paper aims to provide an overview of sovereign wealth funds (SWFs) with regards to the sources of their funding, investment patterns and growth in size in recent times. Furthermore, it provides insights into the role of these funds during the subprime crisis and the implications of this on our global financial markets.

Following an assessment of the benefits against the risks of these funds, it is evident that they do not pose a significant threat to their recipient countries and to the financial stability of the markets. Furthermore, any concerns regarding lack of transparency and non-commercial motives are best addressed through adherence to international guidelines developed by the OECD and the IMF for both the SWFs themselves as well as the recipient countries. At the same time, regional and global financial integration could reduce the political risk associated with some strategic investments made by SWFs in certain parts of the world.
1. Introduction

Sovereign wealth funds (SWFs) have attracted considerable public attention due to their recent emergence as an important investor class. Initially their growth was driven by oil and commodity revenues, but recently the large budget surpluses experienced by Asian countries have also contributed to the increase in SWFs.

Since the inception of the first SWF, the Kuwait Investment Authority, in 1953, these funds have been known to pursue long-term investment strategies. Whilst they traditionally invested in US Treasury bonds, there has been an increasing shift towards risky investment classes such as equities. However it was not until the subprime crisis in 2007 that SWFs became the focus of public attention, following the purchases of stakes in major financial corporations. During this period, SWFs asserted their ability to act as a stabilising force in the financial markets through their capital injections.

The investments made in financial institutions during the subprime crisis, coupled with the rapid growth of SWFs in developing countries, have raised concerns regarding financial market stability, lack of transparency and poor governance structures. If not addressed, these concerns may lead to a protectionist backlash amongst recipient countries.

Establishing international standards and guidelines for both SWFs and their recipient countries can reduce the risk of a backlash against SWF investments. To date, the newly established SWF International Working Group sponsored by the IMF aims to develop a set of self-regulating guidelines for SWFs, while the OECD is aims to develop guidelines for countries who are recipients of SWF investments.

The remaining parts of this paper are structured as follows: section 2 provides an overview of the SWF, section 3 discusses SWF investments in different parts of the world, Section 4 provides information about the size of SWF by country, Section 5 discusses SWF in the light of sub-prime credit problems, Section 6 deals with strategic and political objectives of SWFs, section 7 presents the current discussion by the IMF, the EU and the OECD regarding the code of conduct for SWFs and section 8 concludes.
2. An overview of Sovereign Wealth Funds

Sovereign wealth funds (SWFs) are state-controlled investment vehicles which own and manage public funds. Although there is no commonly accepted definition of SWFs, they tend to be state-owned and have no explicit liabilities. They are also likely to have a substantial exposure to foreign investments. There are a number of justifications of outsourcing public funds to SWFs, including revenue stabilisation, diversification, optimising returns on reserves and saving for future generations.

2.1. Sources of sovereign wealth

The first source of sovereign wealth is the commodity revenue from resource-rich countries, as stated by OCED (2008). This could be either as a result of the revenue generated from the actual sales of the natural resources or could be due to tax revenue generated from private corporation’s activities in some primary commodities (as argued by OECD, 2008). In these countries, SWFs have been operating for decades, since the Kuwait Investment Authority was established in 1953. Other notable examples of oil-exporting countries that operate SWFs include Qatar, United Arab Emirates and Saudi Arabia. In countries such as Chile, Botswana and Kiribati, SWFs are funded by alternative natural resources such as copper, diamonds or minerals. Today, the largest commodity-based SWF is the Abu Dhabi Investment Authority, with over USD 700 billion in estimated assets under management.

A second group of countries establishes SWFs as a result of large current account surpluses. This is prevalent in export-oriented economies within Asia, where ‘excess’ foreign exchange reserves are accumulated to manage inflexible exchange rate regimes. Conventionally, these reserves have been invested by the central banks in liquid sovereign debt as well as precious metals such as gold. More recently, the investment of reserves into SWFs allow countries to earn a higher return on reserves, which is discussed in further detail in Section 2.2.

2.2. Rationale for outsourcing to SWFs

Revenue stabilisation

For countries whose SWFs are funded by oil and commodity revenues, SWFs serve the purpose of stabilising export revenues which would otherwise mirror the volatility of oil or commodity prices. In this
case, the SWF serves as a liquidity pool which is replenished at times of favourable commodity price inflows, and which can be drawn upon in cases of low asset prices or shortages of reserves.

**Risk-return optimisation**

As mentioned above, SWFs also allow for countries to earn a higher return on reserves. Based on conventional reserves management as undertaken by central banks, portfolios are typically invested in short-duration, high-grade government securities and money market instruments. The real return on such investments has been approximately 1% in the past 60 years. In contrast, the equivalent real return on typical pension fund portfolio is almost 6%, as highlighted in Table 1.

**Table 1**

Annualised risk and return of investment portfolios

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Average real return % p.a.</th>
<th>Annualised standard deviation of return %</th>
<th>Probability of negative real return for 10Y holding period %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical central-bank portfolio</td>
<td>0.98</td>
<td>1.24</td>
<td>37.0</td>
</tr>
<tr>
<td>Typical pension fund portfolio</td>
<td>5.75</td>
<td>12.45</td>
<td>12.5</td>
</tr>
<tr>
<td>All-US-stocks portfolio</td>
<td>7.11</td>
<td>19.37</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Source: Kern, 2007

**Intergenerational savings**

Furthermore, with the high and sustained oil and commodity prices in recent times, commodity-based SWFs have gradually evolved into intergenerational savings funds. The accumulation of savings for future generations is based on the assumption that natural resources are non-renewable and will be exhausted after a period of time. A notable example is Norway’s Government Pension Fund. A second rationale for creating a savings fund is that superior international competitiveness of domestic industries can be a transitory phenomenon, which may substantially change over the course of time.

**Diversification and reducing excess concentration**

The revenues from oil and other commodity exporting countries are exposed to substantial concentration risk. This is due to their
dependence on the natural resource sold on international markets. Additional risks include an appreciation of the real exchange rate due to the sale of natural resources, which in turn reduces the competitiveness of other sectors in the economy. Establishing SWFs allows for national wealth to be invested internationally and thus diversifies revenues and reduces concentration risk.

Even for countries that do not rely on commodity exports, SWFs provide mechanisms for breaking up concentrations of portfolios that increase risk. For example, China currently has USD 1.5 trillion of Chinese reserves, invested mainly in the US Treasury market. This not only distorts the yield curve in the US, but yield effects could potentially hurt both China and the USA. Shifting assets to SWFs allow for the reduction of foreign exchange reserve concentration.

3. Investments of sovereign wealth funds

3.1. Long-term focus

The fact that SWFs have no explicit liabilities allows them to pursue long-term investment strategies and this has been the case for most SWFs to date. In particular, the savings funds established to provide for future generations will be more likely to have a long term investment horizon.

3.2. Level of risk

In addition, the absence of liabilities also has a bearing on their willingness to take on risk. As such, the share of risky assets in a SWF portfolio is often substantial and accounts for more than half of total assets. Traditionally, SWFs invested in US Treasury bonds but have gradually shifted to a more diversified investment portfolio and have accepted a higher level of risk to access higher returns.

3.3. Asset allocation

In recent times, there has also been a shift in asset class allocation by SWFs. A trend of increased allocation to equities has been observed, as well as an increased exposure to high-yield alternative assets such as private equity and real estate.

Figure 1 shows the official holdings of US Treasury securities by foreign governments. The increased trend of foreign holdings reflects Japanese and Chinese foreign exchange intervention policies. Singapore
and OPEC are both associated with the largest SWFs, yet have very little holdings of US Treasury securities. This is evidence that SWFs follow a diversified investment strategy and do not concentrate their holdings on Treasury securities alone.

Table 2 presents a summary of some of the largest sovereign wealth funds and reflects the trend of high levels of foreign investment as well as medium to high levels of risky assets such as equity by the majority of SWFs.

Source: OECD, 2008
Table 2
Characteristics of the world’s largest sovereign wealth funds

<table>
<thead>
<tr>
<th>Country</th>
<th>Fund</th>
<th>Assets (USD bn)</th>
<th>Foreign investment</th>
<th>Equity investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil exporters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAE</td>
<td>Abu Dhabi Investment Council</td>
<td>400-800</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Norway</td>
<td>Government Pension Fund – Global</td>
<td>373</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>SAMA</td>
<td>300</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Kuwait</td>
<td>Kuwait Investment Authority</td>
<td>213</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>UAE</td>
<td>Investment Corporation of Dubai</td>
<td>20-80</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Qatar</td>
<td>Qatar Investment Authority</td>
<td>20-60</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Libya</td>
<td>Libya Investment Authority</td>
<td>20-60</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Brunei</td>
<td>Brunei Investment Authority</td>
<td>10-50</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Norway</td>
<td>Government Pension Fund – Norway</td>
<td>~20</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Russia</td>
<td>Future Generations Fund</td>
<td>~24</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>East Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>China Investment Corporation</td>
<td>~200</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Singapore</td>
<td>Government Investment Company</td>
<td>~130</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Exchange Fund Investment Portfolio</td>
<td>~112</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Singapore</td>
<td>Temasek Holdings</td>
<td>~108</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Korea</td>
<td>Korea Investment Corporation</td>
<td>~20</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Source: European Central Bank, 2008
Notes: figures are only rough approximations. “High” and “Low” refer to shares above two-thirds and below one-third respectively.

3.4. Investment activity

With regards to the level of investment activity, Figure 2 shows that since 2003, there has been a rapid increase in the investment activity of SWFs, both in terms of the number of deals and their size. This is due to a number of factors in recent years. One of these factors is the massive trade imbalance between China and the US which led to a significant increase in China’s foreign reserve in recent years. The strong economic activities in China and some other emerging countries have also been important in this process. The rise in the price of oil and the massive increase in the income of some oil exporting countries have also contributed to an increase in the foreign reserve assets of certain countries. At the same time, involvement of SWFs in rescuing some of the financial institutions that have been affected by the sub-prime problems could be another factor in this process. Strategic acquisitions of some mining resources or high tech companies in certain countries such as Australia or the US by some of these SWFs could be another factor in the significant increase in the number of deals and deal volumes.
4. Size of sovereign wealth funds

Due to the opaque nature of SWFs, the exact size of the funds is uncertain. OECD estimates that the total pool of assets lies between USD 2 to 3 trillion, a figure which has already surpassed the total value of hedge funds. Also, based on their current growth, this figure could reach USD 12 trillion by 2015 according to private sector estimates (Jen, 2007). In a very recent report by the IMF, it is estimated that SWFs could increase to 5-6 trillion USD over the next five years.

4.1. Size of SWFs by country

Figure 3 provides a comparison of the largest SWFs by country. It is evident that asset holdings are relatively concentrated in a small number of funds, with the top five funds accounting for approximately 70% of total assets (Johnson, 2007). Oil exporters from the Middle East, as well as Norway’s sizeable Government Pension Fund, account for the largest portion of total assets managed by SWFs. A smaller fraction in the order of USD 600 million is accounted for by Asian emerging economies such as Singapore and China.
4.2. Comparative size of SWFs

The 2 to 3 trillion USD managed by SWFs is relatively small when compared to other assets under management. Figure 4 shows that although the size of the top five SWFs has exceeded that of hedge funds, they are still relatively small compared to the USD 50 trillion managed in total by private asset managers, in particular mutual funds (Beck, 2008).

Source: European Central Bank, 2008
In addition, Figure 5.1 shows, as reported by Kern (2007), the estimated total assets under management of SWFs compared to other asset classes. Although the SWF market is more than twice the size of the hedge fund industry, they are relatively small compared to other institutional investors. For example, they represent only a seventh of the global investment fund industry (USD 21 trillion in assets under management) and less than 5% of bank assets worldwide.

![Figure 5.1: Sovereign wealth funds in comparison](source)

**4.2. Size of SWFs and foreign exchange reserves**

The levels of foreign exchange reserves are a significant factor in determining future SWF growth. Foreign exchange reserve levels are likely to increase rapidly in the future if high commodity prices are sustained and if the US dollar remains weak.

Figure 5.2 presents estimates of foreign exchange reserves by country. Members of the Gulf Cooperation Council such as the UAE and Kuwait have been accumulating foreign assets in SWFs for decades; hence have relatively modest levels of foreign exchange reserves.

On the other hand, some emerging countries like China that initiated their SWFs in recent times, they are holding well above the required amount of foreign exchange reserves. However, over time, this imbalance may well be addressed.
Global reserves have been growing since the late 1990's, with Japan being the main driver of this growth. This is especially during periods of a weak US dollar, where Japan carried out large interventions. Since their currency devaluation in the mid 1990s, China has surpassed Japan as the major holder of foreign reserves, with over USD 1.5 trillion in total. More recently, this growth has accelerated further, and China accumulated USD 446 billion in the year to September 2007, compared with only USD 247 billion in the year to December 2006 (IMF, 2007). It is expected that the process of transferring these accumulated reserves to its SWFs will result in continued growth in the total size of SWF assets.

The growth of global reserves alongside China’s stock market is shown in Figure 6. It is evident that there is a strong relationship between growth of global reserves and China’s stock market growth. As OCED (2008) stated, the reason for this trend is that investors invest in emerging countries as a way of diversifying their risk. As capital moves to countries like China where there is a fixed exchange regime in place, the interest rate remains low. This in turn would assist the local stock market to grow rapidly.
Figure 6
Global reserves and China’s stock market


Figure 7 shows the growth rates of private equity deals and global reserves over time. Between 2001 and 2003, both global reserves and global private equity have experienced phenomenal growth. However in recent times, the private equity bubble has finally burst whilst global reserves levels have continued to increase.

Figure 7
Global reserves and global private equity

Source: OCED, 2008
Figure 8 shows the growth rates of global reserves alongside a commodity price index constructed by the Reserve Bank of Australia. This index has a heavy weighting to materials used by China, including energy, base metals and bulks and constitutes one of the bubbles that SWFs invested in. Between mid-1998 and early 2006, it appears that the growth of global reserves mirrors the increase in commodity prices. However in recent times, global reserves have continued to grow despite the fall in commodity prices.

Figure 8
Global reserves and commodity prices

Source: OECD, 2008

5. SWFs and the Subprime Crisis

5.1. Investments made by SWFs during Subprime crisis

Considerable public attention has been cast on SWFs recently, in particular on their investments made during the subprime crisis in 2007. Last year, the majority of major SWF investments that were made public were placed in financial institutions and SWFs have contributed about $41 billion of the $105 billion of capital injected into major financial institutions since November 2007 (IMF, 2008). Their injections of capital into the markets came at a critical time, when risk-taking capital was scarce and market sentiment was pessimistic.
Table 3
Recent investments by SWFs (2007-2008 Q1)

<table>
<thead>
<tr>
<th>Sovereign Wealth Fund</th>
<th>Acquired Company</th>
<th>Transaction Value</th>
<th>(In USD Billion)</th>
<th>(% of firm value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIC of Singapore</td>
<td>UBS</td>
<td>9.8</td>
<td>8.6</td>
<td></td>
</tr>
<tr>
<td>Abu Dhabi Investment Council</td>
<td>Citigroup</td>
<td>7.6</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>GIC of Singapore</td>
<td>Citigroup</td>
<td>6.9</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Investment Corporation of Dubai</td>
<td>MGM Mirage</td>
<td>5.1</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>China Investment Company</td>
<td>Morgan Stanley</td>
<td>5.0</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>Temasek (Singapore)</td>
<td>Merrill Lynch</td>
<td>5.0</td>
<td>11.3</td>
<td></td>
</tr>
<tr>
<td>Qatar Investment Authority</td>
<td>Sainsbury</td>
<td>3.7</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>KIA (Kuwait)</td>
<td>Merrill Lynch</td>
<td>3.4</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>China Development Bank</td>
<td>Barclays</td>
<td>3.0</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>China Investment Company</td>
<td>Blackstone</td>
<td>3.0</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>Investment Corporation of Dubai</td>
<td>London Stock Exchange</td>
<td>3.0</td>
<td>28.0</td>
<td></td>
</tr>
<tr>
<td>Temasek (Singapore)</td>
<td>China Eastern Air</td>
<td>2.8</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>SAFE (China)</td>
<td>Total</td>
<td>2.8</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>SAFE (China)</td>
<td>British Petroleum</td>
<td>2.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>KIC (Korea)</td>
<td>Merrill Lynch</td>
<td>2.0</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>Temasek (Singapore)</td>
<td>Barclays</td>
<td>2.0</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Qatar Investment Authority</td>
<td>London Stock Exchange</td>
<td>2.0</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>Temasek (Singapore)</td>
<td>Standard Chartered</td>
<td>2.0</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td>Undisclosed “Middle East investor”</td>
<td>UBS</td>
<td>1.8</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Abu Dhabi Investment Council</td>
<td>Carlyle Group</td>
<td>1.4</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Investment Corporation of Dubai</td>
<td>Och-Ziff Capital Management</td>
<td>1.3</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>Investment Corporation of Dubai</td>
<td>Mauser Group</td>
<td>1.2</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Investment Corporation of Dubai</td>
<td>Alliance Medical</td>
<td>1.2</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>GIC of Singapore</td>
<td>Myer Melbourne</td>
<td>1.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>China Citic Securities</td>
<td>Bear Stearns</td>
<td>1.0</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Borse Dubai</td>
<td>Nasdaq</td>
<td>1.0</td>
<td>19.9</td>
<td></td>
</tr>
<tr>
<td>Investment Corporation of Dubai</td>
<td>Standard Chartered</td>
<td>1.0</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Investment Corporation of Dubai</td>
<td>Almatis</td>
<td>1.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>GIC of Singapore</td>
<td>Merrill Lynch Financial Centre</td>
<td>1.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: European Central Bank, 2008
Table 3 provides details of major investments by SWFs between 2007 and the first quarter of 2008. Many of these transactions were in the financial sector and while they were significant in size, usually only a minority stake is purchased on the company. Also, a common feature of these transactions is that they are privately negotiated as opposed to being executed in the public markets. Finally, the transactions often involved convertible bonds, high-yielding bonds that are to be converted into equity stakes in the future (IMF, 2008).

It may be premature to draw strong conclusions, given the short-term nature of the data, added to the fact that these investment patterns may be simply due to the high weight of the financial sector in global capital markets. However, it does support the view that SWFs acted as a stabilising force in the financial markets during the subprime crisis, abating short-term market volatility.

This is especially since stakes in global banks were purchased when their credit default swap (CDS) spreads were negatively affected and their stock prices at their lowest levels (Beck, 2008). Figure 9 shows the CDS spreads of selected financial institutions between the 2007 and 2008 period. The vertical lines represent capital injections at a point in time, and it is evident that stakes were purchased when CDS spreads were at a record high. Some examples of prominent investments made by SWFs during the subprime crisis include stakes purchased in UBS, Citigroup, Merrill Lynch, Credit Suisse and Morgan Stanley.
For these banks, the capital injections by SWFs provided an increased capital buffer. This made it easy for banks to continue their business without attempting to reduce the size of their assets. Table 4 examines these purchased stakes and suggests that the share prices and elevated CDS spreads have been stabilised as a result of the capital injection. In most cases the initial share price reactions to SWF investments were positive, since announcements of an asset write down usually went hand-in-hand with a capital injection from SWFs. In addition, the share price volatility also declined following the capital injection, supporting the view that SWFs could have a volatility-reducing impact on markets. However, it is important to keep in mind that these are short-term results and further study is required to determine long-term impacts of the stabilising role of SWFs in financial markets.
Table 4
Capital injections into financial institutions and market response

<table>
<thead>
<tr>
<th>Date of Announcement</th>
<th>Financial Institution</th>
<th>Writedown</th>
<th>Investors</th>
<th>Amount (USD b) / % total stake</th>
<th>SWFs</th>
<th>Other</th>
<th>SWFs</th>
<th>Other</th>
<th>Stock price (%)</th>
<th>CDS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 Nov 2007</td>
<td>Citigroup</td>
<td>$6b Q3 2007</td>
<td>Abu Dhabi Investment Authority</td>
<td>$7.5 / 4.9%</td>
<td>-1.2</td>
<td>-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Dec 2007</td>
<td>UBS</td>
<td>$18b 2007</td>
<td>GIC of Singapore</td>
<td>$9.7 / 10.0%</td>
<td>$1.8 / 2.0%</td>
<td>1.4</td>
<td>-9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Dec 2007</td>
<td>Morgan Stanley</td>
<td>$9.4b Q4 2007</td>
<td>China Investment Corporation</td>
<td>$5 / 9.9%</td>
<td>4.2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Dec 2007</td>
<td>Merrill Lynch</td>
<td>$8.4b Q3 2007</td>
<td>Temasek Holdings</td>
<td>$4.4 / 9.4%</td>
<td>$1.2 / 2.6%</td>
<td>1.9</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Jan 2008</td>
<td>Citigroup</td>
<td>$18.1b Q4 2007</td>
<td>GIC of Singapore, Kuwait Investment Authority</td>
<td>$6.8 from GIC Singapore / 3.7%, $3 from Kuwait Investment Authority / 1.6%</td>
<td>$2.7 / 1.5%</td>
<td>-7.3</td>
<td>-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Jan 2008</td>
<td>Merrill Lynch</td>
<td>$14.1b Q4 2007</td>
<td>Korea Investment Corporation, Kuwait Investment Authority</td>
<td>$2 / 3.2% from Korea Investment Corporation and Kuwait Investment Authority</td>
<td>$2.6 / 4.1%</td>
<td>-5.3</td>
<td>-12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Feb 2008</td>
<td>Credit Suisse</td>
<td>$2.85b</td>
<td>Qatar Investment Authority</td>
<td>-0.5 / 1-2% open market purchase</td>
<td>3.2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Immediate response refers to the change after announcement compared to the previous transaction day.

Note: The stock price of Citigroup rose 6.5 percent on November 28, 2007, the third day after the announcement of the first capital injection. The stock price declines of Citigroup and Merrill Lynch on January 15, 2008 were confounded owing to the simultaneous announcement of huge writedowns and dilution of the claims of existing shareholders.

Source: IMF, 2008

5.2. Implications

Liquidity

Inflows from SWFs into a range of asset classes can be expected. Given their tendency to pursue risky investments (see Table 2); equity markets are likely to benefit from such inflows, which will create increased liquidity and subsequently market efficiency (Devlin et al, 2007).

Financial stability

The large investments made by SWFs during the subprime crisis also led to concerns regarding the implications on financial stability. In particular, concerns relate to portfolio adjustments creating sudden reversals in capital flows and abrupt price changes. This in turn could potentially result in destabilising effects on both asset markets and whole economies.

However, such concerns are largely unjustified and in fact, a number of factors highlight the ability of SWFs to act as a stabilising force in the financial markets. As a group, SWFs are considered to be relatively conservative investors with a long-term investment horizon. With this in mind, they are more likely to be able to withstand short term volatility, with an expectation of higher returns in the long-term. Secondly, the funding base of SWFs is relatively stable. They are unlike hedge funds in that they are not restricted by capital requirements or investor withdrawals, hence are unlikely to liquidate their positions rapidly. In addition, they are not subject to capital adequacy or prudential regulatory requirements that need to be met (Kern, 2007).

Market opportunities and demand for asset management services

The asset management function of SWFs is similar to that of investment, pension and hedge funds. A number of market opportunities may also arise given that SWF's demand asset management and
investment services. Some SWFs outsource their funds to external fund managers, a notable example being the Korea Investment Corporation, which is estimated to have outsourced around three-quarters its investment portfolio (Kern, 2007).

**Impacts on exchange rates and asset prices**

Given the large size of some SWFs, as Kern (2007) and OCED (2008) stated, shifts in asset allocation could have significant impacts on the relative prices of the asset classes involved. For example, if it switches out of dollars into another currency, there will be an exchange rate impact. Similarly, switching out of one asset like a Treasury security to another such as equity stock will result in significant price impacts. Depending on the nature of the capital flow or allocation, the effects on price will vary. For instance, one would consider effects of changes on the portfolio due to significant increase in assets or as a result of sale of existing assets.

In addition, SWFs may cause a distortion of asset prices through non-commercially motivated purchases or sales of securities. This however, is unlikely given that most SWF portfolios are managed by a stand-alone investment manager or a well-regarded private fund manager. Due to this, they are no different from other market participants in their actions and investment goals.

**Home country benefits**

Despite the concerns associated with the risks SWF investment detailed below, an additional benefit of SWFs is that they contribute to the economic development of their home countries, providing a shield against the volatility of commodity prices. There are also diversification benefits associated with SWFs, and they can improve the risk-return profile of government-controlled portfolios. This in turn may boost financial and fiscal management capacities.

**Recent Financial Crisis**

The international financial crisis in late September and early October 2008 has discouraged SWFs to further expand their business activities in banking sector or any other sector that may not have strong short term positive performance prospect. This new episode is indicating that SWFs are not willing to simply own partially some of the US or European banks or other assets without considering the financial reality of the market. We are seeing less SWFs willing to partially own the US or European banks.
6. Risks and Concerns

6.1. Strategic & Political objectives

The state-owned nature of SWFs raises concerns for the recipient country, especially when controlling stakes are purchased in strategic industries such as energy, technology and infrastructure, or iconic domestic companies. The main concern is that their governance, investment objectives and asset allocations may reflect strategic and political objectives.

This may in turn aggravate protectionist pressures. For example, some developed countries are considering strengthening regulatory frameworks to screen potential acquisitions of domestic companies by SWFs. In addition, the US recently revised legislation governing its Committee on Foreign Investment (Truman, 2007). In Australia, the Federal Government moved to block Chinese companies from acquiring a large proportion of resource rich companies such as BHP or Rio Tinto, as a way of protecting “national security” in the wake of intense pressure from China to increase her foreign resources in iron and ore and other resources. In most cases, regulatory responses against SWFs are unjustified, given that most SWF investments are portfolio investments and do not involve a controlling stake in the company. Moreover, SWFs have had a track record of being passive long-term investors and there have been no instances where strategic assets have been purchased or political leverage exerted against recipient countries.

6.2. Lack of transparency and governance

The lack of transparency of such funds is also a concern. In fact, the seven least transparent sovereign wealth funds are estimated to account for almost half of all SWFs’ holdings. These funds tend to originate from countries with relatively low levels of institutional development.

The extent to which SWFs are transparent, as well as whether low disclosure is related to other institutional factors is examined in Figure 10. A corporate governance index for SWFs proposed by Truman (2007) is used as a measure of transparency, which is then compared to two indicators of institutional development including (i) an index of the quality of the legal system and ii) an index of the democratic accountability of the government.
It is evident that a large degree of heterogeneity in transparency exists. In addition, there is a systematic pattern whereby SWFs with low transparency are associated with economies with low scores in quality of the legal system and/or democratic accountability. This combination of low corporate governance standards with low levels of democratic accountability is likely to raise concerns and in turn, may aggravate protectionist pressures.
However, there may be valid reasons as to why SWFs do not disclose details of their investment activities. Given their size, SWFs have the ability to materially influence the prices of particular securities. Disclosure of their investments may result in large price impacts, as well as increasing the risk of investors who may ‘shadow’ their portfolio adjustments to earn windfall profits.

7. International standards for SWFs

Developing an international consensus around standards and guidelines for SWFs may be helpful in improving the governance structures of SWFs and reduce the risk of a protectionist backlash against SWF investments.

7.1. IMF response

In response to a spate of investments made by SWFs, the G7 requested that the IMF and OECD develop best practices for both recipient countries and on the investor side of SWFs. As a result, the IMF-sponsored ‘SWF International Working Group’ was established in May 2008 and its members represent SWFs from 23 nations. In its recent meetings in July, the SWF International Working Group has been focused on developing a set of self-regulating industry guidelines, also known as ‘Generally Accepted Principles and Practices’ (GAPP). In particular, the GAPP will address issues of increased transparency and voluntary disclosure for SWFs. The group will meet again in September, with an aim to develop a set of guidelines by October (IMF, 2008).

7.2. OECD response

In April 2008, the OECD released a report of guidelines for recipient countries and their policies towards investments by SWFs. These guidelines are based on existing investment instruments which call for the fair treatment of investors, with a commitment to non-discrimination, transparency, progressive liberalisation and undertakings not to introduce new restrictions.

A process of regular ‘peer review’ among recipient countries is also encouraged, to monitor observance of the above principles.

7.3. EU response

In addition to the development of international guidelines, the
European Commission is also proposing a common EU approach to deal with issues of transparency, predictability and accountability. It is expected that a voluntary code of conduct will be developed, with standards in areas of transparency and governance.

In the area of governance, the standards will deal with issues such as:

- Clear allocation and separation of responsibilities
- Issuing of an investment policy that defines the overall objectives of SWF investment
- Operational autonomy for the entity to achieve these objectives
- Public disclosure of the general principles of a SWF’s relationship with government authorities
- Disclosure of general principles of internal governance that provide assurances of integrity
- Issuing of risk management policies.

Similarly, in the area of transparency, the standards will address:

- Annual disclosure of investment positions and asset allocation
- Exercise of ownership rights
- Disclosure of the use of leverage and of the currency composition
- Size and source of an entity’s resources
- Disclosure of the home country regulation and oversight governing the SWF

8. Conclusion

If SWFs continue to grow as they have been to date, the implications are a shift in asset allocations and the emergence of a new investor class in the market. At the same time, concerns arise regarding their threats to financial stability, lack of transparency and non-commercial objectives. It is important when dealing with SWFs to consider their many benefits over the risks. Furthermore, there exists scope for improving the transparency and accountability of SWFs through the development of international standards for both SWFs themselves and their recipient countries.

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is important when dealing with SWFs to consider their many benefits over the risks. Furthermore, there exists scope for improving the transparency and accountability of SWFs through the development of international standards for both SWFs themselves and their recipient countries.

The success of China, India as well as an increase in the income of oil exporting countries as well as resource rich countries such as Australia and Chile are going to increase the amount of capital flowing into different parts of the world in the form of the SWFs. Some of the investment opportunities such as access to mines in iron ore and other resources by Chinese companies in Australia would be treated as national security in Australia. Similarly, attempts by Chinese companies, supported by their SWF to acquire some of the strategic companies in the US or in Europe where China would get access to military technology would be seen as national security issues.

Financial globalisation is removing many national barriers for foreign investment. Capital is more mobile than ever before. At the same time, the growth in SWFs has created an interesting dynamic in the process of financial globalisation.

It should also be noted that the voluntary codes of conduct for SWFs proposed by the IMF and others may not necessarily reduce the fear raised by some countries or groups, as some of these SWFs could still operate in a less transparent way. However, such challenges could be similar to some other capital flowing to offshore centres and tax havens. At the same time, the process of regional and global financial integration, as extensively discussed by Li, Moshirian, Pham and Zein (2006) and Moshirian (2007), could lead to better international codes of conduct for all investors around the world which in turn could ensure that SWFs would also become more transparent in their reporting activities.

In the Asia Pacific region, discussion on an Asian Union by 2020, similar to the EU model, could reduce tension between China and other countries that are currently the recipients of capital from China. In the same way that Germany and France or Spain are able to work closely together and not see the acquisition of resources as a national security threat, it is possible, subject to realistic progress towards an Economic Union in Asia, that China owning mines in Australia may no longer be an issue of national Security. However, as long as some political tension remains amongst major countries such as China, Russia and the US, aspects of SWFs could remain a controversial issue for the 21st century.
References


Fariborz Moshirian has written a very interesting analysis of sovereign wealth funds. After providing an overview of sovereign wealth funds, Moshirian discusses their implications for financial stability and in particular their investments during the subprime crisis. The paper is informative. I will suggest that it is less convincing, though, about the issue of risks and concerns than about the other topics covered.

Moshirian is adding to a very new research area. A search on SSRN in early September 2008 turned up 20 distinct papers on sovereign wealth funds. All of them have 2008 dates for completion of the working papers. The papers themselves cover a variety of topics relating to sovereign wealth funds, including papers on law and suggested practices for sovereign wealth funds.\footnote{A search for related words did not turn up papers on SSRN, so it is not just a matter of a new name being used for an old research topic.}

What is a sovereign wealth fund? As Moshirian indicates, sovereign wealth funds are government-controlled investment vehicles that own and manage government assets. Maybe partly because of the specific issues that I will raise, I will use the name “government investment funds” sometimes to mean the same thing as “sovereign wealth funds.” The name “sovereign wealth fund” is less obvious than it might be, at least in terms of American uses of the words. “Sovereign” is seldom used; “wealth” is all-encompassing and therefore somewhat vague. From one point of view, definitions don’t matter as long as they are clear. Sovereign wealth funds could just as well be called “RRR” and, if “RRR” is defined the same as “sovereign wealth fund” is defined, then the analysis would be identical. While logically correct, names can affect thinking.
What are the concerns about government investment funds? Government investment funds invest in other countries. It seems to me that there basically are two concerns. First, a foreign government might take actions that destabilize financial markets. Second, a foreign government might affect the military technology available to a country. This effect can occur if a foreign government gets access to military secrets. A foreign government also might restrict a country’s access to military assets in the country or take actions that make military assets in the country vulnerable.

The issue concerning financial stability is whether a sovereign wealth fund might take financial actions that destabilize markets in a way that makes residents of another country worse off. Stated this way, my immediate answer is “Yes.” There is no reason to think that governments have the well-being of foreigners in mind when making choices. The predominance of stabilizing actions in markets is due to agents’ self-interested attempts to maximize their wealth. Governments are not generally motivated by maximization of their wealth.

A more pertinent question is whether sovereign wealth funds’ actions that adversely affect financial stability are likely to be rare or relatively common. The investments made by sovereign wealth funds since the onset of the subprime crisis suggest they can make stabilizing investments, although this is limited and equivocal evidence.2

The evidence in Moshirian’s paper in another context suggests that the returns on government investment funds typically are lower than returns on mutual funds and other investments. This generally is interpreted as evidence of incompetence.

The lower returns also can be interpreted as evidence of sacrificing returns to pursue other goals. And indeed, it does not take much of a search to find evidence of investments made for reasons other than maximization of the value of the fund’s assets. For example, the People’s Republic of China agreed to use $300 million of its foreign exchange reserves to buy Costa Rican government bonds and to provide additional

2In fact, the losses on the investments could be interpreted as evidence that the investments were destabilizing. At the time of the investments, the subsequent losses were not so obvious.
annual aid to Costa Rica. These actions were in exchange for Costa Rica switching diplomatic recognition from Taiwan to the People’s Republic of China (Bowley, New York Times, September 12, 2008.)

Nonetheless, my supposition is that sovereign wealth funds probably do not take actions that destabilize financial markets much more often than other investors. Why? The government with an investment fund generally has to be willing to make people in its country worse off to make people in other countries worse off. On the other hand, it is improbable that a general statement can be made that countries will not take actions merely to make others worse off. Governments do take actions that make people in other countries worse off even though they make people in their own countries worse off – think of war. In fact, government sometimes engage in wars with other countries with the express purpose of making citizens of other countries worse off.

This brings up the general issue of sovereign wealth funds and national security. When a foreign government buys assets in a country, it is possible for the country’s national security to be compromised. In some ways, this is a tough topic to analyze. People often say that national security is improved by some government action that just happens to benefit them personally. This suggests skepticism, although it does not make the issue bogus. For example, it would make little sense for the U.S. government to allow the Russian government investment fund to buy a defense contractor in the U.S.

It is hard to get beyond either the obvious or mere assertions concerning government investment funds and other countries’ national security. This issue deserves a serious analysis. Restrictions on sovereign wealth funds’ investments in foreign countries are inevitable.

Overall, this paper is an informative, early summary of sovereign wealth funds’ characteristics. It also does a nice job of summarizing the investments by those funds during the subprime crisis.

The paper ends by saying “[A]s long as some political tension remains amongst major countries such as China, Russia and the US,

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3 This is generally correct if the investment fund is small relative to other countries, but not all investment funds are small and it is not the small ones that raise concerns.
aspects of SWFs (sovereign wealth funds) could remain a controversial issue for the 21st century.” I would turn both clauses into unconditional predictions: Political tension will continue amongst major countries such as China, Russia and the U.S. Related aspects of sovereign wealth funds will continue to be controversial for the 21st century.

References

FIFTH PAPER
SUBPRIME CREDITS OR SUBPRIME POLICIES?
THE DERIVATIVES CONUNDRUM

Paolo Savona
Emeritus Professor of Political Economy, Luiss G. Carli University, Rome

Chiara Oldani
Lecturer of Economics, University of Viterbo “La Tuscia”

Rainer Masera
Professor of Political Economy, Guglielmo Marconi University, Rome

Giancarlo Mazzoni
Surveillance Department, Banca d’Italia, Rome
Guglielmo Marconi University, Rome

Part I
by Paolo Savona

I.1 - Subprime policies: the original sin
I.2 - The US real estate bubble and the direct investment strategy

Part II
by Chiara Oldani

II.1 - Over-reaction and financial distress
II.2 - The role of derivatives
II.3 - Soaring inflation and global slowdown

Appendix
by Rainer Masera and Giancarlo Mazzoni

Valuation, Capital Requirements, Accounting Standards and the Role of Derivatives in the 2007-8 Financial Crisis.
A.1 - The fallacy of composition
A.2 - The pricing and the rating of fixed income and structured products: cash vs. derivatives underlying
A.3 - Counterparty Risk and Exchange Option

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Part I
I.1. - The original sin: subprime policies

Economists of the world over have inundated the media and scholarly publications with essays explaining the causes of the turbulence provoked by the subprime mortgage loan crisis. Few had foreseen, well in advance, that the possible outcome if this high-powered lending business was combined with the explosive growth of the financial derivatives market\(^1\). Their warnings went unheeded, both by the mainstream of the profession (most economists viewed to produce “proofs” of the excellent properties of derivatives), by policymakers (whose sole aim, for reasons we shall see, was to bolster the real economic growth rate) and by market operators, who wallowed happily in the risk they were creating.

The explicit cost of this situation is estimated at around one trillion dollars, half already recorded and the rest still to be written off as bad debts. This already substantial cost has been followed by astronomical stock exchange losses – which may possibly be recouped – and incalculable losses in real economic activity and in credibility.

Yet again, we are faced with a dual failure: market and government failures. The first part of the present work does not aspire to treat this highly philosophical and intensely polemical topic but instead to go to the roots of the crisis, which are not in fact those that most post-crisis analyses have examined. In Part II, we will argue that those analyses have not provided an exhaustive explanation and offer a synthesis with some suggested supplements. The Appendices formally presents and briefly discusses our reference model. The model does not consider the role of the fixed exchange rates applied by some of the leading trading powers, though this is a key aspect of the diagnosis set out in Part I.

The weakness of the explanations that have been suggested is that they depict the subprime crisis as a sort of parthenogenesis of the institutional order in being (consisting of both financial instruments and regulations). True, some reference has been made to the pathological behaviour of the markets, along the lines of the “irrational exuberance” of the “dot.com” boom, but very little attention has been paid to proper pathology, i.e. the violation of the existing rules, and less still to the far more pernicious market pathology of ignorance. In fact, this ignorance

was fed in part by the rush of economists to demonstrate empirically that derivatives were enhancing the efficiency of individual choices and the rationality of market performance. Since its inception in 1996, I must say, the AssCarli-Cesifin Colloquia have raised valid objections, but without denying the invaluable function of the market – if, of course, it is well managed².

Our approach is to go back to the policy origins as the first cause of the problem. We reject the parthenogenetic explanation, i.e. the argument that the crisis was endogenous to the institutional arrangements of the financial markets; that thesis, in our view, can explain the markets’ overreaction in the face of the initial dimensions of the problem and its rapid spread across the globe.

The real genesis of the crisis lies in the legacy of the defunct Bretton Woods system. The legacy was claimed chiefly by the United States and accepted passively by the rest of the world (Britain and Europe, and especially its core, the euro area). “En route”, let is be said, that legacy was shorn of the convertibility of the dollar into gold and the control of international capital movements. America continued to create dollars, because the rest of the world was willing to hold them, so it could continue to sustain domestic demand in excess of own resources. American economists have advanced two mirror-image explanations: Kindleberger, Despres and Salant contend that the US payments deficit reflects differing liquidity preferences between global areas – higher in the rest of the world than in the United States. Bernanke and others have argued instead that in some countries the propensity to save is greater than the propensity to invest, and accordingly that the United States performs a precious service for the rest of the world by investing this excess saving. The validity of this thesis could be tested only if the United States had in place an economic policy designed to stop domestic demand from outrunning America’s internal resources, once it has been recognized that the flexible exchange rates suggested by the abandonment of Bretton Woods have not worked as expected; and if America were to forgo the dollar’s dual role as domestic and international

² The AssCarli-Cesifin Colloquia began at the initiative of prof. Alberto Predieri who suggested analyzing the economic and legal impacts of the uncontrolled diffusion of financial innovations on international markets. A group of experts met six times in Italy (in Florence, Venice, Foligno and, this year, in Lucca) to exchange views on the behavior of international monetary system and derivatives markets. The proceedings of the last four gatherings have been published by the two institutions.
currency and accept an global standard of value (whether you call it “bancor” or SDR is a matter of indifference).

As I have been arguing for some time now, with the derivatives boom the problem of dollar creation via the balance-of-payments deficit no longer consisted solely in excessive domestic demand. The spot demand for dollars, large though it was, paled into insignificance if compared with the forward demand generated by derivatives, as reality has now made clear. Chasing spot demand and ignoring forward demand, central banks lost control of the potential money supply and of money and financial market stability. And the world is now paying the price of a multifaceted crisis – with banking and finance in severe difficulties, economic activity slackening and inflation resurgent - - because monetary policymakers’ hands are tied: they are obliged to pump liquidity into the market to ward off systemic crisis.

This problem, imposing enough in itself, has been compounded by the weakness of the formulas used to value derivative contracts, which – whether out of negligence or bad faith is hard to tell – misled the markets and the rating agencies.

Another serious error was permitting the trade liberalization agreements reached under the WTO to be applied à la carte as regards the exchange rate regime. This accorded with the US desire to bolster its economic growth rate while running an external payments deficit but clashed with the need for exchange rates to reflect the terms of trade between economies, i.e. for global competition to be based on the economic fundamentals and not on the ability of governments to maintain exchange rates incompatible with equilibrium and so generate mounting official reserves. The oil producing countries, and even more

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3 I have been insisting on this thesis in a number of articles and books (the last one in L’esprit d’Europe, Rubbettino, Soneria Mannelli 2007). Lawrence Summers recognizes this need but thinks it is impossible for the United States to deliberately seek such an adjustment. However, the adjustment could stem from the nature of things; that is, if the American economy goes into recession, provoking a “market” adjustment that economic policy as such would never be able to achieve [see La centralità perduta degli Usa (The US lost their world centrality), in Il Sole-24 Ore, August 31, 2008].

4 Elsewhere (“Global Development and the Dollar: a Conflict to Be Solved”, in Financing Development. The G8 and UN Contribution, edited by Michele Fratianni, Paolo Savona and John J. Kirton, Ashgate, Adelshot 2007) I have argued that the economic side of this reality, though casting worrying shadows over world growth, is less important than the geopolitical side, given that official reserves are being converted into euros – thus producing an appreciation of the European currency not justified by the area’s balance of payments – or used to create sovereign wealth funds – made, that is, into an instrument for altering the world socio-political equilibrium. The problem arose as a geo-economic issue but has now become geopolitical.
importantly China, have in fact recouped the discarded part of the Bretton Woods legacy – fixed exchange rates and capital controls – and reaped the obvious benefits.

This is the reason why we believe that the current crisis, which was manifested in the subprime mortgage market, actually originated in “subprime” policies. That is where economists must direct their attention: to devising solutions that get at the causes, not just patching up the effects. Albeit with our reservations concerning geo-economic and geopolitical behaviour, we share the profession’s generally positive judgment of the way monetary and fiscal policymakers have coped with the crisis. But we cannot refrain from pointing out that in the name of realpolitik they have had to retract the incessant preachings of rigour that they had inflicted upon public opinion for so long and all the lessons they had so grandly dispensed around the globe.

In conclusion, the “original sin,” i.e. the genesis of the crisis, can be traced to:

(a) the economic policy of the United States (which, when it comes down to it, is simply politics), with its traditional fiscal and monetary support to domestic aggregate demand, joined more recently by the innovative forms made available by the market (the dot.com and real estate bubbles), with the corollary that the dollar is their currency and our problem\(^5\);

(b) the possibility of trade being conducted under diverse exchange rate regimes and the free exploitation of official reserves for purposes other than dealing with adverse balance-of-payments situations.

The parthenogenesis of the crisis, then, stemmed from:

(c) allowing the derivatives market to develop in the unregulated over-the-counter sector\(^6\);

(d) permitting the banks to dispose of their entire risk (inevitably the worst assets) by shifting from the originate-to-hold model of credit to

\(^5\) In Part II and in Appendix A.1 the emphasis is on the excesses of money creation by the Fed during the 24 months before the crisis, followed by a sudden rise in official rates, which led to an explosive acceleration of defaults on subprime mortgage loans. In my analysis these two aspects are considered the effect of the original sin: the pegging of the real growth rate for the US economy beyond domestic resources.

\(^6\) A leading Italian expert of financial innovations, Renato Maino, has produced a more detailed list of the impact of this development including the expansion of trading activity by new financial intermediaries, an abnormal lowering of the risk premia, the fateful attraction of institutional investors in search of new investment opportunities, the new IFRS accounting rules.
the “originate-to-distribute” system and thereby, de facto, circumventing the capital adequacy requirements;

(e) permitting trade in innovative financial instruments to be founded upon valuations generated by probabilistic formulas based on unacceptable assumptions, calculations that some scholars have called “nonsense”.

We must act also on these system features, not only on policies, if we are to avoid the large-scale replication of the effects of the parthenogenetic component of the crisis. It has been estimated that subprime mortgage loans accounted for a mere 2 per cent of the entire stock of financial liabilities in the United States, but the entire world economy went into crisis.

I.2. - The real estate bubble and the direct investment strategy

Since the 1970s an idea that has been gathering adherents within the economics profession and coming to influence policy choices is that the fiscal policy of deficit spending had been overdone, crowding out economic activity. The consensus was that monetary policy is ineffective in providing real stimulus, partly effective in curbing inflation, but important in shaping expectations. There was a reversal from demand-side to supply-side policies, concentrating on monetary and fiscal rigour, privatization and liberalization.

Bereft of Keynesian stimulus but spurred by the need for growth, the market developed its own policies. At first, these consisted in exploitation of the new information and communications technology and foreign direct investment. Later, when the dot.com surge was played out, the instrument became credit-financed construction activity. The effect of the twofold economic policy rigour, then, was to call forth a new model of endogenous (market) growth, and in fact people began to talk about the “new economy”.

Economists may be divided into those who trace the business cycle to monetary instability (in particular the Chicago school) and those who see the cause in the instability of the real economy (the Keynesian school). A closer look at economic history suggests an alternation between cycles

that originate in money and financial market disequilibria and others that are provoked by real economic disequilibria. This means that markets, of whatever type, are intrinsically instable and need careful policy designed to regulate their activities in the interests of stability.

The “new economy” manifested its instability in outbursts of what was rightly called “irrational exuberance,” but policymakers did little to render it rational. Instead, they worked for a “soft landing” to re-enter into stability. With a market correction that involved plummeting stock exchanges, the “dot.com” cycle ceased to be the engine of American growth. Once again, however, the market, in conjunction with the desires of the Administration backed by the Fed, found the solution: a massive construction boom fueled by a mortgage market in which the originators of the loans transferred them to other investors in the form of derivatives.

The Bretton Woods-style American model was preserved (less fixed exchange rates and capital controls), and with it the growth of the world economy. But as it entailed a massive balance-of-payments deficit (5 to 6 per cent of GDP), the model also had to work for other countries if they were to be disposed to fund America’s excess domestic demand with their own savings. Foreign direct investment, which expanded enormously and in some periods actually exceeded exports, was the market’s tool for “squaring the circle” of global growth. Further, as the real estate bubble and direct investment nevertheless both require public policies to limit their undesirable effects – the former, to be sure, more strongly than the latter – in markets that are less than perfectly competitive; and as these initiatives came in an environment in which American monetary policy was one of benign neglect; and as the diversity of foreign exchange regimes altered the terms of trade, the mounting imbalances led to a crisis for global economic development.

This is not the place for a treatment of the complex geo-economic system within which world trade is conducted, which needs to be radically reformed by the great powers. All we want to do here is to emphasize the innovative vitality of the market, ever seeking growth, and the dire necessity for economic policy, or rather geo-economic policy, to move coherently to curb the market’s excesses and bring out its potential. It can also be observed, naturally, that this is easy to say but hard to do. Yet it has to be said; and above all, heeded.
II.1. - Over-reaction and financial distress

The pursuit of price and financial stability is the aim of monetary management in a world where the importance of traditional paper money has lowered. In February 2007 large mortgage lenders started to report relevant losses, and credit spreads were affected; on August 9th BNP Paribas questioned the value of assets backed by US sub-prime mortgage debt held in its own funds (Cecchetti, 2008, p. 6). Short-term spreads increased fast, all market participants started looking at each others’ balance sheets and the supply of inter-bank lending dried up. The resulting higher financial volatility reflected in the entire European and American yield curves, and forced central banks of G7 countries to intervene in order to sustain the inter-bank market liquidity and avoid a credit crunch.

The credit spreads increased thanks to the substantial mis-pricing of risks and prices, allowed by financial deregulation. The collateralization of financial and real estate assets has fuelled credit supply. The result has been the fallacy of composition in the balance sheets of operators, as explained in greater details in the appendices by Masera and Mazzoni. In order to achieve a greater soundness, the correct valuation of assets and pricing should be put in the first place of the agenda of G7 central banks and financial ministers, and international authorities (IMF and BIS, among the others). The fallacy cannot be solved but at the balance sheet level.

The volatility and the drying up of liquidity and credit negatively influenced operators’ expectations, which hit their lowest value in Summer 2008. The combined negative effects of soaring inflation induced central banks to revise their action in the second half of 2008, from expansionary to restrictive. Nevertheless, the original sins and the roots of financial distress have not been yet addressed and solved, and then the probability of success for central banks is quite low, resulting in the very negative growth forecasts for the world economy in 2008-09.
Graph 1
US Federal Fund and European Euribor Rates (Monthly, %)

Source: Thomson Financial Datastream.
Moving from this complex background, we argue that the hypothesis of agents’ rationality in financial markets does not hold up. In particular, agents showed to have limited rationality (mis-pricing), while opaque and not-so-liquid OTC derivatives markets (especially credit derivatives) had negative monetary effects. This is supported by the results of the Appendix A.2, where we present an analytical model to price fixed-income securities whose payoff depend on cash or derivatives underlying. In particular, we show how the convexity of the underlying affects both the pricing and the rating of these instruments. Closed form results are in fact presented for the derivation of PDs (i.e. the rating) and their time evolution and variance.

On the other hand, the problem of counterparty risk, deriving from OTC transaction, is analyzed in Appendix A.3, where we argue that this risk, which is generally underestimated in current models, can be assessed by considering the potential credit exposure as an exchange option between two portfolios of derivatives.
The deregulation allowed the growth and spread of OTC
derivatives, which exacerbated the financial volatility, thanks to the
leverage effect. At the present, risks produced in the financial market
are not counter-balanced (i.e. produce losses) and central banks are
fine-tuning their action (Cecchetti, 2008) under still small disclosure
requirements. What deserves more investigation in the next future is
the structural modification of risk exposure, and moral hazard.

II.2. - The role of derivatives

Derivatives have a monetary nature, fairly close to the Keynesian
speculative motive for money (L2)$^8$, which has been ignored by the
literature$^9$.

The substitution of monetary assets by derivatives (and many
other innovative financial securities) can also work the other way round,
since in the presence of low interest rates and abundant liquidity, the
last is used to purchase innovative securities, fuelling the demand for
monetary assets$^{10}$. This process aliments itself, except when risks and
credit spreads change, or inflation arises and modifies the preferences of
central banks. Unfortunately over 2007-08 both events took place.

Derivatives have certain effects on the monetary transmission
mechanism, in particular on monetary aggregates, on the portfolio
substitution, on the interest rate channel, on the expectations setting.

1. Effects on monetary aggregates

In the presence of portfolio substitutions, financial operators
substitute monetary assets with liquid derivatives (e.g. rolled over T-Bill
futures). This modifies the information content of aggregates; aggregates
are measured and defined on the basis of the monetary function of their
constituents, and on their relationship with the underlying economic
activity. When financial substitution takes place, assets lose relevance
in the transmission mechanism, and are crowded out$^{11}$. The crowding
out is due to improvements in the system of payments, where there are

$^9$ This paragraph is synthesized from Oldani, 2008.
$^{10}$ This is quite straightforward if considering standardized, liquid and marketable
derivatives contracts (e.g. written on Treasury Bills, Bonds or stock indices).
$^{11}$ See the Lancaster utility model applied to money demand and financial innovation
(1971).
better tools for the payment of debt, and to financial substitution. In consumer-portfolio theory individual preferences are set toward special characteristics, like liquidity, profit (or costs) and risk. Introducing more attractive financial assets in the market crowds out less efficient and less attractive securities, improving the liquidity and pricing process of the innovative assets. This process is demand driven, in the sense that the finance industry introduces innovative instruments on a daily basis to satisfy customers needs; the market decides which innovation is going to survive, and “kills” other securities, by eliminating the demand. By looking at American non-M2 components of M3, we observe that there are efficient substitutes in derivatives market, both Exchange Traded and OTC. US M3 consists of M2 plus institutional money funds (IMFs), certain managed liabilities of depositories, namely large time deposits (LTD), repurchase agreements (RA), and Eurodollars (EU$). The Eurodollar futures and options contracts involve relevant resources, are traded since the Seventies, and are liquid and deep. The same risk-return profile of a time deposit and repurchase agreement can be obtained by means of rolled over Treasury Bills (and Bonds) futures and options.

The result of the prolonged substitution of monetary assets on wide monetary aggregates is the decision took by the US Federal Reserve to cease the measurement and disclosure of M3, after Bernanke took his office, because such monetary aggregate does not provide significant information on the underlying economic activity. The European Central Bank, on the contrary, considers the wide money aggregate M3 in its monetary strategy, but has never matched its desired growth rate.

Since 2006 the US Fed relies on a new measure of wide money: Money Zero Maturity (MZM). It is composed of M2 less small-denomination time deposits plus institutional money funds. These monetary assets provide useful information on the American economic activity, and indirectly confirm the lack of information provided by the Eurodollar, large time deposits (LTD), and repurchase agreements (RA).
Graph.3
US Money (Monthly, $ Billion)

Source: Thomson Financial Datastream.
Graph.4  
EMU Money Growth Rate (Monthly, %)

Source: Thomson Financial Datastream.

2. Effects on the portfolio substitution

Portfolio substitution is influenced by financial innovation. A very basic example is the time deposit, which is financially equivalent to a portfolio with a short future on bond, and a long position on the underlying bond\textsuperscript{12}. The spread of derivatives in portfolios is the result of the evolution of the payment system and can modify the dynamic of money and monetary base, on the basis of the degree of substitution. Moreover, the Goodhart law, which, after observing the evolution process of money, states that once you find statistical evidence or a rule the market circumvents it, offers a powerful explanation of the behavior of financial markets, when a definition of money is taken.

\textsuperscript{12} The underlying bond can be defined by the cheapest to deliver strategy. See Hull (2002) for details, and Angeloni and Massa (1998) on the economic equivalence.
Financial derivatives increase the speed of adjustment of financial markets, but at the same time introduce opaque market correlations. The efficiency of financial derivatives shorten the time necessary to respond to sudden changes in yields, spread and risks; this is a sign of pricing efficiency and market liquidity, but is also the effect of the leverage and the collateralization. The higher speed in the adjustment process has to be managed in a different way from the past, and, as underlined by Cecchetti (2008), over the recent months the US Fed “improvised”. The pricing rules of derivatives rely on restrictive hypotheses, such as the existence of complete market, of the risk free rate, and the log-normal distribution of returns (Hull, 2002). We have doubts on the effective reliance on these hypotheses, and if our doubts were true, the spread of derivatives would modify the markets’ and portfolio correlations coefficients, altering hedging strategies and dramatically reducing their effectiveness.

The economic consequence of financial replication is the selective replacement of inefficient assets. This structural process is not costless, and needs a funded balancing system, and, most of all, a reliable regulation and monitoring system to avoid herding.

3. The interest rate channel

The interest rate channel of monetary policy is heavily affected by derivatives (Savona et al., 2000, Violi 2000, Fan et al 2007). The structure of the banking system and financial markets determine both the speed and magnitude of the response of interest rates to monetary actions. Since markets and operators are very mature, the response of bank lending rates to monetary actions is relatively small, and longer policy actions are required to achieve the desired effect (Sellon 2002). The possibility to hedge allows firms to soften the blow if interest rates unexpectedly rise, weakening the impact of the maneuver (Fan et al 2007). The changes in financial structure have modified the working of the interest rate channel of monetary policy, and it can now work through the capital market as well as the banking system.

Monetary policy is concerned with financial innovation because it modifies the effectiveness of policy implementation and its ability to achieve targets. Monetary policy in most G7 countries relies on interest rate management, to achieve price and financial stability, employment, or to support an exchange rate target. Some central banks rely on the so

13 We are not alone: see Pablo Triana, 2006.
called Taylor rule, where the central bank short term interest rate reacts to deviation of the output from its potential level and to deviation of the inflation rate to the desired level. The literature investigated different specifications of the rule (Carare, 2005) on the basis of different periods, which altered coefficients and reactions.

A fully specified Keynesian model can be solved in the presence of a modified Taylor rule to explicitly consider the target of financial stability, other than output and inflation (Oldani, 2008). The modified Taylor rule can be specified as:

\[ r_t = \alpha + \beta(y_t - y_t^e) + \gamma(\pi_t - \pi_t^e) + \mu_t + \delta \sigma_t + u_t \]

where \( t \) denotes time, \( e \) is the expected value, \( r \) the interest rate, \( y \) is the output, \( \pi \) is the inflation rate, \( \mu \) is the exogenous value of the natural rate of interest, \( \sigma \) is the financial volatility and \( u \) is the error term. Empirical evidences (Oldani, 2008) support the statistical relevance of financial volatility in the Taylor rule on US data. The lack of a long time series for Europe makes not possible the investigation, but the role of financial derivatives on the European credit system has been already accepted and the Bank monitors futures and options markets to extract markets sentiment.

4. The expectation setting

Financial markets influence the entire economic system via investors confidence, and the wealth effect. The recent experience tough us that expectations influence the central bank interest rate setting; or is the other way round? Bidirectional effects cannot be ruled out. As a matter of fact, the ECB (2000) explicitly acknowledges the information content provided by interest rate derivatives; derivatives prices incorporate information on different characteristics associated with market expectations.

Soderlind and Svensson (1997) survey most applied techniques to extract market expectations from financial securities for monetary policy purposes. In particular, they underline the importance of implied forward interest rates and options prices to extract future time paths, or even the entire probability distribution (in the presence of very deep markets). An investigation of Japanese data (Nakamura and Shiratsuka 1999) confirms their theory. The econometric exercise on the ECB interest rate movements...
(Vahamaa 2005) adds that market expectations are asymmetric around monetary policy actions\(^{14}\), and that they change around policy maneuvers. The slope of the yield curve is usually viewed as a useful indicator of expectations about economic activity and inflation. Financial markets anticipate and “price in” changes in the official rates in determining the prices of assets. Derivatives contain information on different aspects of uncertainty, e.g. swap spreads, or the implied volatility of options. The implied volatility of German Bund future options increased during 1999–2000 while the implied volatility of three-month Euribor future options (the most important European banking rate) decreased steadily over the same period. The increase in uncertainty on German bonds failed to have a negative influence on the Euribor, while short-term uncertainty diminished. The information coming from financial markets, including the derivatives market, is taken into account in the way the ECB conducts monetary policy, but “Market expectations extracted from financial asset prices cannot be a substitute of future economic conditions.” (ECB, 2000) This seemingly simple statement is in fact a strong statement on the role of expectations. Those coming from financial markets cannot substitute those referring to future economic conditions. Financial rumors, or temporary deviations in asset prices, cannot influence monetary policy.

Moving further from the monetary nature of single contracts, a pioneering study (Upper 2006) looks at the existence of a statistically significant relationship between derivatives activity and the perception of monetary policy—the perception is captured by the unanticipated variation of the interest rate. The hypothesis is that derivatives are able to anticipate future fluctuations in monetary policy. Up to now, the literature has investigated it on the other way round, i.e. how monetary policy influences future prices. The exercise is run on monthly data (February 1999–June 2006) to abstract from day-to-day fluctuations on G3 countries, the US, Canada and Japan, characterized by highly liquid and developed financial systems. Derivatives considered in the analysis are exchange traded futures contracts written on Federal Funds, Eurodollar, Euribor, and Euroyen, which are the most traded and liquid contracts in these countries. Derivatives activity is represented by the turnover of futures contracts. The limit of the exercise is the

\(^{14}\) Vahamaa (2005) shows that market participants attach higher probabilities for sharp yield increases than for decreases around policy tightening. This confirms that expectations change around policy actions, and that they return to normal only after the change has taken place.
use of Exchange Traded contracts, which have various good substitutes in OTC contracts\textsuperscript{15}. The relationship between derivatives activity and changes in the interest rates is positive and visible in the G3 countries and Europe. Empirical results confirm that all variables are statistically significant except for the anticipated changes, which have no effect on turnover for any contract. Changes in expected interest rates rather than actual changes affect trading in derivatives on short-term interest rates\textsuperscript{16}. Upper’s study, although limited to three countries, shed light over a reverse causation among monetary policy and financial markets that merits further research.

Financial global governance is missing, but allowing free access to all operators to powerful financial securities has not eliminated global risks. Financial derivatives are one of the most interesting expressions of animal spirits, but since we are not sure that markets can automatically reach equilibrium, nor that all market players are fully rational, we support a certain degree of monitoring over these securities. Derivatives have been referred to by practitioners in the field as being very similar to hell: easy to enter and almost impossible to get rid of.

To sum up, working like the turbo in the engine, derivatives exacerbated losses, fuel turbulence, and alimented panic after August 2007. The fault of authorities has been first to deny their role since the last ten years, regardless of huge resources allocated in the business, and not to consider their economic effects after.

II.3. Soaring inflation and global slowdown

A concrete source of danger for the stability of the world prosperity is the sharp rise in inflation; according to the IMF’s \textit{International Financial Statistics (2008)}, global consumer price inflation is running at an annual pace of nearly $5\frac{1}{2}$ percent, compared with less than 4 percent average in recent years. This acceleration in headline inflation in large part reflects the impact of higher energy and commodity prices, but is also the result of benign neglect on commodities, and financial

\textsuperscript{15} Data referring to OTC contracts cannot be employed for estimates, because they are not sufficiently detailed, and the breakdown is too rough.
\textsuperscript{16} Upper (2006) admits that using higher frequency data might change these results, and that the econometric tests on stationarity provide contrasting evidence, suggesting that the robustness check might not support the evidence univocally.
markets. The seeds of inflation have been thrown on the global market since year 2000; in that year the US Federal Reserve reverted the policy stance, from restrictive to expansionary, and reduced Federal Fund rates to help the US economy to land softly. The cheap money financed US consumption and the real estate market. Another relevant mistake in the global architecture has been to allow emerging economies to unilaterally peg their currencies to the US dollar, regardless of their trade structure; this pushed for excessive foreign exchange reserves accumulation, which have been invested in the G7 financial markets.

The monetary expansion pushed down the short time segment of the yield curve; the long-term segment of the curve has been influenced by the excess supply of US bonds, to finance increasing public and war spending, and this supply has been happily purchased by China and other emerging economies. At the present currency reserves exceed US$3 trillion, and US debt exceeds US$ 5 trillion. This expansion came with a strong deregulation of credit, banking and financial systems.

An interesting interpretation of the dynamics of commodity prices is that by Jeffrey Frankel (Harvard University, 2008) who explains that the sudden increase in commodity prices is due to carry trade strategies by speculators, especially Over The Counter. Very low interest rates registered in the last five years in the US, Japan and Europe increase the demand for storable commodities, or decrease their supply, through 3 channels. The first is the decreased incentive for extraction today rather than tomorrow; the reason lies in the opportunity cost of extraction of oil, exploration of gold, or breeding of cattle. The second is the increasing firms’ desire to carry inventories (especially those strategic and particularly expensive, like oil or natural gas inventories held in tanks). The third is the growing speculation, which shifts in spot commodity contracts, and out of Treasury Bills; by looking at US data, it comes out that there is a strong negative covariance between commodity price index, and Federal Fund rate (Graph 5).
Exit way is through increasing liquidity injections to avoid a systemic crunch.
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Appendix

by Rainer Masera and Giancarlo Mazzoni

Valuation, Capital Requirements, Accounting Standards and the Role of Derivatives

Valuation problems represented one of the key issues highlighted by the recent crisis. The financial crisis that began in late July 2007 represented the first test of the new complex (derivative-based) structured-finance products, markets, and business models that had developed over the past decade. The absence of liquid markets, and the interaction of credit, funding and liquidity risk drove market valuations down to levels below theoretical assumptions: occasions of market failure emerged.

The absence of active markets for complex CDS credit products and the observed sales at prices below the theoretical value of their underlying cash flows have presented challenges to financial institutions.

The abnormally tight market liquidity conditions during the crisis intensified discussions on the role of fair value. While many view fair value as the best indicator of asset value at the time of measurement, taken on its own it may not be the best measure for making long-term, value-maximizing decisions. This arises because fair value reflects a single, point-in-time exit value for the sum of all the risks the market assigns to the asset, including credit and liquidity risks. If the market overreacts in its assessment of any risk component, then fair value will reflect this.

Some of the key assumptions and inputs used in valuation models of derivative-based assets proved inadequate, especially assumptions of single common factors and of independence between default probabilities and recovery rates. Practitioners relied on relatively limited datasets to estimate default probabilities, especially in the case of subprime mortgages.

During the upturn, the booming demand for derivative structured products boosted valuations and banks’ profits and equity. Conversely, during the downturn, valuations became depressed as demand and

* The authors take joint responsibility for this Appendix.
A.1 was mainly prepared by R. Masera; A.2 and A.3 were mainly written by G. Mazzoni.
liquidity evaporated. It is thus arguable that fair value accounting did not provide accurate information about the banks’ true risk profile through the cycle. The frequent incremental revisions in bank write-downs after the onset of the turmoil further reduced market confidence. When firms use fair value levels to implement decision rules, such as asset sales, scenarios are triggered that both generate unnecessary realized losses for the individual firm and contribute to a downward spiral of the asset price, thus compounding market illiquidity.

The recent crisis has also illustrated significant problems in the use (and usefulness of) credit ratings of structured products. In particular, the methodologies used by credit rating agencies were not able to capture the complexity of these instruments, given their multiple tranches and their susceptibility to rapid, multiple-notch downgrades. The complexity of these instruments led to an over-reliance on credit ratings by market participants.

Credit ratings have been a key input for many investors in the valuation of structured credit products because they have been perceived to provide a common credit risk metric for all fixed-income instruments. In particular, when reliable price quotations were unavailable, the price of structured credit products often was inferred from prices and credit spreads of similarly rated comparable products for which quotations were available.

Although credit rating agencies insist that ratings measure only default risk, and not the likelihood or intensity of downgrades or mark-to-market losses, many investors were seemingly unaware of these warnings and disclaimers. In any event, major mistakes were detected in agencies’ models.

This financial market crisis also revealed important implications deriving from the new capital adequacy framework.

The increased risk sensitivity of Basel II raised concerns about procyclicality, especially in a situation of market turmoil. Undercapitalized banks, because of large write downs, tend to make abrupt decisions to cut lending when there is evidence of a slowdown. Increased risk sensitivity under Basel II may help dampen some of these procyclical effects by increasing risk awareness and early detection of emerging problems, but any risk-sensitive capital framework will cause capital requirements to fluctuate non-linearly if a borrower’s creditworthiness strengthens or weakens.

In the internal-ratings-based approaches, the potential for
procyclicality is enhanced, and supervisors’ demand to increase capital
buffers exacerbated this situation.

The intensity of cyclicality is increased by the application of the
new accounting standards, which led in many instances to equating fair
value with mark-to-market and/or mark-to-model, even in situations of
evident market failure.

In the first section of this appendix (A.1) all these aspects are
analysed by trying to assess the risk of a possible fallacy of composition:
what holds for the individual, may not hold for the group as a whole.
The risk that the hardened application of the capital and accounting
standards may amplify the slowdown in economic activity, possibly
leading to a recession, is assessed.

In the second section (A.2) we present an analytical model to
price fixed-income securities whose payoff depend on cash or derivatives
underlying. In particular, we will show how the convexity of the
underlying affects both the pricing and the rating of these instruments.
Closed form results are in fact presented for the derivation of PDs (i.e.
the rating) and their time evolution and variance.

In the last section (A.3) we argue that the counterparty risk
deriving from OTC derivatives, which is generally underestimated in
current models, can be assessed by considering the potential credit
exposure as an exchange option between two portfolios of derivatives.

A.1 FALLACY OF COMPOSITION

Valuation, liquidity and capital in the financial industry: micro and
macro perspectives in the light of the new accounting principles,
the revised capital standard and the derivatives explosion.
by Rainer Masera

A.1.1 SUMMARY AND INTRODUCTION

The purpose of this note is to examine the challenges posed by
the new dimension of the financial turmoil as of mid 2008.

The current phase of turbulence is a sequel to the original
shocks which emerged in the spring of 2007. But the character of the
new environment is different and more complex. Liquidity and capital
management come at the forefront, with micro and macro drivers. More
specifically, there is now an interaction of monetary and regulatory
policies with the workings of the capital standard and the accounting principles. The paradox is that accommodating monetary policies - as synthesised by monetary base growth and negative real interest rates - may go hand in hand with the onset of a credit crunch. The issue of a potential fallacy of composition is explored. Investors fear that the period of financial turmoil may be prolonged and deep with recessionary developments and continuing inflation, defaults of corporations and delinquencies by households and hence further writedowns for financial intermediaries, in respect of non-performing loans, with the need to raise more capital. The dilemma for monetary policy is compounded by the complex impacts of derivatives and by the fact that base interest rates are low when confronted with headline inflation, but households and companies have to pay high risk premia to offset the anticipated risks of illiquidity and default. Hence effective interest rates are much higher. This is especially so when real interest rates are measured by deflating for core inflation rather than headline inflation.

The note is structured as follows. This introduction offers and overview of the real and financial sides of the crisis which erupted in 2007 (a more comprehensive interpretation and analysis is offered in Masera (2007) and (2008).

The second paragraph addresses the issue of the various facets of the notion of liquidity. The third paragraph examines the reasons of the crisis in valuation models of derivatives structures - the heart of the crisis -, and the implications for financial institutions through the working of new accounting standards. The credit channels are then examined in paragraph IV, in the light of the Basel II capital regime. The risk of a fallacy of composition leading to a self-feeding credit crunch is finally analyzed and some concluding remarks are offered, also with reference to regulatory policies.

The main features of the 2007 financial crisis are summarized in Chart 1 and outlined in this first paragraph.
*Excesses of subprime lending:* excesses of market operators, enthusiasm for leverage, underpricing of risk, lax monetary policy (too low real interest rates) and inadequate regulation to be blamed $\Rightarrow$ Excessive liquidity leading to underestimation of credit risk by original lenders and investors alike.

*Breaking down of valuation models:* very large “market losses” *(mark-to-market)* and confidence crisis, $\Rightarrow$ estimated total subprime market losses may reach between $400$ and $500$bn.

*Shift from B&H approach to O&T model in the banking system,* eased by the extensive use of synthetic securitisations and credit derivatives $\Rightarrow$ banks relaxed their role of delegated monitors and enforcers of loan contracts.

*Dichotomy from both regulatory (capital and accounting) and transparency point of view* between (i) regulated and (ii) alternative asset managers (hedge, private equity, sovereign wealth funds), which maintained, de facto, close links (SLV’s) with regulated intermediaries.

*Shocks to the credit rating system,* stemming from “mechanical” interpretations of Basel II and technical deficiencies/mistakes $\Rightarrow$ Rating agencies have not taken the place of banks in monitoring credit risk.

*The complex interactions between liquidity, funding and credit risks.* In times of stress, the price of an asset is more a reflection of the degree of liquidity shortage than of the asset’s intrinsic expected pay-offs. Overall market illiquidity determines the price level for each individual security.

*Procyclicality* of fair value accounting and the new capital standard with slow down in economic activity and perspectives of recession.
The new Basel II framework more closely aligns regulatory capital requirements with actual risks, which should lead institutions to make better decisions about extending credit, mitigating risks, and determining overall capital needs.

More specifically, if we focus our attention on asset classes affected by the turmoil we note that according to the new rules the risk weights applied to residential mortgages will be subject to a much more refined differentiation depending both on the credit worthiness of the borrower and on the potential for loss on the exposure. Similarly, Basel II attempts to more fully capture risks in securitized assets held both in the banking and in the trading books. For example, under the securitization approach of Basel II, capital charges are based on explicit assessments of the credit quality of the instrument. In contrast, under Basel I, capital charges had little relationship to underlying risk, being based instead, for example, on an instrument’s maturity and whether it was on- or off-balance sheet. In particular this tended to create regulatory arbitrage incentives.

However to gain a better understanding of this market turmoil it is important to recognize that the financial system has been deeply reshaped by three relevant structural changes which have seriously affected its soundness:

- the insufficient/ineffective monitoring performed by banking intermediaries handling structured products;
- the shift from the Buy-and-Hold (B&H) to the Originate-to-Distribute (OtD) intermediation model;
- the explosion in the use of complex derivatives structures, without proper understanding of their liquidity, funding and credit risks.

The growth of the Originate-to-Distribute approach in the mortgage market played an important role in the rapid expansion of mortgage lending (especially in US) until the recent market turbulence. That expansion was concentrated in the subprime and alt A segments of the mortgage market, where underwriting deteriorated at the point of origination. To an ever-increasing extent from around the middle of 2005 until about mid 2007, originators made loans that layered multiple sources of credit risk, including low documentation of borrower income, very high combined loan-to-value ratios, and loans with nontraditional payment schedules that sometimes allowed principal and interest payments to be deferred. In an environment of compressed risk spreads,
investors have more difficulty signaling concerns about credit risk, which may have reduced the incentives for originators to maintain strict underwriting principles.

On the other hand, the Originate-to-Distribute model of securitization created severe agency problems in which the agent (the originator of the loans) did not have the incentives to act fully in the interest of the principal (the ultimate holder of the loan). Notably, the incentive structures often tied originator revenue to loan volume rather than to the quality of the loans being passed up the chain. These agency problems resulted in lower underwriting standards, giving borrowers with weaker financial positions access to larger loans than they should have had. Investors in mortgage-backed securities apparently ignored the importance of these agency problems and did not adequately understand the risk characteristics of the securities they were holding.

The legal structure of structured products’ contracts behind credit derivatives represents another factor which can deteriorate the stability of the system by making more convenient for creditors to push the defaulting counterparties to bankruptcy rather than trying to rescue them.

Evidence emerges both from market practitioners and academic research (Hu and Black, 2008), that the incentives to avoid bankruptcy may have changed substantially. In fact, creditors who buy protection have developed a strong legal and economic incentive to push companies experiencing repayment difficulties into bankruptcy, rather than help to rescue them.

A crucial instance of the weaknesses in the infrastructure of financial markets was represented by the collapse of Bear Stearns.

During the week of March 10, 2008 rumors spread about liquidity problems at Bear Stearns, which eroded confidence. Its counterparties on thousands of over-the-counter (OTC) derivatives contracts would likely have had serious difficulty promptly determining their vulnerability to counterparty losses. Furthermore, their efforts to replace the hedges provided by those contracts would have placed additional pressures on markets that already were quite stressed. Likewise, providers of short-term secured funding through repurchase agreements (repos) and other forms of secured funding, including money market mutual funds and other conservative investors, could have unexpectedly found themselves holding various forms of collateral rather than the liquid funds they were expecting. These investors would probably have been hard-pressed to
dispose of this collateral and to manage their liquidity needs in a highly stressed environment. In light of potentially systemic consequences of a failure of Bear Stearns, the Federal Reserve took emergency action in the bailing out of Bear Stearns by JP Morgan - Chase.

The shift of banking model from B&H to OtD determined important changes also for the role played by credit rating mechanism that, in some sense, has become an indicator of liquidity.

The credit rating mechanism showed major weaknesses, and attention has been paid more to the rating itself than to its stability. Transition matrixes should indicate how likely it is that an instrument becomes illiquid within a short time, but conflicting indications arose notably with respect to CDSs. The stability of transition matrixes can, in any event, be questioned because of the shift from B&H to OtT.

Credit rating modelling rests on the assumption that transition matrixes would be fundamentally stable and can be therefore relied upon to estimate credit risks also from a forward looking point of view. The problem which arises is similar to that identified by New Classical Macroeconomics with respect to the use of macro-econometric models: expectations and market behaviour can bring forth instabilities in estimated parameters and relationships.

In retrospect, it is clear that investors were too reliant on credit ratings: because many of the securities were rated very highly by the credit rating agencies, investors did not understand the underlying risk and had a false sense of safety. Many structured finance products experienced multiple downgrades. The credit ratings agencies’ failure to correctly assess these underlying risks further undermined investor confidence and worsened market worries about future movements in the market.

When these problems came to light, investors--including leveraged financial institutions--took large losses as the values of mortgage-related assets were marked down in anticipation of higher defaults on the underlying collateral. The market for newly issued subprime and alt-A mortgage-backed securities virtually closed, and the availability of jumbo mortgages dried up. Banks were caught with assets they couldn’t securitize, which put further pressure on their capital positions.
A.1.2. BASE MONEY, ASSET LIQUIDITY/ILLIQUIDITY, EXTERNAL LIQUIDITY (FUNDING)

Before examining the linkages between liquidity, valuation and capital management in the current financial crisis, it is useful to address briefly the various facets of the notion of liquidity. The term liquidity is in fact often used loosely to refer to different concepts. This has been so for quite a long time. Going back to Keynes, in the Treatise, he defined as more liquid an asset than another if it is “More certainly realizable at short notice without loss”. In the simplified portfolio of the General Theory – where bond stands for a bundle of securities in general -, money is “the liquid asset”, all other assets are non-liquid.

Drawing on Keynes, Hicks (1967) marked the distinction between different concepts by referring to money as the (i) fully liquid asset. He then drew the line between: (ii) more or less liquid assets, i.e. assets that have some degree of liquidity and (iii) quite illiquid assets, which have no degree of liquidity being unsellable without notice, or having no prospect of being sellable without notice in any probable emergency.

This analytical approach is still useful: I have simply made a further distinction by separating base money from broader moneys, and by considering the liabilities of the Central Bank as the only fully liquid asset in the spectrum. Recall in this respect the common notion of central banks injecting liquidity into the banking system. The set of liquid/illiquid assets is not defined on an a priori basis. A lesson of the 2007/2008 financial turmoil is precisely that apparently liquid assets can become quite unsellable in conditions of stress.

In general terms, therefore, we can identify three distinct facets of the concept “liquidity”.

The first one is precisely that of central banks injecting or absorbing liquidity from the system. We refer here to base money and the dual concept of very short term interest rates;

The second phenomenon refers to the possibility of buying or selling assets in the market without causing significant movements in prices, and therefore generating limited losses in value (often this is also defined as “market liquidity”). Before the summer 2007, many intermediaries relied on complex financial structures in order to liquidize more and more large categories of assets.

The presence of guarantors, the security-like nature of products (with the absence of direct links to the underlying asset, i.e. the collateral),
the extensive use of regulatory arbitrage and a favorable monetary policy context created the illusion that ABS and other structured securities as CDO notes could allow aggressive leverage policies.

A more analytic definition of liquidity, as the one presented here, shows that the sole always-liquid asset is base money, while every other instrument’s liquidity depends on several external conditions, such as opportunity costs and the existence of an efficient market. When external conditions change (increasing interest rates, a rise in expected default rates, rating agencies’ errors, information problems and so on) investors’ confidence may fall and markets become less liquid (high spreads required), or totally illiquid, enlightening the poor flexibility of hypotheses behind valuation models.

There is, finally, a third concept of liquidity which must be identified: this refers to the difficulty that financial institutions (and other entities) can meet in “external funding”: this is the notion which is often referred to when reference is made to “banks facing a liquidity crisis”. Funding as a source of external liquidity is clearly intimately related to the two notions of liquidity previously examined: the principal link is related to the impairment of market liquidity of assets which can be used as collateral. The revolution in central banking refinancing techniques in 2007-2008 shows, in particular, the links between “funding” and “base liquidity”.

The three concepts outlined here are summarized in Chart 2.

**Chart 2**

Base money, asset liquidity/illiquidity, external liquidity (funding)
A.1.3. VALUATION MODELS IN CRISIS AND THE ACCOUNTING PRINCIPLES

Financial innovation and use of complex and sophisticated derivative structures (OTC products) posed important challenges in terms of valuation. The analytical implications of evaluating complex derivative-based financial assets are explored in Duffie and Garleanu (2001), Gordy (2005), Masera (2008). Two points may be underlined here: (i) the lack of robustness of many valuation models, which effectively broke down when the recognition of counterparty risk ignited illiquidity and funding problems, and (ii) the intrinsic weakness of OTC customized derivatives (especially CDS based) under stress.

The recent market turmoil revealed important weaknesses in banks’ risk management systems. It raised at the same time a number of issues regarding both the valuation of complex or illiquid financial instruments and the degree of transparency on those positions (Chart 3).
Chart 3
Breaking down of (Derivative) Valuation Models

- Difficulties compounded by
  - Financial innovation and use of complex and sophisticated derivative structures (OTC products)
  - Illiquidity of structured securities (due to lack of transparency and uncertainty about ratings) and regulatory requirements have led the practitioners to adopt 'stiff' mark-to-model and mark-to-matrix valuation approaches, accompanied by heavy ratings downgrades
  - Inadequate sovereign system
    - Agencies downgraded structured securities by 34 notches in 2007 and more than 3000 downgrades occurred only in October 2007

<table>
<thead>
<tr>
<th>Valuation Approaches</th>
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<tr>
<td>Mark-to-Market</td>
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<tr>
<td>Unadjusted quoted market prices in active markets for identical assets or liabilities</td>
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The valuation of assets and liabilities has implications for an institution’s financial position and the reading of its performance by users of financial statements. It influences measures that are of key importance for banking supervisors in carrying out their responsibilities, such as regulatory capital and risk weighted assets.

The main challenges posed by the market turmoil in terms of valuation of complex or illiquid financial instruments can be summarized as follows:
- Fair value pricing and accounting (according to IAS/IFRS) and the existence of an active market.
- Practices and governance surrounding the use of modelling techniques.
- Appropriate risk factors to be considered when determining a fair value.
- Implications for risk management in banks.
- Complexity of accounting designations (Chart 4).
# Chart 4

**Accounting Designation for Financial Assets Under IAS 39**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Balance Sheet</th>
<th>P &amp; L</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Held to Maturity</strong></td>
<td>• Recorded at amortised cost on the balance sheet</td>
<td>• Interest income is recognised in the P&amp;L on an accrual basis</td>
<td>• Only financial assets with fixed or determinable payments and fixed maturity with positive interest and ability to hold to maturity. Premature sale apart from a few exceptional circumstances leads to the ‘hitting’ and ban from using the category for above year period for all financial assets</td>
</tr>
<tr>
<td><strong>Loans and Receivables</strong></td>
<td>• Recorded at amortised cost on the balance sheet</td>
<td>• Interest income is recognised in the P&amp;L on an accrual basis</td>
<td>• Non-derivative financial assets with fixed or determinable payments that are not quoted in an active market, whether originated or acquired</td>
</tr>
<tr>
<td><strong>Trading / Fair Value Through P&amp;L</strong></td>
<td>• Recorded at fair market value on the balance sheet</td>
<td>• All fair value gains and losses flow through the P&amp;L.</td>
<td>• All derivatives. Other items intended to be actively traded (trading)</td>
</tr>
<tr>
<td><strong>Available for Sale</strong></td>
<td>• Recorded at fair market value on the balance sheet</td>
<td>• Unrealised fair value gains and losses go to equity (no impact on P&amp;L)</td>
<td>• Any asset other than trading, one-to this category at inception</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FX translation recognised in P&amp;L for monetary items</td>
<td></td>
</tr>
</tbody>
</table>
Prior to the market turmoil, complex structured and bespoke credit products were often valued on the basis of a variety of inputs as there was little secondary market activity. Valuation models included the pricing of instruments on the basis of new originations for similar products or the use of consensus pricing services (including market indices).

The drying up of liquidity in some markets took many financial institutions by surprise. The sudden disappearance of pricing inputs that were deemed observable prior to the crisis necessitated the quick development of new modelling techniques. The complexity of products to which the models had to apply was compounded by governance issues arising from the need to develop and verify these methodologies under significant market, resource and time pressures.

In this environment, significant differences and inconsistencies were observed between and within institutions as regards the process of resorting to modelling techniques.

On the whole, valuation difficulties were more acute for institutions which, prior to the crisis, relied only on few pricing sources. This is especially true when such pricing sources were deemed observable in markets with thin liquidity and when institutions did not have a clear assessment of the underlying risks and components of a transaction.

These difficulties were often amplified by the lack of appropriate resources (both in terms of quality and quantity) dedicated to model approval and review, independent price verification and stress testing, as well as internal control units.

As a result, significant heterogeneity was initially observed between institutions with respect to the modelling techniques and input factors considered for the valuation of similar instruments. While differences between modelling techniques are not a cause of concern as such, there have been doubts as to whether the modelling techniques and the related input factors were in all cases adequate for the determination of reliable fair values.

The market turmoil demonstrated that institutions were not always fully aware of the risks that they were incurring with respect not only to sub-prime but also to other exposures affected by the crisis. It can be questioned whether institutions carried out the necessary due diligence analyses before engaging in activities that involved the issuing of or the investing in structured products.

This applies in particular to the criteria that have been applied to
select the investments and the relevance of such criteria for the valuation of the products. Institutions should not solely rely on external ratings to guide them in their investment decision. External ratings should only be one factor or criterion that they use in their decision. It is crucial in that context that institutions obtain sufficiently detailed disclosure on the assets underlying securitised or structured products and their performance. Such information is key not only for investment decisions but also for the capacity to produce sufficiently reliable valuations in times of stress. More generally, the characteristics of the information sets available to market participants represent the main determinants of the form and the efficiency of the market.

The breaking down of valuation models has profound effects on financial institutions through the workings of the new accounting standards.

Fair value accounting, under stress conditions, led to mark-to-market evaluations of all credit portfolios in trading books, and hence had immediate repercussions on P&Ls and balance sheets.

There are here two questionable steps (1). The first is to assume that the fair value of an asset is the same as its true value. This is not the case, especially when markets are incomplete and when relevant asymmetries of information are present.

The second step is to assume that the marginal market price is the same as the fair/average price of an asset. This is also incorrect. In general, marginal pricing determines equilibrium of flow demand and supply, and can therefore differ from shadow average pricing for stock transactions.

The dichotomy is especially profound when conditions of stress prevail and instances of market failure occur. In these occasions markets are ultimately unable to deliver prices. The bid price is so low and the ask price so high as to preclude trade.

If (i) the quality of the assets is uncertain and heterogeneous, (ii) there are intrinsic difficulties in evaluating non-standardised assets while asymmetries of information prevail, and (iii) traders are occasional, the market is more prone to such market failures.

This is the situation originally described by Akerlof (1970) to interpret the market for “lemons”. Clear analogies can be drawn with the valuation of complex, synthetic CDO’s.

The relevance of instances of market failure in the current crisis is fully recognised by the Supervisory Authorities. Reference can be made, in this respect, to the explanation given in the US by the SEC to take
action to restrict (naked) short sales, with a view to avoid substantial disruption of securities markets. “Loss of confidence can lead to panic selling, which may be further exacerbated by “naked” short selling. As a result, the prices of securities may artificially and unnecessarily decline well below a price level that would have resulted from the normal price discovery process. If significant financial institutions are involved, this chain of events can threaten disruption of our markets”. Similar considerations had been expressed by the Fed, when emergency action was taken in the Bear Stearns case.

Market exuberance implies that success is self-reinforcing, with ample liquidity and neglected risk factors. When the situation changes, a vicious circle can set in: higher spreads, fewer trades, loss of confidence, even higher spreads, growing distance between marginal prices and intrinsic values.

The difference between mark-to-market and to mark-to-model widens, while liquidity disappears.

Mark to market accounting becomes, in this critical situation, a powerful engine of *cyclical amplification*. If “moral suasion” of the authorities and of the accountants leads to forced sales in order to clean the books, the spiral is unavoidable. Distressed sales occur: this is inconsistent with the very principles of the new accounting standards. Fair value can be an exit price, but cannot be a price resulting from distressed sales or liquidations.

According to the FAS 157 wording “Fair value must represent the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants”.

The combination of “forced sales” and “fair value equal mark-to-market” exacerbates the negative swing of the cycle: even banks which do not need to sell or transfer have to register the hypothetical proceeds of a disequilibrium transaction. Inefficient prices are registered in their accounts.

Beyond these general considerations, more specific critical features of fair value accounting can be identified (see Bini (2008) and Rayman (2008)). In particular the banking industry is critically dependent on Principle 39, which by admission of the IAS Board, is one of worst accounting principles, because it is hard to understand by investors, difficult to apply by banks and difficult to monitor and audit, by supervisors and auditors alike.

Additionally, the system is not based on a full goodwill principle.
For instance, an increase in interest rate implies a fall in asset values, but the corresponding increase in the goodwill of the liability side is not captured.

As Bini (2008) noted, had the current fair value accounting been applied during the 1982 Latin American crisis, all nine New York money-center banks would have failed.

The principal element so far of mark-to-market accounting is related to the write-downs of subprime structured assets held on the banking and trading books of the banks. To recall, total write-downs recorded by banks since the onset of the financial turmoil a year ago (Chart 5) amount to over $400 bln.

**Chart 5**

Estimates for Total Global Write-downs Continue to Increase
Now, a new element has to be taken into account: impairment charges on goodwill.

As is known, the principal novelty of the revised accounting principles in this area, is that total goodwill is no longer subject to amortization. Rather, when a permanent impairment takes place, the management of the company has to make the appropriate charges. These charges do not impact on current cash flows and on profit and loss accounts, instead they go directly to the balance sheet.

According to Zion (2008), as of June 30\textsuperscript{th} 2008 aggregate impairment charges for S&P 1500 companies can be estimated in the order of $280 bln, with the bulk affecting the banking sector: Bank of America, Wachovia and Citigroup were mentioned, with estimated impairment amounts of $50,43 and 43 bln respectively.

To recall, the goodwill of S&P 1500 amounts to some $2 trillion. A different line can be taken to underscore the importance of goodwill and the likely impairment pressures. If adjusted book value is currently measured for many large banks, and then goodwill is subtracted, only a few banks have a positive, tangible, adjusted book. In many instances goodwill is a multiple of book.
Combining the traditional credit channel view, the three-fold concept of liquidity, the new valuation paradigms and the revised capital standard it is possible to re-design the credit channel as in Chart 6.
The three traditional Mishkin channels are renamed as: “bank liquidity and credit”, “cash flow and disposable income” and “net worth”. Three new relevant channels can be identified: (i) the impaired bank funding, (ii) the new regulations on capital and accounting, (iii) the drying-up of securities markets. Looking ex-post at the dynamics of the 2007-2008 crisis, the initial shock had a double nature: in part it was due to the end of a long period of accommodating monetary policy, and in part it came from a fall in the value of real estate (collateral assets). The defaults and the consequent flow of real estate into banks’ balance sheets suddenly posed a funding problem, worsened by higher interest rates.

Other important linkages came into play. First and foremost the complex interaction between derivatives markets and monetary aggregates and monetary policies created new paradigms in the relationships between monetary instruments, interest rates and economic activities, as has been demonstrated by Savona and Oldani (2008). Additionally, the perception that valuation models developed in connection to very complex financial structures were inadequate created a confidence shock. As a consequence, the O&T model, which had allowed banks to originate assets on a continuous basis and to operate on larger scales was no longer viable. Furthermore, as confidence declined, securities markets experienced a severe excess of supply and dried-up, leaving on banks’ balance sheets a large number of assets that were no more liquid, thus posing on the one hand a valuation/net worth problem[1], and on the other hand aggravating funding problems. All that turned into a broad liquidity shock.

In such troubled scenario, a major role has been played by monetary policy and supervisory authorities. The coincidence of the financial market turmoil, culminating with the liquidity crisis, and of the deadline for the enforcement of the new capital standard represented a challenge for central banks, both on a short-run and a long-run perspective. In the short-run, in fact, central banks had to avoid any “synthetic” negative event (like a second “Bear Stearns case”). Both the FED and the ECB have thus implemented more aggressive policies with respect to repo agreements and to monetary policy decisions (new collateral accepted, allowance of broker-dealer banks to the facilities in the care of the FED, the postposition of a restrictive cycle of official rates). At the same time, concern has risen with respect to the sustainability of new refinancing policies in the mid-long term.
A.1.5. CONCLUSION: BANKS AND CAPITAL IN 2008, A FALLACY OF COMPOSITION?

The acute phase of liquidity difficulties, the external funding crisis and the asset illiquidity which followed the subprime turmoil have been largely overcome with prompt and decisive actions by the FED and the ECB. They are however, for the first time ever, taking huge amounts of collateral with uncertain valuation and rating. It is commonly accepted that these policies represent a temporary solution and a contingent facility to avoid systemic shocks on banks. Moreover, the present interest rate policy, in particular the FED’s one, may not be sustainable. Real interest rates, due to the combined effect of low nominal rates and high inflation rates, are again negative, adding to inflation pressures on a world wide basis in spite of a slow down in real economic activity.

Stylized facts in mid 2008:

- Banks must maintain risk on their books: the originate-and-transfer model is in structural crisis;
- Overall credit flows to the economy (households, corporations, foreign entities, public agencies) are re-intermediated through banks: securities markets have dried up;
- New regulatory capital standard plus explicit pressure from the supervisory authorities to banks/investment houses to de-leverage require banks to hold more capital as a ratio to risk-weighted assets (plus 2% points in terms of Tier I), in spite of write-offs amounting to some $ 400bn, with the ensuing need to recapitalize in order to offset such losses;
- Widespread rating downgrades;
- Capital absorption requirements under Basel II are inherently procyclical.
- Mark-to-market accounting has also procyclical features, which interact with the capital standard.

All the above factors create pressures on cost and availability of credit for companies and households alike. The weakness in stock markets is partly a cause and partly an effect of the above mentioned developments. Financial institutions are especially hit, which leads to their difficulties of recapitalization.
The risk is now that corporate defaults and household delinquencies may rise beyond the path implicit in the cycle, whose difficulties are, in any event, compounded by oil prices, commodity and food inflation and wage demands.

Recent studies (Adrian and Shin, 2008) show that there is strong evidence of banks’ leverage procyclicality when assets and liabilities are marked to market. Self-feeding asset price processes take place during booms and busts. Active balance sheet management is the fundamental cause of this phenomenon. Beyond such spontaneous policies of the individual banks, the procyclical influence of Supervisory Authorities’ recommendations to the whole banking system must be underlined. Through Moral Suasion they currently ask supervised institutions to de-leverage (de-risk), adding procyclicality to capital adequacy. These consequences are particularly relevant in the case of investment banks, whose liabilities are obtained from wholesale markets.

In sum, the question can be reasonably put whether there is a risk of fallacy of composition (Chart 7): what holds for the individual, may not hold for the group as a whole. As Keynes indicated in the aftermath of the Great Depression, the attempt of every person to save more may result in lower aggregate income and saving by all the people.

Chart 7
A possible fallacy of composition
Mutatis mutandis, could the attempt of every bank to increase capital cushions to de-lever and to improve the solidity of its balance sheet result in lower capital held by all banks and lower aggregate income, if the credit crunch (Chart 8) were to imply higher defaults in the economic system?

Chart 8
Evidence of a Credit Crunch in the USA

Put it otherwise: the enactment of Basel II, the application of IASB fair value (mark-to-market) standards, the moral suasion by supervisory authorities to seek capital cushions even higher than those required by Basel II and to clean books, the sudden rigor of rating agencies, after the lapses and mistakes of the past, should require care to avoid the pitfalls of composition.

In conclusion, major mistakes are at the original of the current crisis: too lax policies, exuberant (incompetent) utilization of complex derivatives structures and underpriced risks can be pinpointed.

Also the significant dangers of procyclicality inherent in the
interplay of the new capital standard and the IFRS and US GAAP principles were neglected.

These weaknesses had been recognized and underlined by a number of analysts, operators and policy makers, but with no relevant impact.

The hard lessons from the 2007/2008 experience must be fully absorbed, but the sudden rigor and hardened application of capital and accounting rules, coupled with disorderly de-levering, heightens the likelihood of a generalized credit crunch and a prolonged downturn. We must not throw the bab(ies) with the dirty water, but a pragmatic application of the standards is necessary, as well as a correction of certain inappropriate features. Application filters can be enacted for both standards. Banks must be empowered to respond of the financial needs of the economy, whose fundamentals are still, in general, solid and merit support, as indicated for instance by the ratios of non-performing assets to total loans and to total capital (Tier I + Tier II). But they may be unable to continue to raise – in the markets and through SWFs – the capital currently required to sustain lending and to avoid recession. Government capital injections will be necessary.

A.2
The pricing and the rating of fixed income and structured products: cash vs. derivatives underlying

In this section (A.2) we present a simple analytical model to price fixed-income securities whose payoff depend on cash or derivatives underlying. In particular, we will show how the convexity of the underlying affects both the pricing and the rating of these instruments. Closed form results are in fact presented for the derivation of PDs (i.e. the rating) and their time evolution and variance. To obtain clear results we use the simplifying assumption of an underlying portfolio characterized by an infinite granularity.

We assume that a portfolio, $L$, underlying a fixed-income and or a structured security follows a stochastic behaviour:

\[
\frac{dL}{L} = \mu \ dt + \sigma \ dz
\]

For pricing purposes we must consider the equivalent risk-neutral process:
200 SUBPRIME CREDITS OR SUBPRIME POLICIES? THE DERIVATIVES CONUNDRUM

[2] \[ \frac{dL}{L} = r \, dt + \sigma \, dz \]

A security, V, whose payoff depends on underlying portfolio L must satisfy the following Partial Differential Equation (PDE):

[3] \[ rL \frac{\partial V}{\partial L} + \frac{1}{2} \frac{\partial^2 V}{\partial L^2} \sigma^2 L^2 - rV + \frac{\partial V}{\partial t} = 0 \]

To simplify our model we limit our analysis to securities with no explicit time dependence, \( \frac{\partial V}{\partial t} = 0 \). Time independence allows to obtain easy results without affecting the main findings of the analysis. We can therefore rewrite [3] as an Ordinary Differential Equation (ODE):

[4] \[ rL \frac{\partial V}{\partial L} + \frac{1}{2} \frac{\partial^2 V}{\partial L^2} \sigma^2 L^2 - rV = 0 \]

We guess a solution of the form \( V = L^x \). In this case we have:

\[ \frac{\partial V}{\partial x} = xL^{x-1} \quad \text{and} \quad \frac{\partial^2 V}{\partial x^2} = x(x+1)L^{x-2} \]

By using these results we can rewrite equation [4] as:

[5] \[ r(x-1) + \frac{\sigma^2}{2} x(x-1) = 0 \]

We therefore have:

\[ x = 1 \quad \text{and} \quad x = \frac{-2r}{\sigma^2} \]

The general solution for the ODE is given by:

[6] \[ V = aL + bL^{-2} \sigma^2 \]

\( a \) and \( b \) must be determined by boundary conditions. We suppose that the derivative portfolio, \( V \), written on \( L \) is continuously rebalanced to obtain a target \( \text{delta} \), \( \Delta \), and a target \( \text{gamma} \), \( \Gamma \). The two boundary conditions are the following:

[7] \[ \frac{\partial V}{\partial L} = \Delta \quad \text{and} \quad \frac{\partial^2 V}{\partial L^2} = \Gamma \]
From equation [6] we are able to derive:

\[ \frac{\partial V}{\partial L} = a - b \frac{2r}{\sigma^2} L^{-2r/\sigma^2 + 1} = \Delta \]  

\[ \frac{\partial^2 V}{\partial L^2} = b \frac{2r}{\sigma^2} \left( \frac{2r}{\sigma^2} + 1 \right) L^{-2r/\sigma^2 + 1} = \Gamma \]

Now we can obtain explicit solution for \( a \) and \( b \):

\[ b = \frac{\Gamma L^{2r/\sigma^2 + 2}}{2r/\sigma^2 \left( \frac{2r}{\sigma^2} + 1 \right)} \]

\[ a = \Delta + \frac{\Gamma L}{\left( \frac{2r}{\sigma^2} + 1 \right)} \]

By substituting these last two equations in [6] we have:

\[ V = \Delta L + \Gamma L^2 \frac{\sigma^2}{2r} \]

We easily showed that a derivative security written on a given underlying portfolio \( L \) can be considered as a portfolio with both a linear and a quadratic exposure on \( L \).

By exploiting Ito’s Lemma and defining:

\[ \alpha \equiv \frac{\Delta L}{V} \quad \text{and} \quad 1 - \alpha \equiv \frac{\Gamma L^2 \sigma^2}{V 2r} \]

we can derive the actual process followed by \( L^2 \) and consequently by \( V \):

\[ \frac{dL^2}{L^2} = \left( 2 \mu + \sigma^2 \right) dt + 2\sigma dz \]

\[ \frac{dV}{V} = \left[ \alpha \frac{dL}{L} + \left( 1 - \alpha \right) \frac{dL^2}{L^2} \right] = \]

\[ = \frac{dV}{V} = \left[ \left( 2 \mu + \sigma^2 \right) - \alpha \left( \mu + \sigma^2 \right) \right] dt + \sigma (2 - \alpha) dz \]

\( \alpha \) can be considered as a coefficient representing the “rate of linearity” of the derivatives portfolio/product. For example for \( \alpha = 1 \) we have a linear
derivative products following the same dynamics of the underlying:

\[ \frac{dV}{V} = \frac{dL}{L} = \mu \, dt + \sigma \, dz \]  

Lower values of \( \alpha \) increase the “convexity” of the portfolio. \( \alpha \) can assume also negative values, meaning that the linear exposure has been, at least in part, “shorted”, by increasing in this way both the expected return and the variance of the underlying portfolio.

To keep the analysis as simple as possible we consider perpetuities \( B^L \) and \( B^V \) written respectively on the cash, \( L \), and derivatives, \( V \), underlying. In both cases we assume that the securities continuously pay a fixed coupon \( C \). Default arrives when portfolio values are respectively under \( L_D \) and \( V_D \).

In this framework it is easy to show that the prices of \( B^L \) and \( B^V \) are given respectively by:

\[ B^L = \frac{C}{r} \left[ 1 - \left( \frac{L}{L_D} \right)^{-2r/\alpha^2} \right] + R R_L \frac{C}{r} \left( \frac{L}{L_D} \right)^{-2r/\alpha^2} \]  

\[ B^V = \frac{C}{r} \left[ 1 - \left( \frac{V}{V_D} \right)^{-2r/\sigma(2-\alpha)} \right] + R R_V \left( \frac{V}{V_D} \right)^{-2r/\sigma(2-\alpha)} \]  

\( R R_L \) and \( R R_V \) are the recovery rates while the risk neutral default probabilities are represented by:

\[ PD_L = \left( \frac{L}{L_D} \right)^{-2r/\alpha^2} \]  

\[ PD_V = \left( \frac{V}{V_D} \right)^{-2r/\sigma(2-\alpha)} \]

We can therefore rewrite [16] and [17] as:

\[ B^L = \frac{C}{r} \left( 1 - R R_L \right) PD_L = \frac{C}{r} L G D_L \, PD_L = \frac{C}{r} - E L_L \]

\[ B^V = \frac{C}{r} \left( 1 - R R_V \right) PD_V = \frac{C}{r} L G D_V \, PD_V = \frac{C}{r} - E L_V \]

This framework allows an analysis of the pricing problems of fixed
income products with cash or derivative (synthetic) underlying. Therefore we have an analytic tool allowing to analyze the main issues highlighted by the recent crisis. For example we can analytically derive the dynamics followed by the PDs and their volatility. The volatility of ratings represented in fact one of the main issues of the recent financial turmoil.

To simplify the notation we define $g = \frac{2r}{\sigma^2}$. By using Ito's lemma the dynamics of the is given by:

$$\frac{dPD_L}{PD_L} = \left[ \frac{1}{2} \sigma^2 g (g + 1) L^2_D - rg L_D \right] dt - g L_D \alpha dz$$

while its variance is represented by:

$$\text{Var}[PD_L, T] = \exp \left\{ \left[ \frac{1}{2} \sigma^2 g (g + 1) L^2_D - rg L_D \right] T \right\} \sqrt{\exp \left\{ g^2 L^2_D \sigma^2 \right\} T} - 1$$

By defining $f = \frac{2r}{\alpha (2 - \alpha)}$ we can obtain in a similar way PD, and its variance:

$$\frac{dPD_V}{PD_V} = \left[ \frac{1}{2} \left( 2 - \alpha \right) f (f + 1) V^2_D - rf V_D \right] dt - f V_D \left[ \alpha (2 - \alpha) \right] dz$$

$$\text{Var}[PD_V, T] = \exp \left\{ \left[ \frac{1}{2} \left( 2 - \alpha \right) f (f + 1) V^2_D - rf V_D \right] T \right\} \sqrt{\exp \left\{ f^2 V^2_D \left( 2 - \alpha \right)^2 \right\} T} - 1$$
A.3. Counterparty risk and exchange options

Let’s suppose that we have simultaneously a long and a short position on two different portfolios of derivatives with the same counterparty. If we consider a given time horizon $T$ the potential credit exposure deriving from these position can be simply considered as an exchange option, expiring at $T$, between the two portfolios, respectively $S_1$ and $S_2$.

Therefore, the value of the counterparty risk can be assessed by pricing the corresponding exchange option. The analytical derivation of the value of an exchange option is summarized in the following.

Under the risk-neutral measure two portfolio of derivatives are characterized by these two stochastic processes:

$$\frac{dS_1(t)}{S_1(t)} = r dt + \sigma_1 dB_t$$
$$\frac{dS_2(t)}{S_2(t)} = r dt + \sigma_2 dB_t$$

For

$$X_t = \frac{S_1(t)}{S_2(t)}$$

we derive immediately from the Ito’s lemma

$$dX_t = \frac{\partial X_t}{\partial S_1} dS_1 + \frac{\partial X_t}{\partial S_2} dS_2 + \frac{1}{2} \left( \frac{\partial^2 X_t}{\partial S_1^2} \sigma_1^2 S_1^2 + \frac{\partial^2 X_t}{\partial S_2^2} \sigma_2^2 S_2^2 + 2 \frac{\partial^2 X_t}{\partial S_1 \partial S_2} \sigma_1 \sigma_2 S_1 S_2 \right) dt$$

we note that

$$\frac{\partial X_t}{\partial S_1} = \frac{1}{S_2}, \quad \frac{\partial^2 X_t}{\partial S_1^2} = 0, \quad \frac{\partial X_t}{\partial S_2} = -\frac{S_1}{S_2}, \quad \frac{\partial^2 X_t}{\partial S_2^2} = 2 \frac{S_1}{S_2^3}, \quad \frac{\partial X_t}{\partial S_1 \partial S_2} = -\frac{1}{S_2^2}$$

it follows that

$$dX_t = \frac{S_1}{S_2} (rdt + \sigma_1 dB_t) - \frac{S_1}{S_2} (rdt + \sigma_2 dB_t) + \frac{S_1}{S_2} \left( \sigma_1^2 - \sigma_1 \sigma_2 \right) dt + X_t (\sigma_1^2 - \sigma_1 \sigma_2) dB_t = \mu^* X_t dt + \sigma^* X_t dB_t$$

where $\mu^* = \left( \sigma_2^2 - \sigma_1 \sigma_2 \right)$ and $\sigma^* = \left( \sigma_1 - \sigma_2 \right)$. 

By using again Ito’s lemma we obtain
\[ d \ln X_t = \left( \mu^* - \frac{\sigma^2}{2} \right) dt + \sigma^* dB_t = \left( \frac{\sigma^2 - \sigma_1^2}{2} \right) dt + (\sigma_1 - \sigma_2) dB_t \]
we can also write
\[ \ln X_T = \ln X_t + \left( \frac{\sigma^2 - \sigma_1^2}{2} \right) (T - t) + (\sigma_1 - \sigma_2) B_t \]
we may therefore conclude that under the risk neutral measure \( P \) has the following distribution
\[ N \left( \ln X_t + \left( \frac{\sigma^2 - \sigma_1^2}{2} \right) (T - t); (\sigma_1 - \sigma_2)^2 (T - t) \right) \]
We define
\[ \Lambda_t = e^{-rt} \frac{S_2(t)}{S_2(0)} \]
to verify that it is a martingale we note that
\[ \Lambda_t = e^{-rt} \frac{S_2(t)}{S_2(0)} = e^{-rt} \frac{S_2(0) \exp\left( -\frac{\sigma^2}{2} t \right) + \sigma_2 B_t}{S_2(0)} = \exp\left( -\frac{1}{2} \sigma_2^2 t + \sigma_2 B_t \right) \]
we can therefore see that
\[ E_0[\Lambda_t] = \exp\left( -\frac{1}{2} \sigma_2^2 t \right) E_0[\exp(\sigma_2 B_t)] = \exp\left( -\frac{1}{2} \sigma_2^2 t + \frac{1}{2} \sigma_2^2 t \right) = 1 = \Lambda_c \]
A new probability measure \( P^* \) is defined by setting
\[ \frac{dP^*}{dP} = \Lambda_T. \]
The value of an exchange option can be written as
\[ C(S_1(0), S_2(0), T) = E\left[ e^{-rT} (S_1(T) - S_2(T))^+ \right] \]
where \( E[\cdot] \) is the expectation taken under the risk-neutral measure \( P \). We can rewrite the previous expression as
\[ C(S_1(0), S_2(0), T) = E\left[ e^{-rT} (S_1(T) - S_2(T))^+ \right] = S_2(0) E\left[ e^{-r(T-t)} \frac{S_2(T)}{S_2(0)} (X_T - 1)^+ \right] = S_2(0) E^* \left[ (X_T - 1)^+ \right] \]
where $E^*[\cdot]$ is the expectation taken under the above-defined $P^*$ measure. We already know the distribution of $X_T$ under $P$. To value the exchange option we have to determine its distribution under $P^*$. According to the Girsanov’s Theorem

$$B^*_T = B_T - \sigma_2 T$$

is a standard brownian motion under $P^*$. We can therefore infer that

$$E^*[B_T] = E^*[B^*_T + \sigma_2 T] = 0 + \sigma_2 T = \sigma_2 T$$

$$Var^*[B_T] = Var^*[B^*_T] + 0 = T.$$

By remembering that

$$\ln X_T = \ln X_0 + \left(\frac{\sigma_2^2 - \sigma_1^2}{2}\right)T + (\sigma_1 - \sigma_2)B_T$$

and using the last two results we immediately see that:

$$E^*[[\ln X_T]] = \ln X_0 + \left(\frac{\sigma_2^2 - \sigma_1^2}{2}\right)T + (\sigma_1 - \sigma_2)E^*[B_T] = \ln X_0 - \frac{(\sigma_1 - \sigma_2)^2}{2} T$$

$$Var^*[[\ln X_T]] = (\sigma_1 - \sigma_2)^2 T$$

we can therefore conclude that under the measure $P^*$ $\ln X_T$ has the following distribution:

$$N\left(\ln X_0 - \left(\frac{(\sigma_1 - \sigma_2)^2}{2}\right)T; (\sigma_1 - \sigma_2)^2 T\right).$$

Now we have all the elements to use a procedure similar to the one used to value European options to value this exchange option

$$C(S_1(0), S_2(0), T) = S_2(0) \int_0^{x^*} \left(\frac{e^x - 1}{\sqrt{2\pi}}\right) \frac{1}{\sqrt{2\pi(\sigma_1 - \sigma_2)^2 T}} \exp \left(-\frac{1}{2} \frac{(\ln X_0 + (1/2)(\sigma_1 - \sigma_2) T)^2}{(\sigma_1 - \sigma_2)^2 T}\right) dZ =$$

$$= S_2(0) \int_0^{x^*} \left(\frac{e^x - 1}{\sqrt{2\pi}}\right) \frac{1}{\sqrt{2\pi(\sigma_1 - \sigma_2)^2 T}} \exp \left(-\frac{1}{2} \frac{(\ln X_0 + (1/2)(\sigma_1 - \sigma_2) T)^2}{(\sigma_1 - \sigma_2)^2 T}\right) dZ$$

where $Z = \ln X_T$. If we define $G = \frac{Z - \ln X_0 + (1/2)(\sigma_1 - \sigma_2)^2 T}{(\sigma_1 - \sigma_2)\sqrt{T}}$ we
note that $dG = \frac{dZ}{(\sigma_1 - \sigma_2)\sqrt{T}}$ and $Z > 0$ is equivalent to $G > \frac{-\ln X_0 + (1/2)(\sigma_1 - \sigma_2)^2 T}{(\sigma_1 - \sigma_2)\sqrt{T}} = -\frac{\ln (S_1(0)/S_2(0))}{(\sigma_1 - \sigma_2)\sqrt{T}} + \frac{1}{2}(\sigma_1 - \sigma_2)\sqrt{T} = -b_2$.

We can therefore write

$$C(S_1(0), S_2(0), T) = S_1(0) \int_{-\infty}^{\infty} \left( \exp \left[ G(\sigma_1 - \sigma_2) \sqrt{T} + \ln X_0 \frac{1}{2}(\sigma_1 - \sigma_2)^2 T \right] \right) \frac{1}{\sqrt{2\pi}} \exp \left( -\frac{1}{2} G^2 \right) dG - S_2(0) N(b_2) =$$

$$= S_1(0) \int_{-\infty}^{\infty} \left( \exp \left[ G(\sigma_1 - \sigma_2) \sqrt{T} + \ln X_0 \frac{1}{2}(\sigma_1 - \sigma_2)^2 T \right] \right) \frac{1}{\sqrt{2\pi}} dG - S_2(0) N(b_2) =$$

$$= S_1(0) \int_{-\infty}^{\infty} \left( \exp \left[ -\frac{1}{2} \left( G - (\sigma_1 - \sigma_2) \sqrt{T} \right)^2 \right] \right) \frac{1}{\sqrt{2\pi}} dG - S_2(0) N(b_2).$$

For $F = G - (\sigma_1 - \sigma_2)\sqrt{T}$, $G > b_2$ is equivalent to $F > b_2 - (\sigma_1 - \sigma_2)\sqrt{T} = -b_1$. We can therefore conclude that the value of the exchange option is equal to

$$C(S_1(0), S_2(0), T) = S_1(0) \int_{-\infty}^{\infty} \left( \exp \left[ -\frac{1}{2} F^2 \right] \right) \frac{1}{\sqrt{2\pi}} dF - S_2(0) N(b_2) = S_1(0) N(b_1) - S_2(0) N(b_2).$$
The Damage

“A company for carrying out an undertaking of great advantage, but nobody to know what it is.” This lure for the South Sea Company, published in 1720, has a whiff of the 21st century about it. Modern finance has promised miracles, seduced the brilliant and the greedy - and wrought destruction.

Alan Greenspan, formerly chairman of the Federal Reserve, said in 2005 that “increasingly complex financial instruments have contributed to the development of a far more flexible, efficient, and hence resilient financial system than the one that existed just a quarter-century ago.” Tell that to Bear Stearns, Lehman Brothers, Merrill Lynch, AIG and Northern Rock. These are some of the most spectacular corporate casualties so far of the credit crisis.

The Money Machine

The industry has defied gravity by using debt, securitization and proprietary trading to boost fee income and profits. Investors hungry for yield have willingly gone along. Since 2000, the value of assets held in hedge funds, with their high fees and higher leverage, has quintupled. In addition, the industry has combined computing power and leverage to create a burst of innovation. The value of outstanding credit-default swaps, for instance, has climbed to a staggering $45 trillion. In 1980 financial-sector debt was only a tenth of the size of non-financial debt. Now it is half as big.
This process has turned investment banks into debt machines that trade heavily on their own accounts. Goldman Sachs is using about $40 billion of equity as the foundation for $1.1 trillion of assets. At Merrill Lynch, the most leveraged, $1 trillion of assets is teetering on around $30 billion of equity. In rising markets, gearing like that creates stellar returns on equity. When markets are in peril, a small fall in asset values can wipe shareholders out.

**The Source of the Crisis**

- Cheap Money – I agree that it played a significant role – perhaps the most important factor.

- It is not a sufficient condition. Interests rates were lower in Japan and predated the lower rates in the U.S.

- Suggests that other factors were also at the root of the problem.

- Nevertheless one should not underestimate the crucial role that low interest rates have played in the current crisis.

**The Source of the Crisis Contd.**

It is always useful to start with the macroeconomic environment. In a sense, this is a crisis borne out of previous crises.

An important difference between the recent period of sustained growth and previous periods is the low level of both short and long term real interest rates over the last 5 years, certainly relative to the last two decades.

The low short rates resulted from extremely accommodative monetary policy as industrial country central banks cut rates sharply to stave off deflation after the recession of 2001, and were not equally quick to raise rates as economies improved.
Role of Low Rates

The U.S. was not by any means the highest in terms of price growth. Housing prices have reached higher values relative to rent or incomes in Ireland, Spain, the Netherlands, the United Kingdom, and New Zealand for example, though not in Germany or Japan.

The authors need to discuss why the crisis first manifested itself in the U.S. One possibly explanation is that it happened because the U.S. went further on financial innovation, thus drawing marginal buyers into the market.

This begs the next question as to why financial innovation went further here?

Other Relevant Issues

Greed - Something that we are all very familiar with and has always been with us and will continue to be with us.

So why are low Interest rates important - they occurred at a time when there were changes in the structure of incentives and resulting behavior of investment managers-managers of financial assets ranging from those running insurance companies to those running venture capital and hedge funds.

With lower interest rates and the changes in the structure of incentives there was a substantial increase in managerial incentives to take on more risk.

Two types are particularly important here.

Mechanism of Impact of Low Interest Rates

The first, is well known and is traditionally known as “risk shifting”. When an insurance company has promised premium holders returns of 6 percent, while the typical matching long-term bond rate is 4 percent, it has no option if it thinks low interest rates are likely to persist, or if it worries about quarterly earnings, but to take on risk, either directly or through investments in alternative assets like hedge funds.

The second type, is that of hedge funds themselves where a form of induced “risk shifting” can be seen. When risk free returns are low the fund may not even exceed the minimum required return if it takes little risk. Thus low rates will increase fund manager incentives to take on risk. Furthermore, since the cost of borrowing can also be low at such
times, fund managers can boost returns by adding leverage. In doing so, they further add to risk.

**The Search for Alpha**

In other words, managers of these funds are rewarded for their ability to generate abnormal returns or in investment parlance "ALPHA".

Managers of “other financial institutions” generate alpha through financial engineering—investing in exotic financial securities that are not easily available to the ordinary investor, or creating securities or cash flow streams that appeal to particular investors or tastes. Of course, if enough of these securities or streams are created, they cease to have scarcity or diversification value, and are valued like everything else. Thus this source of alpha depends on the manager constantly innovating and staying ahead of the competition.

Finally, alpha can also stem from liquidity provision. For instance, investment managers, having relatively easy access to finance, can hold illiquid or arbitrage positions to maturity.

With increased liquidity, it becomes ever harder to generate more alpha? Put another way, as market inefficiencies are narrowed by the flood of money, what can managers do to earn their keep?

One option is to hide risk—that is, pass off returns generated through taking on systematic risk as alpha by hiding the extent of systematic risk. Since additional risks will generally imply higher returns, managers may take risks that are typically not in their comparison benchmark (and hidden from investors) so as to generate the higher returns to distinguish themselves.

For example, a number of insurance companies and pension funds have entered the credit derivative market to sell guarantees against a company defaulting. Essentially, these investment managers collect premia in ordinary times from people buying the guarantees. With very small probability, however, the company will default, forcing the guarantor to pay out a large amount.

Prudent man laws usually restrict the instruments that these firms can invest in - it begs the question how were they able to invest in these assets - that is “how do you convert a pig - the Ninja loan - into a princess - the AAA bond the investors wanted?” You securitize it.
The financial engineers were not content in providing the “plain vanilla” securitization. They created more complicated pools, bundling the securities sold by the mortgage pools into securities pools, and selling tranched claims against them.

The following chart shows how $100 of sub-prime mortgages were converted into a large number of AAA bonds and sundry lesser quality securities.

Thus were born the CDO, the CDO squared and so on. Over 95 percent of securities thus generated were rated A and above, and 80 percent rated AAA.

Note that this was facilitated by the rating agencies which certified securities and even advised issuers on how to dress their securities up so that they would just meet the rating agencies’ hurdle.

### Distribution of Subprime Loans

<table>
<thead>
<tr>
<th>Year</th>
<th>All Subprime 100%</th>
<th>AAA 80.8%</th>
<th>AA 9.6%</th>
<th>A 5.0%</th>
<th>BBB 3.5%</th>
<th>BB/Other 1.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>625</td>
<td>505</td>
<td>60</td>
<td>31</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>1Q06</td>
<td>140</td>
<td>113</td>
<td>13</td>
<td>7</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2Q06</td>
<td>165</td>
<td>133</td>
<td>16</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>3Q06</td>
<td>160</td>
<td>129</td>
<td>15</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>4Q06</td>
<td>135</td>
<td>109</td>
<td>13</td>
<td>7</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>1Q07</td>
<td>95</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2Q07</td>
<td>56</td>
<td>45</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3Q07</td>
<td>28</td>
<td>23</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total 2005</td>
<td>1,402</td>
<td>1,133</td>
<td>135</td>
<td>70</td>
<td>49</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: Inside Mortgage Finance, Morgan Stanley.
Subprime Exposures

<table>
<thead>
<tr>
<th>Sector</th>
<th>Total reported subprime exposure</th>
<th>Percent of reported exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Investment Banks</td>
<td>75</td>
<td>5%</td>
</tr>
<tr>
<td>US Commercial Banks</td>
<td>250</td>
<td>18%</td>
</tr>
<tr>
<td>US GSEs</td>
<td>112</td>
<td>8%</td>
</tr>
<tr>
<td>US Hedge Funds</td>
<td>233</td>
<td>17%</td>
</tr>
<tr>
<td>Foreign Banks</td>
<td>167</td>
<td>12%</td>
</tr>
<tr>
<td>Foreign Hedge Funds</td>
<td>58</td>
<td>4%</td>
</tr>
<tr>
<td>Insurance Companies</td>
<td>319</td>
<td>23%</td>
</tr>
<tr>
<td>Finance Companies</td>
<td>95</td>
<td>7%</td>
</tr>
<tr>
<td>Mutual and Pension</td>
<td>57</td>
<td>4%</td>
</tr>
<tr>
<td>US Leveraged Sector</td>
<td>671</td>
<td>49%</td>
</tr>
<tr>
<td>Other</td>
<td>697</td>
<td>51%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,368</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Note: The total for U.S. commercial banks includes $95 billion of mortgage exposures by Household Finance, the U.S. subprime subsidiary of HSBC. Moreover, the calculation assumes that that US hedge funds account for four-fifths of all hedge fund exposures to subprime mortgages.

Source: Goldman Sachs. Authors’ calculations.
Greelaw, Hatzius, Kashyap and Shin (2008)
Total Assent and Leverage

Source: SHIN (2008)

Implications for Monetary Policy

Rajan (2008) points out that this suggests an additional “behavioral” channel for the transmission of monetary policy than the ones we are familiar with, the traditional money channel, the borrower balance sheet channel (Bernanke and Gertler (1995)), the bank lending channel (see, for example, Bernanke and Blinder (1988, 1992) or Kashyap and Stein (1997)), and the liquidity channel (Diamond and Rajan (2006)).

From a policy perspective, this “behavioral” channel introduces new dimensions to thinking about monetary policy. Increases the importance of finance companies, insurance companies, pension funds, hedge funds, and venture capitalists at the expense of the banking system.

Equally important, it could have wider effects than through credit. It will affect asset prices, and could thus also amplify existing channels like the balance sheet channel, with the riskiest and most illiquid financial assets or borrowers affected the most.
Currency Markets

The second area that the paper focuses on is that of the role of the currency market.

As pointed out earlier the banks’ course was made possible by cheap money, facilitated in turn by low consumer-price inflation. In more regulated times, credit controls or the gold standard or the Bretton Woods system restricted the creation of credit.

Recently central banks have in effect conspired (through their tremendous reserve holdings) with the banks’ urge to earn fees and use leverage. The resulting glut of liquidity and financial firms’ thirst for yield led eventually to the ill-starred boom in American subprime mortgages.

In fact central banks from around the world have also been significantly adversely affected by the crisis.

Carry Trade

Another aspect of the problems created by the failure of the current currency system is that of carry trade.

For e.g., Borrow yen at 1 percent and deposit proceeds in US dollars at 5 percent (or any currency with this kind of interest rate differential). If the spot exchange rate remains unchanged, profit from interest rate differential.

The authors suggest that it is an important contributor to the current financial crisis. However, the mechanism through which this occurs needs to be elaborated.

It should be noted that this is a manifestation of the failure of uncovered interest rate parity which speaks to the failure of the current exchange rate system, as pointed out in the paper.

China

This brings us to the issue of China which the authors point out has benefitted substantially from the flawed currency exchange rate system currently in place.

We are currently going through an emerging market boom unlike previous cycles where the US was in a sense competing for capital with developing countries this time, China and other emerging market
recipients of capital flows are not using them to finance current account deficits, but rather to pile up international reserves, most of which are US treasury bills - China is financing the US.

China needs a flexible exchange rate to attain internal and external balance.

A global cooperative deal is a viable option with China, other asian countries, and oil exporters.

This is something that Paolo Savona has been suggesting for quite a while.

**Derivatives**

As I pointed out earlier, the increasing difficulties in obtaining abnormal returns led to an increase in the number of exotic instruments.

The authors point out that these instruments are very difficult to value and this difficulty has resulted in the fallacy of composition which has contributed to the present crisis.

I agree that the pricing of derivatives is difficult but what I question is the suggestion that the mis-pricing is due to irrationality. I think that it is more a case of lack of transparency in these exotic instruments and the accompanying lack of clarity in these prices. Thus from a policy perspective one of the goals is to institute policies that will lead to clarity in prices.

**Derivatives and Monetary Policy**

An important point that the authors make is that with the growing importance of derivatives on the balance sheet of financial institutions then monetary aggregates should account for derivatives.

The implication is that the transmission mechanism is no longer the traditional mechanism but also works through other financial institutions besides banks. Note that this is a point that was made earlier in a different context.

Adrian and Shin (2008) also make a similar argument. Specifically they argue that balance sheets of market-based financial intermediaries provide a window on the transmission of monetary policy through capital market conditions.
The following tables taken from their paper provides evidence consistent with this argument.

Table 1
Broker-Dealer Assets are Significant for Future Macroeconomic Growth

<table>
<thead>
<tr>
<th>Broker-Dealer Variables</th>
<th>(i) Consumption (4Q growth)</th>
<th>(ii) Durable Consumption (4Q growth)</th>
<th>(iii) Investment (4Q growth)</th>
<th>(iv) Housing Investment (4Q growth)</th>
<th>(v) GDP (4Q growth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset growth (1Q lag)</td>
<td>0.003</td>
<td>0.048*</td>
<td>-0.007</td>
<td>0.062**</td>
<td>0.005</td>
</tr>
<tr>
<td>Equity growth (1Q lag)</td>
<td>0.008**</td>
<td>0.013</td>
<td>0.026**</td>
<td>0.055***</td>
<td>0.006*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macroeconomic conditions</th>
<th>(i)</th>
<th>(ii)</th>
<th>(iii)</th>
<th>(iv)</th>
<th>(v)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lag of left hand side variable</td>
<td>0.746***</td>
<td>0.468***</td>
<td>0.873***</td>
<td>0.829***</td>
<td>0.813***</td>
</tr>
<tr>
<td>PCE core inflation (1Q lag)</td>
<td>-0.199</td>
<td>-2.225***</td>
<td>0.247</td>
<td>0.344</td>
<td>-0.112</td>
</tr>
<tr>
<td>Fed Funds Target (1Q lag)</td>
<td>0.066</td>
<td>0.667</td>
<td>-0.342***</td>
<td>-0.253</td>
<td>0.003</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financial Market Conditions</th>
<th>(i)</th>
<th>(ii)</th>
<th>(iii)</th>
<th>(iv)</th>
<th>(v)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P500 Return (1Q lag)</td>
<td>0.008</td>
<td>-0.002</td>
<td>0.039</td>
<td>0.041</td>
<td>0.009</td>
</tr>
<tr>
<td>S&amp;P500 implied volatility VIX (1Q lag)</td>
<td>0.018</td>
<td>0.075</td>
<td>0.126**</td>
<td>0.183*</td>
<td>0.026*</td>
</tr>
<tr>
<td>10-year/3-month spread (1Q lag)</td>
<td>0.180*</td>
<td>1.456*</td>
<td>0.460</td>
<td>0.972</td>
<td>0.187**</td>
</tr>
<tr>
<td>Baa/10-year spread (1Q lag)</td>
<td>-0.023</td>
<td>-0.182</td>
<td>-1.492**</td>
<td>0.367</td>
<td>-0.183</td>
</tr>
<tr>
<td>Constant</td>
<td>0.252</td>
<td>1.111</td>
<td>1.114</td>
<td>-7.078</td>
<td>0.238</td>
</tr>
</tbody>
</table>

Source: SHIN (2008)
Commercial Bank Assets do not have Additional Explanatory Power for Real Activity (except for Housing Investment)

<table>
<thead>
<tr>
<th></th>
<th>(i)</th>
<th>(ii)</th>
<th>(iii)</th>
<th>(iv)</th>
<th>(v)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(Orthogonalized with respect to Broker-Dealer Variables)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broker-Dealer Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset growth (1Q lag)</td>
<td>0.002</td>
<td>0.050*</td>
<td>-0.007</td>
<td>0.054**</td>
<td>0.001</td>
</tr>
<tr>
<td>Equity growth (1Q lag)</td>
<td>0.009**</td>
<td>0.015</td>
<td>0.026**</td>
<td>0.057***</td>
<td>0.007*</td>
</tr>
<tr>
<td>Commercial Bank Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset growth (1Q lag)</td>
<td>0.060</td>
<td>0.353</td>
<td>0.038</td>
<td>-0.045</td>
<td>0.027</td>
</tr>
<tr>
<td>Equity growth (1Q lag)</td>
<td>0.004</td>
<td>0.047</td>
<td>0.011</td>
<td>0.088***</td>
<td>0.005</td>
</tr>
<tr>
<td>Macroeconomic conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag of left hand side variable</td>
<td>0.688***</td>
<td>0.418***</td>
<td>0.866***</td>
<td>0.812***</td>
<td>0.770***</td>
</tr>
<tr>
<td>PCE core inflation (1Q lag)</td>
<td>-0.199</td>
<td>-2.224***</td>
<td>0.258</td>
<td>0.395</td>
<td>-0.022</td>
</tr>
<tr>
<td>Fed Funds Target (1Q lag)</td>
<td>0.092</td>
<td>0.716</td>
<td>-0.341***</td>
<td>-0.375</td>
<td>0.038</td>
</tr>
<tr>
<td>Financial Market Conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;P500 Return (1Q lag)</td>
<td>0.006</td>
<td>-0.011</td>
<td>0.037</td>
<td>0.031</td>
<td>0.011</td>
</tr>
<tr>
<td>S&amp;P500 implied volatility VIX (1Q lag)</td>
<td>0.020</td>
<td>0.081</td>
<td>0.125**</td>
<td>0.171*</td>
<td>0.036*</td>
</tr>
<tr>
<td>10-year/3-month spread (1Q lag)</td>
<td>0.232*</td>
<td>1.636*</td>
<td>0.452</td>
<td>0.542</td>
<td>0.167</td>
</tr>
<tr>
<td>Baa/10-year spread (1Q lag)</td>
<td>-0.088</td>
<td>-0.658</td>
<td>-1.576**</td>
<td>0.388</td>
<td>-0.516**</td>
</tr>
<tr>
<td>Constant</td>
<td>0.339</td>
<td>1.426</td>
<td>1.315</td>
<td>-5.618</td>
<td>0.944</td>
</tr>
</tbody>
</table>

Source: SHIN (2008)
Figure 8
Response of Housing Investment to Funds Shock (in units of standard deviation) Comparison of Nonstructural Models with and without Broker-Dealer Variables

Source: SHIN (2008)

Possible Extension

A valuable addition to the paper would be if possible to provide an analysis similar to this with a breakdown of the assets in terms of derivative products to see if most of the explanatory power is coming from the derivative holdings.

Of course this is subjected to data availability which may be difficult to obtain. A possible solution would be to use simulation. This way a sensitivity analysis exercise could be done. It is a lot of work and in fact may be a worthwhile paper on its own.
Suggestions

Governance – The next paper presents preliminary evidence that the quality of governance within the particular financial institutions matter. Several authors most notably Bertrand and Mullainathan (QJE, 2001) show the importance of governance in mitigating managerial misbehavior.

There is the need for regulation that will mitigate the adverse effects brought about by the structure of the incentives. This regulation needs to be thought through much more carefully than the Sarbanes Oxley Act which has resulted in a lot of negative consequences.

Also regulation to control the adverse effects of securitization:

For example, existing rules on capital adequacy require banks to put some capital aside for each asset. If the market leads to losses, the chances are they will have enough capital to cope. Yet this rule sets up a perverse incentive to create structures free of the capital burden such as credits that last 364 days, and hence do not count as “permanent”. The hundreds of billions of dollars in the shadow banking system—the notorious SIVs and conduits that have caused the banks so much pain—have been warehoused there to get round the rules. Spain’s banking regulator prudently said that such vehicles could be created, but only if the banks put capital aside. So far the country has escaped the damage seen elsewhere. When reformed capital-adequacy rules are introduced, this is an area that will need to be monitored rigorously.
SIXTH PAPER
SECURITIZATION AND WEALTH EFFECTS

Bill B. Francis
Lally School of Management and Technology
Rensselaer Polytechnic Institute

Iftekhar Hasan
Rensselaer Polytechnic Institute
Bank of Finland

Haizhi Wang
Stuart School of Business
Illinois Institute of Technology

Cristiano Zazzara
Riskmetrics, U.K.

Abstract

In this study, we empirically investigate how stock market and bond market react to the issuances of asset-backed (ABS) and mortgage-backed (MBS) securitizations. We document that securitization is generally associated with negative abnormal return in the stock market. This is true for both MBS and ABS securitization. However, when we break down our sample according the time period, we find in the 1988-1997 time span, the overall stock market reaction to securitization is insignificantly from zero, while the above negative relation is mainly driven by securitization during the 1998-2007 time period. Focusing on a sample of securitization issued by banking institutions, we document the banking capitalization has important implication for the stock market reaction to securitization. In the regression analysis, we identify the size of the sponsor plays an important certification role and is positively associated with announcement return, while frequent market participants have unfavorable market reactions on the announcement of securitization. Our results from bond market indicate that bondholders of asset sellers generally have positive excess return on the announcement of securitizations.

Keyword: Securitization; Wealth Effects; Event Study
JEL Classification: G14; G21; G34

Authors thank Chung-Hua Shen, Christopher Tucci, Giuseppe Morbidelli, Paolo Savona, and the participants of the Sixth Colloquium on Derivatives, Risk-Return and Subprime, Lucca, Italy, 2008.
1. Introduction

In the past three decades, capital markets have experienced an explosive growth of securitization and issuances of securitized assets. As illustrated in Figure 1 and 2, from 1988 to 2007, the gross proceeds of selling asset-backed securities have increased almost 13 folds, and reached the peak in 2006 with amount of 1.6 trillion in US dollars. Given the importance and prevalence of securitization in the past three decades, academic researchers and policy makers are concerned about its causes and consequences. More importantly, the recent financial crisis resulted from the crash of sub-prime mortgage market raises a lot of question about securitizations. In order to better understand this phenomenon, we conduct the study to investigate securitization through “special purpose vehicles” (SPVs) by different types of issuers. Specifically, we attempt to provide a comprehensive study on the wealth effects of securitization to different stakeholders of asset selling companies.

Figure 1
Gross proceeds of securitization according to types of assets ($millions)
The rapid growth of securitization market is due primarily to the awareness of certain important features possessed by securitization transactions and market acceptance. The securitization process can potentially benefit a wide range of participants in the securitization markets including consumers. By selling the pooled assets to an SPV that issues securities and sell them in the market, the asset seller is able to replenish those funds from proceeds which are otherwise impossible. Asset selling companies can consequently initiate more loan originations. With additional liquidity generated in securitization for financial institutions, consumers are better off with more access to available credit in the form of mortgage, auto, student, home equity loans as well as credit cards. Securitization can be a more efficient way for financial institutions and other credit providers to obtain additional funds in terms of financing cost. If the efficiencies realized by
the marketplace through securitization can be passed on to consumers, consumers are better off to have credit with lower interest rates. Without securitization market, it is highly likely that lenders facing high cost to raise addition fund are either unable to extend credit to borrowers or can only provide capital with higher cost.

Securitization also benefits investors with more investment opportunities. SPVs issues securities to the marketplace typically backed by numerous assets. Investors can diversify their risk by invest in a pool of assets. Moreover, according to the specific need of investors, securitized instruments can be structured accordingly to reach maximum flexibility. Investors then have more choices such as long-term vs. short-term investment and fixed rate vs. float rate investment.

However, Securitization, as a structured finance process is not free of criticism. Several serious frictions exist in the securitization markets (Ashcraft and Schuermann 2007) which can be potentially hazardous. The agency problem and information asymmetry arising from these frictions can be detrimental to the markets. Furthermore, securitization is structured to redistribute the credit risk to investors. In reality, many financial institutions retained significant amounts of MBS instead of distributing them to investors, which consequently lead to a concentration of credit risk on those entities holding a lot of MBS. The recent financial crisis triggered by the failure of those mortgage companies and investment firms that have heavily invested in sub-prime mortgage, especially mortgage-backed securitizations (MBS) calls for a closer look at the process of securitization and its consequence. In this paper, we are trying to comprehensively examine how stock market and bond market react to the securitization backed by different types of assets and issued by different types of asset sellers in different time period\footnote{In a separate study, we further look at whether corporate governance plays a role in the process of securitizations as well as whether market reactions to securitization depend how well assets sellers are governed.}.

In general, extending the existing literature (e.g., Thomas, 2001), we find that stock market reaction to securitization changes over the time. Overall, securitization is generally associated with negative abnormal return in the stock market. However, this negative relation is mainly driven by securitization in the post-1997 time period. In the regression analysis, we identify the size of the sponsors play an important certification role and is positively associated with announcement return, while issuing frequency
is negatively associated with market reactions on the announcement of securitizations. Our results from bond market indicate that bondholders of asset sellers generally have positive excess return on the announcement of securitizations. Moreover, our research also shed some light on banking regulation as we find the high capitalized banks tend to get more favorable response from stock market, especially when they are new market entrants and issue securitization without agency ratings.

The rest of this paper is organized as follows. In section 2, we introduce some institutional background of securitization and briefly review prior research. Section 3 reports our data collection procedure and sample construction. In section 4, we present our empirical results. Section 5 summaries and concludes.

2. Prior research

2.1. Institutional background of securitization

In this section, we briefly review some important institutional features of securitization to provide a general background for our research.

2.1.1. Special Purpose Vehicles (SPVs)

Special Purpose Vehicles (SPVs), also known as Special Purpose Entities (SPEs), are legal entities set up for a specific and particular purpose. SPVs are a crucial component of the securitization process. Without the creation of SPVs, securitizations would not take place because of the bankruptcy remote feature of SPVs.

SPVs serve as depositories for specific groups of assets in a securitization. In setting up a SPV, different types of assets along with payments that borrowers are obligated to make to lenders are deposited. The payments received from a specific group of assets in turn form the basis for the SPV to make payments for principal and interests to investors who purchase the mortgage and asset-backed securities (MBS and ABS). SPVs are carefully designed in the way that they cannot become legally bankrupt.


\(^{3}\) Residential and commercial mortgages, home equity loans, student loans, auto loans and student loans with the commitment of borrowers to repay debts are typical assets of the lender that can be securitized.
Once a sponsor transfers a pool of assets to the SPV, the assets are isolated from that sponsor in the sense that even the sponsor enters into the bankruptcy procedure, its creditors cannot touch the specific pool of assets. In order to make the SPV bankruptcy remote, it is necessary to constrain the activities of the SPV to incur debt. SPVs do not have the right to conduct any activities other than those rights granted to them in the legal files creating and governing the securitization process and the SPVs. The bankruptcy remote feature of SPVs is very important in securitization because it prevent investors from taking extra risk beyond their expectation.

2.1.2. Process of securitization and major market participants

Securitization involves necessary steps from setting up an SPV to sell securities to the market place. During the process, there are several important participants who assume different roles. A sponsor or originator creates the bankruptcy remote SPV, and transfers a pool of assets to the SPV. An important concern in securitization is to determine the credit quality the pool of assets. Based on publicly available rating criteria, credit rating agencies assign credit ratings on asset-backed securities. Depending on the characteristics of the pool of underlying assets, credit rating agencies estimate the loss distribution, and determine the amount of credit enhancement that a security needs to reach a given credit rating. Since the SPV’s available manual of activities is limited, credit enhancer helps to minimize the likelihood of lacking enough cash to make payment to investors. The SPVs operate independently and need to employ a servicer who is responsible for providing customer service to the originators, making loan payments, contacting delinquent borrowers, and supervising foreclosures and property dispositions.

The cash flows backing the securitization are tranched into asset-backed securities, the most senior of which are rated and issued in the market and purchased by different investors. Investors tend to be large and sophisticated institutional investors such as private pension funds, credit unions, insurance companies, money market funds, banks and thrifts and mutual funds. The proceeds obtained from issuing ABS or MBS are used to purchase the receivables from the sponsor.
2.2. Related research

Asset securitization is becoming an important vehicle for issuing companies to recapitalize their loans, and it also provides important investment opportunities for a wide range of investors. Given the importance and prevalence of securitization, a large amount of scholarly efforts, both theoretically and empirically, have been put into the understanding the causes and consequences.

Once lenders provide funds to borrowers, the money is no long in the hands of lenders. In essence, securitization provides liquidity to asset sellers though the motivations for doing so may vary. Securitizations allow financial institutions and non-financial companies to sell off a large portion of fixed income claims in their portfolios. It is possible that asset seller may get fresh capital at a lower cost than through direct borrowing, and improve their optimal risk allocation (Benveniste and Berger 1987; James 1988). As a consequence, securitization has the potential to change the wealth and the risk of the securitizing entity (Greenbaum and Thakor 1987).

As we discuss early, the process of securitization involves many participants such as originators, credit rating agencies, assets managers and investors. In the process of securitization, there is a great amount of uncertainties and asymmetric information. Focusing on securitization of subprime mortgage credit, Ashcraft and Schuermann (2007) detail the key frictions existing among different market participants. For instance, there is significant information gap between subprime borrowers and the loan providers. Subprime borrowers consisting of a lot individuals with different background, and they may not fully understand their financing needs and other available alternatives. This is problematic because subprime borrowers may over borrow beyond their capacity of repayment. For another example, the originators are assumed to know the quality of the pool of assets that are subject to securitization, while credit rating agencies only have limited incentive to conduct due diligence. Meanwhile, investors rely on rating agencies’ opinion to make investment decision and are lacking of information for the true value and risk of the pool of assets they are buying.

Existing literature, drawing from various line of research, propose that companies conducting securitization may have different motivations. Nonetheless, these different lines of research are, more or less, related to the role of financial intermediations and the presence of asymmetric information in the financial markets. Thomas (2001)
summarizes three major explanations for securitizations in the literature as signaling, avoiding underinvestment, and making use of comparative advantage. For example, banks can choose to sell part of their assets according to the quality and risk of the projects. Banks know the risk of their own projects and can choose the optimal level of securitization, thus convey the information to the market to signal the risk of their projects (Greenbaum and Thakor 1987).

Securitization can be a way to avoid underinvestment problem (Myers 1977) because securitization can improve risk sharing and increase project funding (Benveniste and Berger 1987; James 1988). Under the optimal risk allocation framework, companies can obtain fresh capital that would otherwise unavailable in the absence of securitization to fund their projects.

Asset sellers may retain a substantial risk of the assets they transfer to SPVs. For example, Chen, Liu and Ryan (2007) conduct empirical analysis for bank loan securitizations and find bank retain more of the risk of their securitized loans when the loans has higher risk. In order to make investor comfortable to purchase securitized loans, banks have to retain “a larger first-loss position” in the loans.

Moreover, a recent study by Jiangli, Prisker and Raupach (2007) provides a model on motivation for banks to choose securitization to obtain liquidity. Banks can also finance themselves through debt and equity. They face a tradeoff between tax disadvantage of equity financing and the financial distress costs that are associated with debt financing. Loan sales and securitization offer two alternative channels for obtain new financing. In their model, they focusing on the role of that banks play in monitoring the borrowers that they lend to. Because banks will only actively monitor their loan customers in the situation that they also hold stakes in those loans. Therefore, loan sales can only be partially implemented which impose selling banks with adverse tail events. In contrast, banks can sell most of securitized assets to outside investors and reduce their insolvency, which will benefit more for bondholders.

The above explanations are not mutually exclusive, and their effects on the shareholders and bondholders for asset selling companies are not straightforward. Though certain hypotheses predicate that securitization may benefit shareholders and transfer wealth from bondholders to shareholders, other explanations have exactly opposite prediction, which necessitates empirical examination. However, the empirical research examining the consequence of securitization on the
wealth of shareholders and bondholders is not abundant. Among the few pieces of research work, Benveniste and Berger (1987) find support for their hypothesis that riskier banks tend to securitize. A study by Beger and Udell (1993) further substantiates Benveniste and Berger's (1987) findings but is unable to identify a significant relation between commercial and industrial loan sales and bank risks. James (1988) and Stanton (1998) document that banks with higher risk, more liquidity constraints, and higher nonperforming loan ratio, are more likely to choose off-balance-sheet activities.

Lockwood, Rutherford and Herrera (1996) and Thomas (1999; 2001) both directly examine the wealth effects of securitization on different stakeholders, though they reach somewhat conflicting conclusions. It is possible that they employ different datasets which lead to the comparability of their empirical findings. Therefore, it is our attempt to provide a more updated and comprehensive analysis on the consequences of securitization to both shareholders and bondholders of asset selling companies.

3. Data and sample description

3.1. Sample construction

In this paper, we rely on SDC platinum New Issues Database to identify asset-backed and mortgage backed issues. We select the time span of 1988 to 2007 to construct our sample. We exclude agency issues and issues without information about issue type. It is common in practice that SDC report multiple same day issues separately because they involve issuances of different securities (Thomas 2001) of the same SPV. Consequently, we count multiple same day issues as one transaction. Lastly, we require asset sellers have stock price information from The Center for Research in Security Prices (CRSP) data file. We end up with 9,407 issues in our sample.

From SDC platinum, we collect information on the identities of issuers, issuing date, listing date, types of assets, main SIC codes of issuers, issuers public status, gross proceeds and agency rating if available. According to the types of issuers, we further categorize our sample into three subsamples, namely issuances by banking institutions, non-banking financial institutions and other issuers. In addition, we make distinction between ABS and MBS. As detailed in previous section, ABS securitizations are divided into different subgroups (e.g.,
credit card, student loan, automobile, home equity and others), while MBS securitizations are divided into pass-through MBS, Collateralized Mortgage Obligations (CMOs) and others. It is plausible that securitizations issued by different asset sellers and backed by different types of assets may well possess different risk profiles and valuation procedures. Consequently, their issuances may have various implications on their sellers’ claimants. Forming subcategories of securitizations allow us to investigate differentiated effect of such issuances accordingly. Furthermore, according to the issuing history of asset sellers, we group them into new market entrants and those with previous securitization experience, and calculate their issuing frequency.

3.2. Excess returns for shareholders and bondholders

We mainly use event study to gauge the excess return for the issuers surrounding the announcement. Therefore, issuers in our sample must be publicly traded and have stock price information in CRSP data file. An important issue is that, literally, for securitizations, there is no announcement date. Therefore, we are not able to precisely identify the events. As discussed in prior literature (Lockwood, Rutherford et al. 1996; Thomas 1999; Thomas 2001), assets securitizations are arranged on a book-building basis. The whole issuing process can start from two weeks to several months prior to the listing. Consequently, there is no exact announcement date. Existing literature uses both issuing dates and a combination of issuing dates and filing dates to identify the event. We follow existing literature and use both methods to conduct our analysis. For the sake of brevity, we mainly report results based on event studies with issuing dates as event dates.

In the setting of standard event study methodology, security returns are assumed to be driven by a single-index market model. Therefore, we calculate security returns using the following simply linear regression model

$$ R_{it} = \alpha_{it} + \beta_i R_{mt} + \epsilon_{it} $$

(1)

Where $R_{it}$ is the return for security $i$ on day $t$, $R_{mt}$ is the return on a market index on day $t$, and $\alpha$ and $\beta$ are market model coefficients. Deviations from the expected return for security $i$ on date $t$, given by the market model, are defined as abnormal returns.

Daily abnormal returns for each firm in event window are
computed as:

\[ AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \] (2)

Where \( AR_{it} \) is the abnormal return for firm \( i \) on day \( t \). We subtract 46 days from the event date, and the resulting day is the last day of the estimation period. For each firm \( i \), we estimated the market model coefficients using daily returns for the 255-day estimation period.

As a next step, we turn to Lehman Brothers Fixed Income Database to identify those securitizations with full price information of bonds issued by the same issuers. Because bond price is reported in Lehman Brothers Fixed Income Database on the monthly basis, we, following exiting study (Thomas 2001), use different time windows in our empirical analysis. We obtain index return from the same data base, and subtract index return from monthly return of individual bonds, and then sum monthly excess return over different time windows.

3.3. Characteristics of asset sellers

In the regression analysis, we obtain additional information on issuers' characteristics from Compustat. From Compustat data file, we collect information on total assets, market to book ratio, common equity, preferred stocks and credit rating. Consistent with prior research, the size of asset sellers is, in most case, the only variable that can significantly explain the excess return. It is plausible that an issuer with larger size is also more likely to be well capitalized (Thomas 2001). We also calculate the capital to assets ratio as tier 1 capital (common stock and preferred stock) over total assets.

4. Empirical results

4.1. Wealth effects of securitization on shareholders of asset sellers

In this section, we mainly examine how stock market reacts to the announcement of securitizations using standard event study method. We then take excess return as our dependent variable, and regress it on different sets of variables that can be potential determinants of excess return.
4.1.1. Event study on excess returns to stockholders

First, we use issuing date as the event date for a particular issuance, and calculate excess return to shareholders over different time windows. While the whole process of securitization can take months to complete, Thomas (2001) does not find significant abnormal return in the longer event windows than 30 days. Though we try different longer windows, we only report results from event study for up to 30 days prior to the issuing date. Table 1 reports our basic results.

Table 1
Excess returns on the announcement of securitization to shareholders of asset sellers: Basic results

<table>
<thead>
<tr>
<th>Type of Issuance</th>
<th>Observations</th>
<th>Event Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-30,0)</td>
<td>(-20,0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9,407</td>
<td>-0.46***</td>
</tr>
<tr>
<td><strong>MBS</strong></td>
<td>4,800</td>
<td>-0.40**</td>
</tr>
<tr>
<td><strong>Pass through</strong></td>
<td>3,967</td>
<td>-0.56***</td>
</tr>
<tr>
<td><strong>CMO</strong></td>
<td>217</td>
<td>1.79**</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>616</td>
<td>-0.09</td>
</tr>
<tr>
<td><strong>ABS</strong></td>
<td>4,607</td>
<td>-0.53**</td>
</tr>
<tr>
<td><strong>Credit card</strong></td>
<td>906</td>
<td>-0.57</td>
</tr>
<tr>
<td><strong>Auto</strong></td>
<td>533</td>
<td>-0.74</td>
</tr>
<tr>
<td><strong>Home equity</strong></td>
<td>2,855</td>
<td>-0.49*</td>
</tr>
<tr>
<td><strong>Student loan</strong></td>
<td>123</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>190</td>
<td>-1.04</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively.

In general, we find that the average excess returns around issuing dates appear to be negative, be they MBS or ABS. We can reject the null hypothesis that the excess return equals zero at 1 percent confidence level in most cases. Interestingly, we find that, in the post-issuance period, stock market reacts negatively as well. This finding suggests that it takes some time for the market to absorb the information and evaluate the consequence of securitizations to asset selling companies,
and react unfavorably. For the overall sample, shareholders of issuing companies experience 1 percent loss in the (-30, 30) window.

Since different types of securitizations involve subcategories of assets possessing different features, we examine the wealth effects of securitization more closely by partitioning our sample. Two major types of mortgage-backed securities are pass-through MBS and Collateralized Mortgage Obligations (CMOs). Pass-throughs are designed to pool multiple mortgages, which allow investors to reduce their prepayment risk through diversification rather than a single mortgage investment. CMOs are structured to distribute cash flow from the underlying collateral over a series of tranches by repackaging pass-through MBS. By definition, CMOs are designed to provide some protection against the prepayment risk beyond the protection offered by pass-throughs with reasonable credit quality and high yields. Our findings are quite consistent with the institutional features of these two types of MBS. The negative excess return associated with issuances of MBS is mainly driven by pass-throughs MBS in both pre- and post-issuance period. We do not find that CMOs and other MBS possess consistent pattern indicating non-zero excess return on the announcement of securitizations.

Asset-backed securities are actually backed by different types of assets. In SDC platinum database, we are able to identify underlying assets for ABS as credit card receivables, home equity loans, student loans and auto loans. We examine them separately, and report our results in Table 1. We find that overall ABS securitization is associated with negative market reaction, and the negative excess return is mainly driven by home equity-backed ABS. Home equity loan backed ABS is one of the major components of ABS market. Home equity loan literally refers to all types of loan secured by residential real estate which is subject to more valuation problems compared to other types of ABS. It is plausible that, though asset sellers transfer the securitized assets to bankruptcy remote trusts, they still retain a significant portion of the risk. Stock market reacts to securitization unfavorably because the potential loss associated with securitized assets.
Table 2
Excess returns on the announcement of securitization to shareholders of asset sellers using alternative event dates

<table>
<thead>
<tr>
<th>Type of Issuance</th>
<th>Observations</th>
<th>Event Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(-30,0)</td>
</tr>
<tr>
<td>Total</td>
<td>9,577</td>
<td>-0.47***</td>
</tr>
<tr>
<td>MBS</td>
<td>4,931</td>
<td>-0.18</td>
</tr>
<tr>
<td>Pass-through</td>
<td>4,080</td>
<td>-0.30*</td>
</tr>
<tr>
<td>CMO</td>
<td>217</td>
<td>1.91**</td>
</tr>
<tr>
<td>Other</td>
<td>634</td>
<td>-0.09</td>
</tr>
<tr>
<td>ABS</td>
<td>4,646</td>
<td>-0.73***</td>
</tr>
<tr>
<td>Credit card</td>
<td>946</td>
<td>-0.74***</td>
</tr>
<tr>
<td>Auto</td>
<td>545</td>
<td>-0.85***</td>
</tr>
<tr>
<td>Home equity</td>
<td>2,841</td>
<td>-0.97***</td>
</tr>
<tr>
<td>Student loan</td>
<td>129</td>
<td>-1.39*</td>
</tr>
<tr>
<td>Others</td>
<td>185</td>
<td>2.30***</td>
</tr>
</tbody>
</table>

Note: *,**,*** indicate significance level at 10%, 5% and 1%, respectively.

We replicate the same test performed in Table 1 by choosing a combination of issuing date and listing date, whenever possible, and report our findings in Table 2 as a robustness check. In general, we find qualitatively the same results which validate our prior findings.
Table 3
Excess returns on the announcement of securitization to shareholders of asset seller in different time periods

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Event Windows</td>
<td>Event Windows</td>
</tr>
<tr>
<td></td>
<td>(-30,0)</td>
<td>(-3,0)</td>
</tr>
<tr>
<td>Total</td>
<td>0.1362</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>N=2,377</td>
<td>N=2,377</td>
</tr>
<tr>
<td>MBS</td>
<td>0.3779*</td>
<td>0.0948</td>
</tr>
<tr>
<td></td>
<td>N=1,379</td>
<td>N=1,379</td>
</tr>
<tr>
<td>Pass through</td>
<td>0.0252</td>
<td>0.0712</td>
</tr>
<tr>
<td></td>
<td>N=926</td>
<td>N=926</td>
</tr>
<tr>
<td>CMO</td>
<td>1.7891**</td>
<td>0.0201</td>
</tr>
<tr>
<td></td>
<td>N=217</td>
<td>N=217</td>
</tr>
<tr>
<td>Other</td>
<td>0.3968</td>
<td>0.4791*</td>
</tr>
<tr>
<td></td>
<td>N=180</td>
<td>N=180</td>
</tr>
<tr>
<td>ABS</td>
<td>-0.1977</td>
<td>-0.1264</td>
</tr>
<tr>
<td></td>
<td>N=998</td>
<td>N=998</td>
</tr>
<tr>
<td>Credit card</td>
<td>-0.0031</td>
<td>0.1212</td>
</tr>
<tr>
<td></td>
<td>N=259</td>
<td>N=259</td>
</tr>
<tr>
<td>Auto</td>
<td>-0.8072</td>
<td>-0.5576**</td>
</tr>
<tr>
<td></td>
<td>N=227</td>
<td>N=227</td>
</tr>
<tr>
<td>Home equity</td>
<td>-0.0756</td>
<td>-0.0728</td>
</tr>
<tr>
<td></td>
<td>N=439</td>
<td>N=439</td>
</tr>
<tr>
<td>Student loan</td>
<td>3.6212*</td>
<td>-1.3242*</td>
</tr>
<tr>
<td></td>
<td>N=13</td>
<td>N=13</td>
</tr>
<tr>
<td>others</td>
<td>-0.4532</td>
<td>0.3081</td>
</tr>
<tr>
<td></td>
<td>N=60</td>
<td>N=60</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively.

As illustrated in Figure 1 and 2, there is a sharp increase in securitization activities after 1998. We wonder whether stock markets will perceive securitization differently at different time periods. Previous research has only examined the phenomenon using pre-1998 data. Therefore, our research also extends the line of inquiry by providing some up-to-date evidence.
It is striking to find that the reaction of stock market to securitizations displays completely different patterns in the 1988-1997 and 1998-2007 time periods. Consistent with Thomas (2001), in the 1988-1997 time period, we find average announcement effect of securitizations on shareholders tend to be neutral. For securitizations backed by certain assets, their wealth effects on shareholders can be positive in some cases (e.g., MBS) and negative in some other cases (e.g., ABS backed by Auto loans in the pre-issuance time windows). However, in the post-1998 period, stock market reacts to securitization unfavorably, which drives our main findings of negative relation between securitization and abnormal return on its announcement. This is true for most categories of securitizations in both pre- and post-issuance windows. It appears that stock market changes its assessment on the consequences of asset securitizations, and reacts accordingly.

Table 4
Excess returns on the announcement of securitization to shareholders of asset sellers by types of issuers

<table>
<thead>
<tr>
<th>Type of Issuance</th>
<th>Observations</th>
<th>Event Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(-30,0)</td>
</tr>
<tr>
<td>Banks</td>
<td>4,146</td>
<td>-0.53***</td>
</tr>
<tr>
<td>MBS</td>
<td>2,314</td>
<td>-0.57***</td>
</tr>
<tr>
<td>ABS</td>
<td>1,832</td>
<td>-0.47</td>
</tr>
<tr>
<td>Non-Bank financial institutions</td>
<td>3,265</td>
<td>-0.43</td>
</tr>
<tr>
<td>MBS</td>
<td>1,465</td>
<td>-0.54*</td>
</tr>
<tr>
<td>ABS</td>
<td>1,800</td>
<td>-0.34</td>
</tr>
<tr>
<td>Other Issues</td>
<td>1,996</td>
<td>-0.38**</td>
</tr>
<tr>
<td>MBS</td>
<td>1,021</td>
<td>0.20</td>
</tr>
<tr>
<td>ABS</td>
<td>975</td>
<td>-0.99***</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively.
We further make distinction between different types of issuers according to their organizational structures. To be specific, we identify those asset selling companies as banking institutions, non-banking financial institutions and other asset sellers according to their primary SIC codes. We find that banks experience significantly negative returns surrounding announcement of securitizations, and mainly for MBS securitizations. For non-banking financial institutions, market reacts neutrally to securitizations. For other asset sellers, the excess returns associated with securitizations are on average negative but mainly for ABS securitizations. We believe that our findings make a lot of sense. Banks are main providers of subprime mortgage loans which contain substantial risk and informational frictions in the process of securitizations (Ashcraft and Schuermann 2007). Other issuers (e.g. auto manufactures) are mainly originators of asset-backed securitizations. As a result, banks and other issuers experience negative excess returns in stock market on their securitizations for MBS and ABS, respectively. As an issuer of ABS or MBS, non-banking financial institutions function more as arrangers rather the originators. Therefore, we do not find evidence that excess returns of securitizations issued by non-bank financial institutions are significantly different from zero.

Table 5
Excess returns to shareholders: Does bank capitalization matter?

<table>
<thead>
<tr>
<th></th>
<th>Window (-30,0)</th>
<th>Window (-3,0)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Capitalization</td>
<td>High Capitalization</td>
</tr>
<tr>
<td>Entire sample</td>
<td>-0.6647***</td>
<td>-0.4071**</td>
</tr>
<tr>
<td></td>
<td>N=1,924</td>
<td>N=1,981</td>
</tr>
<tr>
<td>ABS</td>
<td>-0.8907***</td>
<td>-0.0000</td>
</tr>
<tr>
<td></td>
<td>N=844</td>
<td>N=864</td>
</tr>
<tr>
<td>MBS</td>
<td>-0.0488*</td>
<td>-0.7204**</td>
</tr>
<tr>
<td></td>
<td>N=1,080</td>
<td>N=1,117</td>
</tr>
<tr>
<td>Securitization without rating</td>
<td>-0.3107*</td>
<td>-0.5091**</td>
</tr>
<tr>
<td></td>
<td>N=796</td>
<td>N=868</td>
</tr>
<tr>
<td>New market entrant</td>
<td>-4.3278**</td>
<td>0.5089</td>
</tr>
<tr>
<td></td>
<td>N=41</td>
<td>N=42</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively.
There are a lot of debates on the role of banking institutions in the subprime mortgage crisis. We thus turn to a sub-sample of securitizations issued by banking institutions, and look at this issue more closely. Our results are reported in table 5. As we know, banking industry is highly regulated, and banking institutions are subject capital requirement. The regulation on capital adequacy is to ensure that banks can absorb a reasonable amount of risk in the case of adverse events. Though in the process of securitization, assets used to back the securitization are transferred to the SPVs, sponsoring bank institutions are still responsible for at least part of the risk associated with the securities they issued. Consequently, capital adequacy can be one of the main factors that investors used to assess the uncertainty associated with securitization.

We divide our subsample into two groups, one group with above median capital-to-assets ratio and another group with below median capital-to-assets ratio. We calculate capital-to-assets ratio as tier 1 capital (common stock and preferred stock) over total assets. We find the in both event windows (i.e., (-30,0) and (-3,0)), assets selling banks are doing better if they have higher capital-to-assets ratio. We further look at those selling banks in the top 25 percentile in terms of capital adequacy, and find that stock market reacts positively in the issuance of ABS. However, in the case of MBS issuances, market reacts unfavorably to banks in the top 25 percentile in the (-30,0) time window with a higher magnitude, but react insignificantly positive in the (-3,0) time window. We further exam whether banks with high capital-to-assets ratio perform well if they issue securitizations without agency rating and if they are the first time issuers. Our findings are consistent with our predication. Assets selling banks in the top 25 percentile receive favorable reaction from the stock markets when they issue securitizations without agency rating and when they are the first time issuers.

Overall, we find securitization is associated with sizeable wealth loss for asset selling companies, but this wealth loss for shareholders is mainly driven by securitization issued in after 1998. In the pre-1998 period, we find results consistent with Thomas (2001) that on average, stock market reacts neutrally to the announcement of securitization.

4.1.2. Regressions relating excess return to shareholders to issue characteristics

Table 6 reports our results on the determinants of excess return to shareholders of asset selling companies by regressing abnormal returns on a set of explanatory variables. We enter two dummy variables, Banking Institutions and Non-banking Financial Institutions to capture the
organizational difference of issuers, with other issuers as the base line. We also include the log of proceeds of the issues and log of assets of the issuers. In addition, we add issuing frequency and a new market entrant dummy as control variables. Across all regression models, we employ year dummies to capture the timely trend and economy wide shocks. Furthermore, we cluster the stand errors on issuing entities for all model specifications because one issuer may participate in the securitization market multiple times.

Table 6
Regressions relating excess returns to shareholders to issue characteristics: Full sample

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variable: excess return to shareholders of for the selling companies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Event window (-30,0)</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td>Banking institutions</td>
<td>-0.0049</td>
</tr>
<tr>
<td></td>
<td>(0.0034)</td>
</tr>
<tr>
<td>Non-bank financial institutions</td>
<td>-0.0048</td>
</tr>
<tr>
<td></td>
<td>(0.0037)</td>
</tr>
<tr>
<td>Lnproceed</td>
<td>-0.0010</td>
</tr>
<tr>
<td></td>
<td>(0.0014)</td>
</tr>
<tr>
<td>Lnassets</td>
<td>0.0021**</td>
</tr>
<tr>
<td></td>
<td>(0.0008)</td>
</tr>
<tr>
<td>Issuing frequency</td>
<td>-0.0004**</td>
</tr>
<tr>
<td></td>
<td>(0.0002)</td>
</tr>
<tr>
<td>New market entrant</td>
<td>0.0058</td>
</tr>
<tr>
<td></td>
<td>(0.0110)</td>
</tr>
<tr>
<td>Number of managers</td>
<td>-0.0058</td>
</tr>
<tr>
<td></td>
<td>(0.0111)</td>
</tr>
<tr>
<td>Constant</td>
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</tr>
<tr>
<td></td>
<td>(0.0331)</td>
</tr>
<tr>
<td>Year dummies</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>8,980</td>
</tr>
<tr>
<td>F-statistics</td>
<td>13.35***</td>
</tr>
<tr>
<td>R-squared</td>
<td>5.33</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively
Table 7
Regressions relating excess returns to shareholders to issue characteristics: MBS subsample

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variable: excess return to shareholders of the selling companies</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Event window (-30,0)</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td>Banking institutions</td>
<td></td>
</tr>
<tr>
<td>-0.0080*</td>
<td>-0.0066</td>
</tr>
<tr>
<td>(0.0045)</td>
<td>(0.0057)</td>
</tr>
<tr>
<td>Non-bank financial institutions</td>
<td></td>
</tr>
<tr>
<td>-0.0097**</td>
<td>-0.009</td>
</tr>
<tr>
<td>(0.0050)</td>
<td>(0.0064)</td>
</tr>
<tr>
<td>Lnproceed</td>
<td>0.0004</td>
</tr>
<tr>
<td>(0.0018)</td>
<td>(0.0019)</td>
</tr>
<tr>
<td>Lnassets</td>
<td>0.0022**</td>
</tr>
<tr>
<td>(0.0012)</td>
<td>(0.0015)</td>
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<tr>
<td>Issuing frequency</td>
<td></td>
</tr>
<tr>
<td>-0.0001</td>
<td>-0.0001</td>
</tr>
<tr>
<td>(0.0001)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>New market entrant</td>
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</tr>
<tr>
<td>(0.0187)</td>
<td>(0.0200)</td>
</tr>
<tr>
<td>Number of managers</td>
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</tr>
<tr>
<td>(0.0010)</td>
<td>(0.0012)</td>
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<tr>
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<tr>
<td>(0.0332)</td>
<td>(0.0392)</td>
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<tr>
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<tr>
<td>R-squared</td>
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</tr>
</tbody>
</table>

Note: * ** *** indicate significance level at 10%, 5% and 1%, respectively

Table 6 contains our findings using the full sample. We replicate our analysis with MBS subsample and ABS subsample, and report our empirical results in Table 7 and Table 8, respectively.
## Table 8
Regressions relating excess returns to shareholders to issue characteristics: ABS subsample

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variable: excess return to shareholders of for the selling companies</th>
<th>Event window (-30,0)</th>
<th>Event window (-3,0)</th>
<th>Event window (0,30)</th>
<th>Event window (-30,0)</th>
<th>Event window (-3,0)</th>
<th>Event window (0,30)</th>
<th>Event window (-30,0)</th>
<th>Event window (-3,0)</th>
<th>Event window (0,30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Overall</td>
<td>With rating</td>
<td>Without rating</td>
<td>Overall</td>
<td>With rating</td>
<td>Without rating</td>
<td>Overall</td>
<td>With rating</td>
<td>Without rating</td>
</tr>
<tr>
<td>Banking institutions</td>
<td></td>
<td>-0.0014</td>
<td>0.0020</td>
<td>-0.0089</td>
<td>-0.0026***</td>
<td>-0.0013</td>
<td>-0.0092***</td>
<td>-0.0190***</td>
<td>-0.0247***</td>
<td>-0.0032</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0047)</td>
<td>(0.0052)</td>
<td>(0.0071)</td>
<td>(0.0016)</td>
<td>(0.0020)</td>
<td>(0.0023)</td>
<td>(0.0046)</td>
<td>(0.0064)</td>
<td>(0.0067)</td>
</tr>
<tr>
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<td>-0.0008</td>
<td>-0.0018</td>
<td>-0.0009</td>
<td>0.0001</td>
<td>-0.0079**</td>
<td>-0.0166**</td>
<td>-0.0189**</td>
<td>-0.0030</td>
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<tr>
<td></td>
<td></td>
<td>(0.0053)</td>
<td>(0.0058)</td>
<td>(0.0103)</td>
<td>(0.0018)</td>
<td>(0.0023)</td>
<td>(0.0032)</td>
<td>(0.0071)</td>
<td>(0.0080)</td>
<td>(0.0088)</td>
</tr>
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<td>0.0014</td>
<td>-0.0061***</td>
<td>-0.0001</td>
<td>0.0010</td>
<td>-0.0020**</td>
<td>-0.0005</td>
<td>0.0003</td>
<td>-0.0044</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0024)</td>
<td>(0.0034)</td>
<td>(0.0032)</td>
<td>(0.0007)</td>
<td>(0.0011)</td>
<td>(0.0010)</td>
<td>(0.0027)</td>
<td>(0.0038)</td>
<td>(0.0043)</td>
</tr>
<tr>
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<td>0.0005</td>
<td>0.0051**</td>
<td>0.0018***</td>
<td>0.0018***</td>
<td>0.0014**</td>
<td>0.0041**</td>
<td>0.0057**</td>
<td>0.0008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0011)</td>
<td>(0.0013)</td>
<td>(0.0021)</td>
<td>(0.0003)</td>
<td>(0.0004)</td>
<td>(0.0006)</td>
<td>(0.0017)</td>
<td>(0.0022)</td>
<td>(0.0022)</td>
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<td>Issuing frequency</td>
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<td>-0.0005**</td>
<td>-0.0006</td>
<td>-0.0006***</td>
<td>-0.0002**</td>
<td>-0.0002*</td>
<td>-0.0003***</td>
<td>-0.0008***</td>
<td>-0.0014***</td>
<td>-0.0002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0003)</td>
<td>(0.0005)</td>
<td>(0.0002)</td>
<td>(0.0001)</td>
<td>(0.0011)</td>
<td>(0.0001)</td>
<td>(0.0002)</td>
<td>(0.0047)</td>
<td>(0.0003)</td>
</tr>
<tr>
<td>New market entrant</td>
<td></td>
<td>0.0104</td>
<td>0.0110</td>
<td>-0.0065</td>
<td>0.0087*</td>
<td>0.0067</td>
<td>0.0333**</td>
<td>0.0051</td>
<td>0.0099</td>
<td>-0.0315</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0130)</td>
<td>(0.0143)</td>
<td>(0.0286)</td>
<td>(0.0049)</td>
<td>(0.0052)</td>
<td>(0.135)</td>
<td>(0.0137)</td>
<td>(0.0150)</td>
<td>(0.0266)</td>
</tr>
<tr>
<td>Number of managers</td>
<td></td>
<td>-0.0003</td>
<td>-0.0009</td>
<td>0.0003</td>
<td>0.0002</td>
<td>0.0001</td>
<td>-0.0013*</td>
<td>0.0002</td>
<td>-0.0003</td>
<td>-0.0021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0009)</td>
<td>(0.0013)</td>
<td>(0.0029)</td>
<td>(0.0003)</td>
<td>(0.0005)</td>
<td>(0.0007)</td>
<td>(0.0012)</td>
<td>(0.0016)</td>
<td>(0.0019)</td>
</tr>
<tr>
<td>Constant</td>
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<td>0.0902</td>
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<td>-0.0716***</td>
<td>0.0276</td>
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<td>0.1195</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0635)</td>
<td>(0.0725)</td>
<td>(0.0898)</td>
<td>(0.0170)</td>
<td>(0.0231)</td>
<td>(0.0276)</td>
<td>(0.0602)</td>
<td>(0.0691)</td>
<td>(0.1071)</td>
</tr>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
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<td>3,039</td>
<td>3,199</td>
<td>4,387</td>
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<td>3,199</td>
<td>4,387</td>
<td>3,039</td>
<td>3,199</td>
</tr>
<tr>
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<td>5.09***</td>
<td>4.28***</td>
<td>6.63***</td>
<td>3.63***</td>
<td>4.18***</td>
<td>18.03***</td>
<td>8.42***</td>
<td>7.54***</td>
</tr>
<tr>
<td>R-squared</td>
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<td>3.02</td>
<td>3.04</td>
<td>5.10</td>
<td>1.69</td>
<td>1.56</td>
<td>9.28</td>
<td>5.81</td>
<td>6.20</td>
<td>8.79</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively

Across the full sample and all subsamples, we find the log of assets of selling companies is consistently and positively associated with excess return in the stock market. It is plausible that large issuers are...
more likely to be well capitalized, and their size servers as a certification role. We also find that issuing frequency is significantly and negatively associated with excess returns, especially for the ABS subsample. This finding suggests that market reacts unfavorably to the announcement of securitization of those issuers sponsoring many SPVs. In the adverse tail events, bearing too many asset-backed securities may impose substantial loss to the sponsors of SPVs.

In the regression analysis, we also distinguish issues with or without agency ratings. On average, issuing entities experience wealth loss for securitizing assets without agency ratings. It appears that market relies heavily on the opinions of rating agencies. Absence of credit rating, a particular issue will be perceived as with high uncertainty. Banking institutions and non-banking financial institutions receive even worse market response when they originate issuances without credit ratings.

4.2. Wealth effects of securitization on bondholders of asset sellers

In this section, we turn to the bond market and try to investigate how bond market reacts to the announcement of securitization by different types of sponsors and by different types of issuing securities.

4.2.1. Event study on excess return to bondholders

Table 9
Excess returns on the announcement of securitization to bondholders of asset sellers

<table>
<thead>
<tr>
<th>Type of issuance</th>
<th>Event window</th>
<th>(-2,0)</th>
<th>(-1,0)</th>
<th>(0,0)</th>
<th>(1,1)</th>
<th>(1,2)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>0.46***</td>
<td>0.35***</td>
<td>0.15***</td>
<td>0.12</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N=695</td>
<td>N=698</td>
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<tr>
<td>MBS</td>
<td></td>
<td>0.47***</td>
<td>0.36***</td>
<td>0.07*</td>
<td>0.20**</td>
<td>0.25</td>
</tr>
<tr>
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<td></td>
<td>N=424</td>
<td>N=425</td>
<td>N=425</td>
<td>N=422</td>
<td>N=418</td>
</tr>
<tr>
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<td>0.28**</td>
<td>0.09**</td>
<td>0.21</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>N=271</td>
<td>N=271</td>
<td>N=268</td>
<td>N=265</td>
</tr>
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<td>N=97</td>
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<tr>
<td>Other</td>
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<td>0.04</td>
<td>0.18</td>
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</tr>
<tr>
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<td>(-2,0)</td>
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<td>(1,1)</td>
<td>(1,2)</td>
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<td></td>
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<td>0.35**</td>
<td>0.27***</td>
<td>-0.01</td>
<td>-0.02</td>
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</tr>
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<td>N=273</td>
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<td>N=103</td>
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<td>N=100</td>
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</tr>
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</tr>
<tr>
<td>1.94***</td>
<td>1.21***</td>
<td>0.61**</td>
<td>0.63*</td>
<td>0.70*</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>N=53</td>
<td>N=53</td>
<td>N=53</td>
<td>N=53</td>
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<td></td>
</tr>
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<td>0.09</td>
<td>-0.15</td>
<td>-0.01</td>
<td></td>
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<td>N=103</td>
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</tr>
<tr>
<td>others</td>
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<td></td>
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<td>1.60</td>
<td>1.45</td>
<td>0.35</td>
<td>-0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N=13</td>
<td>N=14</td>
<td>N=14</td>
<td>N=13</td>
<td>N=12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively

Table 10
Excess returns on the announcement of securitization to bondholders of asset sellers by types of issuers

<table>
<thead>
<tr>
<th>Type of issuance</th>
<th>Event window</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-2,0)</td>
</tr>
<tr>
<td>Banking Institutions</td>
<td></td>
</tr>
<tr>
<td>MBS</td>
<td>0.44**</td>
</tr>
<tr>
<td>N=48</td>
<td>N=48</td>
</tr>
<tr>
<td>ABS</td>
<td></td>
</tr>
<tr>
<td>0.06</td>
<td>0.09</td>
</tr>
<tr>
<td>N=83</td>
<td>N=83</td>
</tr>
<tr>
<td>Non-banking financial institutions</td>
<td></td>
</tr>
<tr>
<td>MBS</td>
<td>0.47</td>
</tr>
<tr>
<td>N=283</td>
<td>N=284</td>
</tr>
<tr>
<td>ABS</td>
<td></td>
</tr>
<tr>
<td>-0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>N=102</td>
<td>N=103</td>
</tr>
<tr>
<td>Other issuers</td>
<td></td>
</tr>
<tr>
<td>MBS</td>
<td>0.57***</td>
</tr>
<tr>
<td>N=281</td>
<td>N=283</td>
</tr>
<tr>
<td>ABS</td>
<td></td>
</tr>
<tr>
<td>1.34***</td>
<td>0.96**</td>
</tr>
<tr>
<td>N=86</td>
<td>N=87</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively
We rely on Lehman Brother Fixed Income Database to collect monthly bond price and calculate bond return index. Because the bond price is on monthly basis and securitization involves long period, we, following existing literature (Thomas, 2001), choose wide time windows to compute excess return. We subtract index return from bond monthly return and then sum the monthly excess return over different event windows. Only a small number of issuing companies have bonds outstanding at the same time of securitizations. In addition, our bond price data end in 1997. As a consequence, our sample size reduces significantly. Using this reduced subsample, we report our findings regarding to the excess returns to bondholders in Table 9 and Table 10.

Table 9 reports excess return of securitization on debt claimants according to the types of issuing securities, while Table 10 replicates the analysis according to the organizational structures of asset sellers. Consistent with existing research (Thomas 2001), we find the bond market reacts favorably to the announcement of securitization. It is plausible that by selling assets to SPVs and obtain new capital infusions reduce the insolvency risk of issuing entities which benefits bondholders. Both MBS and ABS securitization are associated with positive excess return in bond market. For MBS securitizations, the positive return is mainly driven by issuing pass-throughs, while, for ABS securitizations, the positive return is mainly driven by auto-loan-backed securitizations. Table 10 is based on different types of issuers confirm our findings. Both banks and non-banking financial institutions experience positively excess bond returns, but mainly for issuing MBS securities. For other issuers, positive excess bond returns are only significant for ABS securitizations. This is not surprising because auto-manufactures dominate this category. However, we do acknowledge that the power of our test is limited because our data from Lehman Brother Fixed Income Database end in 1997.
4.2.2. Regressions relating excess return to bondholders to issue characteristics

Table 11
Regression relating excess returns to bondholders to issue characteristics

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variable: excess return to bondholders of for the selling companies: event window (-2,2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Banking institutions</td>
</tr>
<tr>
<td>Lnproceed</td>
<td>Overall MBS ABS</td>
</tr>
<tr>
<td></td>
<td>-0.8949 (0.6314) -2.2062** (0.7564) 0.4181 (1.0593)</td>
</tr>
<tr>
<td>Issuing frequency</td>
<td>-0.0808 (0.0578) 0.0067 (0.2698) -0.0715 (0.0660)</td>
</tr>
<tr>
<td>New market entrant</td>
<td>-1.0239 (4.6677) -0.4965 (3.0971) 0.6249 (0.6646) 0.3873 (0.7027) 0.1717 (1.6571)</td>
</tr>
<tr>
<td>Lnassets</td>
<td>0.8377* (0.5461) 0.9672 (0.6282) 0.9255 (0.8068) 0.1645* (0.0898) 0.0963 (0.1519) 0.2593* (0.1444)</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.7874 (16.3099) 19.0206 (16.3303) -29.9134 (31.4261) -4.4842 (3.6348) -4.1019 (4.8284) -7.2933 (6.4827)</td>
</tr>
</tbody>
</table>

Year dummies: YES YES YES YES YES YES YES YES YES
Observations: 88 25 63 176 124 52 275 192 83

F-statistics: 1.09*** 2.99** 3.43*** 1.25* 0.98 1.84* 2.07** 0.69 3.28***
R-squared: 0.69 0.69 0.69 0.30 0.45 0.75 0.64 0.42 0.25

Note: *, **, *** indicate significance level at 10%, 5% and 1%, respectively

We then take the excess bond return as our dependent variable and regress it on various institutional features of securitizations. We do not identify a strong pattern for most of the explanatory variables. However, for financial institutions, be they banks or non-banks, excess bond returns are associated with larger size in terms of logged assets. Again, the level of capitalization is very important for financial institutions to certify they soundness. In addition, year dummies seem to explain much of the variation of excess bond return.
5. Summary and conclusion

In this study, we provide the most comprehensive event study results on the wealth effects of securitizations for different stakeholders of issuing companies. We, using more updated data, find that securitization is generally associated with negative abnormal return in the stock market. This is true for both MBS and ABS securitizations. However, after breaking down our sample according to different time periods, we find the negative relation is mainly driven by securitizations in the 1998-2007 time span. During time period from 1988 to 1997, our results reveal the market reacts neutrally to securitization on average. For the subcategories of MBS and ABS, we find that companies issuing of pass-through MBS and home-equity-loan-backed ABS experience significantly negative abnormal returns in the stock market. Specifically, for banking institutions, their capital adequacy ratio is a very important signal to investors to assess the riskness associated with the securities sold to the market. Assets selling banks in the top 25 percentile in terms of capital-to-assets ratio significantly do better in most time windows for which we examine. In the regression analysis, we identify that the size of the sponsors plays an important certification role and is positively associated with announcement returns on the announcement of securitizations, while frequent market participants experience unfavorable market reactions.

Our results from bond market indicate that bondholders of asset sellers generally have positive excess returns on the announcement of securitizations. In a nutshell, our research is explorative in nature. However, by adding new evidence to the emerging line of empirical research on securitization, we are able to better understand the causes and consequences of securitization. In a following up study, we attempt to examine how and to what extent different corporate governance practices may affect the market reactions (i.e., from both stock market and bond market) to the announcement of securitizations.
References


Goals of this paper

Goal 1: comprehensively examine the response of stock return to securitization during 1988-2007 on

A) different markets
   i  stock market
   ii bond market
   react to the securitization

B) backed by different types of assets
   i  MBS: pass-through and CMO
   ii  ABS: credit card, home equity

C) by different types of asset sellers
   i  banks (a) above median capital/TA  (b) below C/TA
   ii  Non-banks financial insutituição
   iii  other industries

D) in different time period.
   1988 - 1997
   1998 - 2007

Goal 2: Excess return to issue characteristics

- Excess return =
  f (banking inst., non-bank Inst., proceed, assets, issuing frequency, new market entrant, number of managers, year dummies)
• Table 6: full sample
• Table 7: MBS
• Table 8: ABS
• Table 9: separating banking inst, non-bank inst and others

Goal 3: CG of issuing companies affect the wealth effect

Asset selling company with
(1) Board indecency: independent directors/total number of directors
(2) CEO duality: CEO and Chair of board
(3) Board diversity: number of minority directors/total number of directors
(4) CFO on board: dummy if CFO is also a bored member
(5) Auditing Committee Size: number of members in the auditing committee

Results

A) different markets
i stock market => negative
ii bond market => positive
Securitization is associated with sizeable wealth loss for asset selling after 1998

B) backed by different types of assets
i MBS: pass-through and CMO => positive abnormal
ii ABS: credit card, home equity => positive abnormal

C) by different types of asset sellers
i banks (a) above median capital/TA (b) below C/TA
ii non-banks financial institution
iii other industries

D) in different time period.
however, Thomas finds securitization is significantly wealth creating for stockholders.
1998 - 2007: negative response occur during this period.
Results of Goal 2

Large asset selling co. increase excess returns
Issuing freq decrease excess returns

Results of Goal 3

Non-banking FI: board structure does not affect. CFO is on board is unfavorable
Banking and others: board structure matters. CFO is on board is favorable

Some Suggestions for the future studies, not Comments for the current one

This is an interesting and close to a pioneered paper
This issue is important but studies are scant. We expect that there are more in the future. This paper will be the pioneer and benchmark for the comparisons.
They look at the response of market to securitization from various dimensions. Data are taken from various sources SDC, CRSP, Lehman Brother Fixed Income and More. The paper is very knowledgeable and hardworking.
This issue is timely important, providing strong policy implications. Such as: the wealth effect for bank to issue MBS or ABS may hurt the value of shareholder today. Should banks continue to do it?
It provides lots of issues for the future researchers.
They, however, do not provide too much explanation because the paper is long enough for its current format.

Is it possible to know the quality of asset when securitizing (transparency)?

Subprime, home-equity lending and credit cards form a major source of assets for securitization, yet these loans have high probabilities of default. Is it possible (i.e., is data available) to know the quality of assets?
For example: Greenbaum and Thakor (1987) predict that banks will securitize their best assets, retaining their worst. Can we test it in the future? Once we know the quality, we could conjecture the response in advance.

**Securitization: Gain and Loss, do issuers know these?**

Securitization is associated with
Gain: diversify and securitizing funding channels
banks, for example
Loss: stock returns drop
Gain: diversifying, increasing ROA
If issuers know this, will they continue to securitize their assets?

Maybe, we could have some conjectured reasons to explain the results (hypothesis)

Because this is already a huge study, authors do not propose conjectured reasons behind results in this paper and probably will explain the results in the next one. Next time, maybe, there will be hypotheses proposed. Such as, negative stock return and positive stock returns.
Such as again. Positive bond market responses may be owing to that fact that securitization increase funding channels and thus raters issue higher credit ratings.

**To explain results: diversification argument ...**

The responses in two sub periods are opposite. Can we interpret it in this way:
For their first sub period: => positive stock abnormal return
Market think that securitization can diversify the risk
For their second sub period => negative abnormal returns
market though now it could diversify risk, it can sense that securitization will create an unknown “risk” in the future (efficient market), though market does not know what it is.
To explain the results: Asset Quality Hypothesis

For the first subperiod:
   Better assets to be securitized
For the second subperiod:
   Worse assets to be scurried

Is it possible to further separate the sample after 2006

1998--2007: negative response occur during this period
Is the sample enough to further separate the sample into two sub-periods since sub prime crisis occurred in 2006?
If we can, we expect stronger negative response because the quality of assets is even worse for securitizations.

Table 5 dividing the sample into well capitalized and not capitalized banks

Lockwood et al. (1996): securitization increases shareholder wealth in well-capitalized banks but reduces sharehold wealth in weak banks.
In ABS: support
In MBS: not support
Can discuss the difference of ABS and MBS for two types of banks.

Minor Comments

Page 14: authors say: “We find the in both event windows (i.e., (-30,0) and (-3,0), assets selling banks are doing well if they have higher capital-to-assets ratio.”
I am not sure whether I am right or not: looking at Table 5, the sign is negative. Thus, there is a negative abnormal return.
Does Event study consider the heteroscedasticity of residuals. Many studies have shown that event studies may suffer from the substantial heteroscedasticity.
REMARKS

Giuseppe Guarino
Emeritus Professor, “La Sapienza” University, Rome

I speak with some embarrassment. I have never been nor am I academically or professionally an economist. Academically I was a jurist. However, listening to the papers, I have realised that the question involves institutional aspects, to which unavoidable issues are attached. It may be useful to spend a few words on this. Two opposite lines of thought, I think, emerge from the papers. The crisis we are facing is clearly a crisis of the market. As such, according to the first line of thought, it must be solved by the market. No public intervention is needed. Indeed it should be avoided. Whatever happens, it is the market that will re-launch the economy.

The scenario suggested by the second line of thought is the opposite. Public intervention is indispensable. But the intervention of a single State, however important and powerful it is, would not be sufficient. The crisis is of a global nature. A new world order is needed to solve it. The principal large economies must contribute.

I see that the choice between one line of thought and the other, or of any other idea, involves the “time” factor. We are facing a crisis, whose ultimate cause has not yet been investigated, the exact dimensions of which we are unable to establish, and which has already produced serious effects in many sectors, but whose further developments are unpredictable. There is a widespread fear that it could suddenly produce an avalanche effect. If danger is imminent there must be a prompt response. The agreement between the major States to give a clearer, more stable and secure order to global finance takes time. It is an objective to pursue. But this is a medium or even long term operation.

If we consider the short term, there is only one alternative. If we count on the market we have to accept all possible consequences, even the most painful ones. These will be necessary to clear the system of all the waste products that have hindered its physiological functioning. After completing the cleaning up process, the market will impress a rapid trend on the economies, compensating for the previous sufferings with a florid development.
If however these sufferings are such that they are not acceptable socially nor politically, nor owing to their excessive economic cost, public intervention will be inevitable. It will be up to the State where the crisis began or where it is having the most serious effects. It will therefore be up to the USA and must be immediate. It is much more likely that this will happen, because it is difficult to imagine that under the present conditions the American economic system can react alone.

We have the precedent of 1929. We do not know if the present crisis is more or less serious, whether it is of the same kind or of a different kind. But we recall that the '29 crisis was solved in the short term with public intervention, the T.W.A., of a kind and extent that was very unusual at that time. Ten years later, in 1939, the effects of the crisis were nonetheless still present and serious: there were 15 million unemployed. A dramatic event, the outbreak of World War II, offered a way out. Loans to the UK, to be spent on purchases in the USA, the start up of a grandiose and onerous armaments plan; then Pearl Harbor and the war got the economy right back on its feet.

In Germany, second in importance among the countries hit by the crisis, there was an almost parallel process. The devastating effects on the economy facilitated Hitler's rise to power. This was followed by a big rearmament and public works plan, largely connected with military requirements; then came the war.

The experience of '29 confirms the hypothesis of immediate public intervention in the USA. It also teaches us what types of intervention to avoid. Therefore public intervention in the USA is a possibility, which must be immediate, and will be of an essentially financial nature.

The European Union, due to its larger population, in terms of real purchasing power, is the most affluent world market. It is a market regime which, though bearing the same name, is different from that of the USA. In the US market, the US President determines with wide discretion the volume of expenditure and the means of allocation and at the same time the volume of the revenues and the channels through which the revenues are to be acquired. The Federal Reserve in coordination with the President, governs the currency, weighing out its aims of stability, employment and development. The European market is subject to strict controls. These derive from the budgetary restraints, substantially that of parity for the EU budget and a 60% debt/GDP ratio and 3% (tending to decrease to 0%) debt/GDP ratio for the National budgets. In addition there is the obligation of stability as the primary aim which the ECB,
solely responsible for managing the Euro, is obliged to pursue. The EU has no discretionary power in relation to economic policy except if the States unanimously agree to transfer their own resources to increase those of the EU. The States in their turn have individual discretionary powers only within the percentages in which the ratio between their debt and state borrowing remains below the parameters. This possibility diminishes as economies gradually mature.

In an acute crisis phase the EU, as a market regime, could hypothetically coordinate with the USA in their search for common remedies, of the types compatible with the market and in implementing them. There is a desire to do so. But the presence of strict standardised restrictions on the EU budget and on the member states’ budgets and in the management of the common currency, allow this to be done only within the limited margins of the residual discretionary power, with the relative conditioning. Much less than the serious urgency would demand.

Connected with the crisis is the management of sovereign funds. Sovereignty should be identified not so much in the fact that its ownership belongs directly or indirectly to a foreign State, but rather in the circumstance that the fund escapes the control of the State in which it operates and is not subject to the regulations that apply in the said State. This means that if the fund is sovereign, the State where the fund operates is not sovereign in respect to it. May I add a further remark of a more general nature. It also concerns sovereign funds. There are two absolute novelties in the present world order, both political and economic, but not only that. The speed and intensity of relations, the onset of indivisible global problems mean that the States of the world are effectively and irreversibly a single, indivisible community. The entities that compose the world community, and which cannot but be part of it, are not at the same level and are not all of the same nature. There are some, among the territorial ones, that in terms of size and power, influence all the others. There are others, not strictly political, such as the ultimate holders of the international liquidity removed from the control of the central banks, or the cartels of the essential raw material producing states (OPEC is just one of them), whose behaviour equally exerts widespread influence. Nor should the smaller political entities which operate as a group be underestimated. The diversity of the single entities makes each one of them subject to internal development processes, which are affected by external conditioning and
which cause them in their turn. The consequences are of two orders and cannot be ignored. The first is that if a crisis involves a large number of countries, it will inevitably end up involving all the others; if it is of a political nature, it will be difficult to solve only on a political level; if it is financial it is likely to also involve production and politics. The second consequence, which derives from the diversity of the internal processes and from the mobility and variety of outside influences, is to be found in the unlikelihood that the effects of the remedies applied will last unaltered through time. On the contrary it will be necessary to introduce continuous monitoring mechanisms and therefore a certain degree of flexibility of the solution applied which will need to be adjusted to the continually changing global environment.
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