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Study of the Impact of Securitization on Consumers, Investors, Financial Institutions and the Capital Markets

American Securitization Forum

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Table of Contents

I. Executive Summary[1]

A. Introduction

National Economic Research Associates, Inc. ("NERA Economic Consulting" or "NERA") has been retained by the American Securitization Forum ("ASF") to conduct a study of the impact of securitization on consumers, investors and the capital markets. More specifically, the study addresses the effects of securitization on credit availability, the cost of credit, and the ability of investors and lenders to manage risk, and the impact of securitization on liquidity. Our study contributes to the existing literature by extending the analysis of securitization beyond agency mortgages to include non-agency mortgages as well as credit cards and auto loans and examining the results within the context of the existing financial meltdown.

Securitization, the process of pooling illiquid assets into marketable securities, has had a significant impact on financial markets and especially on mortgage markets. The growth of securitization has been driven by the many benefits that it offers borrowers, lenders and other investors. While securitization has existed in rather rudimentary forms since the 1970s, its growth since 1998, until recently, has been remarkable. In 1998, $488 billion of residential mortgage-backed securities, commercial mortgage-backed securities, and securities backed by auto loans were issued. This amount grew to $1.27 trillion in 2006. Securitization has also grown in other markets such as credit card receivables, student loans, and equipment leases, among others.

Economic theory suggests that securitization creates value by reducing intermediation costs and increasing opportunities for risk sharing and risk diversification (see, for example, Hess and Smith (1988), Bannier and Hänsel (2007), and Hoffmann and Nitschka (2008)). Securitization creates a new source of liquidity for originators of various types of loans by

[1] We would like to thank James Jordan, the senior advisor of the study, for his insightful comments and suggestions. We would also like to thank Greg Leonard, Steve Olley, David Tabak and Tim McKenna for helpful suggestions. We are especially grateful to Steve Davidson, the former head of Capital Markets research at SIFMA, the SIFMA and ASF staff for their support. We would also like to thank LoanPerformance for providing their loan database for the study. All errors are ours.

allowing them to convert illiquid loans into marketable securities. Securitization allows originators to monetize assets, thus reducing their sensitivity to changes in the availability of external sources of funds and reducing the risks of origination. Loan asset liquidity stimulates investor demand, and risks are shared by a larger pool of investors. Few studies have empirically examined such effects in fixed-income markets, especially the market for mortgage assets which are prone to higher information costs and heterogeneous valuations (Bernardo and Cornell (1997)).

As a first step, NERA reviewed the academic literature on the impact of securitization on consumers, investors and the capital markets. Given the ongoing credit crisis, we assessed the recent literature on the role of securitization and other contributing factors in the crisis and analyzed how the crisis developed. In addition, we designed and conducted a survey of market participants in coordination with the ASF. The survey covered issues such as members' perceptions of the benefits and drawbacks of securitization, their understanding of the regulatory environment, and their views on the current crisis. Both the literature review and the interviews with industry participants helped in identifying and gathering relevant data from public and non-public sources. We then conducted a series of empirical studies to assess the effects of securitization in an objective manner using approaches that would be acceptable in a peer-reviewed journal. We examined our empirical findings in light of the ongoing financial meltdown. Finally, we summarized our findings.

Section II presents an overview of securitization while Section III summarizes the academic literature. Section IV discusses recent academic literature on the role of securitization and other factors contributing to the credit crisis. Section V analyzes the factors leading to the current crisis from our perspective. We present the results of our empirical research on the impact of securitization on the cost of credit, availability of credit, management of risk and liquidity in Sections VI through IX. The interviews are discussed in Section X and the bibliography follows in Section XI.

B. Summary of Findings

1. The Impact of Securitization on the Cost of Credit

The purpose of the first study is to empirically estimate the impact of securitization on the cost of credit to consumers in residential mortgage loans, including conforming loans, jumbo loans[2] and subprime loans,[3] as well as auto and credit card loans. We assess whether the cost savings from securitization are passed on to consumers in the form of cheaper credit. Given the unprecedented dislocation in the securitization markets and the almost complete freeze in lending activities especially in the non-agency sector since 2007, we have not included data from the year 2007 onward in our statistical analysis. However, we examine the causes of the current credit crisis using data from 2007 and 2008 whenever available and discuss our findings in light of the current events. We start our analysis by following the academic work of Kolari et al. (1998) and Naranjo and Toevs (2002) which focused on agency mortgages.

We employ various econometric models, including ordinary least squares ("OLS") and regressions with the Newey-West standard error correction. For some of the markets, we also use co-integration models to address the nonstationarity of the variables. Using the results of co-integration estimation, we generate impulse response functions and variance decompositions that help explain the short-term changes in the cost of credit as a result of changes in securitization over time. We use monthly data in our studies, except for the credit cards study, where data were only available quarterly.

We start by replicating and updating the results found in Kolari et al. (1998) who focus on the government sponsored agencies ("GSEs") during the period from 1985 to 1995. Following the Kolari et al. (1998) methodology, our model estimates that for conforming mortgages, a 10% increase in the level of securitization as a percentage of total mortgage originations corresponds to a 15 basis point ("bps") decrease in mortgage yield spreads during the time period from 1986 to 1997.

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[2] Jumbo loans are mortgage loans for amounts larger than the conforming loan limits that dictate what the Government-Sponsored Enterprises ("GSEs") are allowed to purchase. See, for example, Passmore, Sparks, and Ingpen (2002). The classification of these loans is taken as given from the LoanPerformance database.

[3] Subprime loans are generally considered loans to borrowers with impaired or sparse credit histories and high loan-to-value ratios. The classification of these loans is taken as given from the LoanPerformance database.

We also conduct a study similar to the one by Naranjo and Toevs (2002) which estimates the effect of GSE activities on the spreads between non-conforming (jumbo) and conforming market interest rates in the period from 1986 to 1998. For the more recent period of our study (1999 to 2006), we find no statistically significant effect of securitization on the yield spreads between non-conforming and conforming market rates.

The existing literature primarily concentrated on investigating the effect of the government sponsored agencies. We contribute to the literature by analyzing the impact of securitization on non-conforming mortgage markets, as well as auto and credit card loans and by examining conforming mortgage loan rates using more recent data. Based on data from 1999 to 2006, and the empirical methods we employ, we conclude that a 10% increase in the securitization rate is associated with:

- A decrease in yield spreads for subprime mortgages of between 24 and 38 basis points.
- A decrease in yield spreads for jumbo mortgages of between 4 and 12 basis points.
- A decrease in yield spreads for auto loans of between 22 and 64 basis points.
- A decrease in yield spreads for credit card loans of between 8 and 54 basis points.

We also examine data on securitization rates and yield spreads in 2007 through June 2008 for conventional conforming mortgage loans, subprime mortgage loans and jumbo mortgage loans as well as auto loans and credit card receivables. Except for conventional conforming mortgages and credit card receivables, there remains a negative relation between securitization rates and yield spreads, which is consistent with our findings in the earlier data. Unsurprisingly, the most extreme case involves subprime mortgages. Between January and September 2007, the subprime securitization rate dropped to zero, while the mortgage yield spread increased by 52%.[4] During the same time period, the securitization rate for jumbo mortgages dropped by 41% while the mortgage yield spread increased by 68%. When

[4] We understand from LoanPerformance that based on their data, no subprime loans originated after September 2007 were securitized. Origination activity for subprime mortgages in recent months has been minimal.

discussing the role of securitization, it is critical to keep in mind its impact on the cost of credit to consumers.

2. The Impact of Securitization on the Availability of Credit

Given the current credit crisis and the ongoing debate on the role and future of securitization, it is important to evaluate how the secondary market affects the amount of mortgage financing available to households, especially in underserved areas. It is also important to examine the role of the agency and non-agency sectors under different business and macroeconomic conditions.

In this study, we examine the effects of secondary market activity on the amount of mortgage credit available to consumers. We also document the growth in the dollar volume of loans originated in underserved (low-income and high-minority) areas and in the share of mortgage loans sold to the secondary market from 1990 to 2006.

The existing literature, such as Ambrose and Thibodeau (2004) and Bostic and Gabriel (2005), focuses on the role of the government sponsored agencies on credit availability. To our knowledge, no existing empirical study examined the impact of non-agency purchases or securitizations on the availability of credit.

Our study of the effect of secondary market activity on the amount of mortgage credit available to consumers contributes to the current literature in several ways. First, we delineate the effects of agency and non-agency purchase activity on credit availability. We understand there are no prior empirical studies which examine the impact of non-agency activity on credit availability. As of 2006, the non-agency sector accounted for over 70% of secondary market purchases.[5] Second, we construct a unique panel database using data from the Home Mortgage Disclosure Act ("HMDA"),[6] the Census, LoanPerformance, and other sources to take into

[5] See Appendix V.B – the share of non-agency purchasers of total loans sold to the secondary market has grown from 40% in 1990 to 74% in 2006. This represents a dollar volume increase from $57 billion to $1,225 billion.

[6] HMDA was enacted by Congress in 1975 and requires most mortgage lenders located in metropolitan areas to collect data about their housing-related lending activity, report the data annually to the government, and make the data publicly available. Regulation C, the regulation that implements HMDA, requires reporting of descriptive factors including the geographic location of originated and purchased home loans, information about denied home loan applications, the race, sex, and income of the applicant or borrower, and even price data for some loans.

account the credit characteristics of the borrowers as well as demographic, credit and housing characteristics for each metropolitan statistical area ("MSA") from 2000 to 2006. Finally, our study uses a more recent time period than existing literature on this subject. Thus the findings are more relevant in today's environment, as compared to those of existing studies which use data from the 1990s.

Our empirical analysis shows that increases in secondary market purchases have a positive and significant impact on the amount of mortgage credit per capita, with the non-agency sector displaying a stronger impact in recent years. For example, the model suggests that a 10% increase in the secondary market purchase rate would increase mortgage loans per capita by 6.43% for a given Treasury rate of 4.5%. Higher incomes, lower unemployment rates, older borrowers, higher shares of borrowers from underserved areas, and strong home price growth all correspond to higher loan amounts per capita. The results also suggest that secondary market activities help increase credit availability to a greater extent in lower interest rate environments.

The fixed-effects panel regressions control for the volatility of housing prices, mortgage yield spreads, shares of jumbo loans, new home loans, no fee loans, credit characteristics of the borrowers including FICO scores and demographics including age, income and unemployment. Our results are robust using a two-stage specification to address the potential endogeneity of the yield spreads and loan volume.

In addition, we document the increase in both the share of loans originated in underserved areas and the share of underserved loans sold to the secondary market. Both the dollar volume of originations in underserved areas, as well as the share have increased since 1990 from $47 billion (16% of total originations) to as high as $609 billion in 2004 (26% of all originations).

Similarly, the amount and share of mortgage loans originated in underserved areas that are sold to the secondary market have grown. The value of mortgage loans originated in underserved areas increased from $23 billion in 1990 to $335 in 2006.

The predictions of our model on the availability of credit are not inconsistent with the levels of originations and credit available per capita in 2007.[7] Total mortgage originations dropped from a trillion dollars in 2006 to $733 billion in 2007, a 28% decline in originations. At the same time, non-agency purchases dropped from $570 billion to $306 billion, a 46% decline, while agency purchases increased from $217 billion to $232 billion. Total secondary market activities declined by a third. It is clear that the increase in agency purchases was insufficient to counter the impact of the decline in non-agency purchases.

Our model, which controls for the volatility of housing prices, yield spreads, demographics and credit characteristics, predicted an average drop in credit available per capita of 7% in 2007, while the actual decline in credit available in 2007 was 19%. Although the model predicted a negative impact on credit available to consumers resulting from the decline in secondary market activities, it did not predict the extent of the decline. One possible reason is that the model does not control for the disappearing liquidity and the extreme risk aversion by investors that started in 2007 and has continued up until this point. Our model also predicted that non-agency purchases have a greater impact on availability of credit, which is consistent with the 2007 data.

3. The Impact of Securitization on the Dispersion of Risk

To study the impact of securitization on the dispersion of risk, we assess whether securitization helps banks reduce the effect of interest rate shocks during times when markets are functioning normally; quantify the impact of securitization on capital requirements, taking into account the off-balance sheet positions of banks; document the ability of banks to diversify the regional composition of their mortgage assets; and examine our findings in light of the current financial crisis.

First, we assess whether securitization helped banks reduce the effect of interest rate shocks by examining the factors affecting the growth of various types of bank loans over time, taking into account bank-specific as well as macroeconomic factors. We quantify the effects of securitization on bank loan originations, especially its effects on bank lending decisions under unfavorable interest rate environments. We construct a database from various sources on all

[7] Data on originations and secondary market purchases are not available for 2008.

insured commercial banks, using the Federal Reserve's quarterly Report of Condition and Income releases ("Call Reports") from the first quarter of 1990 to the fourth quarter of 2006 as well as other data sources.

We quantify a bank's ability to securitize existing loans by constructing a "securitizability index", which captures the structure of an individual bank's loan portfolio as well as the securitization level in the overall U.S market, following Loutskina's methodology (2005). The study focuses on commercial banks because of the availability of data. Our model, following Loutskina's article (2005), estimates the determinants of the growth of bank loans as a function of securitizable assets, growth rates of gross domestic product, and measures of liquidity and monetary policy shocks. Banks and years fixed effects are also included.

The models show that for all banks, as well as for groups of small and large banks, the total loan growth (adjusted for inflation) is positively affected by the securitization rate of a bank's loan portfolio and the level of liquid assets for the period 1990 to 2006. Measures of monetary policy shocks have a negative and significant effect on a bank's total loan growth. This is consistent with the hypothesis that banks tend to reduce lending activities as borrowing from external financing becomes increasingly more expensive. When interacting measures of monetary policy shocks with the securitizability index, we get positive and significant results for both the entire sample and the group of small banks. This shows that securitization can help banks mitigate some of the negative impact of monetary policy on bank lending activities.

In addition, in the event of tightening monetary policy, higher levels of securitization have a more pronounced effect on small banks than on large banks. This is possibly due to the fact that large banks have greater access to the capital market, and generally have lower credit risks. Thus, when facing a monetary tightening, large banks are still able to obtain external funding at a relatively low cost.

Second, we quantify the impact of securitization on banks' capital ratios using the securitizability index described above. If banks find it easy to securitize their assets, they may not need to be as conservative in their capital management, and thus could afford to hold less capital. However, there are other factors that are also believed to affect the level of bank capital holdings, such as profitability, loan growth, risk of the loan portfolio, and the shape of the yield curve. It can be argued that in times of profitability and loan growth, banks would be

more optimistic and could afford to reduce their capital ratios. Likewise, when the differential between the long-term and short-term interest rates increases, banks would be more profitable (as they borrow short and lend long), and thus capital ratios may be reduced. When the risk of the loan portfolio is high, capital ratios may be increased to protect the banks from a potential credit crisis should loans default. Finally, we control for the business cycle – when the economy is contracting, it is expected that banks would hold more capital to guard themselves from a credit crisis.

Our empirical results indicate that securitizability is negatively correlated with capital ratios but is not statistically significant. Thus we do not find evidence that securitizable assets affect capital ratios. The positive impact of the Money Zero Maturity ("MZM")[8] growth variable indicates that banks hold more capital during periods of economic contraction. Net income growth and loan growth are also positively correlated with capital ratios.

Third, the study documents the ability of banks to diversify the regional composition of their mortgage assets and demonstrates the growth in the role of non-agencies as purchasers of loans over time. The non-agency share of all loan volume purchased in the secondary market increased from 40% in 1990 to 74% in 2006.

Finally, we examine our findings in light of the current financial crisis. Our models, using data from 1990 to 2006, predict that the drop in securitization activities would have a negative impact on the growth of all types of loans, not just mortgages. A symptom of the ongoing risk aversion is the reluctance of banks to lend. All markets including corporate debt, commercial paper and others have suffered accordingly. As liquidity makes its way back to the markets, we expect a negative impact on banks' credit extension and balance sheet capacity if securitization remains at its current low levels as our empirical models would indicate. Without securitization to transform loans (illiquid assets) into securities, it will not be possible for banks to return to prior loan growth levels, as they would have lost a key source of funding for their operations.

[8] The MZM is a measure of the liquid money supply in the economy.

4. The Impact of Securitization on Liquidity

In this study, we document the growth in originators and servicers with the increased use of securitization, examine the performance of securitized loans as a subset of all mortgages and conduct an empirical analysis of the volatility of yield spreads of mortgage backed securities ("MBS") and commercial mortgage backed securities ("CMBS") over a Treasury benchmark to determine whether they have traded in a narrower range as investors have gained confidence in their ability to price these assets.

First, we document the growth in originators and servicers with the increased use of securitization. Using data from HMDA on reporting agencies, we classify lenders into one of the following four categories based on the agencies to which they report: (i) banks, (ii) mortgage companies, (iii) thrifts, and (iv) credit unions. Mortgage lenders other than banks have shown growth in both volume and share of originations since 1990. In fact, originations by non-bank lenders have grown from $172 billion in 1990 to $1,193 billion in 2006, a growth of 593%. Originations by mortgage companies have increased from approximately $43 billion in 1990 to $809 billion in 2006, which represents an increase in share of total originations from 15% to 36%.

Second, we test the performance of securitized loans by comparing the delinquency rates of all loans against only those that were securitized for subprime, Alt A and jumbo loans during the period April 1997 to March 2007. We test whether the distribution of delinquency rates for all loans and securitized loans are the same. We find that while the delinquency rates for securitized loans are different than those of all mortgages for Alt A and jumbos during the period from 2005 to 2007, they have been similar over the longer period, 1997 to 2007. In addition, delinquency rates for securitized subprime loans are not statistically different from the delinquency rates of all subprime loans, even in recent years.

In addition, we examine whether securitized mortgages have traded at a narrower range by studying whether the volatility of yield spreads of securitized assets decreased over time. We focus on a number of mortgage backed securities and commercial mortgage backed securities indices, including the Merrill Lynch MBS Master Index, Merrill Lynch CMBS Fixed Rate AAA Index, and Merrill Lynch CMBS Fixed Rate Large Cap Index, among others.

We define spread volatility as an annualized end-of-month standard deviation of the difference between the yields on a mortgage backed securities index and a Treasury benchmark. The standard deviation for a given month is calculated over the period of that month. The spread volatility of a mortgage backed securities index over a Treasury benchmark is then modeled as a function of a linear time trend ("trend"), quadratic time trend and a time-independent average ("constant"). We apply a standard OLS approach and the Newey-West technique to adjust our OLS estimation of standard errors for possible serial correlation in error terms (i.e., dependence of a current error term on its past values), which is common in time series data. The results show that a linear trend is statistically insignificant for most of the securitized asset indices in our study. The results of our volatility analysis are inconclusive: in other words, the volatility of mortgage backed securities yield spreads tended to remain relatively stable during the period from the late 1990s to 2006.

We then examine our findings in light of the current crisis. Our analysis shows that it is unclear that securitized loans perform consistently worse than all loans. In addition, recent data show that the delinquency of loans which were originated in 2006, 2007 and 2008 are on a trajectory to surpass the delinquency rates of all other recent vintages. This is true for all types of mortgages and not just subprime. There are various possible contributing factors to the performance of the recent vintages including evidence of lax underwriting standards and the inability of the more recent borrowers to refinance as housing prices started to decline by mid 2006. The impact of securitization on the quality of the loans remains controversial as indicated in the recent academic literature, and requires additional research.

II. Overview of Securitization

A. Introduction

Securitization—the process of pooling relatively illiquid obligations into securities that can be traded in the capital markets—is considered one of the most important financial developments in recent history. This financing technique was developed to address the problem of insufficient mortgage capital, then was adapted and expanded by participants in the private markets to facilitate many types of consumer and commercial borrowing.

Securitization has experienced tremendous growth since it was introduced in the 1970s, expanding from the first and long-predominant asset class, residential mortgage loans, to encompass a wide range of financial assets, including commercial mortgage loans, automobile loans and leases, student loans, credit card receivables and small business loans, as well as such "esoteric" assets as life settlements and mutual fund Rule 12b-1 fees. Before the abrupt decline of securitization volume in 2007, the annual issuance of mortgage-backed securities (MBS) alone had increased from $259 billion to $2,018 billion between 1990 and 2006, a 678% increase or 13% on an annually compounded basis.[9] At the end of 2007 there were more than $7 trillion of MBS[10] and nearly $2.5 trillion of asset-backed securities (ABS)[11] outstanding.[12]

Despite the dramatic growth of securitization, there have been relatively few empirical papers which examine the impact of securitization on consumers, businesses, and the economy in the academic literature, at least until the current financial crisis.

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[9] Data taken from The 2007 Mortgage Market Statistical Annual, Vol. II, pp. 3-7.

[10] Securities Industry and Financial Markets Association, Market Sector Statistics, Mortgage-Related Outstanding, available at <http://www.sifma.org/research/pdf/MortgageRelatedOutstanding.pdf>.

[11] Securities Industry and Financial Markets Association, Market Sector Statistics, Asset-Backed Securities Outstanding, available at <http://www.sifma.org/research/pdf/ABS_Outstanding.pdf>.

[12] Under Regulation AB, promulgated by the Securities and Exchange Commission, any security that is "primarily serviced by the cash flows of a discrete pool of receivables or other financial assets" and that satisfies certain other criteria is an "asset-backed security." In this report we use the term "asset-backed securities" as it is commonly used in the marketplace, to refer to securities backed by pools of home equity loans or non-mortgage assets.

B. Overview: Structure of a Securitization

The party that initiates a securitization transaction, referred to as the "sponsor," may be the originator of the receivables (or an affiliate of the originator) or may aggregate the receivables to be securitized by purchasing them from the originators or in the secondary market. Prior to securitization, receivables in a sponsor's portfolio are commonly financed through short-term lending arrangements in the form of repurchase agreements or secured loans.

Securitization structures vary widely on the basis of asset type and other factors.[13] At the most basic level, however, a securitization of consumer loans or other receivables generally involves the sale of a pool of receivables to a special purpose, bankruptcy-remote entity known as the "depositor," which in turn transfers the receivables to a trust or other issuing entity. The issuing entity[14] then issues securities, in the form of debt or equity, whose cash flows depend primarily on the receipt of payments on the pool of receivables. Most MBS and ABS are backed by a fixed pool of receivables that amortize over time. Short-term receivables or revolving assets such as the receivables arising in credit card accounts are frequently securitized in a "master trust" structure, in which the issuing entity acquires additional receivables in designated accounts and issues additional securities from time to time.

For tax reasons, as discussed below, ABS are generally issued in the form of debt; one or more classes of equity interests are also issued and may be retained by the sponsor of the Agency Mortgage Market securitization (or an affiliate) or sold to investors. MBS are most commonly issued in the form of pass-through certificates.

A principal goal of any securitization structure is the separation of the securitized receivables from the risks associated with possible future insolvency of the sponsor. It is expected that investors in mortgage-backed or asset-backed securities, unlike buyers of corporate debt, should assume the risks associated with a pool of receivables but not the credit risk of the sponsor. Securitizations are structured to minimize insolvency risk through, among other things, a "true sale" of the receivables to an entity that itself presents no material risk of becoming subject to bankruptcy proceedings because its powers are strictly limited and its creditors are only those associated with the securitization transaction. A sale is referred to as a

[13] See *Securitization of Financial Assets*, Ch. 4, (Jason H.P. Kravitt ed. 2008).

[14] An issuing entity may be a foreign or domestic corporation, a partnership or a limited liability company, but a trust is most commonly used.

"true sale" when it is expected that the transfer of the receivables would be respected as a sale by a bankruptcy court or a conservator or receiver in a non-bankruptcy insolvency proceeding, and would not be characterized as a loan collateralized by the receivables.[15]

Another important goal in structuring a securitization is to avoid creating adverse tax consequences for investors. Securitizations are generally structured to avoid or to minimize the effect of imposition of an additional layer of taxation in the form of an entity-level corporate tax on the issuing entity; otherwise, securitization would not be economically practicable.[16]

Most securitization structures employ one or more forms of internal or external enhancement in order to reduce security holders' exposure to credit risk or interest rate risk. In the 1980s external enhancement in the form of pool insurance, letters of credit, and corporate guarantees from third-party guarantors or insurers were popular forms of credit enhancement. However, the inconsistent availability of these forms of third-party enhancement, as observed in their unexpected withdrawal during disruptions in the real estate markets, and the desire to de-link the credit ratings of the securities from the ratings of any particular enhancer, led to greater use of internal enhancement that embeds risk hedging into the structure of the securitization.[17] Common methods of internal credit enhancement include use of excess spread, subordination, and overcollateralization.[18] Interest rate risk may be hedged through the use of interest rate swap or cap agreements.[19] Enhancement levels are generally determined by the rating agencies selected to provide credit ratings to the various classes of offered securities.

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[15] Certain entities, such as banks, insurance companies and other financial institutions, are not covered by the bankruptcy code and are subject to alternative insolvency regimes. See generally Tamar Frankel, *Securitization*, Ch. 10 (2005).

[16] Tax considerations, including tax structures created by Congress in order to facilitate securitization, are discussed below.

[17] Eric Bruskin and Anthony Sanders, "The Non-agency Mortgage Market: Background and Overview," Working Paper (March 1999), p. 4.

[18] Excess spread is the difference between the weighted average net interest rate on the receivables and the weighted average rate at which interest accrues on the securities; interest collections in excess of the amount needed to pay accrued interest on the securities may be used to cover losses or to build overcollateralization. Subordination is the structuring of classes of securities such that losses are borne first by the class lowest in seniority and then by more senior classes. Overcollateralization is the amount by which the total principal balance of the receivables exceeds the total principal balance of the securities; this amount is available to absorb losses. Frank J. Fabozzi and Vinod Kothari, "Securitization: The Tool of Financial Transformation," Yale ICF Working paper No. 07-07 (2007), p. 7, available at <http://ssrn.com/abstract=997079>.

[19] These derivative instruments sometimes also serve as a source of credit enhancement, although their primary purpose is generally hedging of interest rate risk.

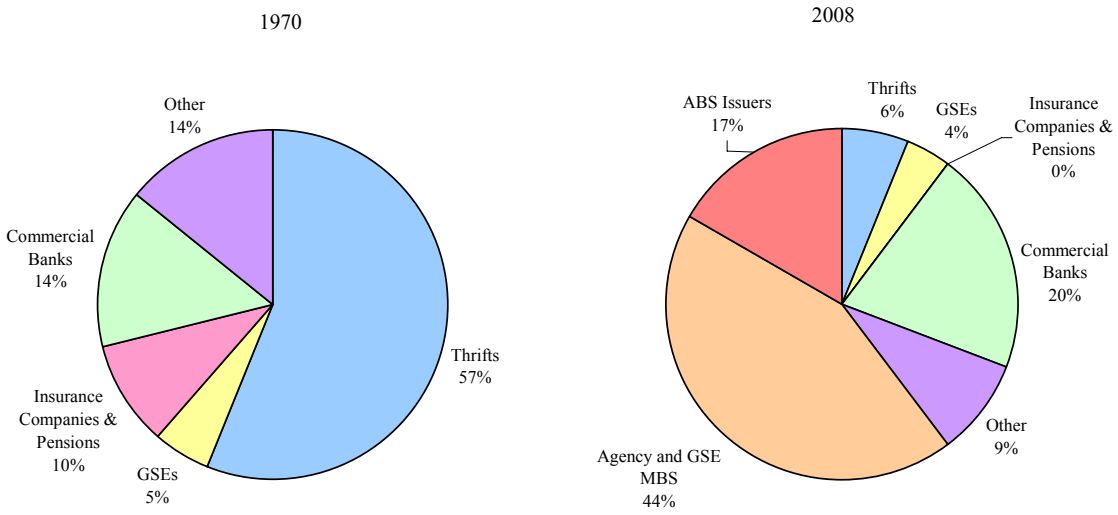
The process of collecting payments on the pooled receivables and other administrative matters with respect to the receivables are generally managed by one or more servicers, who may be supervised by a master servicer. Trust-level administrative functions such as calculation of amounts payable to security holders, distribution of payments and preparation of reports to investors are generally performed by the trustee or by a master servicer or administrator.

One or more broker-dealers are generally retained by the sponsor to market the securities to prospective purchasers. Although MBS and many types of ABS are generally offered for sale to the public,[20] investors in these securities are for the most part institutional investors such as thrifts, insurance companies, pension funds, commercial banks, and Fannie Mae and Freddie Mac. The shift over time in the proportion of mortgage loans and MBS held by various types of institutions illustrates the effect of securitization in broadening the investor base. In 1970, more than half of all holders of mortgage loans and interests in mortgage loans were savings and loan associations. By the end of 2008, only 6% of the holders of mortgage-related investments were thrifts, while the share of holdings by other types of institutional investors had increased. See Figure II.1 below.

[20] Either in offerings registered with the SEC or, in the case of MBS issued or guaranteed by Fannie Mae, Freddie Mac, Ginnie Mae or another federal government agency or instrumentality, in offerings exempt from registration.

Figure II.1

Holders of Home Mortgages and Securities



Sources: Federal Flow of Funds.

C. A Brief History of Securitization

Securitization began in the 1970s, created as a vehicle to provide additional mortgage credit to the residential housing market. At that time, savings and loan associations, or "thrifts," were the predominant originators of mortgage loans. A family buying a home would typically take out a government-insured or conventional (non-government insured) mortgage loan from a thrift that financed its loan portfolio primarily through savings deposits and held the loans until maturity (or prepayment). As a result, the availability of capital for mortgage loans in the United States was limited, segmented and unpredictable, which inhibited the

growth of home ownership.[21] The early mortgage market was localized, and mortgage rates and the availability of credit varied considerably among regions.[22]

Changes in the interest rate environment had serious consequences for the supply of mortgage credit, as well as for thrifts' financial condition.[23] When market interest rates increased significantly over the deposit rate ceiling set by government regulators, savers put their money elsewhere and depository institutions' source of funds for new mortgage loans was reduced.[24] Additionally, the interest rate mismatch between the short-term funding from deposits and the long-term mortgage loans, whose interest rates were generally fixed, had the effect of both limiting funds available for home lending and exposing the lending institution to the risk of negative arbitrage.

Lenders could, of course, sell mortgage loans, and in some cases financial institutions with more demand for mortgage loans and less available funds were able to sell their loans to institutions that had more funding but less demand for mortgage loans in the communities that they served. But the whole loan market was highly illiquid, and therefore did not provide mortgage lenders with ready access to needed capital.

1. The Agency Mortgage Market

Congress sought to provide support to the residential mortgage market as far back as the Depression. In 1938, the National Housing Act of 1934 established the Federal National Mortgage Association (Fannie Mae) to create a more liquid secondary market for mortgage loans insured by the Federal Housing Administration (FHA).[25] The mission of Fannie Mae was to improve the availability of mortgage credit to private mortgage lenders and thereby to

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[21] Lewis S. Ranieri, "The Origins of Securitization, Sources of Its Growth, and Its Future Potential," in *A Primer on Securitization*, eds. Leon T. Kendall and Michael J. Fishman (Cambridge, MA: The MIT Press, 1996), pp. 31-2.

[22] W. Scott Frame and Lawrence J. White, "Fussing and Fuming Over Fannie and Freddie: How Much Smoke, How Much Fire?" *Journal of Economic Perspectives*, Vol. 19, No. 2 (Spring 2005), p. 161.

[23] R. Alton Gilbert and Jean M. Lovati, "Disintermediation: An Old Disorder With A New Remedy," *Federal Reserve Bank of St. Louis* (January 1979), pp. 10-15.

[24] Leland C. Brendsel, "Securitization's Role in Housing Finance: The Special Contributions of the Government-Sponsored Enterprises" in *A Primer on Securitization*, eds. Leon T. Kendall and Michael J. Fishman (Cambridge, MA: The MIT Press, 1996), p. 19.

[25] Andrew Davidson, Anthony Sanders, Lan-Ling Wolff, and Anne Ching, *Securitization: Structuring and Investment Analysis* (Hoboken, NJ: John Wiley & Sons, 2003), p. 76.

increase home ownership. The purchase of whole loans from mortgage lenders by Fannie Mae replenished lenders' cash balances so that they could make more loans. The creation of a secondary market for whole loans, or at least for certain types of loans, increased liquidity in the housing market and made at least some additional mortgage capital available in parts of the country where it was needed.

Fannie Mae's purchase and sale authority was initially limited to mortgage loans insured by the FHA.[26] These were loans to borrowers with less than perfect credit or who lacked the down payment otherwise required, but because the loans were insured by the federal government against default they carried minimal risk.[27] In 1948, Fannie Mae's authority was expanded to include purchase and sale of mortgage loans guaranteed by the U.S. Department of Veteran Affairs (VA).[28]

In 1968, Congress divided what had been Fannie Mae into two parts: the Government National Mortgage Association (Ginnie Mae), a federal agency, and a government-sponsored but entirely private and shareholder-owned enterprise still known as Fannie Mae.[29] Fannie Mae continued to purchase FHA/VA loans for its portfolio, while Ginnie Mae was authorized to "purchase, sell, or otherwise deal in any securities" guaranteed by FHA/VA.[30] In 1970, the Ginnie Mae issued the first mortgage pass-through security, backed by FHA/VA-insured loans and guaranteed by Ginnie Mae. It was the simplest form of mortgage-backed security – a participation certificate entitling the holder to principal and interest payments from the underlying pool of mortgage loans, net of expenses.[31] But it was this ability to securitize a pool

[26] Lakhbir Hayre, "A Concise Guide to Mortgage-Backed Securities (MBSs)" in *Salomon Smith Barney Guide to Mortgage-Backed and Asset-Backed Securities*, ed. Lakhbir Hayre (New York: John Wiley & Sons, 2001), pp. 14-5; <http://www.fanniemae.com/aboutfm/pdf/charter.pdf>.

[27] Anand K. Bhattacharya, Frank J. Fabozzi, and William S. Berliner, An Overview of Mortgages and the Mortgage Market in *The Handbook of Mortgage-Backed Securities*, ed. Frank J. Fabozzi (New York: McGraw-Hill, 2006), pp. 6-7.>

[28] Hayre (2001), p. 14.

[29] Davidson et al., (2003), p. 76; See also <http://www.fanniemae.com/aboutfm/industry/index.jhtml?p=About+Fannie+Mae&s=The+Industry>.

[30] Federal National Mortgage Association (Fannie Mae) Charter Act, As Amended Through October 28, 1992 (Title III of National Housing Act, 12 U.S.C. 1716 et seq.).

[31] Linda Lowell and Michael Corsi, Mortgage Pass-Through Securities, *The Handbook of Mortgage-Backed Securities*, ed. Frank J. Fabozzi (New York: McGraw-Hill, 2006), p. 45.

of mortgage loans and sell the mortgage-backed securities, as opposed to individual loans, in the capital markets that revolutionized the mortgage market.

As the growing secondary market for FHA and VA loans led to demands for similar treatment of conventional mortgage loans, which comprised the majority of mortgages originated, Congress responded by creating the private, shareholder-owned Federal Home Loan Mortgage Corporation (Freddie Mac) in 1970.[32] In 1971, Freddie Mac began to issue mortgage pass-through securities backed by pools of conventional mortgage loans, and a year later, Fannie Mae was granted similar authority.[33] See Figure II.2 below for the growth of Fannie Mae MBS issuance over time. Since 1972, Fannie Mae and Freddie Mac have evolved into nearly identical enterprises, competitors in a market in which Fannie Mae is the largest participant, followed closely by Freddie Mac.

Figure II.2. Fannie Mae Yearly MBS Issuance

Year	MBS Issuance ($ millions)
1999	**$** 300,689
2000	211,662
2001	525,322
2002	723,299
2003	1,198,617
2004	527,145
2005	486,260
2006	481,686
2007	629,526

Source:
Fannie Mae.

As government sponsored enterprises (GSEs), Fannie Mae and Freddie Mac are hybrid entities – shareholder-owned corporations whose purposes and range of permitted activities are

[32] Brendsel (1996), p. 19.

[33] Hayre (2001), p. 15.

prescribed by the federal government. Their primary objectives are to lower the cost of borrowing and improve access to credit within the housing market, particularly in underserved areas.[34] The GSEs provide liquidity to the mortgage market by purchasing "conforming" mortgage loans that satisfy certain standards, by purchasing mortgage-backed securities, and by guaranteeing, for a fee, timely payment of interest and principal on MBS.[35]

The GSEs may purchase only one- to four-family mortgage loans whose principal balance does not exceed a limit set by regulation,[36] or multifamily mortgage loans without a principal balance limit, that satisfy certain qualitative standards.

In 1980, of the $1.1 trillion of loans originated in the residential mortgage market, Fannie Mae and Freddie Mac held in their portfolios or securitized only $78 billion, about 7% of the residential mortgage market.[37] In 2006, of the more than $3.2 trillion in mortgage loans originated Fannie Mae and Freddie Mac securitized $842 billion, or approximately 26% of the market.[38]

Figures II.3 and II.4 below illustrate the origination of FHA/VA and conforming mortgage loans, MBS issuance, and the rate of securitization from 1985 through 2007.

[34] Frame and White (2005), pp. 162-4.

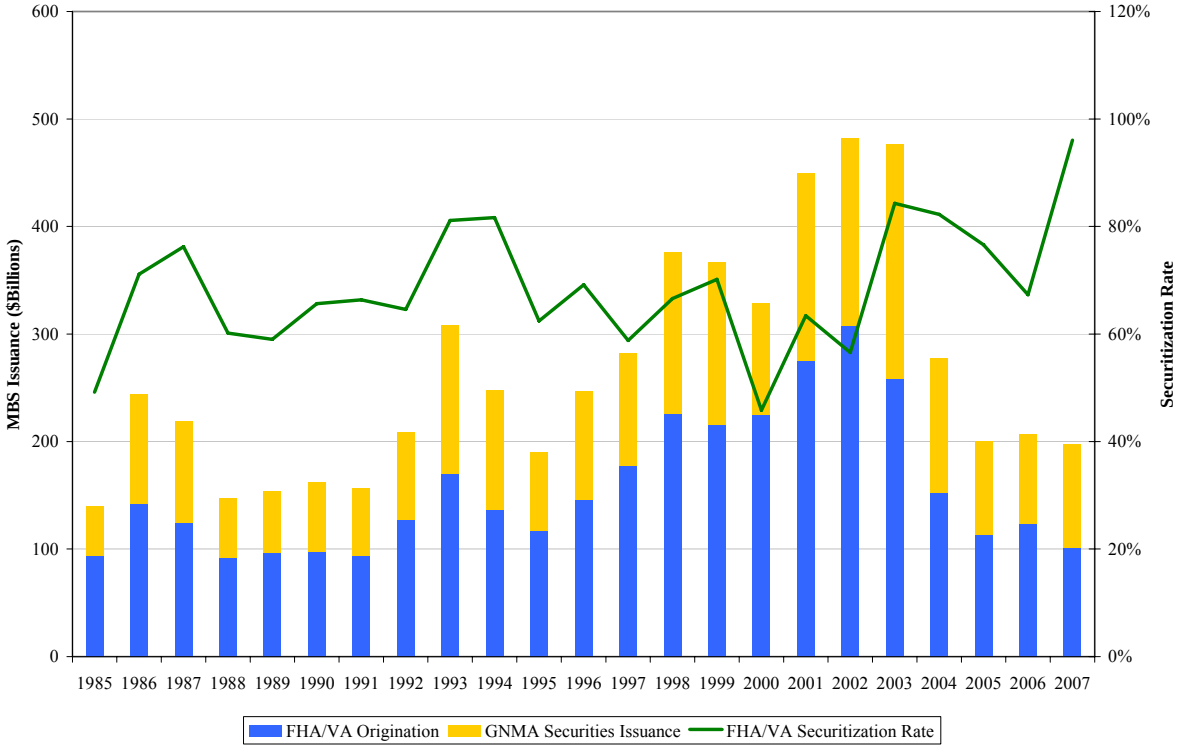
[35] Federal National Mortgage Association and Federal Home Loan Mortgage Corporation Annual Reports for 2007.

[36] The principal balance limit for loans secured by single family homes is $417,000 generally for 2009, higher in certain high cost jurisdictions. Higher limits apply to loans secured by two- to four-family properties.

[37] Frame and White, p. 162.

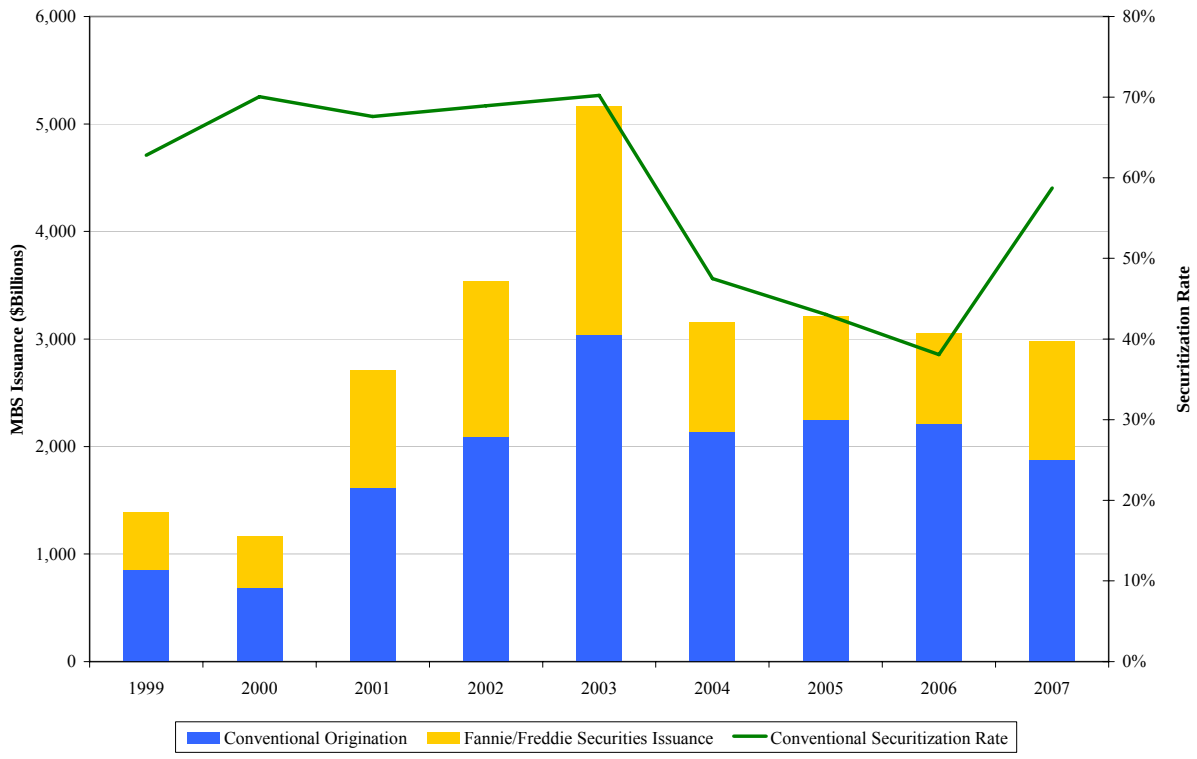
[38] SourceMedia, Fannie Mae, and Freddie Mac.

Figure II.3. Estimated FHA/VA Origination, Issuance, and Securitization Rate, 1985-2007



Source: HUD, OFHEO, Ginnie Mae, and Thomson Reuters.

Figure II.4. Estimated Conventional-Conforming Origination, Issuance, and Securitization Rate, 1999-2007



Source: OFHEO, Fannie Mae, and Thomson Reuters.

2. The Non-Agency Mortgage Market

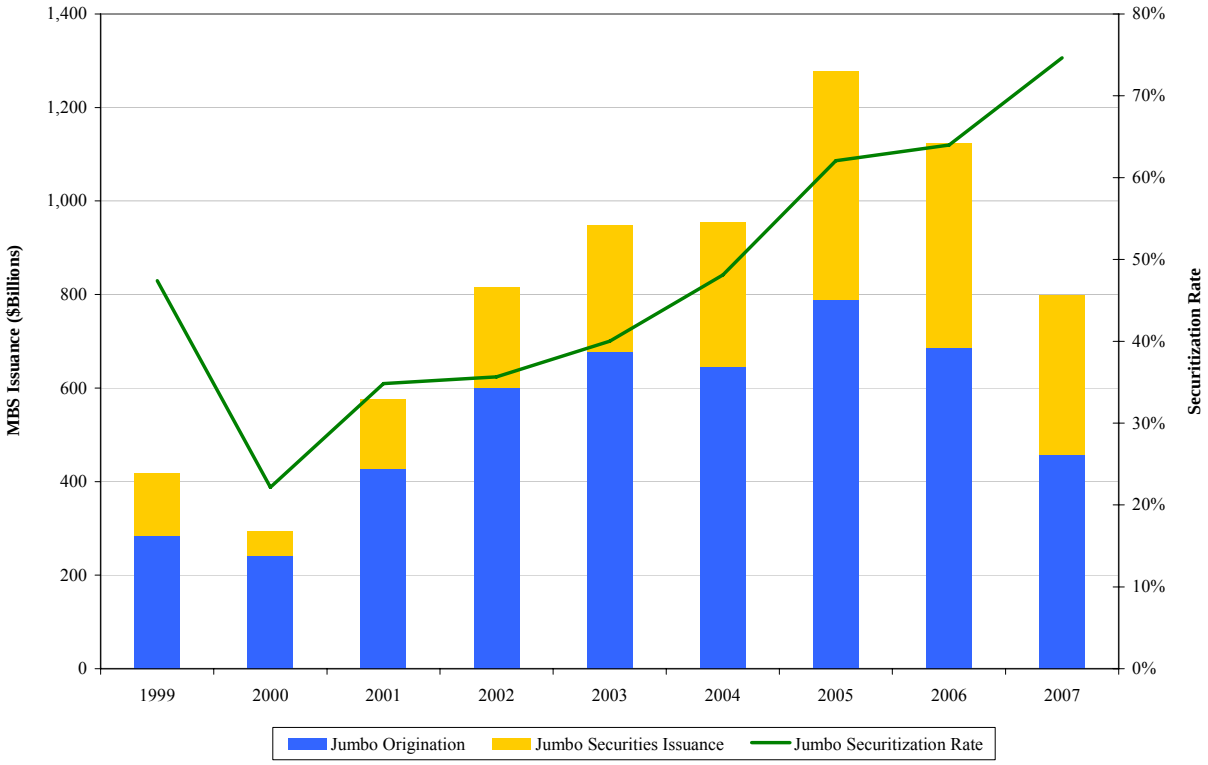
The securitization of conforming mortgage loans by Ginnie Mae and the GSEs set the stage for the emergence of a non-agency MBS market for the securitization of non-conforming mortgage loans and, later, other types of receivables. Prior to the development of the non-agency securitization market, loans that did not conform to GSE standards – whether because their principal balances exceeded the GSE limit or due to their less than prime credit quality – were either held in portfolio by their originators or sold to investors that were familiar with and capable of holding those types mortgage loans.[39]

In the inflationary environment of the late 1970s, market interest rates exceeded regulated deposit rates, and the consequent loss of deposits increased the pressure on depository

[39] Thomas Zimmerman, Defining Non-agency MBS in *The Handbook of Mortgage-Backed Securities*, ed. Frank J. Fabozzi (New York: McGraw-Hill, 2006), p. 93.

institutions' sources of funding for home loans.[40] In 1977 the first rated, non-agency MBS backed by a pool of conventional mortgage loans were issued in an SEC-registered offering sponsored by Bank of America,[41] opening the market for securitization of non-conforming mortgage loans.[42] Figures II.5 and II.6 below document the growth of origination, issuance, and rate of securitization in the prime jumbo and subprime mortgage markets.

Figure II.5. Estimated Jumbo Origination and MBS Issuance 1999-2007



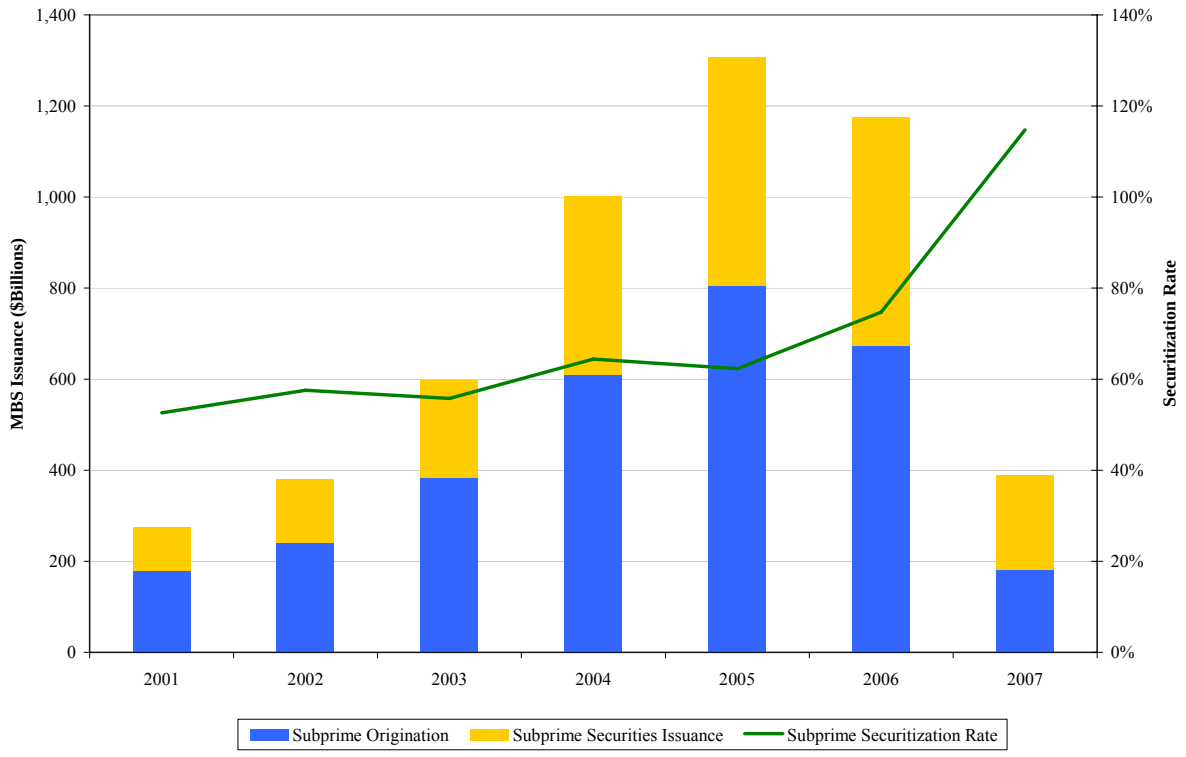
Source: OFHEO and Thomson Reuters.

[40] Ranieri (1996), pp. 33-4.

[41] It was during the course of this transaction that the term "securitization" was coined.

[42] Bruskin and Sanders, p. 5.

Figure II.6. Estimated Subprime Origination and MBS Issuance 2001-2007

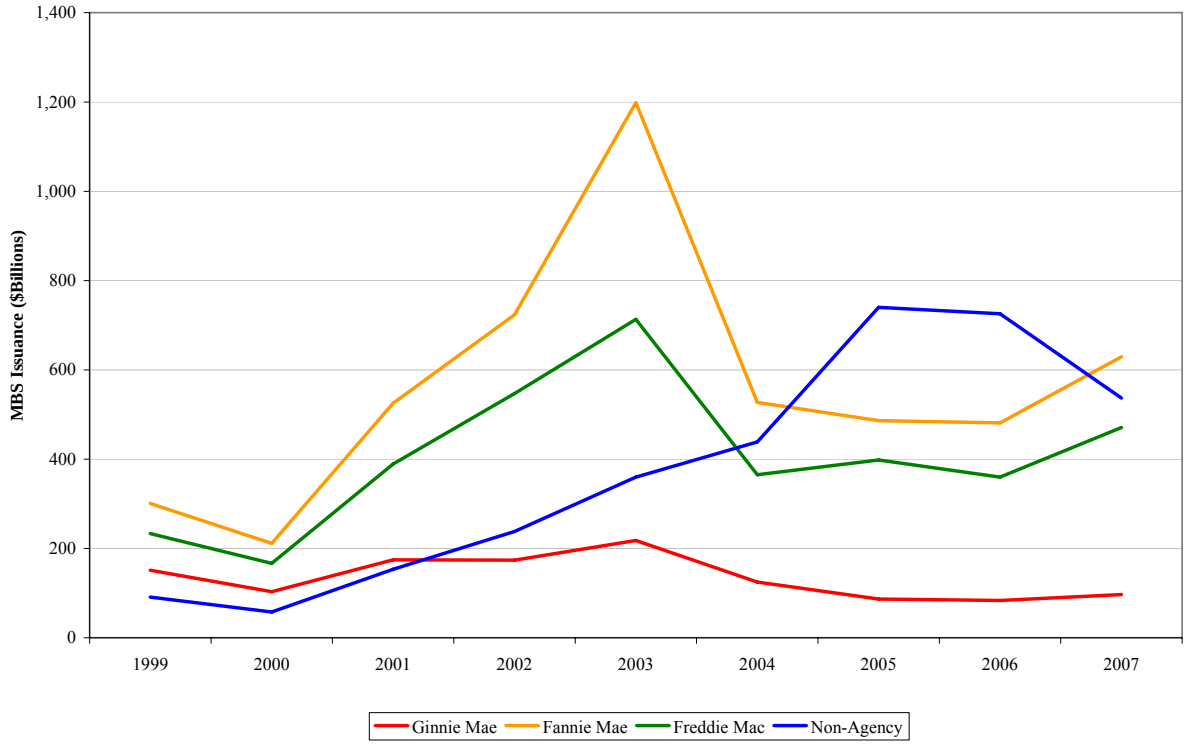


Notes and Sources: SourceMedia and LoanPerformance.

The non-agency MBS market grew significantly from 2001 to 2005. In 2001, non-agency MBS issuance was 14.1% of the total agency MBS issuance. By 2005, non-agency MBS issuance had grown to 76.2% of total agency MBS issuance, as illustrated by Figure II.7 below.[43]

[43] Thomson Reuters and the GSEs.

Figure II.7. MBS Issuances, 1999-2007



Notes and Source: Thomson Reuters and the GSEs.

D. Development of the Securitization Markets

1. CMOs and REMICs

The simple pass-through structure of early mortgage-backed securities had inherent limitations. One of the most challenging aspects of marketing and investing in MBS was – and still is three decades later – addressing prepayment risk. Subject to any applicable prepayment penalty, a mortgage loan may be prepaid at any time that the borrower sells the home or chooses to refinance to take advantage of a decline in market interest rates. Unlike government or corporate debt, investors in MBS were subject to prepayment risk that was difficult to predict.[44] Efforts to manage prepayment risk through sequential-pay structures were frustrated

[44] See <http://www.investinginbonds.com/learnmore.asp?catid=11&subcatid=58&id=26>.

by federal income tax regulations that subjected holders of interests in a trust that issued multiple classes of time-tranched pass-through certificates to adverse tax consequences.[45]

The desire for more complex cash-flow structures led to the development of the collateralized mortgage obligation (CMO), the first of which was issued by Freddie Mac in 1983.[46] In a CMO transaction, a trust or other entity issued multiple classes of notes that were sold to investors and certificates evidencing the beneficial ownership in the trust that were retained by the sponsor (or an affiliate). The notes were secured by a pool of mortgage loans, or a pool of pass-through certificates, pledged as collateral. The various classes of notes could have different payment characteristics, which can be tailored to meet specific investor appetites.[47]

Although the CMO structure avoided the imposition of entity-level tax, it was an economically inefficient structure. The desired tax result depended upon characterization of the notes as debt for tax purposes, which in turn required that the equity holders be entitled to a portion of the economics of the loan pool and that the securities sold to investors have debt-like characteristics. Congress ultimately responded to mortgage industry concerns by creating, as part of the Tax Reform Act of 1986, the real estate mortgage investment conduit (REMIC) as a new vehicle to facilitate the issuance of multi-class MBS.[48] A REMIC may issue any number of securities, "regular interests," having widely varying payment characteristics. The REMIC provisions generally do not impose an entity-level tax on the issuing entity.[49]

After the REMIC legislation made possible more varied payment structures, the volume of non-agency MBS increased substantially. In 1987, there were 9,043 classes of non-agency

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[45] See James M. Peaslee and David Z. Nirenberg, *Taxation of Securitization Transactions* (3rd ed. 2001 & Supp 2007), 196-206.

[46] Victor Cholewicki, "CMOs Transform Mortgage Credit Markets," *Mortgage Banking* (February 1985), pp. 61-6.

[47] See <http://www.sifma.org/services/publications/pdf/an_investors_guide_to_mortgage_securities.pdf>. The first non-agency CMOs were issued in July 1986 by Home Savings of America, the largest savings & loan in the country at the time. See Finance/New Issues; Home Savings' New Feature, *The New York Times* (July 15, 1986).

[48] Davidson et al (2003), p. 21.

[49] Federal income tax is not avoided, however – every REMIC must issue a residual interest, and the holder of the residual interest must include in its taxable income the income or loss incurred by the REMIC. See Peaslee and Nirenberg, Ch. 9. In addition, tax may be imposed on a REMIC in the case of certain prohibited transactions.

REMIC securities issued; by 1997, the number of REMIC classes issued had grown to 53,340.[50]

Most ABS are issued in a form similar to CMOs – debt issued by an "owner trust." In 1996, Congress added the financial asset securitization investment trust, or FASIT, to the tax code in an effort to do for asset-backed securities what the REMIC provisions had done for MBS. But the FASIT vehicle was viewed from the start as flawed, was rarely used in the ABS markets, and was later determined to have been used in tax-motivated transactions that Congress considered inappropriate.[51] The FASIT provisions were repealed in 2004.

2. The Spread of Securitization

The Resolution Trust Corporation (RTC), established by Congress in 1989 to oversee the disposition of large quantities of assets from insolvent savings and loan associations, played a role not only in the expansion of the MBS market but also in the development of markets for new asset classes.[52] In the early 1990s the RTC turned to the capital markets to securitize billions of dollars in loans originated by failed thrifts, fostering a market for securitization of mortgage loans secured by large commercial properties,[53] and executing the first securitizations of nonperforming loans.

Perhaps the first securitization of assets other than mortgage loans was the issuance in 1985 of securities backed by a pool of computer equipment leases in a transaction sponsored by Sperry Corporation.[54] Securitization of other types of receivables, such as auto loans, student loans, and credit card receivables, grew rapidly. The growth of the non-mortgage securitization market was greatly aided by the adoption by the Securities and Exchange Commission in 1992 of Rule 3a-7, which created an exemption from registration under the Investment Company Act

[50] Bruskin and Sanders (1999), p. 8.

[51] Kravitt, p. 10-27.

[52] Michael Jungman, The Contributions of the Resolution Trust Corporation to the Securitization Process, in *A Primer on Securitization*, eds. Leon T. Kendall and Michael J. Fishman (Cambridge, MA: The MIT Press, 1996), pp. 67-79.

[53] Bruskin and Sanders (1999), p. 7.

[54] James A. Rosenthal and Juan M. Ocampo, *Securitization of Credit: Inside the New Technology of Finance* (New York: John Wiley & Sons, 1988), pp. 158-60.

of 1940 (the Investment Company Act) for many types of asset-backed securities for which an exemption had not been readily available without strictly limiting the number of investors.[55]

Over a relatively brief period, markets developed for securities backed by pools of such varied financial assets as home equity lines of credit, recreational vehicle and boat loans, dealer floor plan receivables, and insurance premium finance loans. Securitization techniques were employed to monetize future cash flows from such diverse sources as franchise licensing and royalty fees, lottery payments, music royalties and litigation settlement payments.

3. CDOs

The collateralized debt obligation (CDO) structure was introduced by Drexel Burnham Lambert Inc. in 1987.[56] In a typical "arbitrage" CDO transaction, the issuing entity issues securities in order to fund or refinance its purchase of bonds, loans, and other types of debt or debt-like instruments for its investment portfolio.[57] Initially CDO pools were comprised mainly of high-yield "junk" bonds, but in recent years pools have frequently included bank loans, corporate bonds, sovereign debt, trust preferred securities or mortgage-backed securities, or in some cases credit derivatives. Unlike pools of assets backing most mortgage-backed and asset-backed securities, a CDO pool is frequently actively managed (in varying degrees),[58] and many of the pool assets may be acquired by the issuer only after the CDO securities have been sold. Similar to ABS transactions, the issuing entity issues multiple tranches of CDO notes in senior, mezzanine and junior classes, as well as equity classes.

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[55] See Exclusion from the Definition of Investment Company for Structured Financings, SEC Release No. IC-19105, 57 Fed. Reg. 56,248 (1992).

[56] Salas, Caroline and Darrell Hassler. "CDOs May Bring Subprime-Like Bust for LBOs, Junk Debt." *Bloomberg*. March 13, 2007, available at <http://www.bloomberg.com/apps/news?pid=20601109&refer=home&sid=aCITz8HS6ewk>.

[57] An arbitrage CDO should be distinguished from a "balance sheet" CDO, which is a transaction initiated by a holder of financial assets, such as a commercial bank, that wishes to sell interests in a pool of its portfolio assets to investors. See Srichander Ramaswamy, *Managing Credit Risk in Corporate Bond Portfolios* (John Wiley & Sons, 2004), pp. 207-08.

[58] The extent to which a CDO asset manager is permitted to purchase or sell securities varies significantly. In a "market value" CDO transaction, the pool assets are valued frequently and the manager may have significant discretion in purchasing and selling pool assets. In a "cash flow" CDO transaction, the manager's role is more limited; the primary goal of the manager is to avoid credit losses. Cash flow CDOs may be backed by pools of cash obligations or, in a synthetic CDO structure, by credit default swaps written against reference obligations. See Janet Tavakoli, Introduction to Collateralized Debt Obligations, available at <http://www.tavakolistructuredfinance.com/cdo.pdf>.

Unlike MBS and many types of ABS, CDO securities are offered and sold only in private offerings.

The rapid growth of the CDO market led to the creation of more complex, high-yield structured products, such as the CDO-squared – CDOs backed by a pool of existing CDOs – that debuted in 1999.[59]

CDOs are distinct from resecuritizations, in which one or more existing MBS (most commonly) or ABS are pooled to back the issuance of new asset-backed securities. Resecuritizations are passive vehicles that generally hold the pool assets until the issuing trust terminates by its terms.

4. Securities Law Developments

The Secondary Mortgage Market Enhancement Act of 1984 (SMMEA) was the first federal legislation enacted specifically to facilitate securitization in the non-agency markets. SMMEA addressed two significant obstacles to the marketing of mortgage-backed securities. MBS classified as "mortgage related securities" under SMMEA – generally, MBS backed by first lien mortgage loans and rated in one of the two highest rating categories – are exempt from registration or qualification under the securities laws of most states, and have the same legal investment status for various types of regulated institutional investors, such as depository institutions and life insurance companies, as U.S. government securities.[60]

The growth of non-mortgage securitization was hampered by the need to structure around the requirements of the Investment Company Act. Virtually every securitization issuing entity could, absent an exemption, be classified as an "investment company" subject to registration under the Investment Company Act and the onerous regulatory scheme imposed on mutual funds and other investment companies. As a practical matter, most securitizations can not economically be structured to comply with the requirements applicable to registered investment companies. Prior to the adoption of Rule 3a-7, exemptions from registration as an investment company were available for most types of mortgage-backed securities and for ABS

[59] Michiko Whetten and Mark Adelson, CDOs-Squared Demystified, *Nomura Fixed Income Research*. February 4, 2005. pp. 1-2.

[60] Ranieri (1996), pp. 33, 37.

backed by student loans and certain other assets, but other transactions were forced to rely on an exemption that limited the number of investors and precluded a public offering.[61]

In 1992, as noted above, the Securities and Exchange Commission acted to remove "regulatory barriers" to many securitization transactions by adopting Rule 3a-7, which was intended to "exclud[e] any structured financing, regardless of the type of assets securitized, from the definition of investment company" under the Investment Company Act.[62]

In that same year the SEC revised Form S-3 to permit "shelf" registration of many types of ABS. In a shelf registration, a large amount of securities may be registered at the time that the registration statement is declared effective by the SEC, and then may be offered from time to time in the future – "taken off the shelf" – as market conditions or the needs of the sponsor warrant.

In 1994 and 1995, the staff of the SEC acted to grant the MBS and ABS markets relief from the strict limitations imposed by the Securities Act of 1933 on dissemination of written marketing materials prior to delivery of a prospectus. In a series of no-action letters, the SEC staff sanctioned the distribution to investors, subject to certain conditions, of "computational materials" that displayed projected cash flows, yields and other characteristics of offered securities;[63] "collateral term sheets" that set forth the characteristics of the securitized pool assets; and "structural term sheets" that described the basic terms of the proposed offering.[64]

In 2005 the SEC adopted a comprehensive regulatory regime that specifically addresses disclosure and reporting requirements for issuers of SEC-registered MBS and ABS.[65] Rules governing communication with MBS and ABS investors during the offering process were further refined shortly thereafter, when the SEC implemented a sweeping reform of the securities offering rules.[66]

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[61] Under Section 3(c)(1) of the Investment Company Act, an issuer is excluded from the definition of investment company if, generally, there are no more than 100 beneficial owners of the issuer's securities and the issuer is not undertaking (or planning) a public offering of its securities.

[62] Exclusion from the Definition of Investment Company for Certain Structured Financings, Proposed Rule, SEC Release No. IC-18736, 57 Fed. Reg. 23,980 (1992).

[63] Kidder, Peabody Acceptance Corporation I, Sec No-Action Letter (1994).

[64] Public Securities Association, SEC No-Action letter (1995).

[65] See Asset-Backed Securities, Securities Act Release No. 33-8518, 70 Fed. Reg. 1506 (2005).

[66] See Securities Offering Reform, SEC Release No. 33-8591, 70 Fed. Reg. 44,722 (2005).

III. Literature Review

This section provides an overview of the existing literature that addresses the impact of securitization on consumers, businesses, and the economy. We are interested in how securitization has affected (1) cost of credit, (2) access to credit, (3) dispersion of risk, and (4) market liquidity. We summarize the theoretical framework and motivations of the academic literature for each of the four topics.

As a general matter, the academic literature focuses primarily on the impact of securitization on the residential mortgage market. This makes sense given that residential mortgage securitization makes up the major portion of the total securitization market and that mortgage data are publicly available through databases such as the Home Mortgage Disclosure Act (HMDA) or Monthly Interest Rate Survey (MIRS). Many empirical studies in our literature review focus on the securitization activity of the Fannie Mae and Freddie Mac residential mortgage market. Much of the literature on the securitization of other types of assets (e.g., subprime loans and credit card loans) has been published within the last few years.

The literature cites a number of reasons for why firms may choose to securitize their assets. Securitization is viewed as an innovative tool that lowers the cost of funding and diversifies the sources of credit available to financial institutions. It is argued that securitization efficiently distributes risk among many investors and minimizes information asymmetries, which arise when one party has more or better information than another.[67] We summarize below several key theoretical and empirical papers that address in greater detail the aforementioned motivations for securitizing.

Greenbaum and Thakor (1987) provide a theoretical framework for understanding the role of securitization in reducing information asymmetries. They explore the conditions under which securitization would be preferred to deposits as a funding method for banks. They argue that when a bank has more or better information than the depositor or investor, securitization may resolve any information asymmetries by allowing banks to signal the quality of their assets through the level of credit enhancements. In their model, in an environment without government deposit insurance, banks would prefer to securitize the better loans and keep the

[67] Fabozzi and Kothari (2007), pp. 8-9; Gorton and Souleles (2005), p. 2.

poorer quality loans on their books. However, with full deposit insurance that is priced cheaply and with low bank capital requirements, bank deposits become the dominant source of funding, even for higher quality loans.

Schwarcz (1994) presents a qualitative discussion of why securitization enables many companies to raise funds at a lower cost than through debt and equity. The cost of debt funding depends on a credit rating that is based on the credit quality of the institution. Funding is more expensive for institutions that have lower ratings because they would need to add credit enhancement or increase the coupon on their bonds. Securitization allows institutions to transfer their assets to a SPV, which issues bonds that have credit ratings dependent only on the performance of the underlying pool of loans and any additional credit enhancement used.[68] Schwarcz (1994) reasons that institutions with lower credit ratings would prefer to securitize their assets if the cost of funding through securitization is lower than the cost of other types of funding.[69] He also concludes that securitization can enable certain companies to achieve a genuine reduction in financing costs, by providing access to lower cost capital market funding. This is especially beneficial for companies that would not otherwise be able to access the capital markets.

Hill (1996) discusses the benefits of securitization through a Modigliani and Miller framework. Modigliani and Miller argue that the capital structure of a firm has no effect on its value, and therefore as a theoretical matter, the need for securitization should not exist in perfect markets. However, Hill (1996) finds two main benefits of securitization. (1) Securitization may reduce information costs for sellers and investors in securities and thus alleviate the "lemons" problem.[70] Through economies of scale and the standardization of the process of obtaining and reporting information, securitization lowers the bank's cost of telling investors that its securities are not lemons. Firms that suffer from greater information asymmetries, such as firms that have limited public information available or those that are in financial distress, would benefit most from securitization. (2) Securitization may also reduce a firm's agency and regulatory costs. By allowing originators or servicers to specialize, Hill

[68] Fabozzi and Kothari (2007), pp. 8-9.

[69] Schwarcz (1994), p. 136.

[70] For more details, see George A. Akerlof's "The Market for Lemons: Quality Uncertainty and the Market Mechanism." *The Quarterly Journal of Economics*, Vol. 84, No. 3 (August 1970), pp. 488-500.

(1996) argues that securitization can decrease agency costs, which are the costs associated with the origination and servicing process. Hill (1996) concludes that specialization allows for the improvement of appraisal, loan monitoring, and payment collection techniques, and thus allows for overall costs to be minimized. Securitization could also reduce regulatory costs associated with maintaining a bank's capital adequacy ratio. Banks are required to maintain a specific level of capital, given the riskiness of their loans and assets. Assets securitized by the GSEs require less capital than required for whole loans or non-agency MBS. Therefore, banks may take advantage of these differences to reduce capital.

Gorton and Souleles (2005) hypothesize that a key motivation for using SPVs in corporate finance is to reduce bankruptcy costs. In securitization transactions, where the loans are transferred and sold to a SPV, a bank can reduce the amount of assets factored into any potential bankruptcy costs. Gorton and Souleles (2005) create models to test two key hypotheses using credit card securitization data. (1) Riskier banks, as measured by their credit rating, securitize more. (2) Investors are not only concerned with the credit quality of the securities issued by the bank's SPV but also with the default risks of the issuing bank. To determine which banks securitize, their analysis controls for a bank's assets, the percentage of credit card receivables and the capital ratio, which is defined as the ratio of equity to assets. Results show that over the sample period (1991-2000) there is some evidence that banks with lower credit ratings were more likely to securitize than banks with higher credit ratings. After controlling for factors such as the quality of the underlying assets, they find that investors require, on average, an additional 46 basis point yield on credit card securities issued by riskier banks. The authors conclude that the firms with the high expected bankruptcy costs will tend to use securitization more often as a method of financing.

In all, there are few empirical studies that examine the role of non-GSE participants in the mortgage market or other markets.

A. Cost of Credit

One frequently asked question is whether securitization reduces the cost of borrowing for consumers. Numerous studies have attempted to answer this question by analyzing the impact of mortgage securitization on mortgage interest rates. The argument for the benefits of

securitization goes as follows: increases in securitization have increased the supply of mortgage credit available to lenders. This in turn drives down the mortgage interest rate offered to consumers.

The GSEs are major participants in the securitization market and the impact of their activities on the cost of credit has been studied extensively. There is a general consensus in the literature that the GSEs have a funding advantage through their implicit backing by the government and they are said to enjoy a lower cost of borrowing. Hence, they are able to securitize mortgages without using credit enhancement.[71] There is less agreement over the extent to which the GSEs have passed on this benefit to consumers.[72]

One of the first studies to analyze the GSEs' impact on mortgage yields is by Black, Garbade, and Silber (1981). They develop a theoretical model to study how the yield on Federal Housing Authority (FHA) mortgage loans[73] responds to increases in the outstanding amount of Government National Mortgage Association (GNMA) securities. The model predicts that FHA yields should be lowered as demand for GNMA securities increases. Their empirical results verify the inverse relationship between mortgage securitization and mortgage yields. Empirical results show that over the period of 1971-1978 each $10 billion increase in the outstanding amount of GNMA securities reduces FHA loan yields by about 2% of the current Treasury yield. For example, if treasury yields are 7%, a 2% decrease would result in a 14 basis points decrease in FHA loan yields.

Kolari, Fraser, and Anari (1998) examine the effects of securitization on yield spreads in the primary mortgage market for the period 1985-1995, when securitization became the dominant source of financing for the mortgage market. They apply a cointegration technique to test the long-run impact of increasing securitization over time on the mortgage loan yield spread. They find that as the proportion of mortgage securitization to total mortgage

[71] Passmore, Sparks, and Ingpen (2002).

[72] Ambrose and Warga (2002); Nothaft, Pearce, and Stevanovic (2002); Read Lehnert, Passmore, and Sherlund (2006) for more details.

[73] Borrowers with difficulty qualifying for loans (i.e., those with less than perfect credit or the inability to pay significant portions of the down payments) were able to qualify for FHA-insured mortgage loans made by private lenders. These loans were fully insured against default by the FHA, which gave lenders greater flexibility in calculating income and payment ratios and lowered the interest rates paid by borrowers had they taken out a conventional loan. See <http://www.fha.gov/about/index.cfm#history>

originations increases by 10%, the yield spreads on home loans decrease by 20 basis points. This negative correlation between the growth of securitization and interest spreads that they find has also been observed in other studies.[74]

A theoretical analysis conducted by Heuson, Passmore and Sparks (2001) finds the opposite causality between mortgage rate and securitization than the one stated by Kolari, et al. (1998). They construct a baseline supply and demand model of borrower and lender behavior in a competitive market with perfect information. They then include the role of a securitizer who determines the minimum interest rate on the MBS and credit quality of the loans that can be securitized. The model finds a negative relationship between securitization and the mortgage rate. The authors speculate that declining interest rates increases securitization rather than the reverse. Their model result has not been tested empirically.

Another study that examines the impact of securitization on the cost of borrowing is conducted by Hendershott and Shilling (1989). It is the first study to utilize the jumbo-conforming differential to assess the effect of GSEs' securitizations. Between the early 1980s and 1986, the authors observe a surge in GSEs' securitization of loans below the conforming loan limit, which are loans eligible for purchase by the GSEs. They hypothesize that the rapid growth of GSE purchases in the 1980s reduced the yields on conforming loans when compared to those on loans above the limit (jumbo loans). The authors use loan-level data collected in California by the FHLBB monthly survey and separate the data into two time periods, May to June 1978 and May to June 1986. These are the years before and after the GSEs' dominance emerged. They reduce the dataset to study only fixed-rate mortgages, removing loans by mortgage and commercial banks, loans with a LTV ratio less than 70%, and loans with less than a 25-year term to maturity. To test their hypothesis, they use OLS regression analysis to examine the effect of changes in the loan size on changes in the effective loan rate. The model includes dummy variables for the LTV ratios and whether the loan is at or under the conforming loan limit. Results show that in 1978, the average interest rate for jumbo loans is 3 basis points higher than the interest rate for conforming loans. In 1986, the average interest rate for jumbo loans was 24 basis points higher. The authors conclude that the expansion of the

[74] Black, Garbade and Silber (1981); Chloewicki (1985); Hendershott and Shilling (1989); Nothaft, Gabriel and Rothberg (1989); Passmore, Sparks, and Ingpen (2002); Naranjo and Toevs (2002).

GSEs has reduced the yields on conforming loans. They also find that by 1986, the interest rate for jumbo loans was 30 basis points higher than comparable loans. The interest rate for loans that are just above the loan limit was 15 basis points higher than comparable loans. This study supports the conclusion that the GSEs have created a liquid market for conforming loans, which has then lowered the conforming fixed rate mortgages interest rate for consumers.

Numerous studies have since measured the jumbo-conforming yield differential using different assumptions and models. Though the magnitudes of these differentials vary, the studies consistently find a significant difference between conforming and jumbo interest rates. The literature presents various reasons for this observed difference. Some studies attribute it to the GSEs, which have created a liquid market for conforming loans, thus driving down the conforming loan interest rate.[75] Others studies attribute it to variables such as house-price volatility.[76] We summarize the studies below.

Cotterman and Pearce (1996) examine how mortgage rates would adjust if Fannie Mae or Freddie Mac securities were not perceived to have the implicit backing of the government. They use the difference between the conforming and non-conforming interest rates as an approximation of the magnitude of the effect of the GSEs on mortgage rates. Using fixed-rate mortgage data from California and 11 other states, Cotterman and Pearce (1996) estimate the jumbo-conforming loan differential from 1989 to 1993 using Hendershott and Shilling's (1989) methods. They estimate that interest rates on conforming loans were 25 to 40 basis points lower than on loans larger than the conforming loan limit in the 1990s. The authors hypothesize that this differential arises due to the higher costs associated with securitizing jumbo loans. They argue that non-agency issuers that securitize non-conforming loans account for the GSE guarantee via more costly methods such as credit enhancements and securitizing higher quality assets.

Ambrose, Buttimer, and Thibodeau (2001) offer a different explanation to the cause of the jumbo-conforming rate differential. They suggest that house-price volatility may explain the observed yield differential. The authors construct a mortgage-pricing model that requires an input for house-price volatility to calculate the theoretical mortgage rates for conforming and

[75] Cotterman and Pearce (1996).

[76] Ambrose, Buttimer, and Thibodeau (2001).

jumbo loans. Using house price data from 1980-1997, they empirically determine the price volatilities for moderately-valued (conforming) homes and high-valued (jumbo or non-conforming) homes. Controlling for other economic factors, they find that the volatility in moderate and high value house prices has produced a significant jumbo-conforming yield differential. Their model predicts that, on average, house price volatility may account for more than 20% of the yield differential. However, the magnitude of this impact depends on the assumptions made about the economic parameters in the model.

The Congressional Budget Office (CBO) (2001) measures how much of the GSEs' funding advantages have been passed on to consumers in terms of lower mortgage rates. The CBO follows similar methods to those used by other studies but measures the jumbo-conforming rate differential using a larger sample of nationwide data between 1995 and 2000. The CBO estimates that the average yield spread between GSE securities and similar debt issued by private lenders is 41 basis points. Of this 41 basis point advantage, the study estimates that 25 basis points are passed on to borrowers in the form of lower interest rates. The remaining 16 basis points are kept for the benefit of Fannie Mae and Freddie Mac shareholders.

Passmore, Sparks, and Ingpen (2002) compare mortgage securitizations performed by GSEs with those by private companies. The authors construct a model to generate a theoretical spread between the rates paid on the MBS issued by the GSEs and private companies and the rates on the underlying mortgages. They also analyze how the competitive or non-competitive behavior of the GSEs affects mortgage rates. They then compare these values to the actual spread calculated using MIRS data from 1992-1999. The authors isolate a sample of conforming loans and jumbo loans with similar characteristics and plot the difference in the median interest rates. There is substantial variation in the spread, particularly when the spread is negative in 1994. The authors speculate that this may be due to new MBS pricing practices. The average spread between conforming and non-conforming loans is 18 basis points during the whole time period and 23 basis points excluding the years 1992-1994. Passmore, Sparks, and Ingpen (2002) conclude that the GSEs generally lower mortgage rates, which is consistent with their model results. This is more apparent when the GSEs behave competitively because

the GSEs' implicit support from the government allows them to sell securities without the credit enhancements that are otherwise used by private firms.

McKenzie (2002) measures the jumbo-conforming yield differential using MIRS data from 1986 to 2000. He uses OLS regression analysis with variables that other studies have identified as affecting mortgage rates. These variables are loan size, LTV ratio, regional dummy variables, time dummy variables, and a dummy variable to mark whether the loan is above or below the conforming loan limit. He finds that controlling for these factors, the average jumbo-conforming yield differential over 1986 to 2000 is 22 basis points while over 1996 to 2000, this differential is only at 19 basis points.

Passmore, Sherlund, and Burgess (2005) examine the spread between jumbo mortgages and conforming mortgages bought by GSEs using MIRS data from April 1997 through May 2003. They begin by developing a theoretical framework based on supply and demand in the mortgage market to determine the factors that affect the jumbo-conforming spread. Other than the impact of the GSE funding advantage, they identify mortgage demand, bank funding capacity and liquidity in the jumbo market as additional factors that affect the spread. They then regress the mortgage rate on various loan characteristics including a dummy variable for jumbo mortgages to capture the jumbo-conforming spread. Last, they regress the estimated jumbo-conforming spread on the factors derived from their theoretical model. The coefficient on the GSE funding advantage is treated as the pass-through rate of the funding advantage to consumers. The study finds that the average jumbo-conforming spread is 16 basis points and that the GSE funding advantage likely accounts for about seven basis points of this difference.

Blinder, Flannery, and Lockhart (2006) offer a new estimate of the jumbo-conforming mortgage rate differential using a modified version of Hendershott and Shilling's model (1989). Similar to prior studies, they include dummies in their models to account for the factors that affect the observed difference between jumbo and conforming loans other than the effects of securitization. Using MIRS data from April 1997 to May 2003, the authors construct three models. The first studies the effect of changes in loan factors (e.g., LTV, principal amount, or whether the loan is new) and market factors (e.g., current Treasury rates or month of origination) on the jumbo-conforming yield spread. The second deals specifically with the impact of securitization on near-conforming loans that are issued every November and

December, before the OFHEO releases the new conforming loan limits in January of next year. The authors argue that originators tend to offer lower interest rates to near-conforming loans in anticipation of any conforming loan limit increases that may occur. Last, the authors decompose the effect of credit and market factors that could affect rates in the jumbo and conforming markets. For example, they account for the observation that jumbo loan rates can be more sensitive to variables such as LTV ratios than conforming loans. After controlling for other factors, they estimate the rate on a conforming loan as if it were priced like a jumbo loan with the same characteristics and vice versa. All three regressions produce similar estimates of the jumbo-conforming spread, which is on average 25 basis points.

In a related strand of research, Gonzalez-Rivera (2001) extends the analysis of the GSEs' securitization activity to document how the loans that they purchase for their retained portfolios affect the mortgage yield spread. She tests for a cointegrating relationship between GSE purchases and the mortgage yield spread in the secondary market and finds a significant positive relationship. Her tests for causality indicate an interactive relationship between GSE purchases and mortgage yield spread. She finds that an increase in the yield spread by one basis point leads to an increase in GSE purchases by $554 million. She then tests for a cointegrating relationship between the primary market yield spread, the secondary market yield spread and purchases. The results show that the secondary market yield spread is directly related to the primary market yield spread. This suggests that the GSEs directly affect the secondary market yield spread through purchases for their retained portfolios, which can then lead to benefits in the primary market yield spread.

Naranjo and Toevs (2002) study the effect of Fannie Mae purchases and GSE securitization on yield spreads relative to the 10-year Treasury rate for conforming and non-conforming mortgages. They also calculate the jumbo-conforming spread. Results from their models show that both types of activities significantly lower the yield spreads of conforming and non-conforming loans. They find that when Fannie Mae increases its purchases by 10%, the conforming yield spread decreases by 17 basis points, while the non-conforming yield spread decreases by 8 basis points. This suggests that activity in the secondary market for conforming loans also affects the non-conforming mortgage market, perhaps because lenders

use the conforming mortgage market to hedge their non-conforming mortgages and to determine the pricing of their securities.

Lehnert, Passmore, and Sherlund (2006) analyze the impact of portfolio purchases by the GSEs on primary and secondary mortgage yield spreads. The paper uses a vector autoregression (VAR) model of the relationship between GSE secondary market activities and mortgage interest rate spreads for the period from 1993 to 2005. The model examines how mortgage rate spreads react to a change in GSE portfolio purchases. The authors construct impulse functions to test whether one standard deviation shocks in issuance and purchase have a significant effect on primary and secondary mortgage spreads. Although the model predicts a positive correlation between purchases and spreads and a negative correlation between MBS issuance and spread, both predictions have confidence intervals that include zero. Unlike the studies discussed previously, the authors of this study were unable to find a statistically significant relationship between GSE activities and mortgage yield spreads.

Some recent papers have addressed the impact of securitization on the cost of credit in overseas markets. Pais (2008) examines the effects of securitization on mortgage rates set by various types of lenders in the UK mortgage market. Pais finds that lenders who fund mortgages through securitization (centralized lenders) are able to react more quickly to changes in interest rates as compared to lenders who fund mortgages through bank deposits (depository institutions). This enables lenders that securitize to pass on interest rate changes faster to borrowers. While faster responses to changes in LIBOR can have positive benefits for borrowers, they can also leave borrowers relatively worse off in times of high interest rates.

B. Availability of Credit

Existing literature suggests that securitization increases banks' liquidity and hence credit availability. Securitization allows issuing banks to convert traditionally illiquid loans into marketable securities, and thus frees up capital for more loans.[77] There are a few studies that measure the impact of securitization on the access to credit for consumers and businesses;

[77] Loutskina (2005); Loutskina and Strahan (2006).

there has been more work, however, on quantifying the role of GSE activity in increasing mortgage credit within underdeveloped areas.

Studies conducted by Loutskina (2005) and Loutskina and Strahan (2006) examine the role of securitization on reducing the impact of a bank's financial condition on its willingness to supply credit. Loutskina (2005) constructs a securitization index which measures a bank's ability to securitize the assets on its balance sheet at a given time. She examines how increased potential liquidity arising from the ability to securitize has affected a traditional bank's willingness to supply credit. She regresses the log of real loan growth on a series of variables including bank size, the securitization index, and a monetary policy indicator. Results show that when the money supply is constrained (e.g., monetary tightening), banks with greater ability to securitize their loan portfolios have smaller contractions in loan growth. The study suggests that securitization increases the supply of bank credit across sectors including illiquid business loans.

Loutskina and Strahan (2006) focus their analysis on the relationship between the willingness of banks to approve jumbo mortgages, relative to non-jumbo mortgages and their function of the banks' funding costs and balance sheet liquidity. They argue that conforming loans have much greater liquidity than jumbo loans due to the market for these loans created by the GSEs. This added liquidity cushions the impact of a bank's financial condition on its acceptance rate. Their results show that the acceptance rates of conforming loans do not vary with a bank's liquidity and funding costs, confirming that a bank's financial condition seems to have no impact on its willingness to originate conforming loans. The results do show that the acceptance rates of jumbo loans are dependent on bank conditions. They find that banks with more balance sheet liquidity and lower funding costs approve a greater percentage of jumbo loans relative to non-jumbo loans. The authors conclude that low-cost funding and increased balance-sheet liquidity increases the likelihood that banks approve jumbo mortgages, while having no effect on the likelihood that banks approve non-jumbos loans. They suggest that increased securitization has made access to funding less sensitive to the constraints of local credit supply.

The empirical literature also contains some discussions about the impact of GSE purchases on the availability of credit and increased housing market activity in underserved

areas. Ambrose and Thibodeau (2004) evaluate the Affordable Housing Goals (AHG) on increasing mortgage credit availability in specifically targeted MSAs. The AHG requires that a specific percentage of GSE purchase activity be focused in low- and moderate-income areas. The authors analyze the relationship between the volume of loan origination and the number of borrowers from underserved areas, controlling for economic and demographic characteristics. The authors also analyze seasoned loans purchased by the GSEs to test the impact of GSE activity. Using HMDA data from 1996-1999, they find a positive relationship between total mortgage originations and the percentage of underserved borrowers within the MSA, although the effect was mainly limited to 1998. They also find that in MSAs where the GSE purchase activity increased, the total mortgage origination volume also increased. They conclude that this increased availability of credit in underserved areas demonstrates the positive effect of increased GSE activity as mandated by the AHG.

Goderis et al. (2007) assess the impact of banks' engagements in advanced credit risk management on their target loan levels (they assert that banks adjust their current loan values relative to previous years to obtain a target level of loans). The authors find that banks that are fully engaged in advanced credit risk management techniques (identified by the issuance of at least one collateralized loan obligation) experience an increase in their target loan levels. The authors argue that CLO issuance is an observable signal that a bank is involved in advanced credit risk management and that CLOs are amongst the primary methods by which banks can shift large amounts of risk off their balance sheets. They conclude that banks using advanced credit risk management techniques result in a permanent increase in target loan levels of around 50%, though adjustment to this target indicates that the impact on actual loan levels is spread over many years.

Recent literature in the wake of the financial crisis that began in 2007 note that securitizations increased the availability of mortgage credit, but perhaps at the expense of improper credit-risk rationing that contributed to the spike in mortgage defaults and arguably sparked the crisis. Mian and Sufi (2008) examine the financial crisis in the context of mortgage defaults at the zip-code level that they assert occurred disproportionately more in subprime zip codes (they define subprime zip codes as those in the highest quartile of zip codes based on the fraction of residents with a credit score below 660). The authors document that the higher

defaults coincided with an unprecedented expansion of mortgage credit between 2002 and 2005, again disproportionately higher in subprime zip codes. They examine three possible (competing) explanations of the subprime mortgage expansion and the subsequent rise in defaults: (i) improvements in the credit-worthiness of subprime borrowers as evidenced by better income prospects, (ii) an outward shift in the supply of mortgage credit, and (iii) higher house price growth expectations that would lower the estimated losses given default for lenders and thereby relax lending standards. The authors find evidence for the second scenario, supply-side factors, and attribute the growth to the rise in securitizations, especially those from subprime zip codes. Furthermore, they note that default rates from 2005 to 2007 increased significantly more in zip codes where mortgages were sold in private securitizations or non-commercial bank finance companies during the boom in 2002-2005, perhaps a sign of a moral hazard created by the securitizations.

C. Dispersion of Risk

The literature suggests that banks securitize their assets because pooling and tranching can result in risk diversification and effective risk sharing among many investors.[78] The empirical literature analyzing the effectiveness of securitization in dispersing risk, however, is limited. Only recently have a number of studies been published that quantitatively look at the impact of securitization on an issuing bank's risk profile.

Dionne and Harchaoui (2003) analyze the impact of securitization on capital ratios and then on bank risk. They examine the relationship between securitization and risk-adjusted capital ratios. Using data from Statistics Canada's Securitization Survey (1988 – 1998), they find that increased securitization reduces risk-adjusted capital ratios. They question whether securitization increases the riskiness of banks as measured by its change in credit risk.[79] The authors suggest that Basel I regulatory requirements do not provide the most efficient framework for banks to assess the riskiness of assets.

[78] Greenbaum and Thakor (1987); DeMarzo (2005); Franke and Krahnen (2005); Jiangli, Pritsker, and Raupach (2007).

[79] Dionne and Harchaoui (2003) define credit risk as the ratio of provisions for banks unrecoverable loans to total assets or the total risk weighted assets to total assets.

Franke and Krahnen (2005) and Hansel and Krahnen (2007) measure the changes to a bank's systematic (beta) risk after a securitization announcement in Europe. The overall risk of an issuing bank is dependent on how it decides to reinvest the proceeds from securitization. A bank that reinvests in risk-free assets is expected to have less overall risk, compared with a bank that expands its loan originations and thus increases its risk exposure. Hansel and Krahnen (2007) construct several models to measure the change in beta after a securitization announcement; beta is measured against the DJ Euro Stoxx 600 market index. In almost all models, the estimated change in beta due to a securitization announcement is positive and statistically significant. Results from the studies show that a bank's beta tends to rise after a securitization announcement (about 64% of the time) with an average increase of 0.024 for the overall model. The second part of the analysis involves regressing the estimated change in beta on a number of firm-specific factors (i.e., portfolio size, profit, equity ratio, etc.) to determine the source of the change in systematic risk. They find that the change in beta is higher following a securitization announcement for banks that have a lower return on equity and a lower equity ratio. This indicates banks that are financially weak experience a higher increase in their systematic risk relative to banks that are financially sound following securitization.

Securitization is also viewed as a method of hedging interest rate risk. The literature suggests that securitization allows banks to respond to changes in the interest rate environment in several ways. It gives banks more choices on how to hedge their assets. For example, they can do so by changing the duration of assets through pooling and tranching loans into securities, buying investment-grade tranches of a deal, or retaining the residual tranche.[80] Securitization also provides greater access to capital. This is consistent with the empirical study conducted by Loutskina (2005) that shows that banks that are able to securitize more easily are more liquid and therefore less sensitive to shocks that arise from changes in monetary policy.

Another topic of research is the impact of retaining the first loss piece[81] in a securitization transaction. Because of potential moral hazard and adverse selection problem, issuing banks often hold on to the residual tranche of a securitization. By selling the senior

[80] Hess and Smith (1988).

[81] The first loss piece holds the default risks of the collateral in the portfolio. Franke and Krahnen (2005).

tranches to investors, banks lower their tail risk, which is the risk of extreme unexpected losses.[82] Their combined effect can effectively reduce a bank's exposure to extreme losses.[83]

D. Market Liquidity

We are unable to find any empirical studies that measure the impact of securitization on transparency in the markets. Recent reports have identified that the lack of transparency has been a source of weakness within the structured finance market.[84]

IV. The Credit Crisis and the Role of Securitization

Since the start of the ongoing credit crisis, some academics have pointed to aspects of securitization as contributing causes to the crisis. Others have disagreed and the controversy is far from over. For example, Berndt and Gupta (2008) and Keys, Mukherjee, et al. (2008) argue that securitization led to a decline in lending standards, while Bhardwaj and Sengupta (2008) concluded that there is no marked decline in underwriting standards. Franke and Herrmann (2007) and Hellwig (2008) cite the complexity of securitization and lack of transparency as a contributing factor to the crisis. Bannier and Hänsel (2007) argue that securitization is an important risk sharing tool, while Longstaff (2008) examines how securitization created "cross-market linkages" leading to contagion with shocks being transferred from one sector to another. The recent literature also discusses other factors leading to the credit crisis. This section of the study discusses the recent literature on the causes of the credit crisis.

The literature discusses a variety of factors leading to the crisis. First are housing prices. The continuous increase in housing prices in real terms and its deviation from rents and building costs since the late 1990s has created a housing bubble that burst by mid 2006. A decline in housing prices prohibited borrowers from refinancing and increased default rates

[82] Franke and Krahnen (2005).

[83] Jiangli, Pritsker, and Raupach (2007).

[84] Bank of England (2007); The Financial Stability Forum (2008).

(Mizen, 2008 and Gerardi et al., 2008). Second, credit rating agencies were criticized for their inability to accurately price risk (Calomiris, 2008). Third, regulation is said to have failed in keeping up with innovation (Berndt et al., 2008 and Brunnermeier, 2008). Fourth, leverage is said to magnify losses and create spirals in which asset prices continue to fall (Mizen, 2008, Greenlaw et al., 2008 and Buiter, 2008). Fifth, accounting, and notably mark-to-market accounting, is often criticized for being impractical during turbulent times (Gorton, 2008 and Brunnermeier, 2008).

We divide the remainder of this section into two parts: 1) an overview of recent academic analysis of the role of securitization in the crisis, and 2) other factors contributing to the crisis. The former discusses moral hazards, lack of transparency and increased contagion as the main criticisms of securitization. The latter analyzes other contributors to the crisis including housing prices, mark-to–market accounting, regulations and rating agencies.

The Role of Securitization in the Credit Crisis

A. Impact of Securitization on Incentives

There is a controversy in the recent literature over the impact of securitization on incentives. Hull (2008) argues that agency problems in the banks' originate-to-distribute model may have contributed to the crisis and casual empiricism suggests that the interests of mortgage originators were not aligned with those of investors. In some cases, the mortgage originators keep the equity tranches which helps to align the interests of the originators and the investors. Hull acknowledges that securitization, however, did not in many instances remove credit and other risks associated with securitized mortgages from the originators'/sponsors' books. Often the AAA tranches of the securities were bought by other parts of the banks. Hull also stresses the importance of securitization as useful tool, but suggests that it helped in the creation of the housing bubble and cites the findings of Keys (2008) that links securitization to lax underwriting standards as evidence.

Similarly, Hellwig (2008) discusses the fact that if originators held the equity tranches of securitizations and if, due to the packaging and diversification, the probability of portfolio

returns falling short were negligible, then moral hazard risks would also be negligible. However, he notes that often originating institutions did not hold the equity tranches of the portfolios that their securitizations created. Furthermore, macroeconomic factors such as national housing prices necessarily create a correlation amongst mortgages, even from different geographic locations. Hellwig concludes that the moral hazard created by securitization was among the contributing factors of the recent crisis.

Ashcraft et al. (2008) describe various frictions in the securitization process leading to conflicts of interest including: (1) complexity of some of the subprime products: some of the products were too complex, leading to misunderstanding of or misrepresentations to the borrowers; (2) credit ratings: there are not sufficient distinctions between structured and corporate ratings; (3) lack of due diligence by the asset managers: the authors argue that this reduces the incentives for the arranger to conduct proper due diligence; and (4) errors in credit ratings: the rating agencies assigned ratings to subprime MBS with significant errors according to the authors. No empirical evidence was provided to support the authors' analysis.

Mian and Sufi (2008) also suggest that securitization may have created a moral hazard for originators. They argue that a securitization-driven shift in the supply of mortgages to subprime borrowers strongly contributed to the expansion in mortgage credit from 2002 to 2005 that was subsequently followed by a sharp increase in mortgage defaults from 2005 to 2007. They note that the growth in originations and securitizations in subprime zip codes (defined as zip codes in the highest quartile of zip codes based on the fraction of residents with a credit score below 660) occurred despite worsening credit conditions such as negative income and employment growth in these same zip codes. They also acknowledge that alternative channels other than moral hazard could help explain how securitization contributed to the increase in the supply of credit. They offer Fannie Mae and Freddie Mac's advocacy of affordable housing expansion and technological advancements in risk management as possible alternatives.

Schwarcz (2008) finds the moral hazard argument weak and argues that lower lending standards may have been caused by distortions that resulted from a liquidity glut. Lenders, he proposes, may have competed aggressively for business and allowed mortgagors to borrow

almost completely on the assumption of future home price appreciation. Schwarcz (2008) also argues that the originate-to-distribute model cannot be held accountable for lower mortgage underwriting standards because standards were not similarly lowered on other assets that were securitized. Instead, Schwarcz (2008) contends that other conflicts of interest, unrelated to securitization, involving ordinary agency costs, as well as a combination of herd mentality and complacency may explain the decline in underwriting standards.

Rajan, Seru, and Vig (2008) examine mortgage default models and their failures in predicting the rise in subprime mortgage defaults in the 2002-2007 period. They argue that a fundamental cause was that the models relied heavily on "hard" information about borrowers (such as FICO scores and loan-to-value ratios) and largely ignored changes in lenders' incentives to collect "soft" information (such as the likelihood of borrowers to lose their jobs or other upcoming expenses for borrowers). The authors assert that securitization increased the distance between lenders and the ultimate party bearing the default risk of the loans (investors). Furthermore, as the "soft" information would not be verifiable by investors, they would have to depend solely on the "hard" information. This, they argue, created a moral hazard for lenders. Their empirical analysis finds that a default model made in a low securitization period (pre-2002) under-predicts defaults during high securitization period (2002 and beyond). Additionally, they find that FICO scores and loan-to-value ratios explain an increasing share of the variation of mortgage rates over time and that the variance of interest rates actually declines over time, consistent with the notion that these hard signals are the primary factors in the pricing decision. The authors also discuss the decline in home prices as a potential cause of the mortgage defaults, but argue that the model deterioration occurs as early as 2002, when home prices were still experiencing strong growth.

B. Impact of Securitization on Underwriting Standards

Several recent academic studies analyze whether securitization led to weak underwriting standards and reach different conclusions. Dell'Ariccia, Igan, and Laeven (2008) conclude that the expansion in the subprime mortgage market was associated with easing of credit standards and those areas that witnessed expansion fastest had the most lax credit standards. Denial rates and loan-income ratios are used as indicators of lending standards and

these show a decline in lending standards during the period 2000 to 2006. It is worth noting that the authors do not control for the credit characteristics of the borrowers (e.g. FICO) but use economic and demographic variables. The explanatory variables include average income, income growth, unemployment rate, self-employment rate, number of competing lending institutions, home price appreciation and the number of loan applications. In addition, they use a dummy variable for securitization based on whether the loan was securitized and kept on the books of the originating institution or sold to another party.

Chomsisengphet, Murphy, and Pennington-Cross (2008) examine the factors determining the demand for adjustable rate, non-amortizing, balloon, and interest-only mortgages using LoanPerformance data for the period 2000 to 2007. They conclude that economic and financial factors such as home price appreciation, unemployment rates, debt-to-income ratios, average income, and credit scores cannot explain the demand for non-traditional mortgage products. Rather, the explanation, they argue, could be a result of relaxed underwriting standards, increased steering by originators to these products, or a shift in borrower's preference.

Keys, Mukherjee, Seru, and Vig (2008) provide empirical evidence to suggest that securitization adversely affect the screening incentives of lenders. More specifically, they find that conditional on being securitized, the portfolio that is more likely to be securitized defaults by about 20% more than a similar profile group with a lower probability of securitization. Using loan level data obtained from LoanPerformance during the period 2000 to December 2006, they test how lender behavior varies at a FICO score of 620.[85] The authors use a FICO score of 620 because they are concerned with the "differential impact securitization has on behavior of lenders around the cutoff." Keys, Mukherjee, Seru, and Vig (2008) hypothesize that "as we approach the cutoff from either side, any unobservable differences in features of the loans should disappear to the limit." Thus, any differences that do arise are the result of differences in lending screening standards above and below the ad-hoc cutoff for securitization. As Bhardwaj and Sengupta (2008) point out, a credible test of this hypothesis requires data on

[85] Keys, Mukherjee, Seru and Vig (2008) use a FICO score of 620 as an ad-hoc cutoff point because of the rule of thumb in the lending market which makes securitization of loans more likely if a certain FICO score threshold is attained.

loans that have been securitized and loans which were retained on the originators books. Also, the rationale of choosing the FICO of 620 as the cutoff and ignoring all others is not clear or justified in the article. More importantly, Bhardwaj and Sengupta (2008) demonstrate that the loan-to-value ratios and mortgage rates are endogenously determined in the case of subprime loans. The endogeneity problem was never addressed by Keys et al and could potentially lead to a bias in their results.

Deyanyk and Van Hemert (2008) find that the quality of loans deteriorated for six consecutive years before the credit crisis and that securitizers were, to some extent, aware of it. They further conclude that the rise and fall of the subprime mortgage market follows a classic lending boom-bust scenario, in which unsustainable growth leads to the eventual collapse of the market. They examine subprime loans in the U.S. from 2001 to 2007 and find that over time, the number of full documentation loans decreased while the average combined loan-to-value (CLTV) ratio increased.

Purnanandam (2008) also examines the originate-to-distribute model and concludes that the originate-to-distribute model resulted in the origination of inferior quality loans by these banks. The empirical analysis shows that banks with higher securitization levels had a higher percentage of mortgage charge-offs after the disruption of mid-2007 because it became more difficult for banks to sell the loans. Using bank charge-offs as a measure of loan quality, the author uses a balanced panel and a difference-in-difference approach for the seven quarters between 2006-Q3 and 2008-Q1. The author does not include any variables to control for the borrowers' credit quality such as FICO scores, loan-to-value ratios, or default history.

Bhardwaj and Sengupta (2008) conduct an empirical study using loan level data in which they conclude that there is no evidence of a marked decline in subprime underwriting standards post-2004. The authors show that underwriting may have weakened along some dimensions (such as lower documentation levels) but it certainly strengthened along others (such as higher FICO scores). They argue that while underwriting standards may have been poor to start with, the lax underwriting standards cannot be the reason for the collapse in the subprime mortgage market.

Moreover, the authors stress two important factors: 1) the multidimensional nature of credit risk. Lenders often compensate for the increase in risk ex ante by raising the requirements along other dimensions. So, one has to take various factors into account when controlling for the credit characteristics of borrowers; and 2) the endogeneity problem, especially when using the loan-to-value ratio and the mortgage rates as explanatory variables for the performance of the loans. While loan-to-value ratios and FICO scores determine the credit risk of a borrower, the terms of the credit risk are determined by the borrowers' attributes.

Gerardi et al (2008) show that while loans originated in 2005 and 2006 carry extra risk factors, particularly increased leverage, the underwriting standards alone cannot explain the surge in foreclosures.

Anderson, Capozza, and Van Order (2008) examine foreclosure rates since the late 1970s and conclude that technological enhancements in origination processes and automated underwriting systems helped to create relaxed lending standards. They characterize two periods of deterioration: the first occurred in the mid to late 1990s, where lowering credit standards such as loan-to-value ratios were clearly visible, and the second post-2002, when securitization created moral hazards for lenders that were not immediately visible in the "hard" credit characteristics such as loan-to-value ratios and credit scores. Furthermore, the latter part of 2005 and 2006 witnessed economic conditions (and specifically, home prices) that began to worsen, exacerbating the problem. They suggest that relaxed underwriting standards and unfavorable economic conditions had an equal share in explaining the recent surges in foreclosure rates.

Liebowitz (2008) argues that while the reversal of a housing bubble is among the main causes of the sharp rise in defaults in recent years, the housing bubble itself was caused by a decline in lending standards precipitated by increased pressure from various branches of the government since the early 1990s. He asserts that home-ownership goals, especially those targeted amongst poor and minority Americans, fueled a decline in lending standards that led to lower down payments and a relaxing of due diligence around borrowers' credit characteristics that contributed to the current crisis. The subsequent rise in demand created a housing bubble that also attracted speculators who increased the demand for exotic mortgage products such as

option adjustable-rate mortgages and others. The decline in home prices caused these speculators to abandon their investments, resulting in the surge in foreclosures that are mainly among the adjustable, rather than fixed-rate mortgages.[86] Furthermore, the author opines that attempts to blame the subprime sector (and elicit subprime lending practices) are misguided, as both the prime and subprime segments showed similar patterns of spikes in foreclosures.

The debate over the impact of securitization on the underwriting standards continues. Some academics like Keys (2008) believe the originate-to-distribute model is the cause of the crisis and argue that securitization led to lax underwriting standards. Others such as Gorton (2008) and Bhardwaj (2008) view this as an overly simplistic explanation of the crisis and point to the bankruptcy of the top subprime lenders as evidence that the originators retained significant exposure to risk of the underlying mortgages.

C. Information Asymmetries and Transparency

Gorton (2008) states that securitization is not the problem. "It is not the cause of the crisis. Securitization is an efficient form of financing and there is no evidence that there is a systematic agency problem in its functioning. Rather the particular form of the design of the subprime mortgages is at the root of the problem. It was highly sensitive to housing prices, and this sensitivity was passed through to a variety of other financial structures."[87]

Still, Gorton (2008) argues that the way structured products distribute risk is opaque. When one party in a transaction has more information than another, an incentive is created for the former party to use the information to their advantage. The same concern about the lack of transparency and complexity of the financial mortgage products are echoed by Schwarcz (2008) and Hull (2008). Hellwig (2008) also opines that the lack of transparency meant that the extent of systemic risk exposure could not be foreseen by the various market players. He discusses that funding troubles at one firm can quickly spread to other firms due to the "lemons" problem, where in the presence of asymmetric information, potential investors fear

[86] Anderson, Capozza, and Van Order (2008) also note that foreclosures spiked for adjustable rate mortgages in end-2006 and 2007 across both the prime and subprime markets.

[87] Gorton, September 2008, p. 77.

that sellers are trying to unload their lower-quality assets and so they pull funding entirely or, at the very least, demand deep discounts for them.

Schwarcz (2008) discusses how the complexity of financial products resulting from securitization can deprive investors from the information required for markets to work efficiently. Hull (2008) discusses the complexity of some of the securitized products that were traded and states that investors did not understand them enough to accurately determine their cash flows.

Brunnermeier (2008) adds that the extent of securitization is a distinguishing feature of this crisis. He explains that it made it more opaque for institutions to assess their exposure to counterparty risk and also made it more difficult to value these structured products.

Loutskina and Strahan (2008) provide an interesting analysis of the role of information that does not directly relate to securitization. They show how inadequate information helps explain the real estate bubble and crash. The authors argue that lenders who are concentrated in few markets behave like informed investors, while diversified lenders behave like uninformed investors. Concentrated lenders are said to earn higher profits than diversified lenders. The authors show that the share of concentrated lenders has declined over the past 15 years to nearly zero in 2006. As a result, the authors argue that the real estate market became dominated with uninformed investors which set the stage for the bubble and then the crash.

D. The Role of Securitization in Risk Dispersion and Contagion

A positive consequence of securitization is its ability to redistribute and diversify risk.[88] However, in light of the crisis, economists have increasingly cited contagion through securitization as a major contributor to the current crisis. This contagion, or transmission of shocks from one source to another may not actually decrease risk, but rather spreads it to other market participants. Brunnermeier (2008) refers to this as "spillover effects" and Chan-Lau and Ong (2007) claim that securitization may "magnify shocks" since they disperse risk.

[88] See Dionne and Harchaoui (2003) and Franke and Krahnen (2005).

Gallegati et al. (2008) argue that interdependencies created through securitization are beneficial when the economic environment is favorable, but detrimental when the environment worsens. They suggest that a likely primary explanation is the process of securitization itself as it causes linkages to be formed that increase the risk of contagion. The authors conclude that linkages between financial actors reduce the likelihood of individual defaults when economic conditions are good, but the expected number of defaults becomes higher in times of downturn and the defaults become a systemic failure.

Hänsel and Krahnen (2007) analyze whether the credit risk transfer instruments affects the risk taking by financial institutions. Using data on European CDOs, the authors find that the issue of CDOs raises the systemic risk of the issuing banks. Similarly, Michalak and Uhde (2008) find that securitization has a positive correlation with European banks' systemic risk. However, this result only holds for approximately 57 percent of their sample; the other 43 percent of banks saw lower systemic risk with securitization.

Using data on CLOs by European financial institutions, Bannier and Hänsel (2007) examine the influence of firm-specific as well as macroeconomic factors on institutions' securitization decision. They find that the probability of a bank engaging in loan securitization increases with bank size (measured by total assets), decreases with banks' liquidity (measured by the ratio between money lent to other banks and money borrowed from other banks), and increases with credit risk (ratio of credit risk provision to net interest income). As such, they conclude that securitization transactions are used to reduce banks' exposures to default risk and to increase their liquidity situations.

Recent research has also considered the role of securitization in risk-sharing at a macroeconomic level. Hoffmann and Nitschka (2008) find that countries with the highest degrees of mortgage securitization experience consumption volatility, conditional on idiosyncratic business cycle shocks, that is 20 to 30 percentage points lower than countries without these secondary markets for mortgages. The authors note that their results are not inconsistent with the current crisis, although their data end in early 2008. They argue that the increased international risk sharing implies that a domestic housing bust can be spread into a

global problem. They suggest that securitization helps share the costs of the crisis internationally.

Causes of the Ongoing Credit Crisis

E. Housing Prices as the Trigger of the Credit Crisis

There is almost a consensus that the burst of the housing bubble is the main cause of the current crisis. Mizen (2008) discusses how the credit crunch occurred when house prices fell and subprime mortgage defaults increased. He discusses the introduction of new assets based on subprime and other types of mortgages, which were securitized and were considered safe. He argues that they were not as safe as the rating suggested because they were tied to house prices, and while house prices were rising, the assets offered higher returns than assets with similar risk ratings. However, as house prices began to fall, foreclosures on mortgages began to increase. To make matters worse, investors, he argues, had concentrated risks by leveraging their holdings of mortgages in securitized products leading to magnified losses.

Bhardwaj and Sengupta (2008) argue that the story of the subprime mortgage crisis is a story of mortgage prepayments. The continuous increase in housing prices since 1995 had a positive impact on the ability of subprime borrowers to prepay and reduced the rates of defaults, according to the authors. Using loan level data, they show that the rise in the house price index led to a higher probability of prepayment and a lower probability of default.

Gerardi et al. (2008) attribute much of the dramatic increases in foreclosures that took place in Massachusetts between 2006 and 2007 to falling house prices in 2005. Using a "competing risks, proportional hazard, duration model of default and sale, and using a set of proxies" to control for certain variables, they find that the probability of success, as defined by the ability to remain in the house or elect to sell, is very sensitive to house price appreciation.[89]

[89] See Gerardi et al. (2008), p. 35.

Mayer et al. (2008) examine the rise in mortgage defaults in the context of the characteristics of subprime and Alt-A loans. They argue that loosening underwriting standards, combined with declining home prices, were the main, immediate contributors to the rise in mortgage defaults. They posit that home price appreciation likely fueled the growth in the non-prime mortgage markets

Similarly, Doms, Furlong, and Krainer (2007) assess three main potential factors to the rising subprime delinquency rates: (i) riskier borrower pool, (ii) local economic weakness, and (iii) local home price appreciation and the decline in growth rates. The authors find that while all three factors contribute to the decline in performance, the best single predictor is the recent patterns in home price appreciation.

F. The Role of the Rating Agencies

The controversy over the role of the rating agencies is ongoing. In a theoretical paper that discusses the origins of the subprime turmoil, Calomiris (2008) states that rating agencies were using unrealistic assumptions about subprime risks which were fundamental to the growth of the subprime market in the years leading to the crisis. The author notes the ratings agencies failed to revise their unrealistically low expected losses on subprime mortgage securities.

Some recent research also focuses on the ratings agencies' lack of transparency regarding ratings. Crouhy, Jarrow, and Turnbull (2008) state that rating agencies have been unclear about the precise meaning of their ratings for structured product bonds and the robustness of their methodologies for such products. The authors argue this poses a problem because unsophisticated investors in complex securitized assets lacked the same level of information that the loan originators had about the quality of the underlying assets. They began to rely heavily on credit ratings to assess their risks. Investors may have even used credit ratings as a sufficient metric for assessing risks.

Fender, Tarshev, and Zhu (2008) demonstrate, using a hypothetical CDO, that shocks to assumptions used in the credit ratings can affect CDO tranche ratings more than similar corporate bonds. The reason is the tranching process, which results in (i) a nonlinear relationship between the credit quality of underlying assets and those of tranched products, and

(ii) a higher sensitivity of the ratings of tranched products to changes in the systematic risk factor.

Manns (2008) argues that ratings agencies were virtual prerequisites for most debt issuances, and yet had no accountability or incentive to perform their role as "gatekeepers of risk." The author advocates accountability through the use of SEC-administered user fee systems where creditors would finance the ratings, not the issuers of the debt.

G. The Role of Leverage in Amplifying Losses

Leverage has also been discussed as a contributing factor to the crisis by amplifying losses. Mizen (2008) states that subprime mortgage investors concentrated their risks through leveraged positions using borrowed funds and this magnified losses when the housing bubble burst and defaults surged. He explains that as realized losses are reflected on the total, leveraged portfolio, even small losses can greatly impact the initial capital. For example, a highly leveraged investor with a leverage ratio of 20:1 would experience a 100 percent loss of initial capital on just a 5 percent realized loss. Thus, a heavily leveraged portfolio can experience total loss of capital even when default rates are low.

Buiter (2008) discusses the role of leverage and its procyclical pattern. When assets are marked to market, increases in asset prices tend to be associated with rising leverage and falling asset prices with declining leverage. This procyclical pattern of leverage is reinforced by Basel capital adequacy requirements. He explains that banks have to hold a minimal fraction of their risk-weighted assets as capital, so when the economy is booming, a given amount of capital can support a larger stock of assets. The banks then seek to purchase assets, which in turn puts an upward pressure on them and creates a positive feedback loop.

Greenlaw et al. (2008) describe the financial intermediary sector as one comprising leveraged institutions whose capital is much smaller relative to the assets they hold. In the face of credit losses that erode capital, these institutions tend to scale back leverage and rebuild capital. Due to the de-leveraging, the overall lending reduction is many times larger than the losses in capital. They argue that this reduction in lending may have been the link between the initial problems that began in the mortgage markets and the deeper crisis affecting the overall

economy. The authors explain the current credit crisis will abate if one or more of the following holds: banks and brokers contract their balance sheets to have desired level of leverage, banks and brokers raise equity capital to obtain desired level of leverage, or perceptions change to a better outlook so that the current level of leverage is desirable.

Hellwig (2008) notes that leverage by conduits and structured investment vehicles reached levels not previously seen by hedge funds and others, sometimes reaching close to 100%. The problem was further exacerbated by the fact that these vehicles engaged in maturity transformation, where they invested in long-term securities but financed themselves with short-term debt. The author argues that when refinancing the short term funding becomes an issue, the sale of assets at depressed prices sometimes becomes the only alternative, thereby putting downward pressure on the valuation of all institutions holding similar assets.

H. Accounting

Accounting rules have also received attention as contributors to the crisis. Off-balance sheet accounting treatment of many securitization structures under U.S. GAAP (FAS Statement 140 and Interpretation FIN 46R) has often been cited as responsible for disguising the presence and disclosure of risks that would be more apparent had the related exposure remained on-balance sheet.[90] Fair-value accounting has also received considerable attention. Gorton (2008) discusses the Financial Accounting Standards Board Statement 157, *Fair Value Measurements,* effective for years beginning after November 2007, that defines fair value as the price that would be received to sell an asset in an "orderly transaction between market participants." He describes the current crisis as a panic that has inhibited traders from trading and led to a virtual disappearance of normal market function. The author argues that in the absence of reliable market prices, mark-to-market accounting rules forced large write downs and reduced GAAP-governed capital, thereby causing firms to issue more securities and sell more assets at unfavorable terms, thereby further depressing prices and exacerbating the problem. Similarly, Brunnermeier (2008) also argues that mark-to-market accounting makes losses visible and so feeds a downward spiral of losses. He also notes, though, that a mark-to-market methodology serves to make losses transparent and thereby reduces asymmetric information.

[90] See, for example, Herz (2008).

However, there are academics who believe that mark-to-market accounting principles actually provide a warning of existing issues and that they are unfairly being blamed for the crisis. Caprio et al. (2008) state that a key reason behind the change to mark-to-market accounting was to require troubled financial firms to recognize and resolve developing losses more promptly than in the past. They assert that the most serious accounting impact in creating and deepening the securitization crisis was not the mark-to-market methodology but rather firms' use of off-balance-sheet extensions to warehouse risks that they would eventually have to bring back on to their balance sheets when losses began to accumulate. The authors point out that fair value accounting (in which mark-to-market is an option) does allow for "mark-to-model" for certain portfolios over the use of transaction prices.

V. How Did We Get Here? The Story of the Credit Crisis

A. Introduction

Since August 2007, approximately 40 banks, a major insurance company, government sponsored enterprises (Fannie Mae and Freddie Mac), and several investment banks have either failed or required substantial government assistance.[91] Still, the financial crisis has yet to show signs of coming to an end. One may wonder, how did problems that first manifested in a relatively small part of the mortgage market lead to a contagion affecting other types of credit including credit cards, student loans, and others, and then quickly spread to threaten the liquidity and possible solvency of many financial institutions around the world?

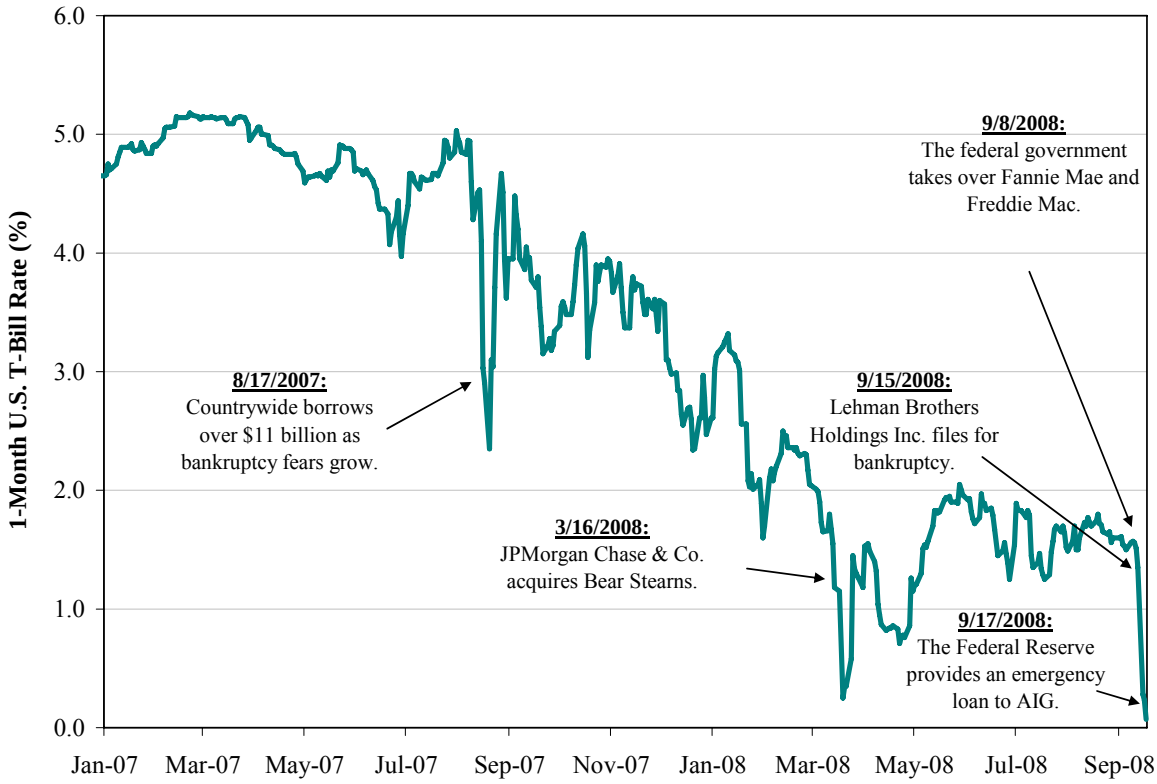
There is no easy answer to this question, but as the crisis unfolds, there are several possible explanatory factors. In this section, we examine the problems in the mortgage markets and the subsequent contagion that led to the current credit crisis and provide a critical analysis of the possible contributing factors.

As we write this section, global equity indices have declined substantially, lending remains anemic, and most of the major world economies have now entered recessions. On September 17, 2008, the yield on 1-month Treasury bills dropped to almost zero, 0.07 percent to be exact, a rate unseen since 1941. Investors were willing to hold Treasury bills even without earning a yield, which is equivalent to keeping one's savings under a mattress. The yield on Treasury bills has been declining since January 2007 and dipped significantly around the collapse of Bear Stearns in March 2008 and then again in September, as illustrated in Figure V.1. This level of market stress indicates extreme risk aversion and the extent of the current panic.

[91] See the FDIC's "Failed Bank List," http://www.fdic.gov/bank/individual/failed/banklist.html. The figures are as of February 2009.

Figure V.1. 1-Month Treasury Bill Rates

Daily Data from January 2, 2007 through September 17, 2008



Notes and Sources:
All data are obtained from the Federal Reserve.
The 9/17/2008 drop to 0.07% represents the lowest U.S. Treasury yield since 1941 (Financial Times).

B. First Signs of the Credit Crisis in the Subprime Market

Unlike other financial crises in recent history, the current crisis started in the housing sector. A combination of various industry trends, along with a change in the economic environment over the past five to seven years, led to a surge in delinquencies and foreclosures in the mortgage market. The first signs of trouble appeared in a relatively small portion of the mortgage industry known as "subprime."

There is no legal definition for a subprime borrower, but lenders use a combination of characteristics to identify one, including:

- Borrowers with lower credit scores;[92]
- High debt-service-to-income ratio, greater than 40 percent on average;
- Higher loan-to-value ratio of 80 percent or more;
- Smaller loan size of $100,000 on average;
- Less documentation; and/or
- Higher mortgage rates of 200 basis points on average over prime borrowers.[93]

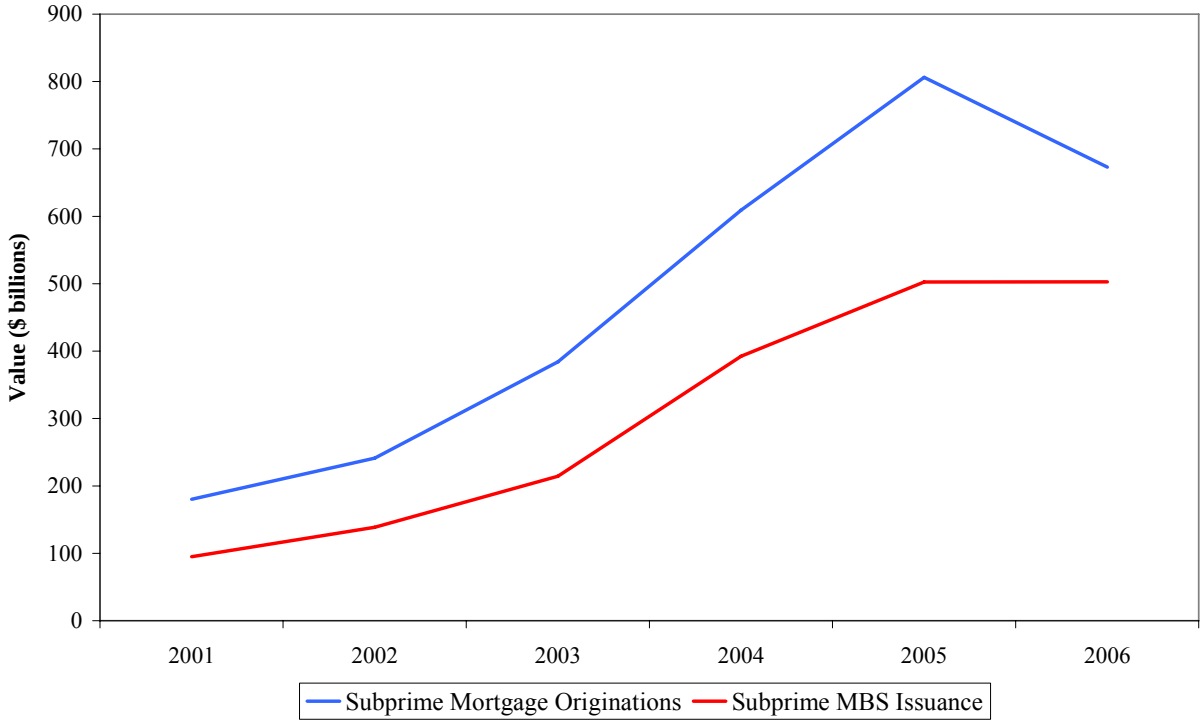
From the early 1990s to 2006, housing prices increased at a national level. This continuous growth in prices meant that even if a subprime borrower's personal finances were stressed, the increase in his home's value often gave him the option to refinance or even sell instead of going into delinquency. Furthermore, because mortgage rates remained low for most of 2000 to 2005, one was usually able to refinance into another low-rate product. As a result, subprime mortgage originations and securitizations increased between 2001 and 2006 by 274 percent and 431 percent, respectively, as shown in Figure V.2. During the same time period, all types of mortgage originations significantly increased, including prime, Alt-A and jumbo mortgages.

[92] Michael Staten, Professor and Director, Credit Research Center, Georgetown University, "Subprime Lending: Defining the Market and its Customers," Testimony before the United States House of Representatives Committee on Financial Services (March 2004).

[93] Sumit Agarwal and Calvin Ho, "Comparing the Prime and Subprime Mortgage Markets," Chicago Fed Letter (August 2007).

Figure V.2. Subprime Mortgage Originations and MBS Issuance

Annual Data from 2001 through 2006



Source: LoanPerformance and SourceMedia.

1. Factors Leading to the Deterioration of Mortgages

The use of adjustable rate mortgages ("ARMs"), particularly for subprime borrowers, has increased in recent years. An estimated 80 percent of subprime borrowers received ARMs or hybrid loans.[94] An example of these types of loans is the so called "2/28." These are loans that are made at fixed low rates for the first two years after which the mortgage rate adjusts upwards. The ability to refinance after the two years becomes especially important for subprime borrowers who rely on the increase in the value of their houses to be able to roll into another mortgage.

However, interest rates started to rise in 2004, in part causing the deceleration and eventual decline in housing prices. Subprime borrowers—ones with poor credit history by

[94] Susan Wachter, Professor, University of Pennsylvania's Wharton School of Business, "What kinds of loans do subprime borrowers get?" http://www.npr.org/templates/story/story.php?storyId=9096735.

definition—were the first to feel the impact.[95] They could no longer rely on low mortgage rates and rising home prices to provide them with the opportunity to refinance in order to extract equity from their homes or to sell them for a profit. In fact, for many, the increasing interest rate environment meant an increase in debt service. As a result of these factors, many subprime borrowers began to have difficulty meeting their mortgage obligations, resulting in higher rates of delinquencies and foreclosures.

Although the problem manifested itself first in the subprime sector, we now know that delinquencies and foreclosures of prime loans have also soared. Several factors contributed to the credit deterioration in the mortgage sector, including: 1) relatively lax underwriting standards in recent years; 2) increased indebtedness on the part of homeowners; 3) the combination, described above, of the availability of cheap credit and increasing housing prices during the years 2000 to 2005; and 4) the increase in the use of non-traditional mortgage products. These factors were not specific to subprime borrowers but affected all types of borrowers, leading to a full blown credit crisis as we will discuss later. In the remainder of this section, we will discuss each of these factors in more detail.

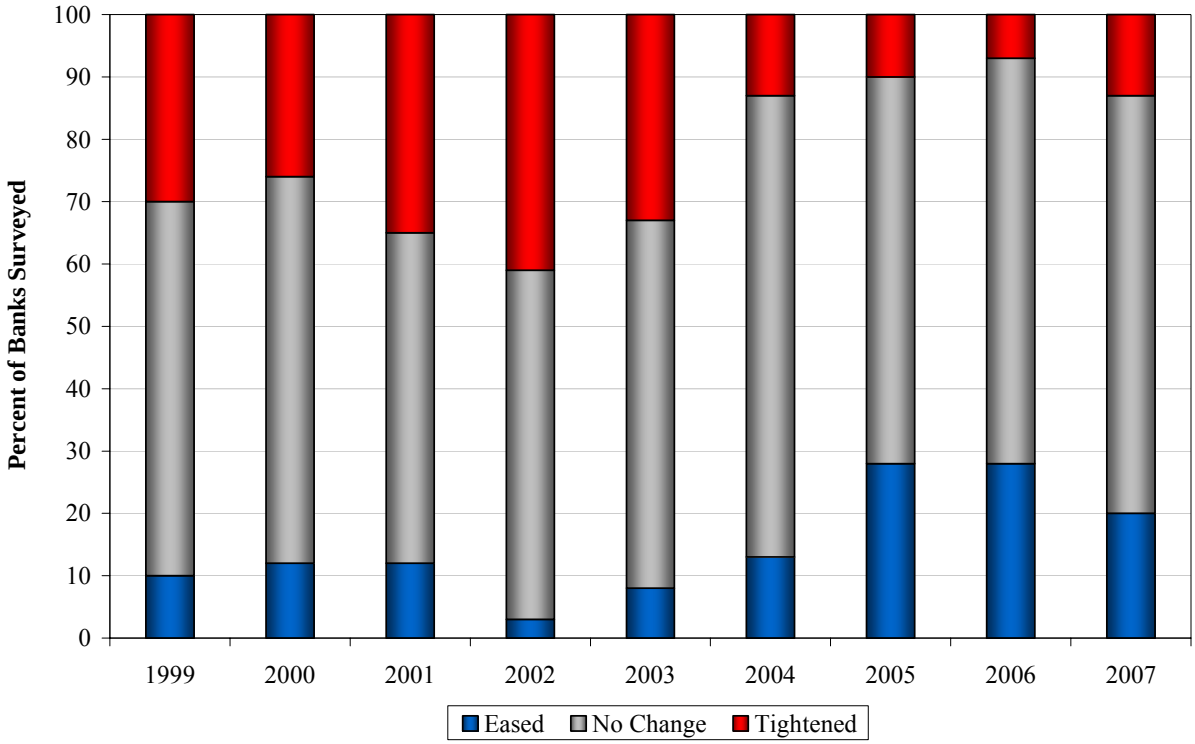
a. Relatively Lax Underwriting Standards in Recent Years

According to annual surveys conducted by the Office of the Comptroller of the Currency ("OCC"), credit underwriting standards were eased during the years 2004 to 2006, as shown in Figure V.3. The OCC surveyed the examiners of the largest 78 national banks regarding their assessment of the conditions under which credit was extended. The percentage of responders easing lending standards that year rose from 3 percent in 2002 to 28 percent in 2006, while those keeping lending standards the same that year rose from 56 to 65 percent during the same period. The survey is not specific to subprime lending; rather, it focuses on broader underwriting standards.

[95] Beginning in June 2004, the Federal Open Market Committee ("FOMC") raised the target federal funds rate seventeen consecutive times until September 2007.

Figure V.3. Changes in Retail Credit Underwriting Standards

Annual Data from 1999 through 2007



Source: 2007 Survey of Credit Underwriting Practice, Office of the Comptroller of the Currency

Similarly, the percentage of loans with full documentation has been in decline during the same time period, as illustrated in Figure V.4.

Figure V.4. Share of Full Documentation Loans

Annual Data from 2003 through 2007*

Year	Share of Subprime Mortgages Backing Private Label ABS With Full Documentation
(1)	(2)
2003	64%
2004	62%
2005	59%
2006	55%
2007*	52%

Notes and Sources:

OFHEO Presentation, June 2007.

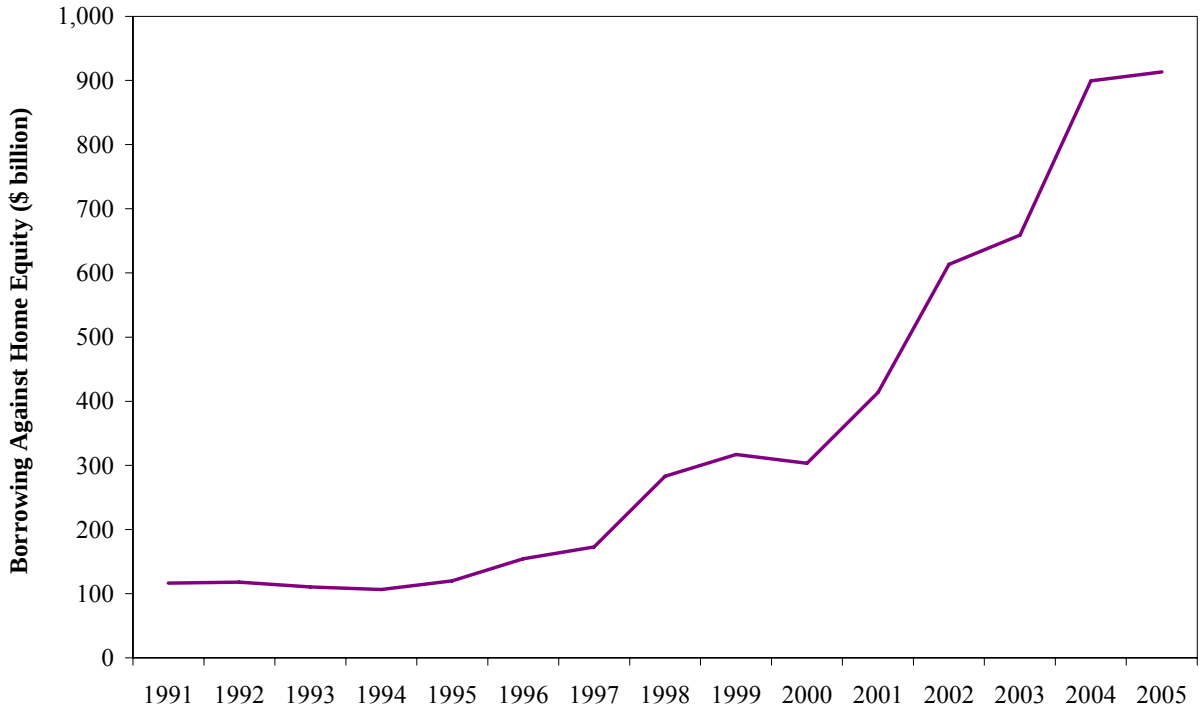
* 2007 reflects data only through 1Q-2007.

b. Increase in Homeowners' Debt Burden

Another factor that led homeowners, particularly subprime borrowers, to be vulnerable to any changes in costs of credit was increasing indebtedness. Household debt burdens increased in the 2000 to 2006 period and reached hitherto unseen levels. As Figure V.5 shows, homeowners had been borrowing against equity in their homes at unprecedented rates since 2000. This means that subprime and other types of borrowers relied on the availability of credit and the increasing value of their homes to be able to refinance and meet their obligations. At the same time, housing affordability was decreasing. According to the National Association of Realtors ("NAR"), the monthly payment of principal and interest for a mortgage on the median-priced family home peaked at a level in excess of 23 percent of median family income in 2006.

Figure V.5. Gross Equity Extraction Increased Significantly Since 2000

Annual Data from 1991 through 2005



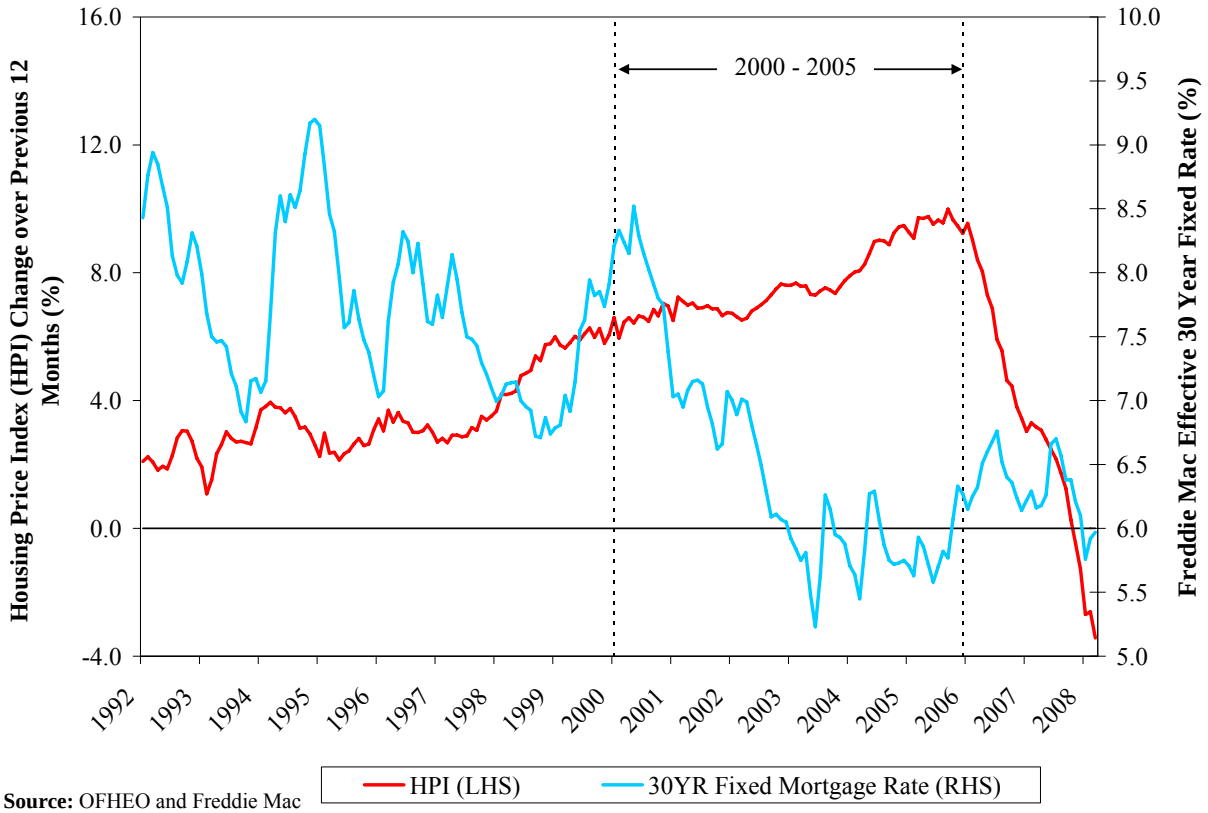
Sources: Alan Greenspan and James Kennedy, "Sources and Uses of Equity Extracted from Homes", Finance and Economics Discussion Series, Federal Reserve Board, 2007.

c. Combination of Low Cost of Credit and Increasing Housing Prices during the Period 2000 to 2005

The increase in housing prices and the decline in the cost of credit made the prospect of getting a mortgage seem less risky since the options of refinancing or selling the house were both viewed as viable. As shown in Figure V.6, the opposing trends in housing prices and cost of credit are evident during the period 2000 to 2005. This led to a surge in subprime and other types of mortgage originations and securitizations until the deceleration occurred by the end of 2005 and beginning of 2006.

Figure V.6. Low Cost of Credit and Rising Housing Prices

Monthly Data from January 1992 through March 2008



Source: OFHEO and Freddie Mac

d. Increase in the Use of Riskier Types of Non-Traditional Mortgage Products

In addition to the macroeconomic conditions, the same time period witnessed an increase in the use of non-traditional mortgage products such as interest-only and negative amortization loans.[96] The latter types were not restricted to subprime borrowers, but were perceived to be relatively riskier than the traditional mortgage products. Ben Bernanke, Chairman of the Board of Governors of the Federal Reserve, discussed some of the risks associated with such loans in early 2008:

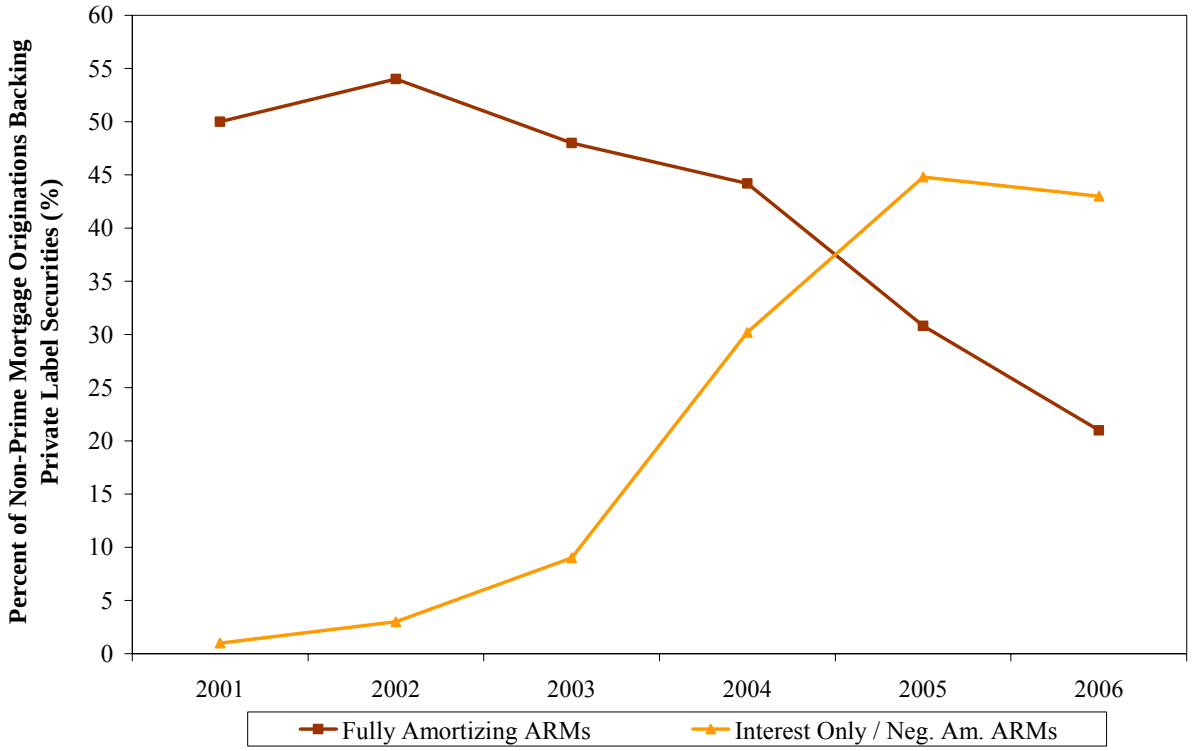
[96] An interest-only loan is a loan in which, for a set term, the borrower pays only the interest on the principal balance, while the principal balance remains unchanged. A negative-amortization loan refers to a loan structure in which mortgage payments are lower than the interest rate on the mortgage and so the difference is added on to the initial principal, thereby increasing the principal balance.

> [H]istorically, borrowers with little or no equity have been substantially more likely than others to fall behind in their payments. The large number of outstanding mortgages with negative amortization features may exacerbate this problem.[97]

As illustrated in Figure V.7, the share of interest-only/negative amortization mortgages increased between 2001 and 2006, while the share of fully amortizing loans declined.

Figure V.7. Share of Interest-Only/Negative Amortization Mortgages Have Increased in Non-Prime Originations Backing Private Label Securities

Annual Data from 2001 through 2006



Source: OFHEO, "Housing, Subprime, and GSE Reform: Where Are We Headed?" July 18, 2007

C. The Reversal in Housing Prices and Interest Rates

Starting in 2006, several analysts began noting the slowdown in the housing market. For example, a study by the Federal Reserve in November 2006 noted, "[S]igns of a housing

[97] Ben Bernanke, Chairman of the Board of Governors of the Federal Reserve, "Reducing Preventable Mortgage Foreclosures." Speech at the Independent Community Bankers of America Annual Convention, Florida (March 2008).

market slowdown are unmistakable. New and existing home sales have been declining since mid-2005…"[98]

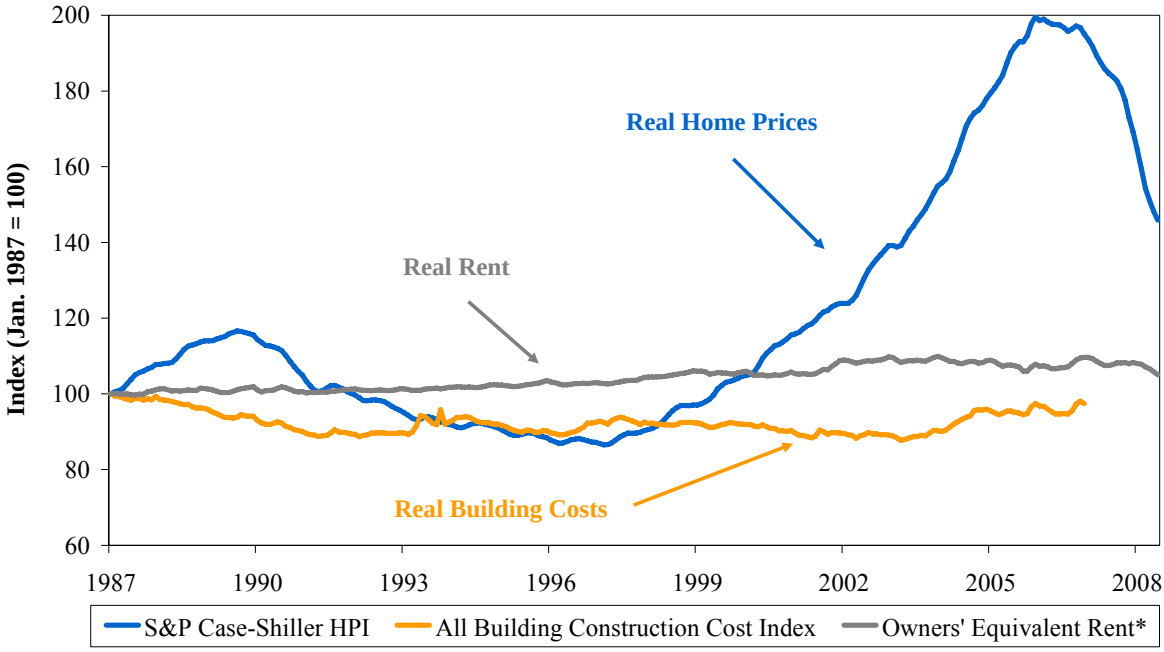
Figure V.8 below illustrates the housing bubble and when it burst using the Case-Shiller Index.[99] Analysts have long maintained that housing prices are expected to move in tandem with rents and building costs, a proposition that is supported by the data as far back as 1987. Starting in early 2000, housing prices adjusted for inflation began to increase to levels far exceeding the trends in rent and building costs. This deviation from fundamentals—often regarded as a sign of an asset bubble—peaked in 2005 and began to reverse in 2006. The correction is still in progress and is a key contributing factor to the current distress in the mortgage markets.

[98] John Duca, "Making Sense of the U.S. Housing Slowdown," Economic Letter—Insights from the Federal Reserve Bank of Dallas, Vol. 1, No. 11 (November 2006).

[99] The S&P Case-Shiller U.S. National Home Price Index tracks the value of single family housing in the U.S. and measures changes in housing market prices given a constant level of quality—changes in the types, sizes, or physical characteristics of the homes are specifically excluded. It utilizes a "repeat sales method" that only includes properties that have sold at least twice, thereby capturing the true appreciated value of each specific sales unit.

Figure V.8. Real Home Prices vs. Real Rent and Real Building Costs

Monthly Data from January 1987 through June 2008



Notes and Sources:
Data are from Federal Reserve Bank of St. Louis, Bloomberg, LP, Standard & Poor's, Bureau of Labor Statistics.
Monthly data were first adjusted by CPI and then rescaled to Jan. 1987=100.
* Owners' Equivalent Rent "measures the change in the implicit rent a homeowner would pay to rent, or would earn from renting, his or her home in a competitive market" (http://www.bls.gov/cpi/cpifact6.htm).

Around the same time period of 2004 to 2006, mortgage rates began to rise from their low levels, thus hindering the growth in originations and refinancing activities. As these alternatives started to disappear, delinquencies and foreclosures began to surge.

D. Signs of a Full Credit Crisis

In 2007, it became evident that the credit deterioration extended well beyond subprime mortgages. Other collateral, including Alt-A and prime mortgages as well as credit cards, automobile loans, and student loans, all showed declines in credit quality. Figure V.9 shows the surge in delinquency rates in both subprime and prime markets. This was consistent with the size of consumers' debt burdens, which surged in the fourth quarter of 2006 as measured by

the Federal Reserve's Household Debt Service Ratio, defined as "the ratio of debt payments to disposable personal income."[100] See Figure V.10.

Figure V.9. Prime and Subprime Delinquency Rates

Quarterly Data from 1Q-2000 through 4Q-2007

Source: Bloomberg LP

[100] The Federal Reserve, "Household Debt Service and Financial Obligations Ratios," available at http://www.federalreserve.gov/releases/housedebt/.

Figure V.10. Household Debt Service Ratio

Quarterly Data from 1Q-1985 through 2Q-2008

Source: Federal Reserve

E. The Role of Structured Finance

There is a controversy over the role of securitization and structured credit products in the crisis and whether innovation may have served to magnify its impact. In this section, we will briefly describe the role of various financial instruments with special emphasis on collateralized debt obligations ("CDOs"), credit default swaps ("CDS"), structured investment vehicles ("SIVs"), and the interrelationship of these instruments with leverage and short-term borrowing. Many of these products have been in existence for decades and have been used to increase liquidity and the availability of credit in the financial markets. This section will focus on the conditions under which securitized and structured credit products may have magnified the exposure to, and losses from, the current crisis.

1. Securitization and Mortgage-Backed Securities

Securitization is the process of turning pools of financial obligations, whether they are mortgages, credit cards, leases, or others, into securities. Since the early 1980s, securitization has been a tool used to generate liquidity for lenders and to increase access to capital for consumers and various corporations. The mortgage market is the largest to employ securitization technology. In recent years, there has been significant growth in mortgage securitization by the government sponsored agencies (Fannie Mae and Freddie Mac) and non-agency actors, as well.[101]

In brief, the securitization process involves the creation of a special purpose entity or a trust which becomes the owner of the loans. The trust is usually a bankruptcy-remote, special purpose vehicle (a subsidiary of either the originator or an investment bank) that underwrites the securities. The trust structure is used because it is exempt from taxes, allows the originator to treat the transaction as a loan sale, and insulates investors from the liabilities of the originator and issuer. A mortgage-backed security ("MBS") is a bond whose cash flow is derived from the principal and interest payments of mortgages.

Fannie and Freddie guarantee the timely payment of principal and interest for a fee, so the credit risk of the borrowers is not at issue unless the government sponsored agencies default. However, as Fannie and Freddie's securitized products (agency pools) are believed to have a government guarantee, default risk is not a key issue as it is for non-agency or private label products. Non-agency pools of loans expose the investors to credit risk and hence, some form of "credit enhancement" is required in order for these securities, including subprime MBS, to obtain credit ratings. Such enhancement mechanisms can come from unrelated parties, or be part of the deal structure itself. As such, they are referred to either as external or internal credit enhancements, respectively. The most common internal forms of credit enhancements include tranching, overcollateralization, and subordination. Following a process known as credit tranching, the securitized loans are divided into different classes according to their level of risk.

[101] See *The Handbook of Mortgage-Backed Securities*, Frank J. Fabozzi, ed. (New York: McGraw-Hill, 2006), for a detailed description of the securitization process.

The top tranches are the AAA and AA rated bonds. Below these are the lower-rated classes. At the lowest level is the "equity" or "first-loss" tranche, which is usually not rated.

Since MBS derive their value from the underlying collateral, it is not surprising that the value of these securities declined as the delinquency and defaults of mortgages surged beyond expected levels. A variety of investors hold MBS, including banks, hedge funds, insurance companies, collateralized debt obligations and conduits known as structured investment vehicles. We discuss the latter two entities in more detail below.

2. Collateralized Debt Obligations

A CDO is a special purpose entity that holds debt as collateral and issues long-term liabilities in the form of tranched securities.[102] The underlying collateral can be corporate bonds, MBS, asset-backed securities ("ABS"), other CDOs, or other products. CDOs differ in their structures and purposes. Almost all CDOs issue multiple classes of securities that are tranched with respect to seniority in bankruptcy and timing of repayment.[103] The process of forming a CDO is similar to the formation of an MBS as described above. There are different purposes for issuing CDOs. Some CDOs are set up to hedge credit risk and reduce regulatory capital—known as balance sheet CDOs—and others are designed to exploit management expertise, earn management fees and collect interest on high-yield assets—known as arbitrage CDOs.[104]

Although CDOs have existed since 1987, the market experienced significant growth during the period 2000 to 2006. In 2004, there was approximately $157.4 billion in global CDO issuance. In 2006, there was $551.7 billion in issuance, a growth of approximately 250 percent. CDOs with structured collateral have been an increasing fraction of all CDO issuance. In 2006, CDOs with structured finance products as the underlying collateral comprised almost

[102] There are many primers written on structured products, CDOs, CDS, and other derivatives. This section will not discuss the products in detail, but please see JPMorgan's "CDO Handbook" for a detailed discussion of CDOs.

[103] Christopher Flanagan and Thomas Sam, "CDO Handbook," JPMorgan Global Structured Finance Research (April 2002).

[104] Ibid.

57 percent of the global CDO issuance.[105] Specifically, mortgage products have constituted a large share of the underlying collateral:

> The FDIC reports that 81 percent of the $249 billion of CDO collateral pools issued in 2005, or $200 billion, was made up of residential mortgage products. (FDIC Outlook, Fall 2006) Moody's CDO Asset Exposure Report for October 2006 reveals that 39.5 percent of the collateral within the 678 deals covered by Moody's consists of RMBS, just over 70 percent of that in subprime and home equity loans and the other 30 percent in prime first-lien loans. Hence, CDOs hold a lot of RMBS.[106]

As housing prices declined at the national level, recent vintages of the ABS CDOs experienced significant rating downgrades because of their exposure to subprime and other non-agency collateral: "During 2007, Moody's downgraded 31 percent of all the ABS CDO tranches it had rated. In some cases, these downgrades have reached to the top of the CDO capital structure: 14 percent of tranches initially rated AAA were downgraded."[107]

Several factors may have led to the poor performance of CDOs and in particular the ABS CDOs. Many analysts incorrectly assumed that housing prices would either continue to increase or remain flat. Even when analysts ran sensitivity analyses or stress testing assuming a decline in housing prices, the extent of the actual decline was not foreseen. The housing bubble and its subsequent burst created a chain reaction that impacted various aspects of the valuations and risk structures of these mortgage-related products.

Incorrect assumptions about correlation risk also contributed. Many securitized products including CDOs are structured based on the assumption of a certain degree of diversification in the performance of the underlying collateral. However, contrary to the correlation assumptions underlying many CDO valuations, different types of collateral underperformed at the same time following the decrease in housing prices. Mortgage borrowers, whether subprime or prime, relied on the increase in housing prices to be able to

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[105] See SIFMA's Global CDO Issuance Market Data, available at http://www.sifma.org/research/pdf/SIFMA_CDOIssuanceData2008q2.pdf.

[106] Joseph Mason and Josh Rosner, "How Resilient are Mortgage Backed Securities to Collateralized Debt Obligation Market Disruptions?" Working Paper (February 2007), p. 28, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1027472.

[107] Basel Committee on Banking Supervision, "Credit Risk Transfer," July 2008, p. 12.

refinance their houses and other expenses, but when housing price growth started to stall at the national level in 2006, delinquencies and defaults of prime, Alt-A, jumbo, and subprime mortgages all suffered. Therefore, even if the valuation models had taken into account a certain degree of correlation among the pooled assets, the decline of housing prices at the national level could and did increase the correlation to unprecedented levels. The collateral underlying the structured CDOs were all exposed to the same systemic shock as housing prices continued to decline. The correlation of the performance among the pooled assets and the time-varying correlation are key factors that complicate the valuation of CDOs.

In addition, the default triggers in some ABS CDOs may force liquidations. A trigger can divert funds away from the junior tranches or give the holders of the senior tranches the option to liquidate once the performance of the underlying collateral reaches a certain level. According to the Basel Committee on Banking Supervision, "Around 50 ABS CDOs hit default triggers before the end of 2007, with about half entering liquidation."[108]

3. Structured Investment Vehicles

SIVs are another type of investor in mortgage-backed securities and collateralized debt obligations. SIVs are off-balance sheet entities that are usually set up by large financial institutions.[109] They rely on short- and medium-term borrowing by issuing asset-backed commercial paper and medium-term notes and then use the proceeds to invest in a variety of securities including tranches of CDOs. Because they rely on short-term financing, SIVs meet the debt service on these obligations using the cash flow generated from their investment assets, which are longer-term, as well as other sources such as rolling over debt and acquiring liquidity lines from banks. Various financial entities, including money market funds, invest in the asset-backed commercial paper and can be indirectly exposed to the credit risk of the collateral underlying these securities. Over the past year, some large financial institutions have felt compelled to bring the assets of the troubled SIVs they have sponsored back onto their balance sheets, casting disfavor on SIVs in general.

[108] Ibid., p. 13.

[109] There are other types of conduits which invested in structured products but we will focus the discussion on SIVs.

4. Short-term Borrowing and Leverage

SIVs were not the only financial entities that relied on short-term borrowing and leverage. Many other participants, including "SIV lites," banks, hedge funds, insurance companies, and others, followed suit. For banks in particular, short-term, collateralized borrowing was a cheaper and easier source of funding than either borrowing long-term (generally unsecured) or raising equity financing.[110] This was because borrowing against collateral provides an easier means of procurement, and banks' assets that serve as collateral are generally short-term in nature. Moreover, many of these entities combined a reliance on short-term financing with a high degree of leverage—in some cases exceeding 70 times capital. With such an approach, relatively low levels of losses on the underlying collateral could and did lead to large losses on the equity and borrowed capital, which effectively led to higher levels of leverage. In turn, the losses led to asset sales as these participants sought to de-lever.

In summary, the increased use of ABS CDOs in recent years along with the increased leverage and reliance on short-term funding increased the number of market participants who were (directly or indirectly) exposed to the housing market. The market participants in question were then exposed to systemic risk related to the value of houses. When housing prices collapsed, investors fled to quality, and credit disappeared together with the ability to leverage, leading to magnified losses.

5. Credit Default Swaps

Some analysts argue the problems were compounded by derivative exposures via instruments such as credit default swaps ("CDS"), and we assess some of the controversy over CDS. A CDS is a contract that provides insurance against the risk of a default by a particular entity.[111] The entity is known as the reference entity and a default by it is known as a credit event. The buyer of the insurance has the right to sell a particular bond issued by the entity at par value when a credit event occurs. The bond is known as the reference obligation and the

[110] For a discussion of why short-term debt became an important source of funding for banks, see Anil Kashyap, Raghuram Rajan and Jeremy Stein, "Rethinking Capital Regulation," paper prepared for the Federal Reserve Bank of Kansas City Symposium at Jackson Hole (August 2008).

[111] John Hull and Alan White, "Valuing Credit Default Swaps I: No Counterparty Default Risk." *The Journal of Derivatives* 8 (1), 29-40 (April 2000).

total par value of the bond that can be sold is known as the swap's notional principal.[112] These are bilateral over-the-counter agreements and are often used to spread the cost of a credit event, such as default or bankruptcy, and enable participants to hedge against the creditworthiness of companies or even countries.

The notional exposure of CDS is often cited as evidence that this market is far greater than that represented by the underlying securities. But it is misleading to rely on the notional value of CDS. As shown in Figure V.11, the notional amount outstanding of CDS in 2007 was $62 trillion, which is close to the level of the world gross domestic product that year. However, the notional value of outstanding CDS does not represent the outstanding liabilities for several reasons. First, parties with offsetting CDS contracts would actually offset their credit exposure to the reference entity. The Bank for International Settlements notes that approximately 55 percent of the notional amount outstanding as of December 2007 was with reporting dealers, for whom net exposure in a more meaningful metric.[113] Second, all reference entities upon which credit default swaps are written would have to default *simultaneously* for the entire outstanding notional amount to be paid. This would mean that the primary reference entities, including General Motors, Brazil, Daimler Chrysler, Telecom Italia, Italy, Turkey, Russia, and others, would all have to default at the same time.[114]

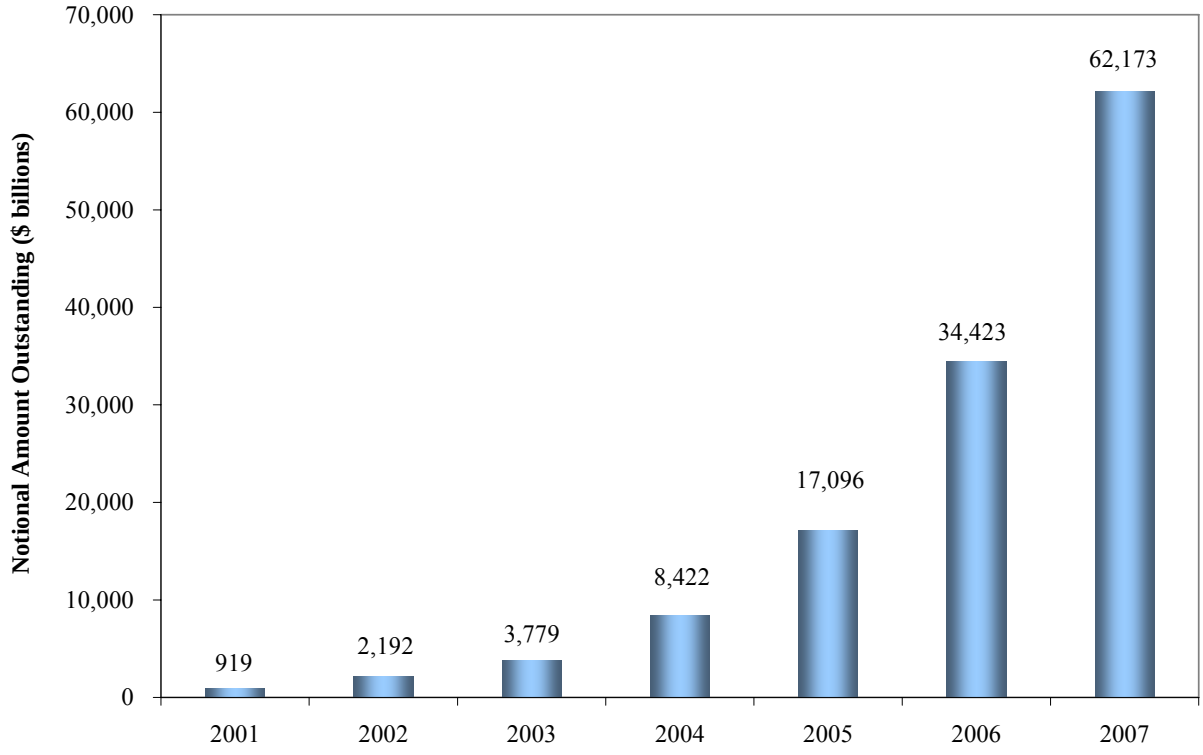
[112] International Swaps and Derivatives Association, Inc.: http://www.isda.org/.

[113] Bank for International Settlements, "OTC derivatives market activity in the first half of 2008" (November 2008).

[114] David Mengle, "Credit Derivatives: An Overview," International Swaps and Derivatives Association (2007).

Figure V.11. Notional Amount of Credit Default Swaps Outstanding

Annual Data from 2001 through 2007



Source: ISDA

A more appropriate estimate of exposure to CDS would be the "gross replacement value," akin to the market price of equities.[115] The Bank for International Settlements estimates that the gross market value of the total CDS outstanding as of December 2007 was approximately $2 trillion.[116]

Derivatives are meant to redistribute existing risk between market participants and allow participants to hedge risk.[117] One of the risks associated with CDS is counterparty risk, which relates to the potential for either of the CDS parties to be unable to fulfill the terms of the

[115] Dr. Richard Lindsey, Testimony before the Committee on Agriculture, Nutrition, and Forestry, United States Senate (October 14, 2008).

[116] Bank for International Settlements, "OTC derivatives market activity in the first half of 2008" (November 2008).

[117] David Skeel and Frank Partnoy, "The Promise and Peril of Credit Derivatives." University of Pennsylvania, Institute for Law & Economics Research Paper No. 06-22 (2006).

contract. However, large, aggregate exposure to the same counterparty, such as AIG, may cause disruptions in the marketplace if the viability of the protection seller is in question.

According to its second quarter 2008 SEC filing, AIG participated in the U.S. residential mortgage market through a variety of methods, among them the use of CDS. It provided credit protection on the super-senior risk layer of diversified portfolios of investment-grade corporate debt, collateralized loan obligations ("CLOs"), and multi-sector CDOs, as well as some protection on tranches below the super-senior level.[118] As of the second quarter of 2008, AIG had approximately $440 billion in total notional exposure in its super-senior CDS portfolio and had recorded a fair value unrealized loss on the portfolio of approximately $26 billion.[119] As of July 31, 2008, AIG estimated that a downgrade by Moody's to "A1" and by S&P to "A+" would allow counterparties to request approximately $13 billion in additional collateral.[120] The size of AIG's exposure as a provider of credit protection was a key factor in the Federal Reserve's decision to provide an $85 billion secured loan to prevent AIG's bankruptcy on September 16, 2008. As its reasoning, the Fed stated, "The Board determined that, in current circumstances, a disorderly failure of AIG could add to already significant levels of financial market fragility…."[121]

Disruptions caused by counterparty failures may create a "domino" effect and imply *multiples* of the losses on the underlying securities being transmitted to various agents in the capital markets. While there are corresponding gains (because of the contracts' bilateral nature), concentrated losses can lead to the distress, and in some cases failure, of market participants. If the market perceives a key counterparty to be experiencing significant problems, this could lead to novation requests as counterparties try to reduce their exposure to the

[118] A collateralized loan obligation is a securitization of bank loans, generally commercial and industrial loans.

[119] AIG's Form 10-Q, filed on August 6, 2008, pp. 39, 42.

[120] Ibid., p. 40.

[121] See the Federal Reserve Press Release (September 16, 2008), http://www.federalreserve.gov/newsevents/press/other/20080916a.htm.

troubled firm.[122] The firm may then find itself facing additional collateral requirements and other problems leading to self-fulfilling results. [123]

In addition, the subprime credit derivative indices, known as the ABX, are of particular relevance to the current crisis. The ABX is comprised of a series of CDS based on twenty deals that consist of subprime mortgages. ABX contracts are commonly used by investors to hedge against, or to speculate on, the risk of defaults on mortgage securities. ABX swaps offer protection if the securities do not perform as expected in return for regular insurance-like premiums. A decline in the price of the ABX indices signifies investor belief that subprime mortgages will suffer increased financial losses. Likewise, an increase in the ABX indices signifies investor belief that subprime mortgages are more likely to perform better. The prices of the ABX indices can be used to infer information about the market's assumptions regarding default and recovery rates of the collateral, under normal market conditions.

As Figure V.12 illustrates, a $100 investment in the 07-01 BBB ABX index in January 2007 was worth $5 in September 2008. This drop in value suggests significant losses on the underlying collateral which has not yet completely materialized. The corresponding ABX AAA index also lost more than half of its value during the same time period. There is an ongoing dispute among economists as to the role of the ABX indices in the crisis. Gorton (2008), for example, argues that the ABX indices provided information to the market about the subprime mortgages that was not previously available.[124] There are several other home equity indices that have been used to hedge exposure to home equity, including the Lehman and Merrill home equity indices; both have been available for several years. In addition, investors in subprime asset-backed securities have access to detailed information about the performance of the collateral underlying the securities from the periodic reports they receive from the trustees as well as analyses from the rating agencies and other data sources.

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[122] In legal terminology, a novation is a mutual agreement among all concerned parties to substitute a new contract in place of an existing one.

[123] Dr. Richard Lindsey, Testimony before the Committee on Agriculture, Nutrition, and Forestry, United States Senate (October 14, 2008).

[124] Gary Gorton, "The Subprime Panic." Yale International Center for Finance Working Paper No. 08-25 (September 2008).

Other economists have examined the factors leading to the significant drop in the value of the ABX indices. The question is, to what extent does the decline in the ABX indices reflect actual (or projections of) losses on the underlying collateral? Fender and Scheicher's (2008) empirical analysis shows that a declining risk appetite and increased concerns about market liquidity have contributed to the significant drop in the ABX values.[125] Their results suggest that the drop in value of the ABX indices may not reflect actual losses on the subprime collateral. Others wonder why there is no demand for the ABX indices if the market price does not reflect actual or projected losses. Given the current freeze in the subprime markets and relative difficulty in obtaining dealer marks, it is too early to fully explain the significant drop in the value of the indices.

Figure V.12. ABX BBB and BBB- 07-01 Indices

Daily Data from January 19, 2007 through October 7, 2008

Source: Markit

[125] Ingo Fender and Martin Scheicher, "The ABX: How Do the Markets Price Subprime Mortgage Risk?" *BIS Quarterly Review* (September 2008).

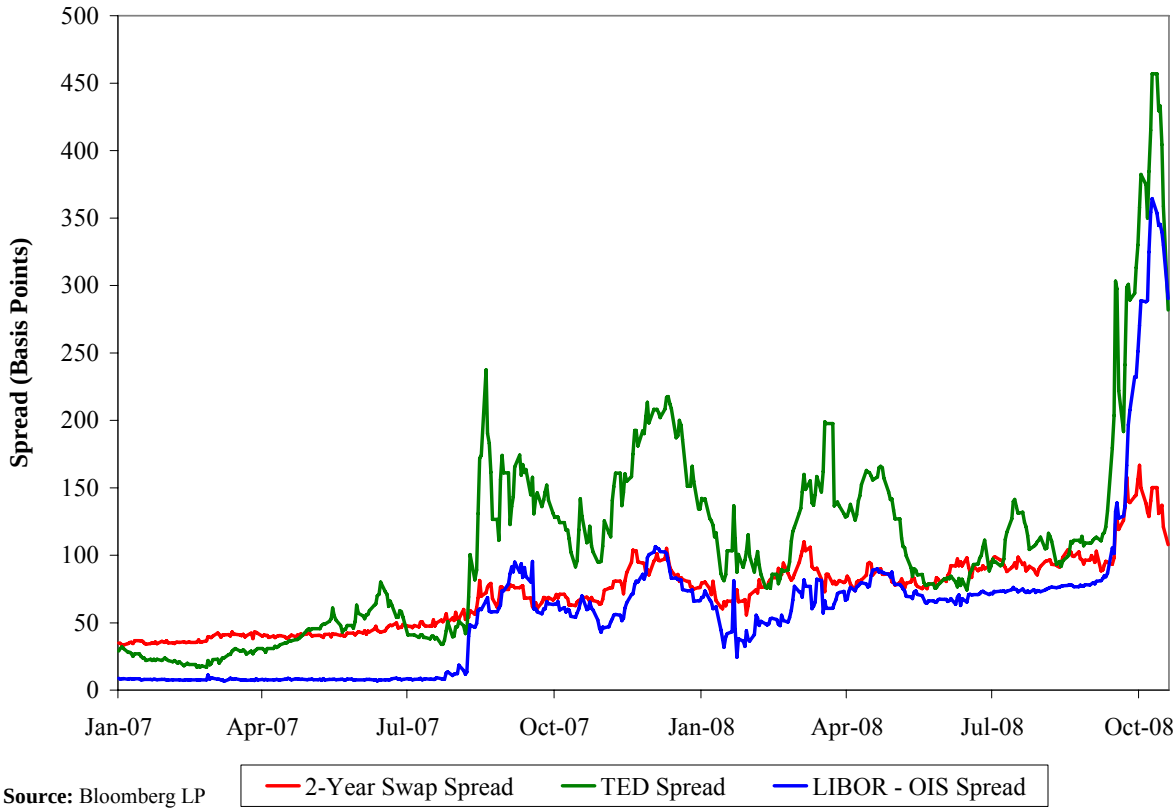
F. Flight to Quality and the Contagion

As the crisis deepened and the spillover effects became evident in various parts of the financial markets, investors fled all but the safest investments (generally Treasuries). Spreads on various debt securities began to rise. The TED spread, 2-year swap spreads, and the London inter-bank offered rate ("LIBOR")—overnight index swap ("OIS") spread also reached recent highs as illustrated in Figure V.13. The TED spread is the difference in the dollar rate for 3-month inter-bank borrowing and the U.S. Treasury's 3-month borrowing costs. The 2-year swap spread is the cost of exchanging 2-year U.S. fixed-rate interest payments for floating rates. The cost is expressed as the premium of the swap over comparable Treasuries. In times of increasing uncertainty and risk-aversion, spreads rise as investors demand higher premiums for providing fixed-rate interest payments. The 2-year swap spread reached a high of 170 basis points on October 3, 2008. Similarly, an increase in the LIBOR-OIS spread indicates a decline in banks' willingness to lend. It is measured as the spread between the rate banks charge for loans in London and the OIS rate.[126] The TED spread and the LIBOR-OIS spread reached highs on October 10, 2008, of 457 basis points and 366 basis points, respectively. At the same time, the CDS market indicated increased concerns about counterparty risk.

[126] The overnight index swap ("OIS") represents the market expectation of the federal funds rate. Thus, the LIBOR-OIS spread is seen as a measure of the credit risk premium. See James McAndrews, Asani Sarkar and Zhenyu Wang, "The Effect of the Term Auction Facility on the London Inter-Bank Offered Rate" Federal Reserve Bank of New York Staff Report No. 335 (July 2008). Former Federal Reserve Chairman Alan Greenspan recently wrote in an article for *The Economist* that the LIBOR-OIS spread was a measure of market perceptions of potential bank insolvency and therefore of extra capital needs. See Alan Greenspan, "Banks Need More Capital," *The Economist* (December 18, 2008).

Figure V.13. 2-Year Swap Spread, TED Spread, and LIBOR – Overnight Index Swap Spread

Daily Data from January 2, 2007 through October 20, 2008



Source: Bloomberg LP

1. Even Highly-Rated AAA Corporate Bonds Experienced Widening Spreads

The AAA corporate bond yield spread measures the difference between the yields on AAA corporate bonds and risk-free assets. The spread indicates the premium that investors require in order to invest in AAA corporate bonds. A smaller spread indicates that investors view lending to corporations as less risky, and vice versa. As of June 2007, the spread was 70 basis points. As investors became increasingly wary of the uncertainties about prices of various securities, the spread jumped to almost 125 basis points by August 2007 and over 200 basis points by March 2008, as illustrated in Figure V.14. Thus, the cost of borrowing to corporations significantly increased over a relatively short period of time. The levels that the spread reached during 2007 and 2008 are not unprecedented; they are below the levels seen, for example, in September 2001. However, combined with the other conditions of the credit

markets, they remain a sign of investors' risk-aversion and concern over the viability of even highly-rated corporations.

Figure V.14. Corporate Bond Yield Spreads Began to Rise

Daily Data from January 1, 2004 through May 22, 2008

Sources: Moody's, Federal Reserve

2. Asset-Backed Commercial Paper was Hit in the First Part of August 2007

Investors' flight to quality in the face of the news about subprime-related losses and the poor performance of various collateral had a significant impact on even the most liquid part of the markets, asset-backed commercial paper.[127] Companies used this market to meet their short-term financing needs. As the summer of 2007 began, there were indications that the mortgage problem had spread beyond subprime. In July, Moody's downgraded $5 billion in securities backed by subprime assets and S&P placed $12 billion on watch for possible

[127] Asset-backed commercial paper is a short-term investment vehicle with a maturity that is typically between 90 and 180 days. The notes are backed by physical assets such as mortgages, and are generally used for short-term financing needs.

downgrades.[128] Various hedge funds including Basis Capital, Absolute Capital, and Sowood Capital either had to halt redemptions or sell assets at fire-sale prices and close funds. In addition, German lender IKB, Paris-based asset manager AXA IM, and Singapore-based United Overseas Bank all reported subprime related troubles. By the first week of August, two Bear Stearns funds had filed for bankruptcy, and academics noted, "During the week of August 6, 2007, a number of high-profile and highly successful quantitative long/short equity hedge funds experienced unprecedented losses."[129]

The mounting losses and the speed with which they seemed to be spreading created a virtual panic that led to a flight to quality by investors—even from the liquid asset-backed commercial paper markets—and spurred immediate central bank action. During the first week of August 2007, the Federal Reserve as well as other central banks around the world had to interfere to inject about $290 billion into the markets to ensure liquidity. Figure V.15 illustrates the decline in the asset-backed commercial paper market.

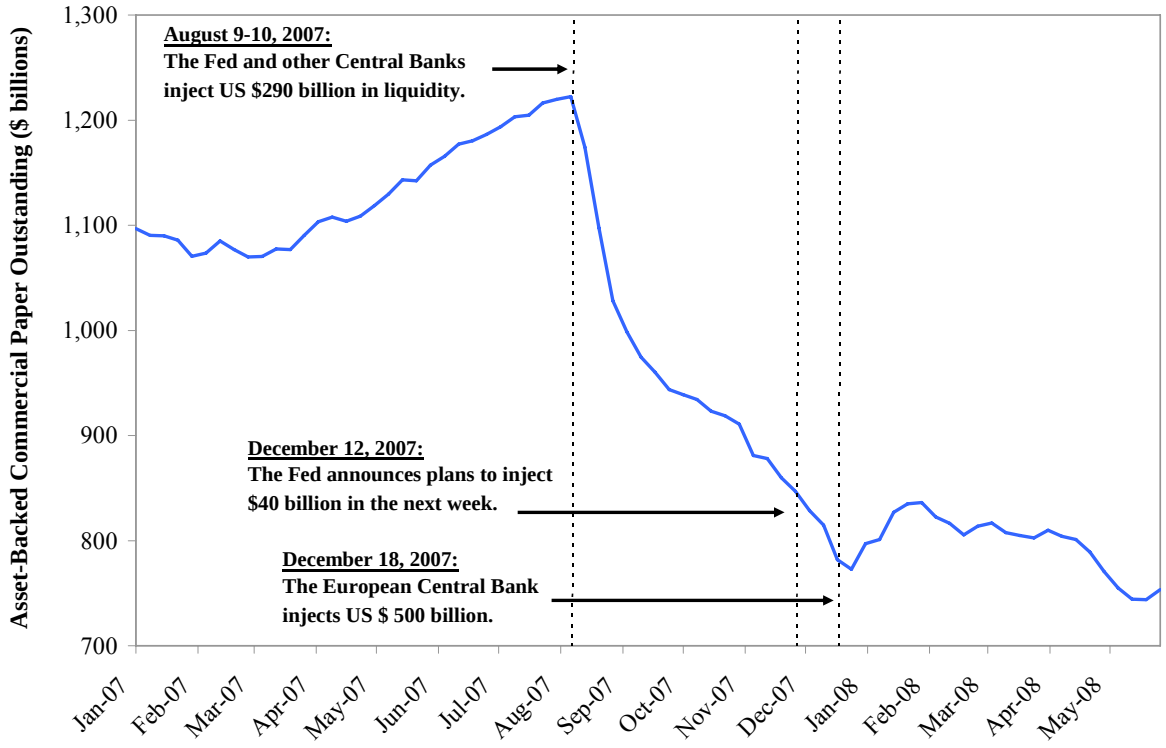
The significant decline in the commercial paper market had a direct impact on the real economy as it was a major source of short-term funding for industrial and commercial corporations such as AT&T and General Electric. The freeze meant that funding for highly-rated corporations had become more difficult and more expensive.

[128] Saskia Scholtes, "FT.com: Subprime Bonds in Ratings Downgrades," *Financial Times* (July 10, 2007).

[129] Amir Khandani and Andrew Lo, "What Happened to the Quants in August 2007?" Working Paper (September 2007), available at SSRN: http://ssrn.com/abstract=1015987.

Figure V.15. Asset-Backed Commercial Paper Market

Weekly Data from January 2007 through May 2008



Source: Bloomberg LP

3. LIBOR

The crisis also spread to lending between banks. As banks became concerned about the quality of other banks' assets and also sought to conserve their own cash (in part to deal with other banks' concerns regarding their quality), LIBOR rose.[130] This meant that banks became reluctant to lend to each other as they became increasingly uncertain about the viability of their counterparties. A higher LIBOR means less liquidity in the markets. Moreover, other rates such as the Treasury-Eurodollar spread and the LIBOR-OIS spread showed that this panic was widespread.

G. Discussion

The credit crisis continues as we write this section. The bubble that was brewing in the housing market since at least 2000 finally burst in 2006. As housing prices continue to decline

[130] LIBOR is a guide for the rate banks use to lend to each other.

at the national level, delinquencies and defaults on subprime and prime mortgages, credit cards, auto loans, and others continue to increase. The flight to quality has led to a severe liquidity crisis that has extended to all sectors of the world economy. The decline in the commercial paper market has made it quite costly for large corporations to fund their short-term needs. LIBOR remains elevated and securitization has dropped significantly in all sectors, further drying up liquidity. Governments in all countries have taken extraordinary measures to restore order to the markets and confidence to investors, including direct capital injections in some financial institutions, guarantees of bad debts, and other unconventional means. Even after the credit crisis is over, it is not clear that the financial markets will ever be the same again.

VI. The Impact of Securitization on the Cost of Credit

A. Introduction

The extension of credit enables individuals to finance various items like housing and automobiles, and any items purchased using a revolving credit line (e.g., credit cards). In the past, individuals relied on securing the financing for big ticket items from a single lender like a regional bank. Because the supply of credit was localized, there was less competition between lenders to provide financing at low interest rates. With the expansion of securitization, the number of lenders has dramatically increased and become global in its reach. Theoretically, the bundling of individual loans into one aggregate loan should achieve the economies of scale necessary for larger investors to participate in the consumer credit markets. The automation of data collection made possible by advances in computing technology has allowed investors to track the performance of the underlying collateral. The standardization of these bundles of loans into tradable securities should bring market efficiencies into personal finance by allowing diverse sets of investors bidding for the rights to lend individuals money. For these reasons, an increase in the percentage of loans that have been securitized should lower the cost of credit to individual borrowers.

The purpose of our study is to empirically estimate the impact of securitization on the cost of credit to consumers. We assess whether the cost savings from securitization are passed on to consumers in the form of cheaper credit. Our study examines the impact of securitization on the cost of credit for conforming mortgage loans, jumbo loans[131] and subprime loans.[132] We start our analysis by following the academic work of Kolari et al. (1998) and Naranjo and Toevs (2002). We then extend the study beyond conforming mortgages to different types of mortgages as well as auto loans and credit cards.

We employ various econometric models including ordinary least squares ("OLS") regressions with the Newey-West standard error correction. For some of the markets, we also

[131] Jumbo loans are mortgage loans for amounts larger than the conforming loan limits that dictate what the Government-Sponsored Enterprises ("GSEs") are allowed to purchase. See, for example, Passmore, Sparks, and Ingpen (2002). The classification of these loans is taken as given from the LoanPerformance database.

[132] Generally considered loans to borrowers with impaired or sparse credit histories and high loan-to-value ratios. The classification of these loans is taken as given from the LoanPerformance database.

use co-integration models to address the nonstationarity of the variables. Using the results of co-integration estimation, we generate impulse response functions and variance decompositions to help explain the impact of short-term changes in the cost of credit as a result of changes in securitization over time. We use monthly data in our studies, except for the credit cards study, where data were only available quarterly.

We start by replicating the results found in Kolari et al. (1998) who focus on the GSEs during the period from 1985 to 1995. Following the Kolari et al. (1998) methodology, the model estimates that for conforming mortgages, a 10% increase in the level of securitization as a percentage of total mortgage originations corresponds to a 15 basis point ("bps") decrease in mortgage yield spreads during the time period from 1986 to 1997.[133]

We also conduct a study similar to the one by Naranjo and Toevs (2002), which estimates the effect of GSE activities on the spreads between fixed interest rates in the non-conforming (jumbo) and conforming markets in the period from 1986 to 1998. For the more recent period of our study (1999 – 2006), we find no statistically significant effect of securitization on the yield spreads between non-conforming and conforming market rates.[134]

The existing studies primarily concentrated on investigating the effect of the government sponsored agencies. We extend these studies by researching non-conforming mortgage markets, as well as auto and credit card loans. We find that a 10% increase in the securitization rate is associated with:

- A decrease in yield spreads for subprime mortgages of between 24 and 38 basis points.
- A decrease in yield spreads for jumbo mortgages of between 4 and 12 basis points.
- A decrease in yield spreads for auto loans of between 22 and 64 basis points.

[133] As discussed below, it appears that Kolari et al. (1998) excluded a constant from the estimation of the long-run relationship between conforming market securitization and yield spreads. For the data sample in our possession, we do not believe that this approach is justified. If the constant is included, the results are inconclusive. See Appendix IV.B below.

[134] Unlike Naranjo and Toevs (2002), we conducted separate studies of the effect of securitization on both yield spreads on fixed rate loans (see description of Test 6 in Figure IV.2 below) and yield spreads on adjustable rate loans (Test 5 in Figure IV.2 below) for the period from 1999 to 2006. We did not find statistically significant results in either of the studies.

- A decrease in yield spreads for credit card loans of between 8 and 54 basis points.

We examined data on securitization rates and yield spreads in 2007 and up to June 2008 for subprime mortgage loans, jumbo mortgage loans, conventional conforming mortgage loans, auto loans, and credit card receivables. Recent observations suggest a negative relation between the securitization rates and the yield spreads for all except conventional conforming mortgages and credit card receivables, which is consistent with our findings. The extreme situation, unsurprisingly, is in the case of subprime mortgages. Between January and September 2007, the subprime securitization rate dropped to zero, while the mortgage yield spread increased by 52%.[135] In the same time period, the mortgage yield spread for jumbo mortgages increased by 68% and the securitization rate dropped by 41%. Credit card data which cover the first quarter of 2007 to the second quarter of 2008 show that yield spread for credit cards has increased by 32%. When discussing the role of securitization, it is important to keep in mind its impact on the cost of credit to consumers for mortgages, auto loans, credit cards, or other products.

B. Data and Variable Description

There is no single comprehensive source for securitization rates of various products and yield spreads. We obtain data on a monthly and quarterly basis for the time period 1986 to 2006 from the following sources: the Federal Housing Finance Board ("FHFB"), which includes the Monthly Interest Rate Survey ("MIRS"), the Federal Reserve, Inside Mortgage Finance, Freddie Mac, eMBS, LoanPerformance, and Bloomberg. The specific variables used are discussed below.

The yield spread. One of the key variables in our studies is the yield spread ("YSP") on the primary market interest rates over an appropriate proxy for a market benchmark interest rate.[136] For non-conforming mortgage products, we use the weighted-average coupon rates on

[135] We understand from LoanPerformance that based on their data, no subprime loans originated after September 2007 were securitized. Origination activity for subprime mortgages in recent months has been minimal.

[136] As a proxy for risk-free rates, we use 10-year constant maturity Treasury rates. Naranjo and Toevs (2002) also used this series as their proxy for risk-free rates. As our data are of a monthly frequency, we use average monthly series from the Federal Reserve.

primary market mortgages from LoanPerformance's servicing database,[137] broken down into the industry categories of subprime and jumbo loans (Tests 1 and 2, see Figure VI.2 below). For conventional conforming mortgages, we obtain the primary market rates from FHFB (Tests 3 and 4). For the mortgage studies, the yield spreads for these tests are calculated by subtracting average monthly 10-year constant maturity U.S. Treasury rates from these coupon rates.

For Tests 5 and 6, we define YSP as the spread between the weighted-average coupon rates of jumbo and conforming loans for both adjustable rate loans (Test 5) and fixed-rate loans (Test 6) from FHFB.

For auto loans, we use the average interest rate on new car loans at auto finance companies as reported by the Federal Reserve and subtract the average 3-year constant maturity Treasury rates on a monthly basis, also from the Federal Reserve. For credit cards, we use the average credit card rates at commercial banks and subtract the average quarterly Bank Prime Loan Rate. Both series are from the Federal Reserve.

The securitization rate. One of the major factors in our models is the securitization rate ("SEC"), which is defined as the amount of primary market consumer loans passed on to the secondary market for securitization divided by the total amount of primary market consumer loans originated in the same period. To allow for easier interpretation of the results, we apply a logarithmic transformation to the SEC variable in all our studies.

For the non-conforming mortgage market (Tests 1 and 2), we use monthly issuance data from LoanPerformance's securitization database and monthly originations data from LoanPerformance's servicing database. LoanPerformance recognizes that their data do not capture the whole U.S. mortgage market and recommend scaling their numbers using estimates of the total market size. For the subprime loans market, we scale up the issuance and originations numbers using estimates from the Federal Reserve.[138] The Federal Reserve has

[137] Weighted-average coupon rates are calculated as coupon rates for individual loans weighted by the size of the loan.

[138] Similar data on total U.S. market issuance and originations are also available from Inside Mortgage Finance ("IMF"). However, IMF changed its definition of subprime loans to include Alt-A and Home Equity Loans in 2001. As our study period for the subprime mortgage loans extends beyond 2001, we could not use IMF data for this market.

estimates of the total debt outstanding for mortgage-backed securities and primary market mortgages on a quarterly basis, so we linearly interpolate the monthly amount outstanding figures between any two quarters. We then divide the total amount outstanding figures by the LoanPerformance amount outstanding figures to come up with a scaling factor. Finally, we multiply each month's scaling factor by the amount of issuance or originations in the respective LoanPerformance database each month.

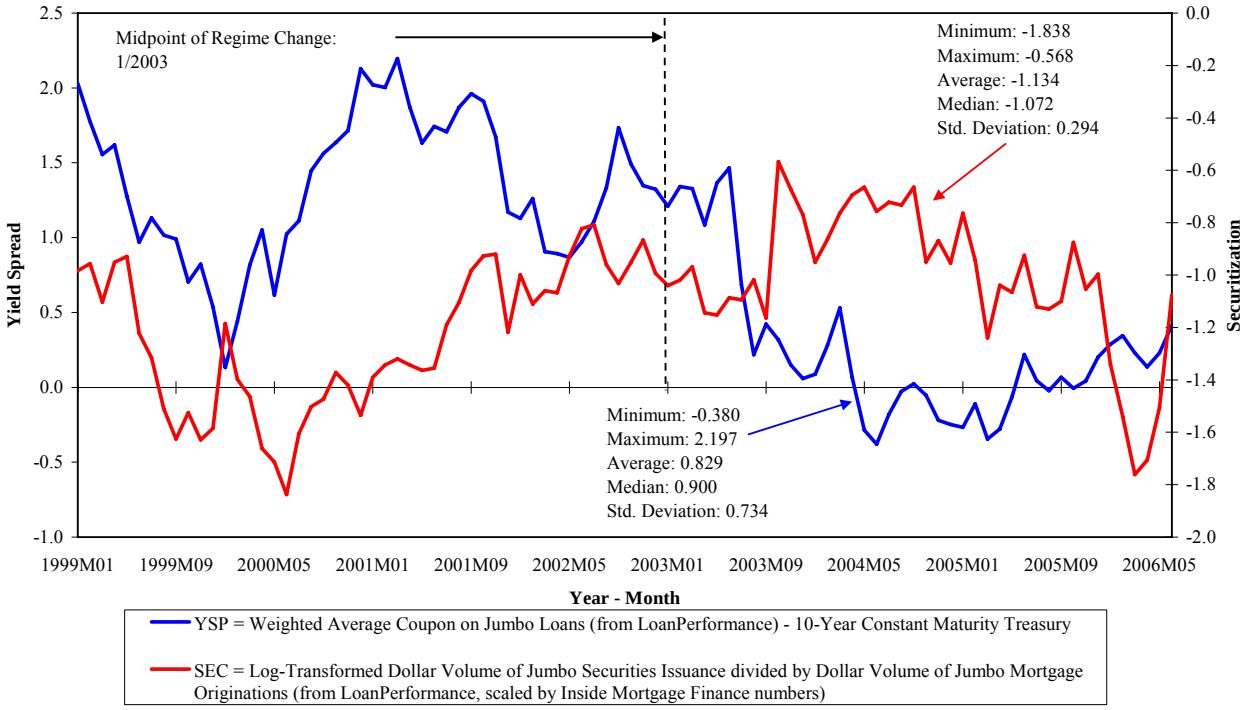
For the jumbo loan market, we scale up the issuance and originations numbers by those published by Inside Mortgage Finance ("IMF"). For the period of our research, IMF provides total issuance and originations only on a quarterly basis. To be able to scale monthly LoanPerformance data, we assume an equal amount of the issuance/origination ratio in each month in a given quarter and divide it by the LoanPerformance issuance/origination figures to get a scaled monthly series.[139]

The relationship between YSP and SEC for jumbo mortgages appears to experience a regime change. To examine the impact of this change, we examine a subperiod of the available data from the beginning of 2003 through June 2006. The existence of the regime change is clear from Figure VI.1 below, which shows the relationship between YSP and SEC over the period of January 1999 to June 2006.

[139] We are able to obtain reasonable estimates of the jumbo loan market securitization only from January 1999 to June 2006.

Figure VI.1

Test 2.1
Jumbo Home Loans (Whole Period)
Correlation Coefficient: -.274



In the studies that involve conforming mortgage loans (Tests 3 - 6), we use Fannie Mae and Freddie Mac mortgage issuance, as reported by Inside Mortgage Finance and eMBS Inc.

The data for the auto loans and credit cards studies (Tests 7 and 8) are obtained from the Federal Reserve. Securitization for the auto loan market is defined as the ratio of the dollar value of securitized motor vehicle loans to the dollar value of owned motor vehicle loans. Securitization for the credit card market is calculated as the ratio of securitized revolving credit loans to owned revolving credit loan assets.

In our study of the subprime market (Test 1), we also consider two additional variables that may have an effect on yield spreads: prepayment risk ("PRS") and default risk ("DFL").

Prepayment risk. Prepayment risk is proxied by subtracting a 1-year constant maturity Treasury rate from a 10-year constant maturity treasury rate.[140] This variable is intended to measure the relative attractiveness of refinancing a mortgage at a lower rate.

Default rates. Default risk is modeled using the foreclosure rate for subprime mortgages from LoanPerformance.

The graphs and descriptive statistics of the data used in all of our other studies are presented in Appendix VI.A. Figure VI.2 below summarizes the key variables (SEC and YSP) used in our studies.

Figure VI.2

Test #	Market	Period	Number of Observations	YSP	SEC
1	Subprime Home Loans	1/1999 through 12/2006	96 Monthly Observations	YSP = Average Primary Market Interest Rate for Subprime Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury	SEC = Dollar Volume of Subprime Securities Issuance divided by Dollar Volume of Subprime Mortgage Originations (from LoanPerformance, scaled by Federal Reserve numbers)
2.1	Jumbo Home Loans (Whole Period)	1/1999 through 6/2006	90 Monthly Observations	YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury	SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)
2.2	Jumbo Home Loans (Subperiod)	1/2003 through 6/2006	42 Monthly Observations	YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury	SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)

[140] Data are from the Federal Reserve.

3	Conventional Conforming Home Loans (Kolari Replication)	1/1986 through 12/1997	144 Monthly Observations	YSP = Average Primary Market Interest Rate for Fixed Rate Conforming Loans (from FHFB) - 10-Year Constant Maturity Treasury	SEC = Fannie Mae and Freddie Mac Mortgage Issuance divided by Dollar Volume of Mortgage Originations (from Inside Mortgage Finance)
4	Conventional Conforming Home Loans	1/1999 through 12/2006	96 Monthly Observations	YSP = Average Primary Market Interest Rate for Fixed Rate Conforming Loans (from FHFB) - 10-Year Constant Maturity Treasury	SEC = Fannie Mae and Freddie Mac Mortgage Issuance (from EMBS) divided by Dollar Volume of Conventional Conforming Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance)
5	Adjustable Rate Jumbo-Conforming Mortgage Spread (Naranjo Replication)	1/1999 through 6/2006	90 Monthly Observations	YSP = Average Interest Rate for Adjustable Rate Jumbo Loans – Average Interest Rate for Adjustable Rate Conforming Loans (from FHFB)	SEC = Fannie Mae and Freddie Mac Mortgage Issuance (from EMBS) divided by Dollar Volume of Conventional Conforming Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance)
6	Fixed Rate Jumbo-Conforming Mortgage Spread (Naranjo Replication)	1/1999 through 6/2006	90 Monthly Observations	YSP = Average Interest Rate for Fixed Rate Jumbo Loans – Average Interest Rate for Fixed Rate Conforming Loans (from FHFB)	SEC = Fannie Mae and Freddie Mac Mortgage Issuance (from EMBS) divided by Dollar Volume of Conventional Conforming Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance)
7	Auto Loans	1/1989 through 12/2006	216 Monthly Observations	YSP = Auto Loan Primary Market Interest Rate (from the Federal Reserve) - 3-Year Constant Maturity Treasury	SEC = Securitized Motor Vehicle Loan Assets divided by Owned Motor Vehicle Loan Assets (from the Federal Reserve)
8	Credit Cards	Q1 1989 through Q4 2006	72 Quarterly Observations	YSP = Credit Card Primary Market Interest Rate - Prime Bank Loan Interest Rate (from the Federal Reserve)	SEC = Securitized Revolving Credit Loan Assets divided by Owned Revolving Credit Loan Assets (from the Federal Reserve)

C. Statistical Analysis: Theoretical Framework and Estimation Techniques

1. Testing If the Data Are Stationary

Time series data (i.e., data collected over time) are often non-stationary: their major statistical parameters (mean, variance) may tend to change over time. In other words, at any given point in time, there is no guarantee that non-stationary data will converge to some long-term stable (equilibrium) relationship. In contrast, a stationary (or "weakly-stationary") process[141] is defined as one with major statistical parameters (mean, variance) that do not change over time. As a general rule, inference based on standard estimation techniques (e.g., OLS) can lead to misleading results.

One of the most common examples of non-stationary data is known as the "unit root." In a series with a unit root, the current data value equals last period's value plus a weakly-stationary error term. These series have an interesting property: if we subtract the last period's data value from the current period's value (i.e., we calculate the "first difference" of the series), the resulting series is stationary (as it equals just a weakly-stationary error term). Thus, even though the "level" of the series is non-stationary, its first difference is a stationary process. Because of this property, unit roots belong to a wider group of "I(1)" ("integrated of order 1") processes: we need to difference such series only once before we obtain a stationary process. Similarly, stationary processes are often referred to as "I(0)" ("integrated of order 0") processes, as there is no need to difference the data in order to obtain a stationary process.

A number of testing techniques have been developed that help researchers determine whether a given time series appears to be stationary or not. We use the following standard tests: Augmented Dickey-Fuller ("ADF"), Phillips-Perron ("PP"), and Kwiatkowski-Phillips-Schmidt-Shin ("KPSS") tests to determine whether or not the variables appear to be stationary. The results of these tests are presented in Figure VI.3 and in Appendix VI.B, Exhibits 1A – 8A for all other markets.

The ADF is a parametric test with the default ("null") hypothesis that a given series has a unit root. If we can reject the null at some conventional level of statistical significance (for

[141] In this paper, we use the terms "stationary" and "weakly-stationary" interchangeably.

instance, 5%),[142] we conclude that the series is most likely stationary (or, at least, it is not a unit root process). PP is a similar test: it has the same null hypothesis as ADF, but it is non-parametric. We approach this test the same way as ADF: if we can reject the null at the 5% level of statistical significance, we conclude that the series is most likely stationary. KPSS has a different null hypothesis; it states that a given series is stationary. So, if we fail to reject the KPSS null hypothesis, we can conclude that the series may be stationary.

In practice, because of different estimation methods and, in case of KPSS, different null hypotheses, the three tests may lead to different conclusions. We conclude that the series is stationary (or non-stationary) if the majority of tests indicate so. We consider a possibility of non-stationarity if at least one of the tests indicates that the series is non-stationary.

Samples of actual time series data often contain a linear trend – i.e., there is an apparent linear increase (or decrease) in the level of the series over time. All stationarity tests we apply in our studies allow for the inclusion of the linear trend in the test equation. We present the results of estimation both with and without trend. We also include linear trend components in the ADF and PP test equations to see if the series may have a linear trend. If the trend is significant at the 5% level, the test results with the trend included are likely to be more reliable.

2. Ordinary Least Squares (OLS) Estimation

In a few of our studies – in particular Tests 5 and 6 – the YSP and SEC series appear to be stationary. The YSP and SEC variables in the conforming loans market in the most recent period (1999 – 2006, Test 4) also appear to be stationary. If the series are stationary, then an ordinary least-squares ("OLS") regression approach may be appropriate. The OLS method assumes that a "dependent" variable (in our studies, YSP) can be linearly predicted by one (or more) factors, or "independent" variables (in our studies, SEC[143]). The OLS method estimates the long-term relationship between the dependent variable and independent variable(s) by minimizing the sum of squared "errors," or differences between the linearly predicted dependent variable (YSP) and its actual values. One of the disadvantages of this method is that

[142] It is the most commonly used level of statistical significance. In all tests in this section of the paper, we use only the 5% level of statistical significance. The 5% level of significance means that there is only a 5% chance that we reject the null hypothesis when the null hypothesis is actually true.

[143] In Test 1, we also consider DFL and PRS as other potential factors.

if one of the factors is determined simultaneously (jointly) with the dependent variable, OLS estimates may be unreliable.[144]

For the studies that involve stationary series (Tests 4 – 6), we estimate the long-term relationship between YSP and SEC using OLS. We use the Newey-West technique to adjust our OLS estimation for possible serial correlation in error terms (i.e., dependence of a current error term on its past values), which is quite common in time series data. If serial correlation is not corrected, an OLS estimate of the standard error on the estimated coefficient of the relationship between YSP and SEC may be invalid.[145]

3. Co-integration Analysis

For non-stationary series, it is possible that the first differences of these series are stationary (as in the case of a unit root). Thus, we also test if the first difference of the data is stationary. If the level of a series is non-stationary but the first difference of this series is stationary, a series is an I(1) process. All non-stationary series in our studies (see Tests 1 (subprime mortgages), 2 (jumbo mortgages), 8 (credit cards), and possibly 7 (auto loans) and 3 (conforming loans before 1997)) appear to be I(1). If two series are I(1), we further test if they form a linear combination that is stationary (i.e., "co-integrated"). If they are, common co-integration techniques may be applied, and the presence of the long-term relationship between these two variables may be statistically estimated.

To test if YSP and SEC are co-integrated, we apply the Johansen Co-integration Test. This test estimates a number of possible linear combinations between variables ("co-integrating vectors"). If a unique co-integrating vector is found, then the variables have a unique long-term equilibrium relationship. [146] We use the trace test statistic suggested by Johansen (1995).

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[144] In the literature, this is referred to as a "simultaneity bias". The factor that is jointly determined with the dependent variable is referred to as "endogenous." See Wooldridge (2003).

[145] The OLS estimation technique assumes that errors (i.e., the residuals unexplained by the model factors) are not serially correlated and have a constant variance. If any of these assumptions are violated, the OLS estimates of standard errors on coefficients are generally invalid. It is possible to correct OLS standard errors for both possible serial correlation and heteroskedasticity (i.e., non-constant variance) using the computation technique developed by Newey and West (1987, in Wooldridge (2003)).

[146] In the case of two variables ("bivariate" model), in order to establish if there exists a unique linear relationship between two variables, the Johansen test determines a rank of the estimated coefficient matrix constructed based on the equations for two variables. If the co-integration rank is 1, there is a unique co-integrating relationship

If, according to the Johansen Co-integration Test, two (or more) variables are found to be co-integrated with a unique co-integrating vector,[147] we estimate a long-term equilibrium relationship between them using a vector error correction model ("VEC"). VEC models the linear long-term relationship between two or more variables assuming that the long-term equilibrium between the variables can be achieved via some short-term adjustments. These short-term adjustments ("error corrections") are also directly estimated by VEC, and it may take more than one period (a month in our studies) to achieve a long-term equilibrium. We consider both the Akaike Information Criterion ("AIC") and Schwartz (Bayesian) Information Criterion ("BIC") to find the appropriate number of periods ("lags" in error correction terms, or lagged first differences in the variables) that need to be included in the model. Typically, VEC also assumes a constant, or an intercept (either in the data, or in the co-integrating relationship). If the data appear to have a trend, VEC may be adjusted by allowing for linear trends in the data or, if the trend is visible in the co-integrating relationship, it can be included in the co-integrating relationship.[148]

One of the advantages of the VEC method is that even if all variables are jointly determined, VEC estimates are still valid.[149] However, VEC estimation has a few disadvantages. In particular, VEC estimates differ depending on the model assumptions (e.g., depending on the number of lags to be included in the model), and may vary relatively widely from one data sample to another.[150] Stock (1987)[151] showed that in cases of co-integrated variables, standard OLS estimation may be still appropriate, as OLS estimates of the long-term relationship between co-integrated variables are "super-consistent" (i.e., when a sample size increases, OLS coefficient estimates converge relatively quickly to the true parameter values they are attempting to estimate.[152] However, OLS estimates of standard errors on these

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between the two variables. The test can be extended to more than two variables ("multivariate" model, see Test 1). See Johansen (1995).

[147] I.e., a unique linear combination of two or more variables.

[148] We generally assume that there is a constant in the linear models we estimated. In order to decide if it is appropriate to include the trend, we consider AIC and BIC criteria and also if the trend was statistically significant at the 5% significance level.

[149] See Patterson (2000), Chapter 14.

[150] See Patterson (2000), pp. 331, 356 and 644.

[151] See in Patterson (2000), pp. 331, 356.

[152] This is true even if an endogenous variable is included in the equation (i.e., if one of the factors and a dependent variable are jointly determined). See Patterson (2000), p. 644.

coefficients are not valid; they cannot be used to decide if a particular variable is statistically significant or not. Also, unlike VEC, OLS models ignore any dynamic or short-term adjustments ("error corrections" or "lags") that typically enable a convergence to the long-run equilibrium relationship between co-integrated variables. Furthermore, OLS estimates may have a "finite sample" bias, i.e., they cannot be relied upon when sample sizes are small. Also, OLS and VEC estimation procedures may result in different estimates.[153] Nevertheless, OLS can provide alternative estimates of the long-run relationship between securitization rates and yield spreads. Thus, in cases of non-stationary series, we also estimate the long-term relationship between SEC and YSP using OLS models.

For Test 1 (subprime mortgages), in addition to the estimation of the impact of SEC on YSP, we have enough data to be able to estimate the effect (if any) of default (DFL) and prepayments (PRS) risks on YSP. As DFL and PRS series appear to be I(1) processes, co-integrated with SEC and YSP, we estimate a multivariate VEC model that, in addition to estimating a long-run relationship between YSP and SEC, controls for the effects of PRS and DFL (if any) on YSP.

Using the reported VEC models, we also estimate the speed of adjustment to the long-term equilibrium between SEC and YSP by forecasting the decomposition of the YSP variance, and graph "impulse response functions," which show the sensitivity of yield spreads to the shocks in the securitization rates (or any other factor, such as PRS and DFL).[154]

4. Granger Causality Tests

To analyze if there is any causality implied in the relationship between yield spreads and securitization rates (i.e., if changes in securitization cause the changes in yield spreads, or vice versa), we apply Granger Causality tests to all our studies. Granger Causality tests assess the possibility of so-called Granger causality only: they test if yield spreads depend linearly on the securitization rate values in the previous periods (a certain number of "lags" of the

[153] See Patterson (2000), p. 356.

[154] Shocks are represented by Cholesky-transformed standard deviations of innovations in SEC (or PRS and DFl variables, in the case of the multivariate model, Study 1). "Innovations," in this case, are the estimated "error" terms in the SEC equation. "Cholesky transformation" refers to the computational technique, and imposes an ordering of the variables in the model, giving the largest weight to the variable that appears first (SEC, in our case).

securitization rate), or the other way around. This may not include any other type of causal relationship between the two variables, and in general, a number of researchers caution against confusing the notion of "Granger-causality" with a wider notion of economic causality.[155] We consider both the AIC and BIC to find the appropriate number of "lags" in the two variables (SEC and YSP) to be included in the test relationships.

D. Empirical Findings

The results of unit-root tests (ADF and PP) and a test for stationarity (KPSS) are shown in Figure VI.3 below (subprime market, YSP and SEC series only), and in Appendix VI.B, Exhibits 1A – 8A for all other markets and variables. The results of OLS estimation are presented in Exhibits 1C – 8C in Appendix VI.B, and in Figure VI.6 below (Test 1, a bivariate model).

Figure VI.3. ADF and PP Unit Root Tests and KPSS Stationarity Test: Subprime Mortgages

Variable	ADF statistic	PP Statistic	KPSS Statistic	ADF Trend	PP Trend
YSP	-2.62	-2.36	0.16	-1.53	-0.84
SEC	-5.17 *	-5.17 *	0.16	4.56 *	4.56 *
ΔYSP	-7.81 *	-7.62 *	0.05 *	0.79	0.68
ΔSEC	-13.79 *	-14.01 *	0.07 *	0.25	0.25

* indicates significance at the 5% level. For the KPSS test, the null hypothesis is that the variable is stationary so failure to reject the null indicates stationarity (indicated by a *).

The results of Johansen Co-Integration tests are presented in Appendix VI.B, Exhibits 1D – 8D (Panel A), and in Figure VI.4 below.

Figure VI.4. Johansen Co-integration Test: Subprime Mortgages

Eigenvalue	Likelihood Ratio	5% Critical Value	Hypothesized No. of Vectors
0.142	18.398	15.495	None *
0.039	3.827	3.841	At most 1

An asterisk after "None" ("no co-integrating vectors"; the first row of these exhibits) indicates a statistically significant rejection of the null hypothesis that there are no co-integrating vectors. For the second row of the exhibits, the null hypothesis is that there is at

[155] See, for instance, Gilbert (2004), pp. 13-15; Pearl (2000), p. 39. Granger-causality has a number of practical limitations: it assumes a linear relationship between variables, that the data are stationary (which is not the case for some of our models) and that there are no omitted variables in the model.

most one co-integrating vector. As there is no asterisk after this row in all our studies of non-stationary series, we cannot reject the null hypothesis that there is at most one (unique) co-integrating relationship between YSP and SEC series. Thus, all non-stationary series in our studies (see Tests 1 (subprime mortgages), 2 (jumbo mortgages), 8 (credit cards), and possibly 7 (auto loans) and 3 (conforming loans before 1997)) appear to be I(1) processes with a single co-integrating vector.

As all non-stationary series in our studies are co-integrated, we can apply a VEC estimation method to estimate long-term equilibrium relationships between yield spreads and securitization rates for different consumer loan markets (subprime and jumbo mortgages, credit cards). We present our VEC estimates in Figure VI.5 below and in Appendix VI.B (Exhibits 1D – 8D, Panel B). (As noted above, the OLS estimates of the same relationships are presented in Figure VI.6 below and in Appendix VI.B, Exhibits 1C – 8C.)

Figure VI.5. Johansen Normalized Co-integrating Coefficients: Subprime Mortgages

	YSP	**SEC**
Coefficient	1	3.803
Standard Error		*(0.797)*

Co-integrating Equation: **YSP = -3.803*SEC**

Figure VI.6. Ordinary Least Squares Regression With Newey-West Standard Error Correction: Subprime Mortgages

Securitization (SEC) Coefficient *(p-value)*		**Constant** *(p-value)*		**Adjusted R Squared**
-2.4348	*	3.0050	*	0.4225
0.0000		*0.0000*		

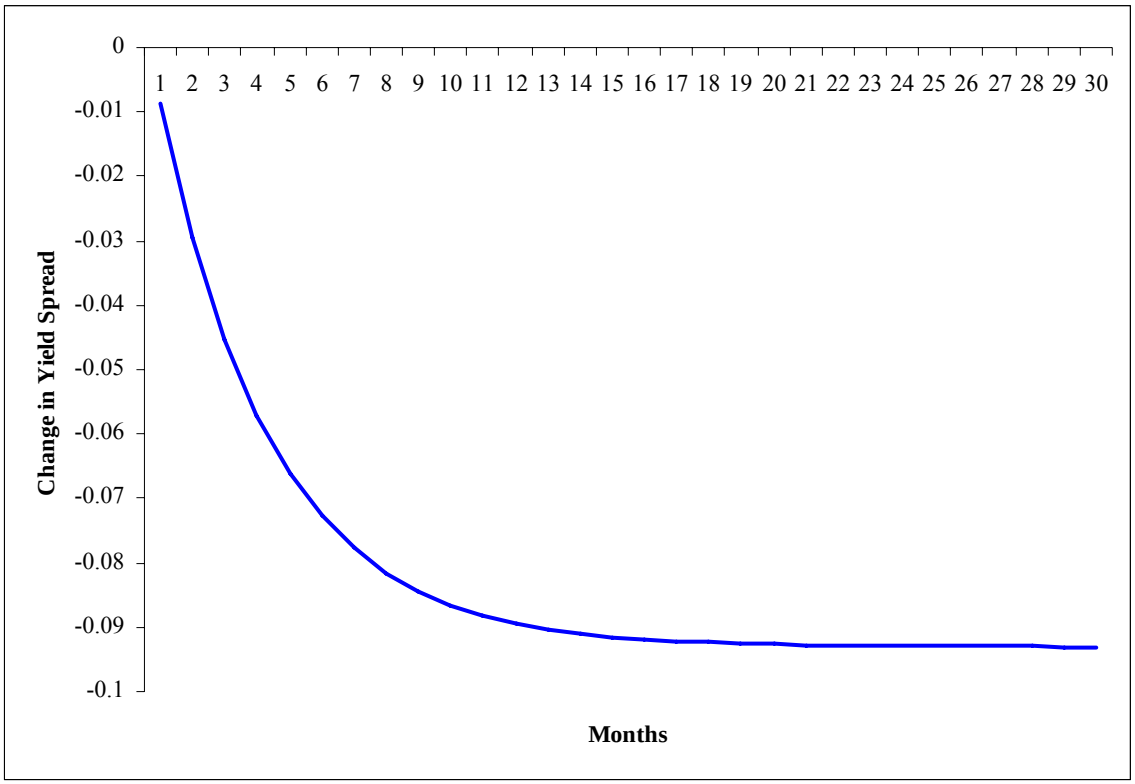
* denotes significance at the 5% level.

Using the reported VEC models, we also estimate the speed of adjustment to the long-term equilibrium between SEC and YSP. Figure VI.7 below and Exhibits 1E – 8E in Appendix VI.B show these estimates. Figure VI.8 below and Exhibits 1F – 8F in Appendix VI.B illustrate the sensitivity of yield spreads to the shocks in the securitization rates (or any other factor, such as PRS and DFL, see Exhibit 1F in Appendix VI.B).

Figure VI.7. Forecast Error Variance Decomposition of the Yield Spread (YSP) : Subprime Mortgages

	Percentage of Squared Prediction Error in YSP Explained by:	
Month Ahead	***YSP***	***SEC***
1	99.87566	0.124343
2	99.17813	0.821874
3	98.20015	1.799854
4	97.09481	2.905188
5	95.96117	4.038829
6	94.85875	5.141252
7	93.8202	6.179802
8	92.86088	7.139124
9	91.98552	8.01448
10	91.19269	8.807315
11	90.47759	9.522414
12	89.83385	10.16615
13	89.25458	10.74542
14	88.73295	11.26705
15	88.26251	11.73749
16	87.83738	12.16262
17	87.45229	12.54771
18	87.10254	12.89746
19	86.78402	13.21598
20	86.49313	13.50687
21	86.22671	13.77329
22	85.98202	14.01798
23	85.75667	14.24333
24	85.54858	14.45142
25	85.35593	14.64407
26	85.17713	14.82287
27	85.01079	14.98921
28	84.85568	15.14432
29	84.71074	15.28926
30	84.57502	15.42498

Figure VI.8. Response of YSP to Cholesky One S.D. SEC Innovation: Subprime Mortgages



The results of Granger Causality tests are presented below in Figure VI.9 and in Appendix VI.B, Exhibits 1B – 8B.

Figure VI.9. Forecast Granger Causality Test: Subprime Mortgages

Null Hypothesis	Probability of F Statistic (3 Lags Chosen)	
SEC does not Granger Cause YSP	0.0214	*
YSP does not Granger Cause SEC	0.08037	

* denotes significance at the 5% level.

1. Application to the Subprime Mortgage Market (Test 1)

Figure VI.3 shows the results of ADF and PP unit root tests (the second and third columns of the table), and the KPSS stationarity test (the fourth column) for YSP and SEC series in the study of subprime mortgages. The fifth and sixth columns of the table show if

there is an indication to include a linear trend in the test equations: an asterisk indicates that a linear trend is statistically significant at the 5% significance level (i.e., it needs to be included). A trend is not significant for YSP, but is significant for SEC. YSP is clearly an I(1) process: it is non-stationary in levels but stationary in first differences according to all three statistical tests mentioned above. The results for SEC variable are less clear: it is stationary in levels for two out of the three tests (KPSS says it is non-stationary) as well as in first difference. (Notably, if a trend is excluded from the test equations, SEC is found to be non-stationary in levels according to all three tests. See Appendix VI.B, Exhibit 1A.) Thus, there is some indication that SEC is an I(1) variable, but it is not clear (i.e., it may be stationary). We decided to apply both OLS and VEC estimation techniques in this case.

The results of the Granger Causality Test are presented in Figure VI.9. The test indicates that SEC Granger-causes YSP at the 5% significance level.

The Johansen Co-integration Test indicates that there is a unique co-integrating relationship between SEC and YSP. See Figure VI.5. As Figure VI.3 indicates that linear trends may be present, we estimate VEC assuming linear trends in the data. See Figure VI.5.

VEC estimates the long-term co-integrating relationship between YSP and SEC as follows:[156]

(1) YSP = -3.803 SEC

The result indicates that for a 10% increase in the securitization rate, yield spreads on subprime mortgages will decrease approximately by 38 basis points.

OLS estimates are fairly consistent with the VEC model estimates of a long-term relationship between the securitization rates and subprime market yield spreads: a 10% increase in the securitization rate, yield spreads on subprime mortgages will decrease approximately by 24 basis points. See Figure VI.6.

The forecast of the YSP variance decomposition shows that the variability in SEC explains increasingly of the variability in YSP going forward in time. After six months, SEC explains about 5% of the variation in YSP, while after a year, SEC explains about 10% of the

[156] This model includes no lags in adjustment terms (as suggested by minimizing the AIC/BIC criteria).

variation in YSP. See Figure VI.7. The impulse response function in Figure VI.8 illustrates the impact of a one standard deviation shock to SEC on YSP for a period of 30 months. In the case of a change in the SEC variable equal to Cholesky one standard deviation, YSP will decrease by approximately 7 basis points within a six-month period and by approximately 9 basis points within twelve months.

Results for the multivariate model are consistent with the results of the bivariate model. See Appendix VI.B, Exhibit 1. Even controlling for prepayment and default risks, the VEC model indicates that a 10% increase in subprime mortgage securitization leads to a decrease in subprime mortgage yield spreads of approximately 24 basis points. Notably, the impact of both DFL and PRS variables on YSP appear to be statistically indiscernible from zero.

2. Conforming Loan Market

We first attempt to replicate the negative relationship between conforming loans yield spreads and securitization rates found in some of the previous studies (e.g., Kolari et al. (1998)). See the description of variables in Figure VI.2, Test 3. We could not obtain precisely the same data as the authors of previous studies. Exhibit 3 in Appendix VI.B summarizes all our results.

The results of the ADF test (without a trend) indicate that both YSP and SEC series may be I(1) processes (Appendix VI.B, Exhibit 3A). However, all other tests for stationarity indicate that both YSP and SEC may be stationary in levels. Exhibit 3D in Appendix VI.B shows that a unique co-integrating relationship may be estimated only if we do not include an intercept in the model. Using this model without intercepts (constants), we find that for a 10% increase in the securitization rate of conforming mortgages, there is a corresponding 15 bps decrease in the conforming mortgage yield spread.[157] For comparison, Kolari et al. (1998) estimated about a 20 bps decrease in the conforming mortgage yield spread for a 10% increase in the securitization rate. It appears that Kolari et al. (1998) also excluded a constant from their estimation of the long-run relationship between conforming market securitization and yield spreads.[158] This is not a standard approach and we do not believe that excluding a constant is

[157] The Granger Causality test indicates that YSP may Granger-cause SEC at the 5% significance level. See Exhibit 3B in Appendix IV.B.

[158] See Kolari et al. (1998), p. 684. The authors indicate that they dropped the constant from their estimation of the long-term relationship as it was not statistically significant at the 5% significance level.

justified. If the constant is included, no consistent long-term relationship between securitization and yield spreads in the conforming loans market using our sample of the data can be found.[159] OLS results are also inconclusive: the effect of SEC on YSP is statistically indistinguishable from zero at the 5% significance level. See Exhibit 3C in Appendix VI.B.

When we extend the data from the 1990s to the present to test whether the relationship between YSP and SEC in conforming loans market exists in the more recent period, the results—using our particular sample of the data—appear to indicate no statistically discernible relationship. All variables appear to be stationary in levels, and the OLS estimate of the effect of SEC on YSP is statistically indistinguishable from zero. See the description of variables in Figure VI.2, Test 4, and the results of all statistical tests in Exhibits 4, Appendix VI.B.

3. Summary of Empirical Findings for Other Markets

Based on the data we have available and the empirical methods we employ, we conclude that a 10% increase in the securitization rate is associated with:[160]

- A decrease in yield spreads for jumbo mortgages of between 4 and 12 basis points. See Appendix VI.B, Exhibit 2.2.[161]
- A decrease in yield spreads for auto loans of between 22 and 64 basis points. See Appendix VI.B, Exhibit 7.
- A decrease in yield spreads for credit card loans of between 8 and 54 basis points. See Appendix VI.B, Exhibit 8.

We also conduct a study similar to the one by Naranjo and Toevs (2002) who estimated that GSE activities decreased the spreads between non-conforming and conforming market interest fixed rates in 1986 – 1998. Unlike Naranjo and Toevs (2002), we conduct separate studies of the effect of securitization on both fixed yield spreads (Test 6) and adjustable yield

[159] In some of the models with an intercept, the coefficient on SEC appears to be either statistically insignificant or positive (and an intercept appears to be statistically significant).

[160] For all these studies, there is no clear or statistically significant Granger-causality, in either direction. See Exhibits 2.1B, 2.2B, 7B, 8B in Appendix IV.B.

[161] As discussed in Section B and shown in Figure IV.1, it appears that there was a regime change in early 2003. The results cited above are for the most recent period (January 2003 – June 2006). For comparison purposes, we also run all tests for the whole period for which we have data: January 1999 through June 2006. See Exhibit 2.1 in Appendix IV.B. The model estimates a 7 to 30 basis point decrease in yield spreads for a 10% increase in the securitization rate.

spreads (Test 5), and use the data for a more recent period of 1999 - 2006. We found no statistically significant effects of securitization on the yield spreads between non-conforming and conforming market rates in either of these two studies. See Appendix VI.B, Exhibits 5 and 6.

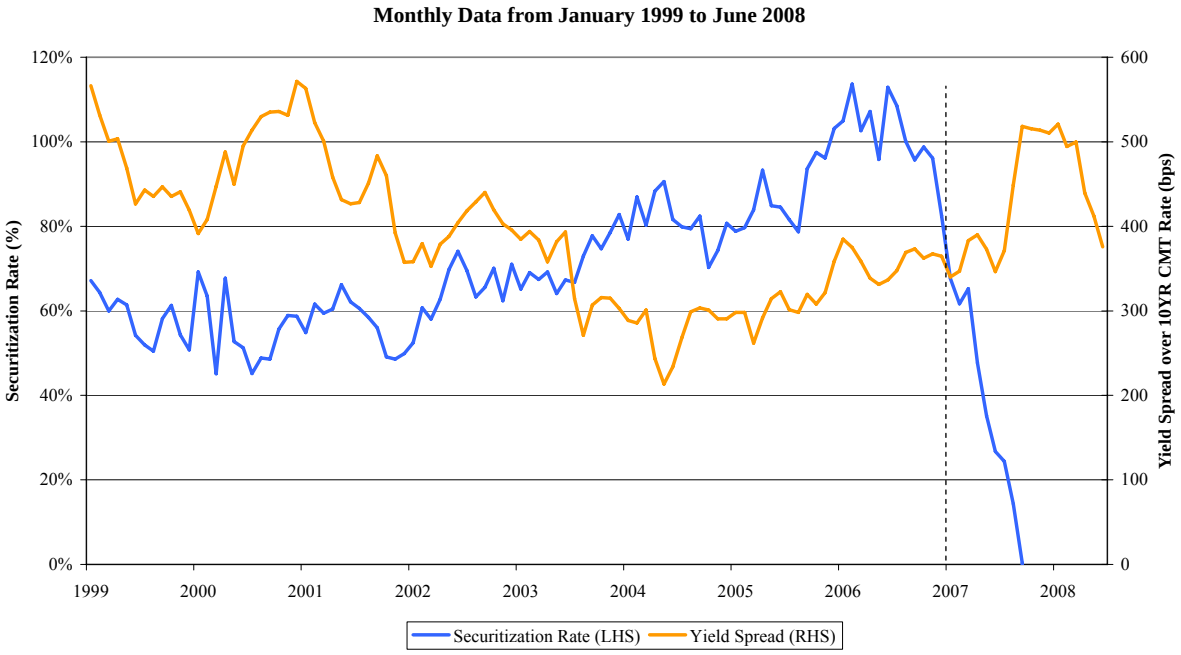
E. Our Findings and the Current Crisis

We examined data on securitization rates and yield spreads in 2007 and up to June 2008 for subprime mortgage loans, jumbo mortgage loans, conventional conforming mortgage loans, auto loans, and credit card receivables. Recent observations suggest a negative relation between the securitization rates and the yield spreads for all products other than conventional conforming mortgages and credit card receivables, which is consistent with our findings. The extreme situation, unsurprisingly, is in the case of subprime mortgages. Between January and September 2007, the subprime securitization rate dropped to zero, while the mortgage yield spread increased by 52%.[162] In the same time period, the mortgage yield spread for jumbo mortgages increased by 68% and the securitization rate dropped by 41%. From the first quarter of 2007 to the second quarter of 2008, the yield spread for credit cards has increased by 32%. When discussing the role of securitization, it is important to keep in mind its impact on the cost of credit to consumers for mortgages, auto loans, credit cards, or other products.

Below are graphs including the recent data for securitization rates and yield spreads for subprime mortgages, jumbo mortgages, conventional conforming mortgages, auto loans and credit card receivables.

[162] We understand from LoanPerformance that based on their data, no subprime loans originated after September 2007 were securitized. Origination activity for subprime mortgages in recent months has been minimal.

Figure VI.10. Subprime Mortgages – Securitization Rate and Yield Spread



Notes and Sources:

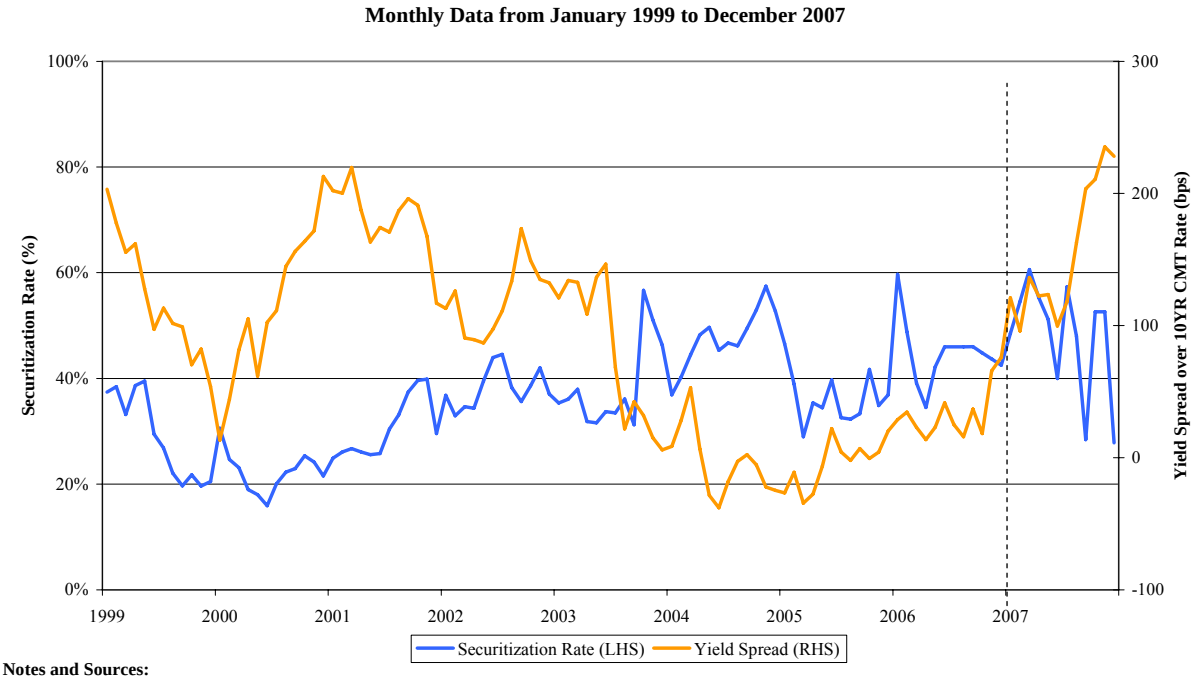
Data are from LoanPerformance and the Federal Reserve.

Securitization rates are based on loans originated and securitized by month of loan origination. Origination and issuance data from LoanPerformance's servicing and securities databases are scaled by Federal Reserve data and then used to calculate securitization rates.

Yield spreads are based on the difference between initial mortgage rates on subprime loans (from LoanPerformance's securities database) and 10-Year Constant Maturity Treasury rates.

Securitization rates stop in September 2007 as there are no loans originated after this date that have been securitized in the LoanPerformance database.

Figure VI.11. Jumbo Mortgages – Securitization Rate and Yield Spread



Notes and Sources:

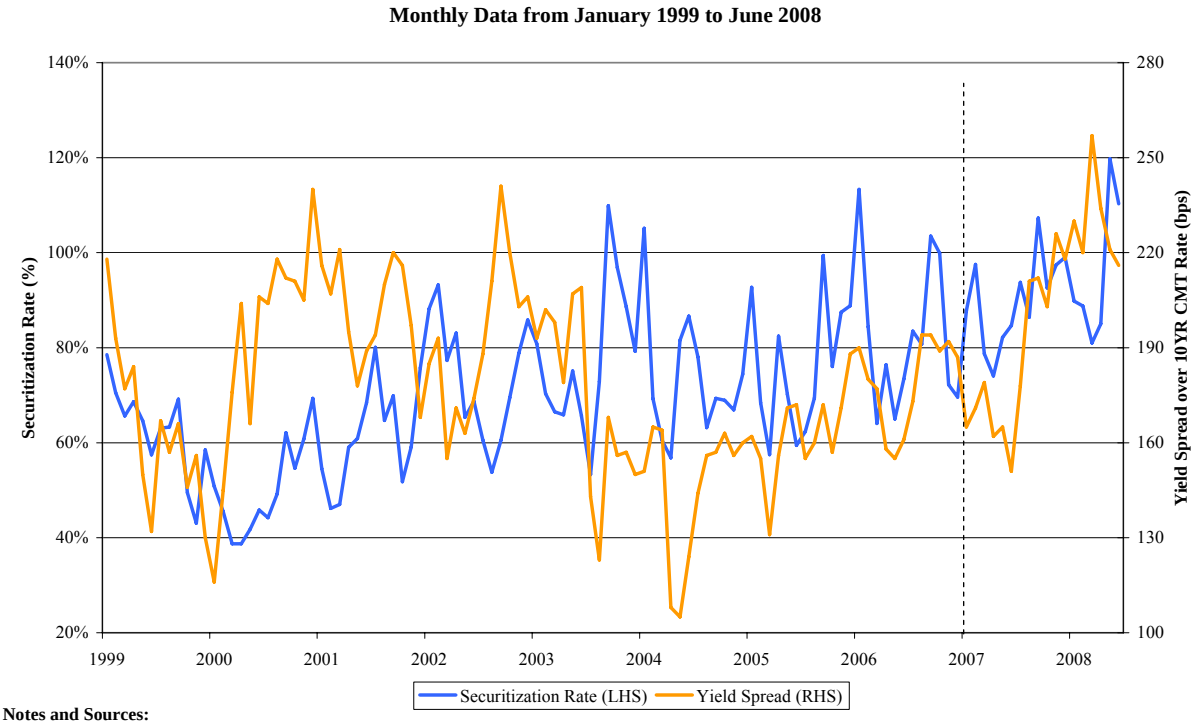
Data are from LoanPerformance, Inside Mortgage Finance, and the Federal Reserve.

Securitization rates are based on loans originated and securitized by month of loan origination. Origination and issuance data from LoanPerformance's servicing and securities databases are scaled by Inside Mortgage Finance data and then used to calculate securitization rates.

Yield spreads are based on the difference between initial mortgage rates on jumbo loans (from LoanPerformance's securities database) and 10-Year Constant Maturity Treasury rates.

Securitization rates from June 2006 to March 2007 are based on Inside Mortgage Finance data because LoanPerformance data are unreliable in the time period.

Figure VI.12. Conventional Conforming Mortgages – Securitization Rate and Yield Spread



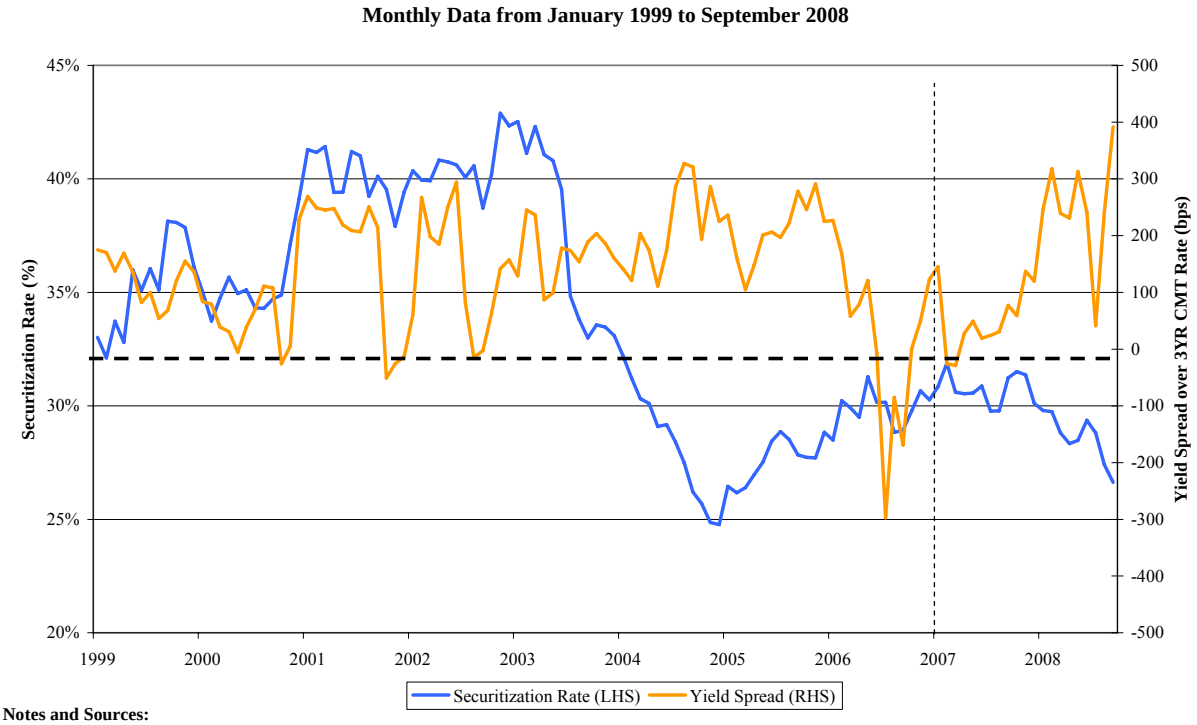
Notes and Sources:

Data are from eMBS, LoanPerformance, Inside Mortgage Finance, the Federal Housing Finance Board, and the Federal Reserve.

Securitization rates are based on loans originated and securitized in the same month. Origination data from LoanPerformance's servicing and securities databases are scaled by Inside Mortgage Finance data. Issuance data are collected as agency issuance (FHLMC and FNMA) from eMBS.

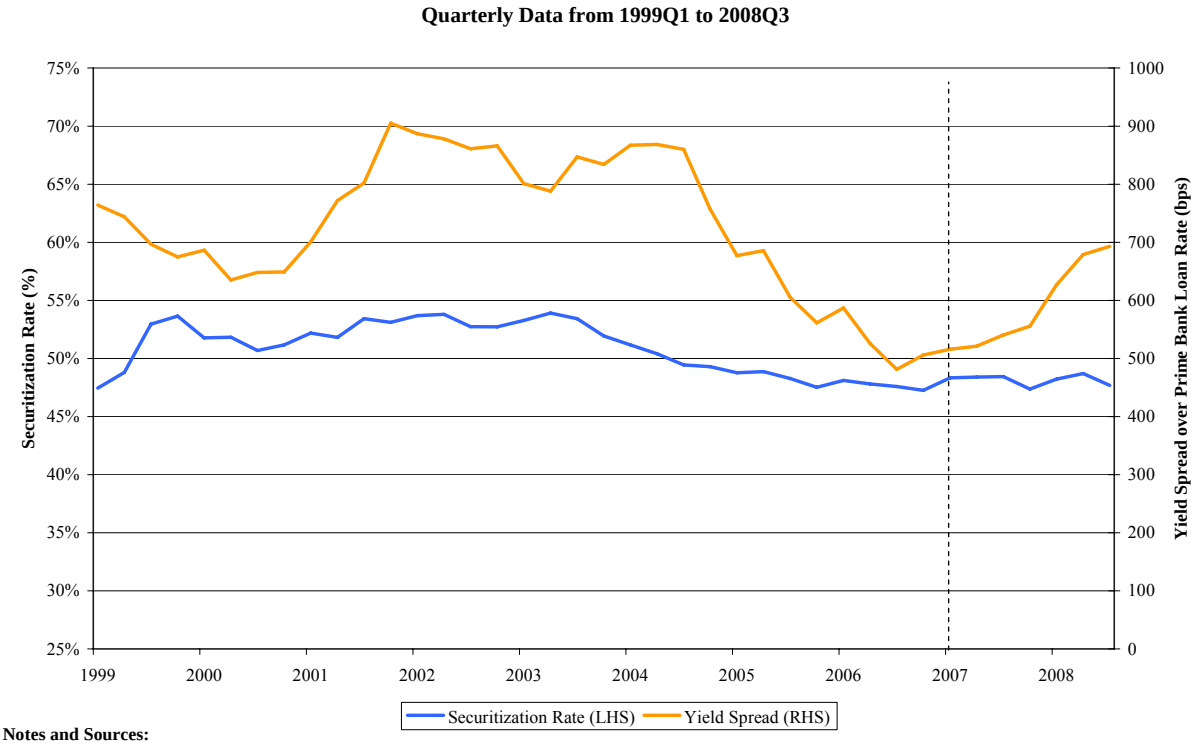
Yield spreads are based on the difference between average rates for conventional loans (MIRS) and 10-Year Constant Maturity Treasury rates.

Figure VI.13. Auto Loans – Securitization Rate and Yield Spread



Notes and Sources:
Data are from the Federal Reserve.
Securitization rates are based on consumer credit data from finance companies and is the dollar ratio of securitized motor vehicle loans to total motor vehicle loans (owned and securitized).
Yield spreads are based on the difference between auto loan primary market interest rates and 3-Year Constant Maturity Treasury rates.

Figure VI.14. Credit Card Receivables – Securitization Rate and Yield Spread



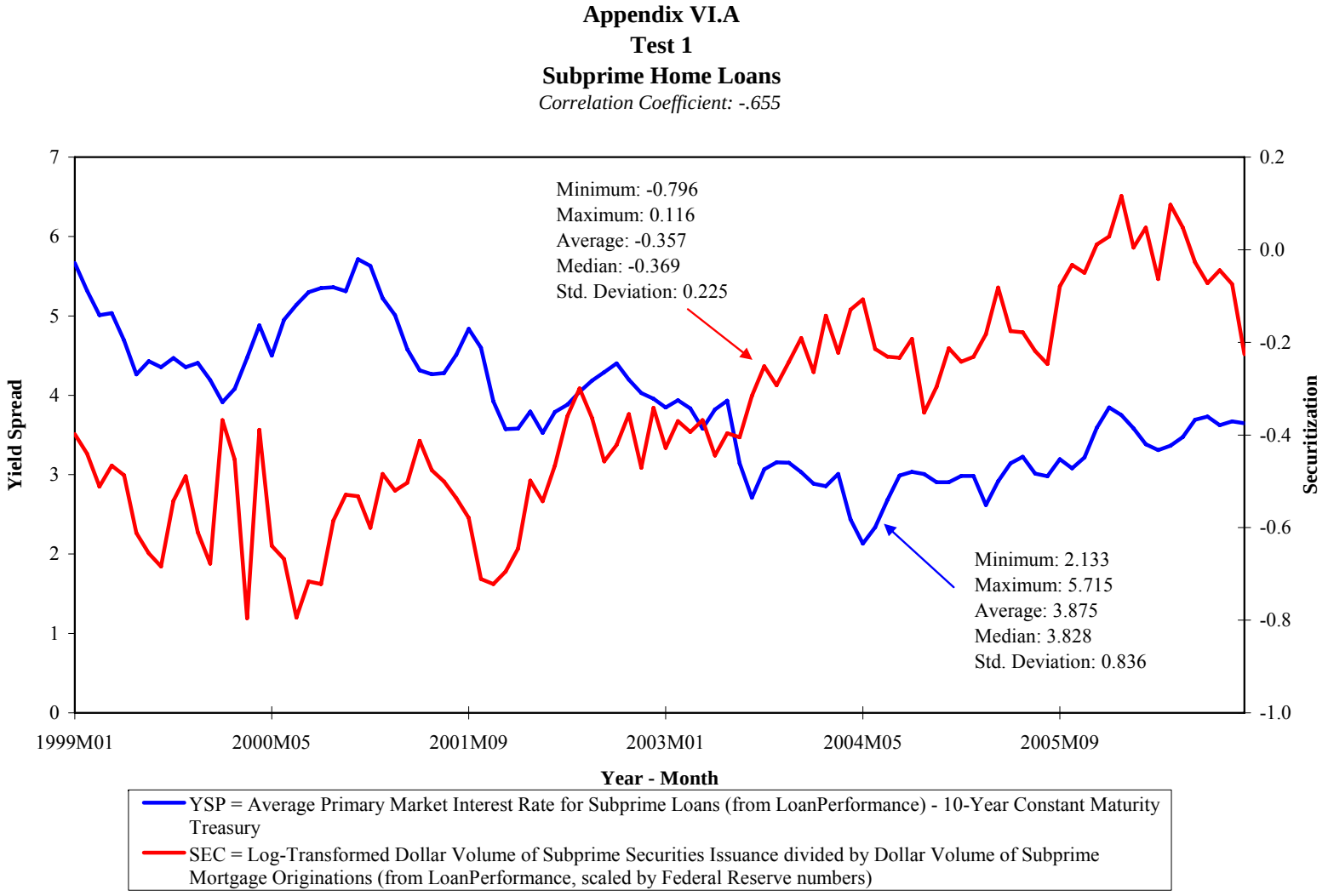
Notes and Sources:
Data are from the Federal Reserve.
Securitization rates are based on consumer credit data and is the dollar ratio of securitized nonrevolving credit to nonrevolving credit outstanding.
Yield spreads are based on the difference between credit card primary market interest rates and prime bank loan interest rates.

F. Conclusion

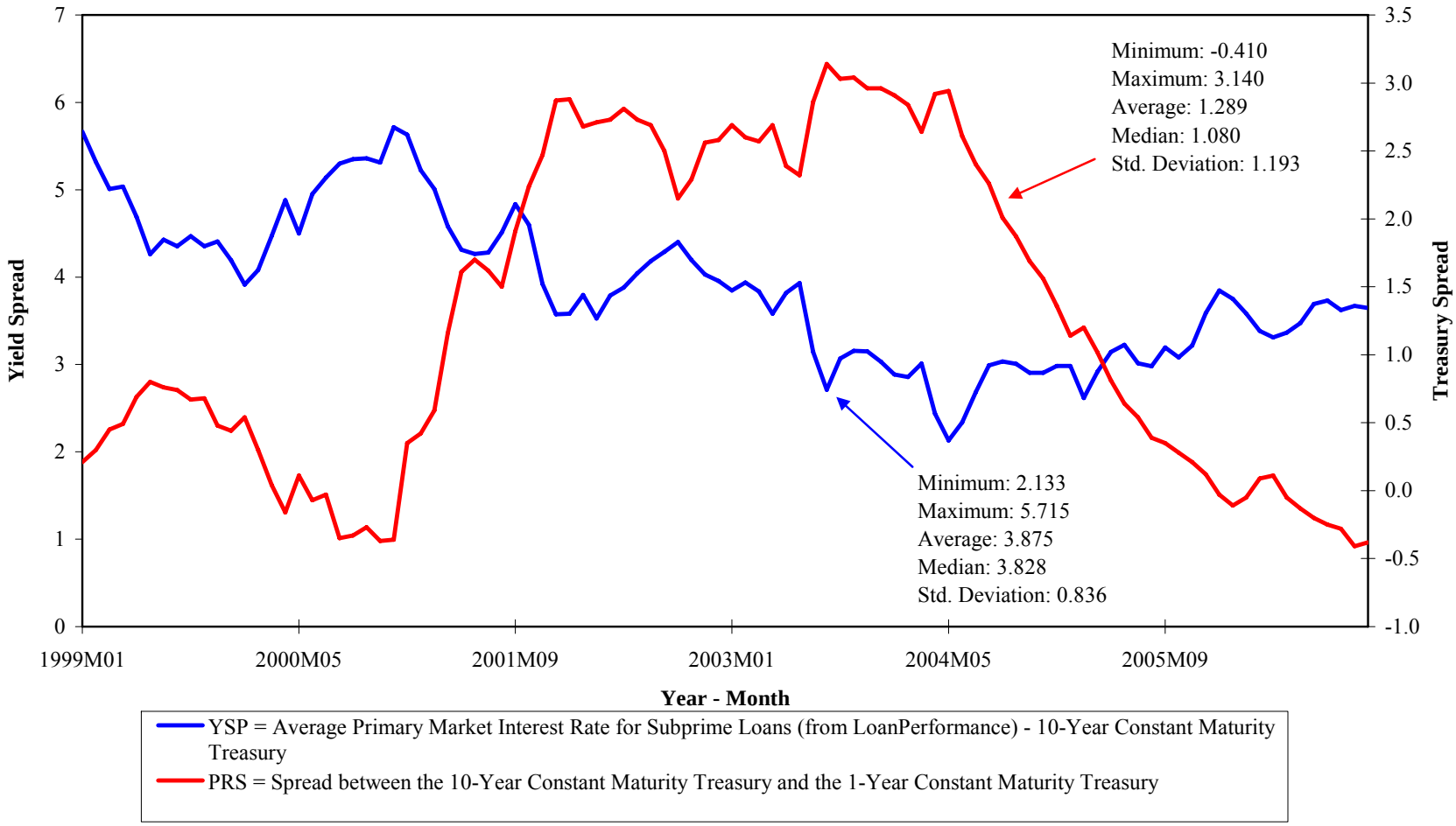
The continued expansion of the rate at which primary market loans are securitized has decreased the interest rates paid by consumers. From auto loans to credit cards to various types of mortgages, each consumer debt market has realized the benefits of the increased participation of investors who are able to trade securitized consumer debt. Much of the benefits to the conventional conforming mortgage market were identified early and have been realized with the creation of the GSEs. As such, our studies of the recent time period are inconclusive as to the effect of increased securitization on the borrowing costs of conventional conforming mortgages. The success of the conventional conforming mortgage market has been replicated by private lenders in other markets (subprime mortgages, jumbo mortgages, auto loans, and credit cards). The development and maturation of the markets for these expanded asset classes has been measurably observed in the aggregate data in the recent years prior to the current

financial crisis, resulting in benefits in the form of lower financing costs that have flowed through to consumers.

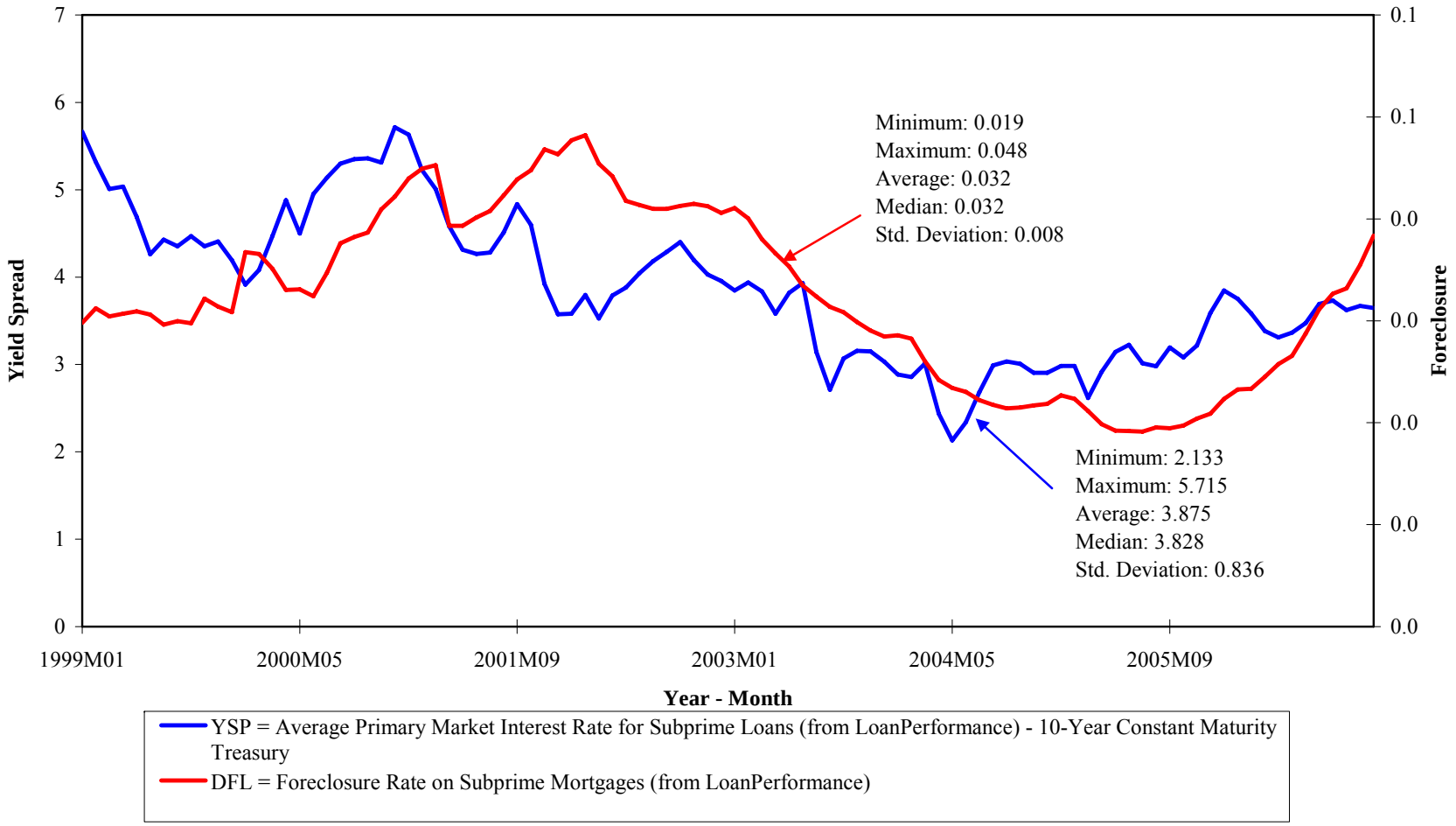
Appendix VI.A Graphs of Cost of Credit Variables



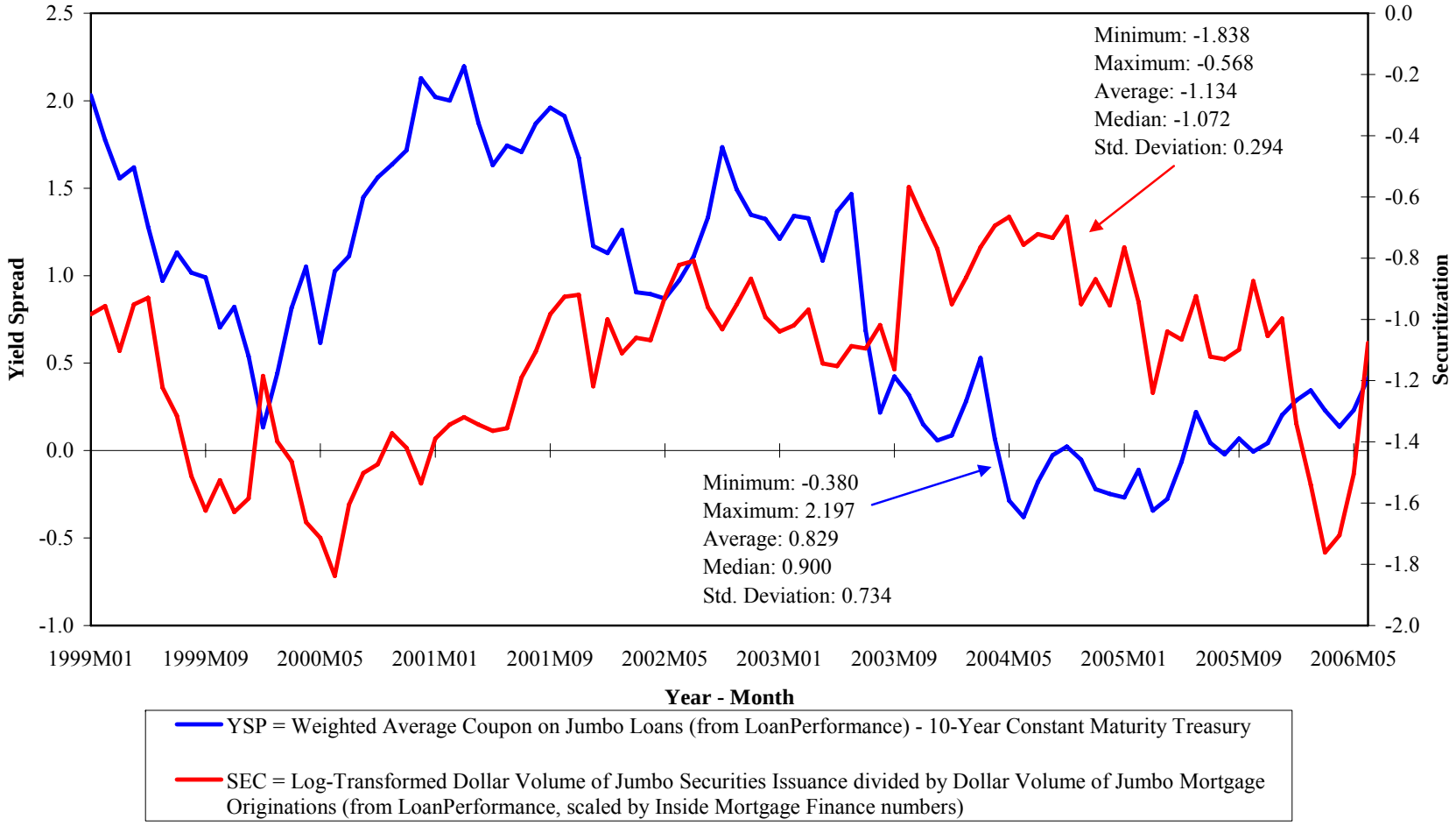
Appendix VI.A
Test 1
Subprime Home Loans
Correlation Coefficient: -.449



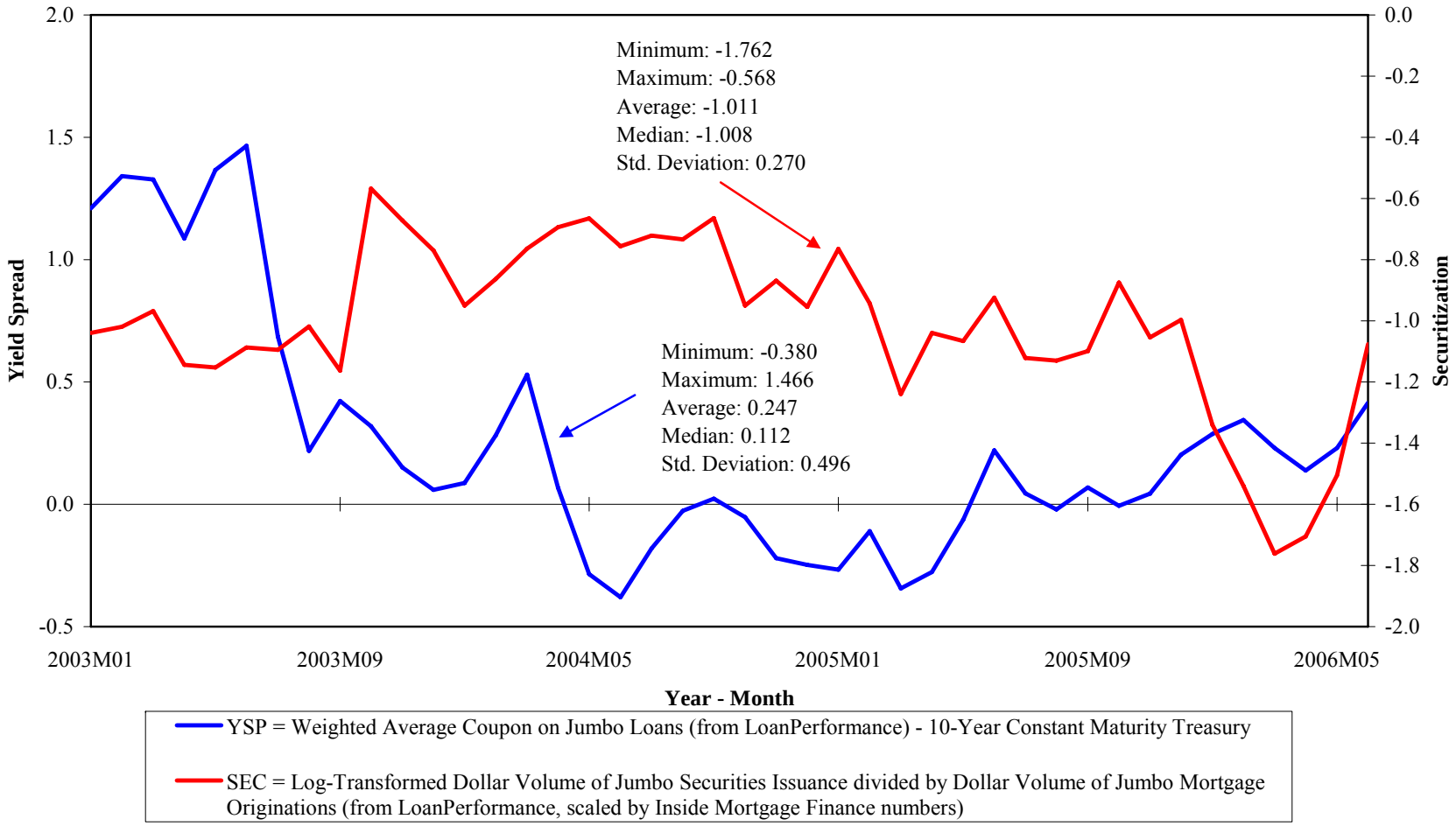
Appendix VI.A
Test 1
Subprime Home Loans
Correlation Coefficient: .590



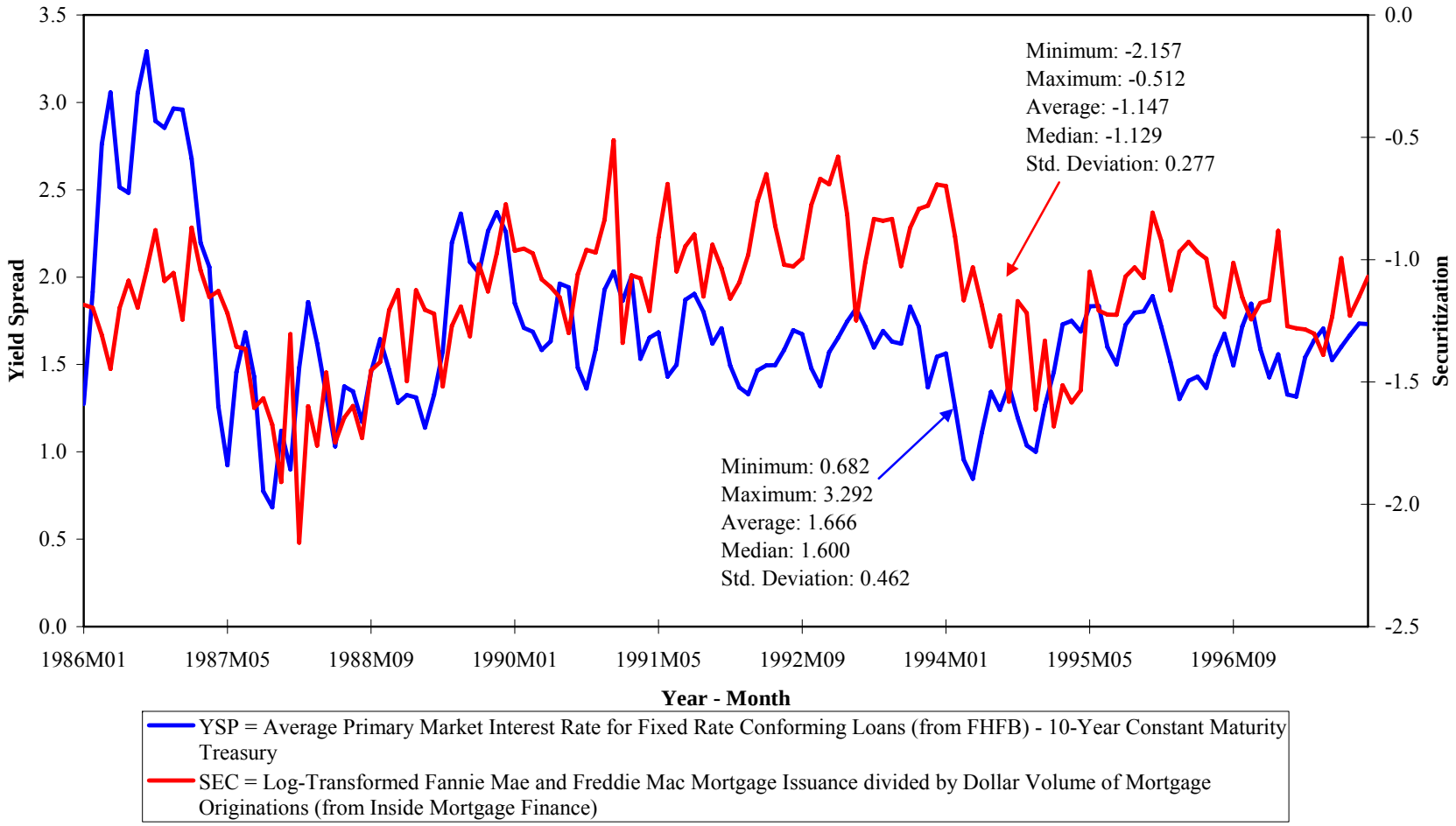
Appendix VI.A
Test 2.1
Jumbo Home Loans (Whole Period)
Correlation Coefficient: -.274



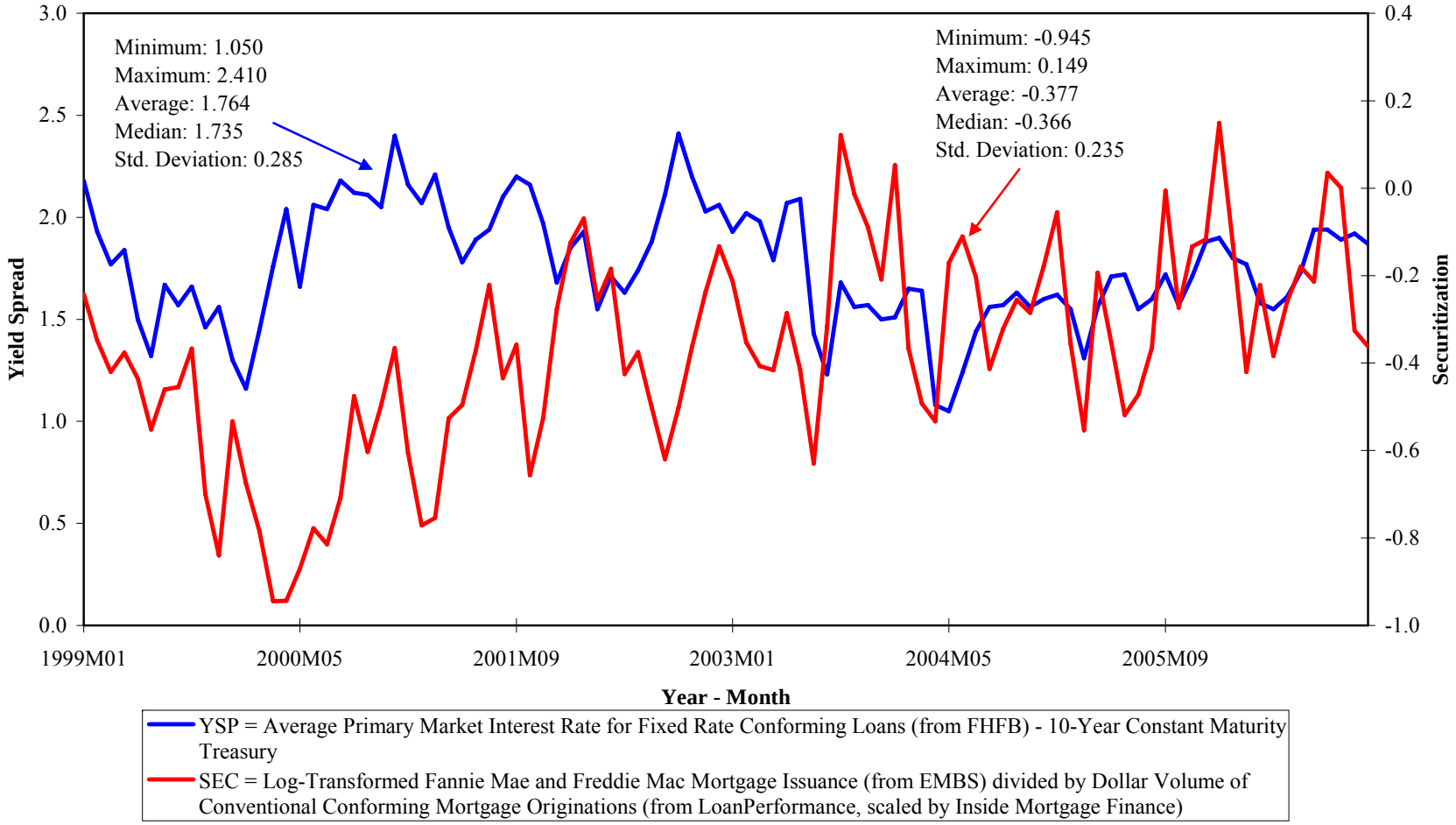
Appendix VI.A
Test 2.2
Jumbo Home Loans (Subperiod)
Correlation Coefficient: -.202



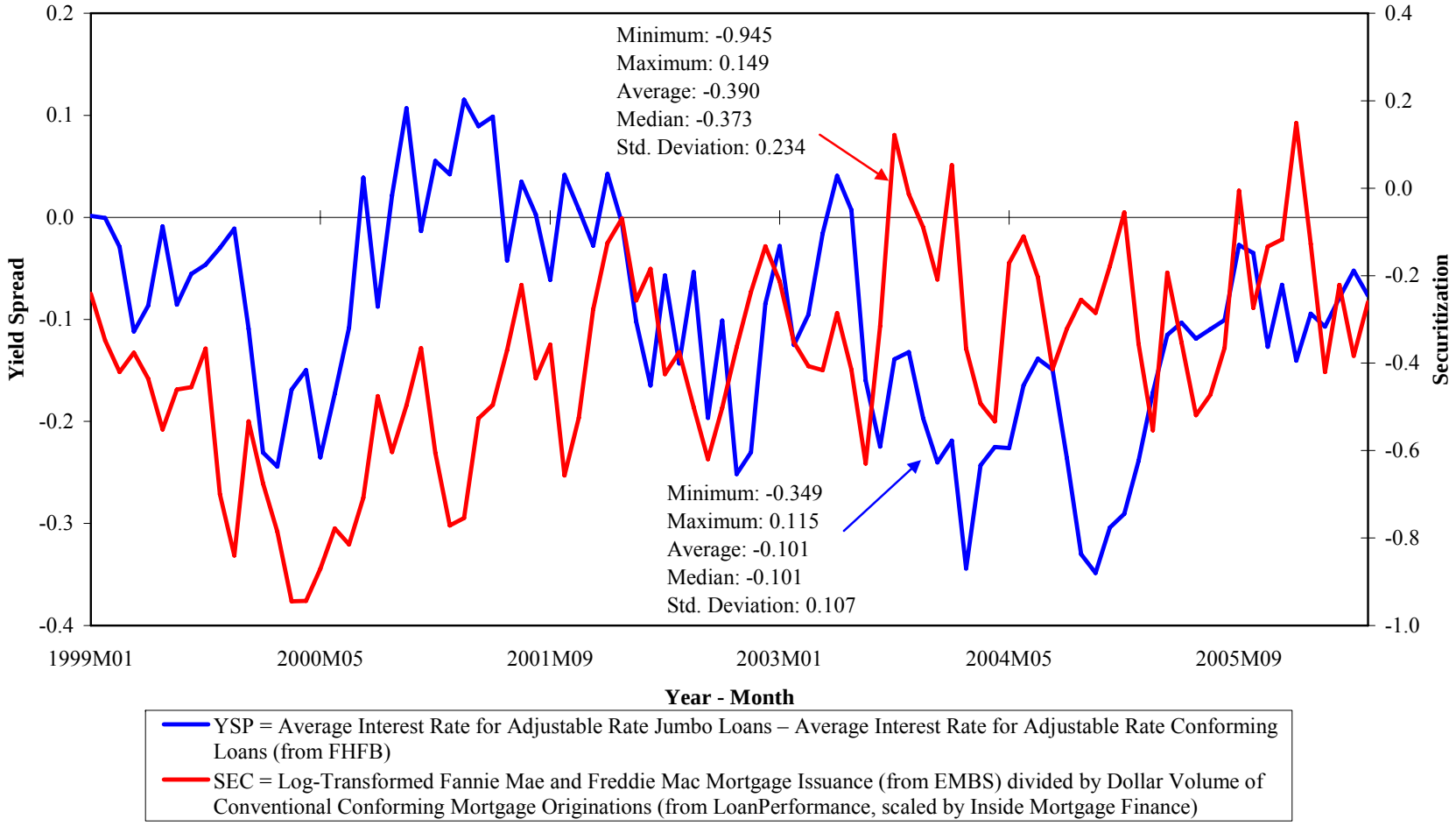
Appendix VI.A
Test 3
Conventional Conforming Home Loans (Kolari Replication)
Correlation Coefficient: .195



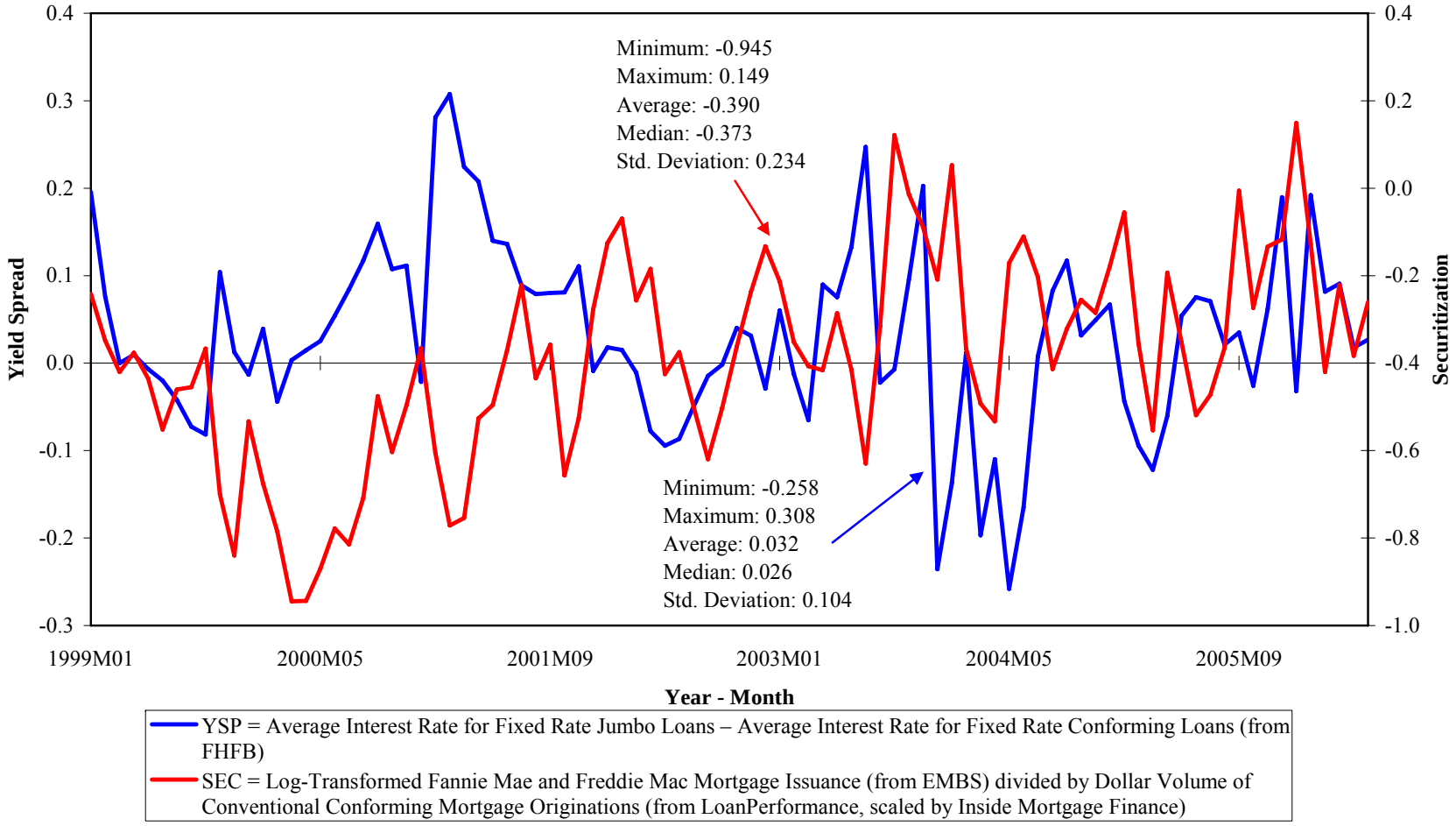
Appendix VI.A
Test 4
Conventional Conforming Home Loans
Correlation Coefficient: -.122



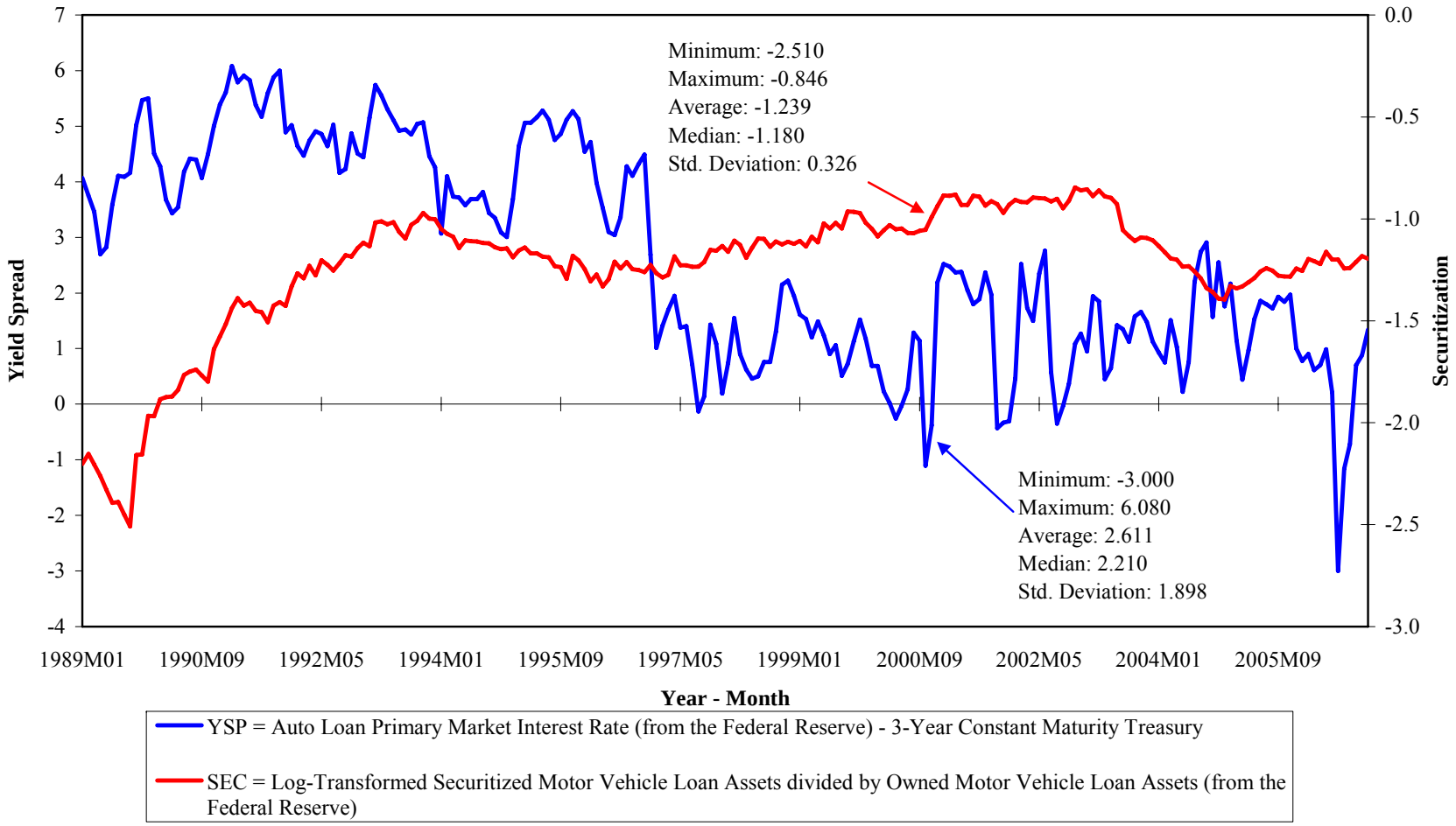
Appendix VI.A
Test 5
Adjustable Rate Jumbo-Conforming Mortgage Spread (Naranjo Replication)
Correlation Coefficient: -.163



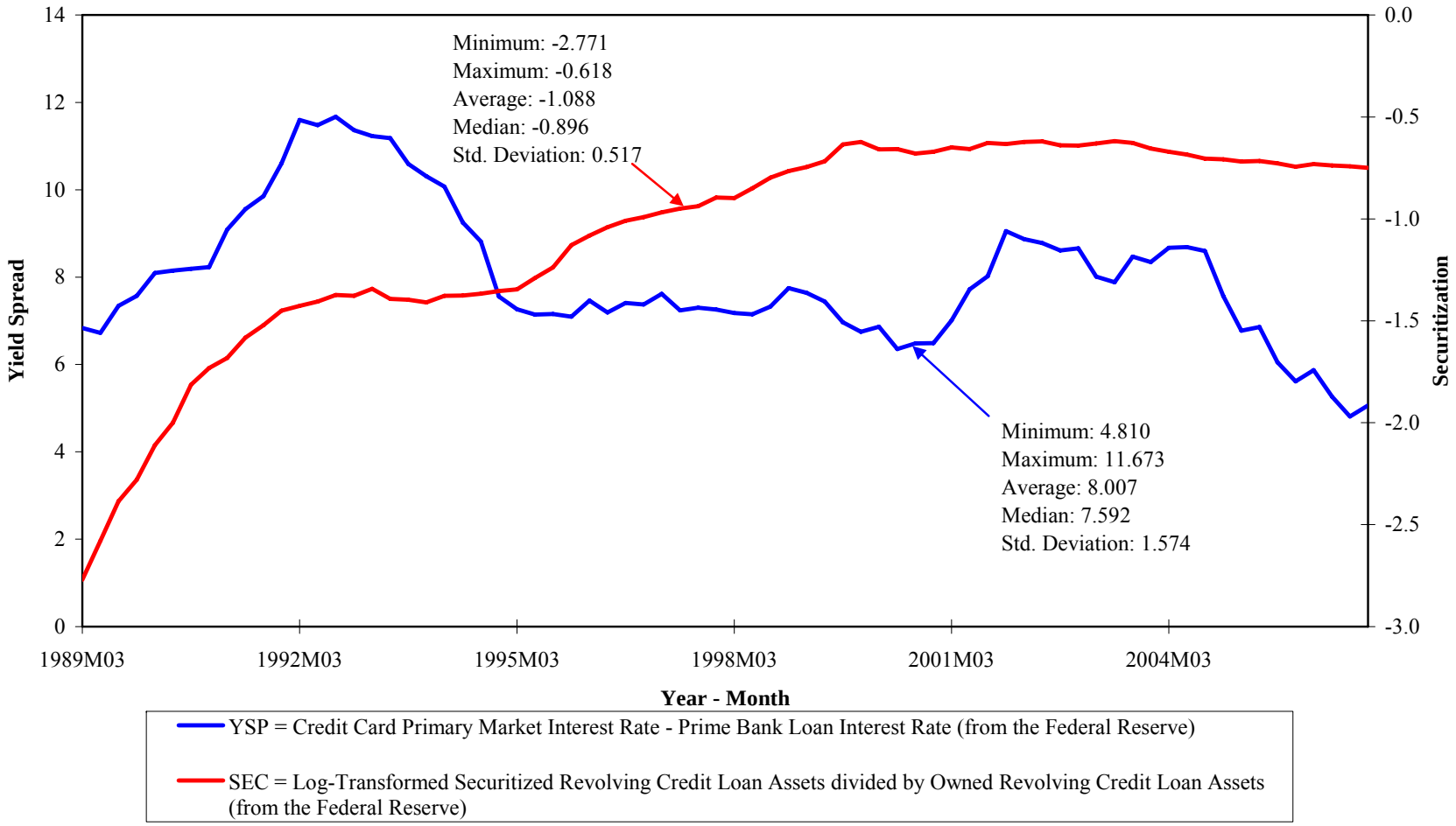
Appendix VI.A
Test 6
Fixed Rate Jumbo-Conforming Mortgage Spread (Naranjo Replication)
Correlation Coefficient: -.213



Appendix VI.A
Test 7
Auto Loans
Correlation Coefficient: -.382



Appendix VI.A
Test 8
Credit Cards
Correlation Coefficient: -.272



Appendix VI.B Results of Cost of Credit Statistical Tests

Appendix VI.B

Test # 1 Subprime
Period: 1/1999 through 12/2006
Frequency: 96 Monthly Observations

Model Specification:
YSP = Average Primary Market Interest Rate for Subprime Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Subprime Securities Issuance divided by Dollar Volume of Subprime Mortgage Originations (from LoanPerformance, scaled by Federal Reserve numbers)
DFL = Foreclosure Rate on Subprime Mortgages (from LoanPerformance)
PRS = Spread between the 10-Year Constant Maturity Treasury and the 1-Year Constant Maturity Treasury

1A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-0.84	-1.53
SEC, securitization rate	4.56 *	4.56 *
DFL, foreclosure rate	0.32	0.18
PRS, prepayment proxy	-2.52	-1.67
ΔYSP, first difference	0.68	0.79
ΔSEC, first difference	0.25	0.25
ΔDFL, first difference	0.74	0.74
ΔPRS, first difference	-1.74	-1.74

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-2.62	-2.36	0.16
SEC, securitization rate	-5.17 *	-5.17 *	0.16
DFL, foreclosure rate	-0.69	-1.02	0.19
PRS, prepayment proxy	-0.73	-0.66	0.28
ΔYSP, first difference	-7.81 *	-7.62 *	0.05 *
ΔSEC, first difference	-13.79 *	-14.01 *	0.07 *
ΔDFL, first difference	-6.22 *	-6.39 *	0.27
ΔPRS, first difference	-7.09 *	-7.02 *	0.11 *

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-1.84	-2.32	0.94
SEC, securitization rate	-1.47	-1.76	1.13
DFL, foreclosure rate	-0.99	-1.07	0.62
PRS, prepayment proxy	-0.86	-0.92	0.29 *
ΔYSP, first difference	-7.79 *	-7.63 *	0.15 *
ΔSEC, first difference	-13.86 *	-14.09 *	0.08 *
ΔDFL, first difference	-6.22 *	-6.38 *	0.26 *
ΔPRS, first difference	-6.79 *	-6.72 *	0.45 *

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

1B: Granger Causality Test (Bivariate Model)

Null Hypothesis	Probability of F Statistic (3 Lags Chosen)
SEC does not Granger Cause YSP	0.0214 *
YSP does not Granger Cause SEC	0.08037

* denotes significance at the 5% level.

1C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Default Rate (DFL) Coefficient *(p-value)*	Prepayment Proxy (PRS) Coefficient *(p-value)*	Constant *(p-value)*	Adjusted R Squared
-1.4341 *	1.4699 *	-0.4008 *	8.9681 *	0.7947
0.0002	*0.0000*	*0.0000*	*0.0000*	

* denotes significance at the 5% level.

Appendix VI.B

Test # 1 Subprime
Period: 1/1999 through 12/2006
Frequency: 96 Monthly Observations

Model Specification:
YSP = Average Primary Market Interest Rate for Subprime Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Subprime Securities Issuance divided by Dollar Volume of Subprime Mortgage Originations (from LoanPerformance, scaled by Federal Reserve numbers)
DFL = Foreclosure Rate on Subprime Mortgages (from LoanPerformance)
PRS = Spread between the 10-Year Constant Maturity Treasury and the 1-Year Constant Maturity Treasury

1D: Johansen Co-integration Test

VEC Model Specification: Intercept in the co-integrating equation and 1 lag

Panel A: Johansen's Trace Test

Eigenvalue	Likelihood Ratio	5% Critical Value	Hypothesized No. of Vectors
0.272	61.733	54.079	None *
0.159	31.840	35.193	At most 1
0.115	15.552	20.262	At most 2
0.042	4.054	9.165	At most 3

Panel B: Normalized Co-integrating Coefficients

	YSP	SEC	DFL	PRS	Constant
Coefficient	1	2.392	0.755	-0.011	-0.410
Standard Error		*(0.652)*	*(0.580)*	*(0.105)*	*(2.225)*

Co-integrating Equation: **YSP = -2.392*SEC - 0.755*DFL + 0.011*PRS + 0.41**

Appendix VI.B

Test # 1 Subprime
Period: 1/1999 through 12/2006
Frequency: 96 Monthly Observations

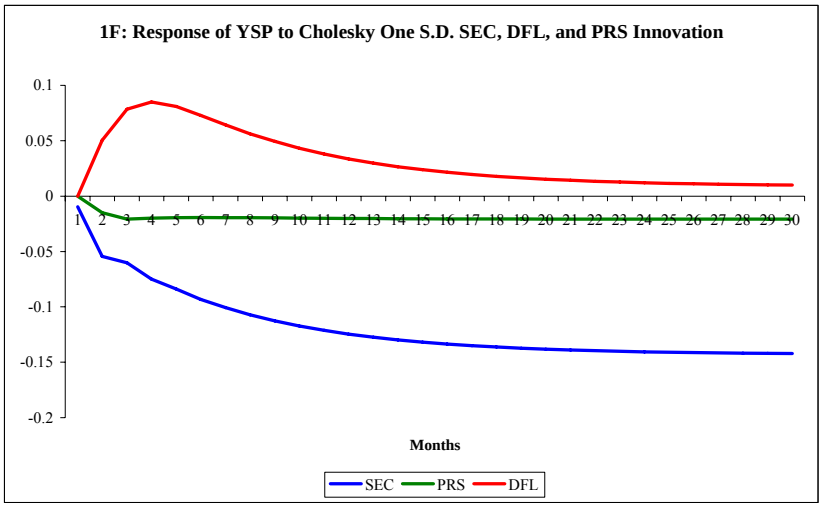
Model Specification:
YSP = Average Primary Market Interest Rate for Subprime Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Subprime Securities Issuance divided by Dollar Volume of Subprime Mortgage Originations (from LoanPerformance, scaled by Federal Reserve numbers)
DFL = Foreclosure Rate on Subprime Mortgages (from LoanPerformance)
PRS = Spread between the 10-Year Constant Maturity Treasury and the 1-Year Constant Maturity Treasury

1E: Forecast Error Variance Decomposition of the Yield Spread (YSP)

VEC Model Specification: Intercept in the co-integrating equation and 1 lag

Month Ahead	Percentage of Squared Prediction Error in YSP Explained by: *YSP*	*SEC*	*DFL*	*PRS*
1	99.82836	0.171644	0	0
2	95.51081	2.349292	1.965243	0.174657
3	92.2267	3.236747	4.21789	0.318663
4	89.38043	4.457731	5.780276	0.381561
5	87.13325	5.751793	6.688202	0.426758
6	85.17197	7.208575	7.154496	0.464957
7	83.37832	8.770451	7.349064	0.502168
8	81.66264	10.4189	7.379626	0.538831
9	79.99149	12.12129	7.312176	0.575052
10	78.3495	13.85336	7.186638	0.610499
11	76.73461	15.59277	7.027689	0.644936
12	75.14937	17.32172	6.850744	0.678168
13	73.59851	19.02583	6.665577	0.710076
14	72.08688	20.69413	6.478397	0.740598
15	70.61873	22.31842	6.293137	0.769711
16	69.1974	23.89293	6.112243	0.797427
17	67.82519	25.41385	5.937181	0.823778
18	66.50347	26.87894	5.768772	0.848811
19	65.2328	28.28721	5.607408	0.87258
20	64.01304	29.63861	5.4532	0.895147
21	62.8435	30.93385	5.306076	0.916575
22	61.72308	32.17414	5.165846	0.936928
23	60.65038	33.3611	5.032255	0.956267
24	59.62376	34.49659	4.905002	0.974654
25	58.64144	35.58265	4.783772	0.992146
26	57.70156	36.6214	4.668242	1.008797
27	56.80222	37.61502	4.558094	1.024661
28	55.94152	38.56568	4.453018	1.039785
29	55.11756	39.4755	4.352719	1.054215
30	54.32852	40.34657	4.256915	1.067993

1F: Response of YSP to Cholesky One S.D. SEC, DFL, and PRS Innovation



Appendix VI.B

Test # 2.1 Jumbo (Whole Period)
Period: 1/1999 through 6/2006
Frequency: 90 Monthly Observations

Model Specification:
YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)

2.1A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-0.95	-0.95
SEC, securitization rate	1.35	1.35
ΔYSP, first difference	0.40	0.35
ΔSEC, first difference	0.25	0.09

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-2.02	-2.02	0.16
SEC, securitization rate	-2.98	-2.96	0.18
ΔYSP, first difference	-7.74 *	-8.29 *	0.08 *
ΔSEC, first difference	-6.34 *	-10.21 *	0.10 *

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-1.90	-1.96	0.77
SEC, securitization rate	-2.66	-2.59	0.47
ΔYSP, first difference	-7.77 *	-8.32 *	0.10 *
ΔSEC, first difference	-6.42 *	-10.34 *	0.10 *

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

2.1B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (1 Lag Chosen)
SEC does not Granger Cause YSP	0.09706
YSP does not Granger Cause SEC	0.78939

* denotes significance at the 5% level.

2.1C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Constant *(p-value)*	Adjusted R Squared
-0.6851	0.0526	0.0648
0.0924	*0.9135*	

* denotes significance at the 5% level.

Appendix VI.B

Test # 2.1 Jumbo (Whole Period)
Period: 1/1999 through 6/2006
Frequency: 90 Monthly Observations

Model Specification:
YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)

2.1D: Johansen Co-integration Test

VEC Model Specification: Linear trend in the data and 5 lags

Panel A: Johansen's Trace Test

Eigenvalue	Likelihood Ratio	5% Critical Value	Hypothesized No. of Vectors
0.145	15.876	15.495	None *
0.032	2.693	3.841	At most 1

Panel B: Normalized Co-integrating Coefficients

	YSP	SEC
Coefficient	1	2.970
(Standard Error)		*(0.828)*

Co-integrating Equation: **YSP = -2.97*SEC**

Appendix VI.B

Test # 2.1 Jumbo (Whole Period)
Period: 1/1999 through 6/2006
Frequency: 90 Monthly Observations

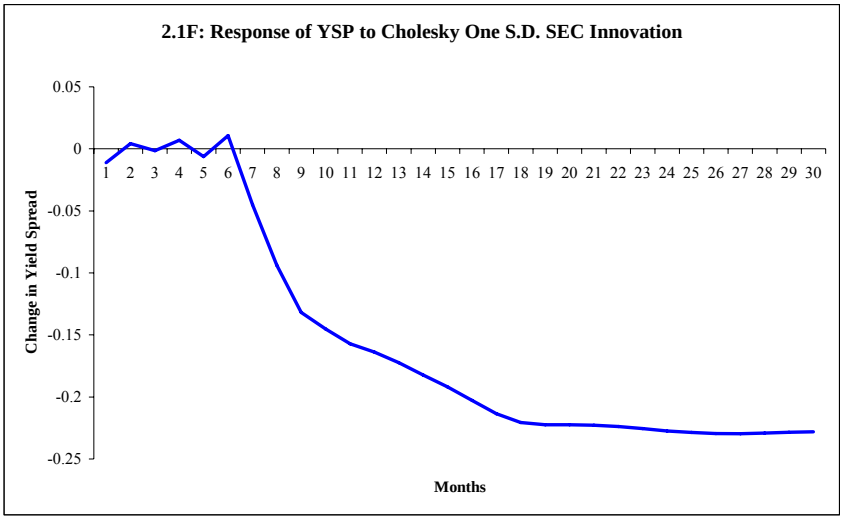
Model Specification:
YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)

2.1E: Forecast Error Variance Decomposition of the Yield Spread (YSP)

VEC Model Specification: Linear trend in the data and 5 lags

Month Ahead	Percentage of Squared Prediction Error in YSP Explained by: *YSP*	*SEC*
1	99.73006	0.269938
2	99.84923	0.150769
3	99.87386	0.126139
4	99.85298	0.14702
5	99.84479	0.155214
6	99.78979	0.210209
7	98.65572	1.34428
8	94.22119	5.778807
9	86.89275	13.10725
10	79.90008	20.09992
11	73.39487	26.60513
12	67.51852	32.48148
13	61.99025	38.00975
14	56.82248	43.17752
15	52.06834	47.93166
16	47.6414	52.3586
17	43.55209	56.44791
18	39.92936	60.07064
19	36.84494	63.15506
20	34.22657	65.77343
21	31.96071	68.03929
22	29.96132	70.03868
23	28.17986	71.82014
24	26.58837	73.41163
25	25.16405	74.83595
26	23.88662	76.11338
27	22.74053	77.25947
28	21.71209	78.28791
29	20.78541	79.21459
30	19.94385	80.05615

2.1F: Response of YSP to Cholesky One S.D. SEC Innovation



Appendix VI.B

Test # 2.2 Jumbo (Subperiod)
Period: 1/2003 through 6/2006
Frequency: 42 Monthly Observations

Model Specification:
YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)

2.2A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	0.26	4.74 *
SEC, securitization rate	-1.38	-1.38
ΔYSP, first difference	1.50	2.04
ΔSEC, first difference	-0.21	-1.10

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-3.85 *	-0.93	0.20
SEC, securitization rate	-2.66	-2.51	0.19
ΔYSP, first difference	-4.51 *	-8.39 *	0.47
ΔSEC, first difference	-4.68 *	-7.37 *	0.20

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-2.70	-2.07	0.41 *
SEC, securitization rate	-2.25	-2.26	0.41 *
ΔYSP, first difference	-3.84 *	-5.12 *	0.33 *
ΔSEC, first difference	-4.59 *	-7.22 *	0.19 *

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

2.2B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (1 Lag Chosen)
SEC does not Granger Cause YSP	0.24877
YSP does not Granger Cause SEC	0.81334

* denotes significance at the 5% level.

2.2C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Constant *(p-value)*	Adjusted R Squared
-0.3709	-0.1280	0.0168
0.1688	*0.6300*	

* denotes significance at the 5% level.

Appendix VI.B

Test # 2.2 Jumbo (Subperiod)
Period: 1/2003 through 6/2006
Frequency: 42 Monthly Observations

Model Specification:
YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)

2.2D: Johansen Co-integration Test

VEC Model Specification: Linear trend in the data and 5 lags

Panel A: Johansen's Trace Test

Eigenvalue	Likelihood Ratio	5% Critical Value	Hypothesized No. of Vectors
0.691	42.879	15.495	None *
0.016	0.568	3.841	At most 1

Panel B: Normalized Co-integrating Coefficients

	YSP	SEC
Coefficient	1	1.240
(Standard Error)		*(0.256)*

Co-integrating Equation: **YSP = -1.24*SEC**

Appendix VI.B

Test # 2.2 Jumbo (Subperiod)
Period: 1/2003 through 6/2006
Frequency: 42 Monthly Observations

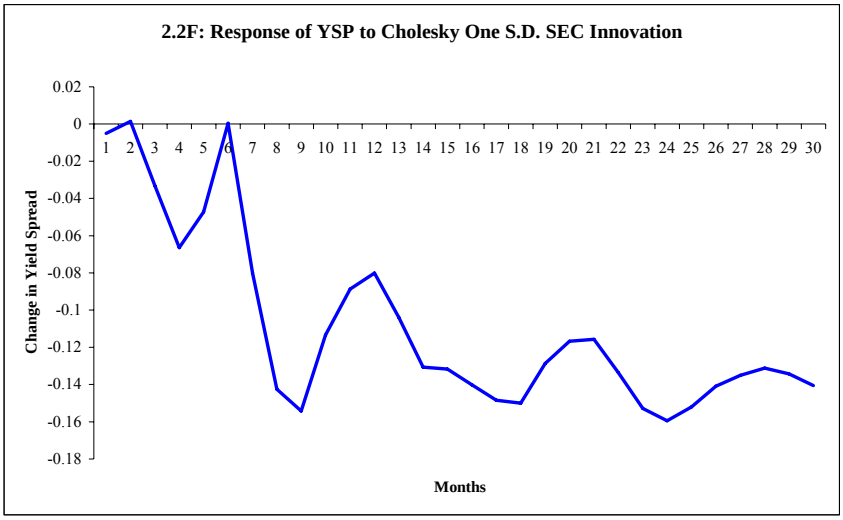
Model Specification:
YSP = Weighted Average Coupon on Jumbo Loans (from LoanPerformance) - 10-Year Constant Maturity Treasury
SEC = Dollar Volume of Jumbo Securities Issuance divided by Dollar Volume of Jumbo Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance numbers)

2.2E: Forecast Error Variance Decomposition of the Yield Spread (YSP)

VEC Model Specification: Linear trend in the data and 5 lags

Month Ahead	Percentage of Squared Prediction Error in YSP Explained by: *YSP*	*SEC*
1	99.82934	0.170664
2	99.87827	0.121732
3	95.23853	4.761468
4	80.37616	19.62384
5	74.78281	25.21719
6	74.86125	25.13875
7	62.02068	37.97932
8	40.68004	59.31996
9	29.20229	70.79771
10	26.622	73.378
11	25.60017	74.39983
12	24.2144	75.7856
13	22.30899	77.69101
14	19.6292	80.3708
15	17.53882	82.46118
16	15.84044	84.15956
17	14.41778	85.58222
18	13.13221	86.86779
19	12.29373	87.70627
20	11.64794	88.35206
21	11.068	88.932
22	10.37984	89.62016
23	9.602629	90.39737
24	8.941153	91.05885
25	8.497805	91.50219
26	8.145787	91.85421
27	7.799548	92.20045
28	7.477132	92.52287
29	7.165563	92.83444
30	6.855958	93.14404

2.2F: Response of YSP to Cholesky One S.D. SEC Innovation



Appendix VI.B

Test # 3 Conventional Conforming Home Loans (Kolari Replication)
Period: 1/1986 through 12/1997
Frequency: 144 Monthly Observations

Model Specification:
YSP = Average Primary Market Interest Rate for Fixed Rate Conforming Loans (from FHFB) - 10-Year Constant Maturity Treasury
SEC = Fannie Mae and Freddie Mac Mortgage Issuance divided by Dollar Volume of Mortgage Originations (from Inside Mortgage Finance)

3A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-1.41	-0.53
SEC, securitization rate	1.18	0.80
ΔYSP, first difference	0.23	0.64
ΔSEC, first difference	0.01	-0.11

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-3.01	-3.93 *	0.08 *
SEC, securitization rate	-3.31	-5.32 *	0.15
ΔYSP, first difference	-12.10 *	-9.86 *	0.04 *
ΔSEC, first difference	-12.29 *	-25.24 *	0.28

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-3.04 *	-3.67 *	0.30 *
SEC, securitization rate	-3.22 *	-5.12 *	0.28 *
ΔYSP, first difference	-12.13 *	-9.90 *	0.04 *
ΔSEC, first difference	-12.34 *	-25.35 *	0.29 *

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

3B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (2 Lags Chosen)
SEC does not Granger Cause YSP	0.57465
YSP does not Granger Cause SEC	0.04449 *

* denotes significance at the 5% level.

3C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Constant *(p-value)*	Adjusted R Squared
0.3244 *	2.0384 *	0.0311
0.0380	*0.0000*	

* denotes significance at the 5% level.

Appendix VI.B

Test # 3 Conventional Conforming Home Loans (Kolari Replication)
Period: 1/1986 through 12/1997
Frequency: 144 Monthly Observations

Model Specification:
YSP = Average Primary Market Interest Rate for Fixed Rate Conforming Loans (from FHFB) - 10-Year Constant Maturity Treasury
SEC = Fannie Mae and Freddie Mac Mortgage Issuance divided by Dollar Volume of Mortgage Originations (from Inside Mortgage Finance)

3D: Johansen Co-integration Test

VEC Model Specification: No intercepts and no trends and no lags

Panel A: Johansen's Trace Test

Eigenvalue	Likelihood Ratio	5% Critical Value	Hypothesized No. of Vectors
0.097	15.079	12.321	None *
0.004	0.505	4.130	At most 1

Panel B: Normalized Co-integrating Coefficients

	YSP	SEC
Coefficient	1	1.520
(Standard Error)		*(0.149)*

Co-integrating Equation: **YSP = -1.52*SEC**

Appendix VI.B

Test # 3 Conventional Conforming Home Loans (Kolari Replication)
Period: 1/1986 through 12/1997
Frequency: 144 Monthly Observations

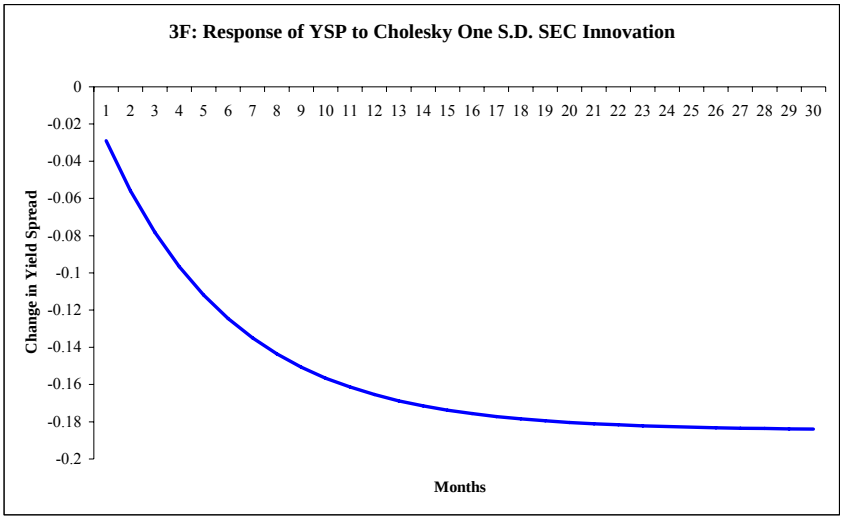
Model Specification:
YSP = Average Primary Market Interest Rate for Fixed Rate Conforming Loans (from FHFB) - 10-Year Constant Maturity Treasury
SEC = Fannie Mae and Freddie Mac Mortgage Issuance divided by Dollar Volume of Mortgage Originations (from Inside Mortgage Finance)

3E: Forecast Error Variance Decomposition of the Yield Spread (YSP)

VEC Model Specification: No intercepts and no trends and no lags

Month Ahead	Percentage of Squared Prediction Error in YSP Explained by: *YSP*	*SEC*
1	98.59376	1.406236
2	96.43681	3.563189
3	93.63277	6.367225
4	90.42549	9.574508
5	87.0213	12.9787
6	83.5788	16.4212
7	80.21008	19.78992
8	76.98782	23.01218
9	73.95424	26.04576
10	71.12958	28.87042
11	68.51912	31.48088
12	66.11853	33.88147
13	63.91771	36.08229
14	61.90341	38.09659
15	60.06105	39.93895
16	58.37579	41.62421
17	56.83322	43.16678
18	55.41976	44.58024
19	54.12285	45.87715
20	52.93101	47.06899
21	51.83386	48.16614
22	50.82204	49.17796
23	49.88718	50.11282
24	49.02179	50.97821
25	48.21918	51.78082
26	47.47338	52.52662
27	46.77908	53.22092
28	46.13154	53.86846
29	45.52651	54.47349
30	44.96022	55.03978

3F: Response of YSP to Cholesky One S.D. SEC Innovation



Appendix VI.B

Test # 4 Conventional Conforming Home Loans (Kolari Extension)
Period: 1/1999 through 12/2006
Frequency: 96 Monthly Observations

Model Specification:
YSP = Average Primary Market Interest Rate for Fixed Rate Conforming Loans (from FHFB) - 10-Year Constant Maturity Treasury
SEC = Fannie Mae and Freddie Mac Mortgage Issuance (from EMBS) divided by Dollar Volume of
Conventional Conforming Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance)

4A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-0.32	-0.32
SEC, securitization rate	3.16 *	3.16 *
ΔYSP, first difference	0.29	0.28
ΔSEC, first difference	0.07	0.13

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-3.70 *	-3.70 *	0.12 *
SEC, securitization rate	-5.24 *	-5.11 *	0.09 *
ΔYSP, first difference	-9.10 *	-11.80 *	0.06 *
ΔSEC, first difference	-9.22 *	-18.85 *	0.22

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-3.74 *	-3.74 *	0.26 *
SEC, securitization rate	-3.99 *	-3.90 *	0.89
ΔYSP, first difference	-9.15 *	-11.91 *	0.09 *
ΔSEC, first difference	-9.28 *	-19.14 *	0.22 *

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

4B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (1 Lag Chosen)
SEC does not Granger Cause YSP	0.42804
YSP does not Granger Cause SEC	0.10593

* denotes significance at the 5% level.

4C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Constant *(p-value)*		Adjusted R Squared
-0.1475	1.7088	*	0.0043
0.3567	*0.0000*		

* denotes significance at the 5% level.

Appendix VI.B

Test # 5 Adjustable Rate Jumbo-Conforming Mortgage Spread (Naranjo Replication)
Period: 1/1999 through 6/2006
Frequency: 90 Monthly Observations

Model Specification:
YSP = Average Interest Rate for Adjustable Rate Jumbo Loans – Average Interest Rate for Adjustable Rate Conforming Loans (from FHFB)
SEC = Fannie Mae and Freddie Mac Mortgage Issuance (from EMBS) divided by Dollar Volume of
Conventional Conforming Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance)

5A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-1.07	-1.07
SEC, securitization rate	3.04	3.04
ΔYSP, first difference	0.41	0.41
ΔSEC, first difference	0.20	0.25

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-3.63 *	-3.63 *	0.10 *
SEC, securitization rate	-5.06 *	-4.97 *	0.10 *
ΔYSP, first difference	-11.50 *	-12.84 *	0.08 *
ΔSEC, first difference	-7.84 *	-20.28 *	0.50

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-3.48 *	-3.48 *	0.42 *
SEC, securitization rate	-3.89 *	-3.80 *	0.79
ΔYSP, first difference	-11.55 *	-12.85 *	0.10 *
ΔSEC, first difference	-7.88 *	-20.55 *	0.50

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

5B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (1 Lag Chosen)
SEC does not Granger Cause YSP	0.50056
YSP does not Granger Cause SEC	0.72933

* denotes significance at the 5% level.

5C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Constant *(p-value)*		Adjusted R Squared
-0.0744	-0.1301	*	0.0155
0.3131	*0.0001*		

* denotes significance at the 5% level.

Appendix VI.B

Test # 6 Fixed Rate Jumbo-Conforming Mortgage Spread (Naranjo Replication)
Period: 1/1999 through 6/2006
Frequency: 90 Monthly Observations

Model Specification:
YSP = Average Interest Rate for Fixed Rate Jumbo Loans – Average Interest Rate for Fixed Rate Conforming Loans (from FHFB)
SEC = Fannie Mae and Freddie Mac Mortgage Issuance (from EMBS) divided by Dollar Volume of
Conventional Conforming Mortgage Originations (from LoanPerformance, scaled by Inside Mortgage Finance)

6A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-0.38	-0.38
SEC, securitization rate	3.04	3.04
ΔYSP, first difference	0.17	0.08
ΔSEC, first difference	0.20	0.25

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-5.39 *	-5.53 *	0.08 *
SEC, securitization rate	-5.06 *	-4.97 *	0.10 *
ΔYSP, first difference	-9.90 *	-16.67 *	0.06 *
ΔSEC, first difference	-7.84 *	-20.28 *	0.50

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-5.41 *	-5.55 *	0.16 *
SEC, securitization rate	-3.89 *	-3.80 *	0.79
ΔYSP, first difference	-9.96 *	-16.78 *	0.08 *
ΔSEC, first difference	-7.88 *	-20.55 *	0.50

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

6B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (1 Lag Chosen)
SEC does not Granger Cause YSP	0.96495
YSP does not Granger Cause SEC	0.92422

* denotes significance at the 5% level.

6C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Constant *(p-value)*	Adjusted R Squared
-0.0950	-0.0051	0.0345
0.1202	*0.8384*	

* denotes significance at the 5% level.

Appendix VI.B

Test # 7 Auto Loans
Period: 1/1989 through 12/2006
Frequency: 216 Monthly Observations

Model Specification:
YSP = Auto Loan Primary Market Interest Rate (from the Federal Reserve) - 3-Year Constant Maturity Treasury
SEC = Securitized Motor Vehicle Loan Assets divided by Owned Motor Vehicle
Loan Assets (from the Federal Reserve)

7A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-3.30 *	-3.30 *
SEC, securitization rate	-0.61	-0.61
ΔYSP, first difference	-0.02	-0.09
ΔSEC, first difference	-2.29	-2.29

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-4.27 *	-4.17 *	0.18
SEC, securitization rate	-2.25	-2.26	0.28
ΔYSP, first difference	-12.79 *	-16.07 *	0.06 *
ΔSEC, first difference	-15.52 *	-15.50 *	0.08 *

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-2.18	-2.24	1.47
SEC, securitization rate	-3.16 *	-3.12 *	0.80
ΔYSP, first difference	-12.82 *	-16.13 *	0.07 *
ΔSEC, first difference	-15.20 *	-15.25 *	0.50

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

7B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (1 Lag Chosen)
SEC does not Granger Cause YSP	0.0966
YSP does not Granger Cause SEC	0.72736

* denotes significance at the 5% level.

7C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*		Constant *(p-value)*	Adjusted R Squared
-2.2244	*	-0.1444	0.1419
0.0001		*0.8472*	

* denotes significance at the 5% level.

Appendix VI.B

Test # 7 Auto Loans
Period: 1/1989 through 12/2006
Frequency: 216 Monthly Observations

Model Specification:
YSP = Auto Loan Primary Market Interest Rate (from the Federal Reserve) - 3-Year Constant Maturity Treasury
SEC = Securitized Motor Vehicle Loan Assets divided by Owned Motor Vehicle
Loan Assets (from the Federal Reserve)

7D: Johansen Co-integration Test

VEC Model Specification: Linear trend in the data, and both an intercept and a trend in the co-integrating equation and 5 lags

Panel A: Johansen's Trace Test

Eigenvalue	Likelihood Ratio	5% Critical Value	Hypothesized No. of Vectors
0.125	35.257	25.872	None *
0.034	7.290	12.518	At most 1

Panel B: Normalized Co-integrating Coefficients

	YSP	SEC	Trend
Coefficient	1	6.355	0.031
(Standard Error)		*(1.742)*	*(0.009)*

Co-integrating Equation: **YSP = -6.355*SEC - 0.031*Trend**

Appendix VI.B

Test # 7 Auto Loans
Period: 1/1989 through 12/2006
Frequency: 216 Monthly Observations

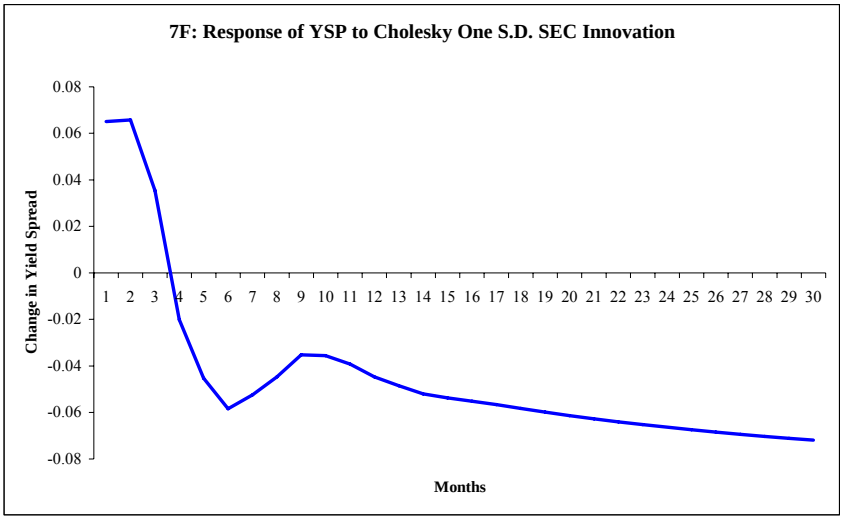
Model Specification:
YSP = Auto Loan Primary Market Interest Rate (from the Federal Reserve) - 3-Year Constant Maturity Treasury
SEC = Securitized Motor Vehicle Loan Assets divided by Owned Motor Vehicle
Loan Assets (from the Federal Reserve)

7E: Forecast Error Variance Decomposition of the Yield Spread (YSP)

VEC Model Specification: Linear trend in the data, and both an intercept and a trend in the co-integrating equation and 5 lags

Month Ahead	Percentage of Squared Prediction Error in YSP Explained by: *YSP*	*SEC*
1	99.00419	0.995807
2	98.98873	1.011268
3	99.07153	0.928469
4	99.12671	0.873286
5	99.05718	0.942825
6	98.88001	1.119991
7	98.77361	1.226388
8	98.74497	1.255025
9	98.7705	1.229495
10	98.78041	1.219595
11	98.77175	1.228254
12	98.74036	1.259638
13	98.69399	1.306007
14	98.63539	1.364614
15	98.57459	1.425408
16	98.5118	1.488196
17	98.44659	1.553407
18	98.37772	1.622284
19	98.30631	1.693691
20	98.23236	1.767638
21	98.15671	1.843289
22	98.07986	1.920138
23	98.00223	1.997772
24	97.92376	2.076241
25	97.84464	2.155361
26	97.76505	2.234952
27	97.68522	2.314779
28	97.60535	2.394649
29	97.52565	2.474352
30	97.44625	2.553751

7F: Response of YSP to Cholesky One S.D. SEC Innovation



Appendix VI.B

Test # 8 Credit Cards
Period: Q1 1989 through Q4 2006
Frequency: 72 Quarterly Observations

Model Specification:
YSP = Credit Card Primary Market Interest Rate - Prime Bank Loan Interest Rate (from the Federal Reserve)
SEC = Securitized Revolving Credit Loan Assets divided by Owned Revolving Credit Loan Assets (from the Federal Reserve)

8A: Augmented Dickey-Fuller and Phillips-Perron Unit-Root Tests and Kwiatkowski-Phillips-Schmidt-Shin Stationarity Test

Variable	PP Trend Statistic	ADF Trend Statistic
YSP, yield spread	-2.57	-2.04
SEC, securitization rate	1.12	0.79
ΔYSP, first difference	-1.41	-1.41
ΔSEC, first difference	-2.59	-2.59

* denotes significance at the 5% level.

Model Specification: Trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-2.68	-2.23	0.07 *
SEC, securitization rate	-3.13	-4.15 *	0.24
ΔYSP, first difference	-5.98 *	-6.28 *	0.09 *
ΔSEC, first difference	-4.99 *	-4.84 *	0.13 *

Model Specification: No trend and automatic lag selection

Variable	ADF Statistics	PP Statistics	KPSS Statistics
YSP, yield spread	-1.88	-1.46	0.39 *
SEC, securitization rate	-2.34	-6.50 *	0.98
ΔYSP, first difference	-5.77 *	-6.05 *	0.19 *
ΔSEC, first difference	-3.85 *	-4.03 *	0.68

* denotes rejection of the null hypothesis that the series has a unit root at the 5% level. In the case of KPSS, denotes failure to reject the null hypothesis that the series is stationary.

8B: Granger Causality Test

Null Hypothesis	Probability of F Statistic (2 Lags Chosen)	
SEC does not Granger Cause YSP	0.04247	*
YSP does not Granger Cause SEC	0.00056	*

* denotes significance at the 5% level.

8C: Ordinary Least Squares Regression With Newey-West Standard Error Correction

Securitization (SEC) Coefficient *(p-value)*	Constant *(p-value)*		Adjusted R Squared
-0.8280	7.1057	*	0.0607
0.2380	*0.0000*		

* denotes significance at the 5% level.

Appendix VI.B

Test # 8 Credit Cards
Period: Q1 1989 through Q4 2006
Frequency: 72 Quarterly Observations

Model Specification:
YSP = Credit Card Primary Market Interest Rate - Prime Bank Loan Interest Rate (from the Federal Reserve)
SEC = Securitized Revolving Credit Loan Assets divided by Owned Revolving Credit Loan Assets (from the Federal Reserve)

8D: Johansen Co-integration Test

VEC Model Specification: Intercept in the co-integrating equation and 4 lags

Panel A: Johansen's Trace Test

Eigenvalue	Likelihood Ratio	5% Critical Value	Hypothesized No. of Vectors
0.220	22.219	20.262	None *
0.080	5.600	9.165	At most 1

Panel B: Normalized Co-integrating Coefficients

	YSP	SEC	Constant
Coefficient	1	5.412	-3.941
(Standard Error)		*(0.798)*	*(0.683)*

Co-integrating Equation: **YSP = -5.412*SEC + 3.941**

Appendix VI.B

Test # 8 Credit Cards
Period: Q1 1989 through Q4 2006
Frequency: 72 Quarterly Observations

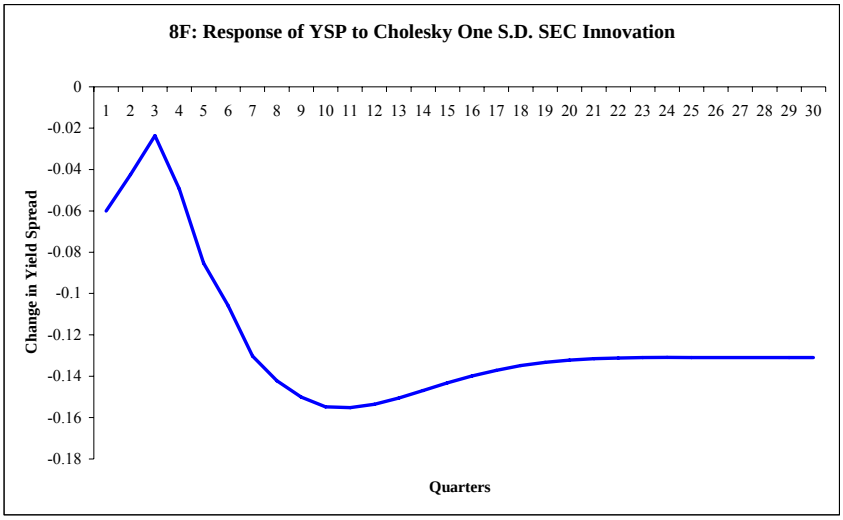
Model Specification:
YSP = Credit Card Primary Market Interest Rate - Prime Bank Loan Interest Rate (from the Federal Reserve)
SEC = Securitized Revolving Credit Loan Assets divided by Owned Revolving Credit Loan Assets (from the Federal Reserve)

8E: Forecast Error Variance Decomposition of the Yield Spread (YSP)

VEC Model Specification: Intercept in the co-integrating equation and 4 lags

Quarter Ahead	Percentage of Squared Prediction Error in YSP Explained by: *YSP*	*SEC*
1	97.97163	2.028369
2	98.7449	1.2551
3	99.25634	0.743661
4	99.36463	0.635374
5	99.16945	0.830546
6	98.92336	1.076642
7	98.58939	1.410614
8	98.26094	1.73906
9	97.94863	2.051373
10	97.65356	2.346437
11	97.38985	2.61015
12	97.15799	2.84201
13	96.95695	3.043049
14	96.78513	3.214869
15	96.63831	3.361692
16	96.51255	3.487445
17	96.40422	3.595783
18	96.3098	3.690203
19	96.22644	3.773559
20	96.15179	3.848211
21	96.08395	3.916048
22	96.02151	3.978493
23	95.96339	4.036609
24	95.90884	4.091162
25	95.85731	4.142686
26	95.80845	4.19155
27	95.76199	4.238009
28	95.71776	4.282239
29	95.67562	4.324376
30	95.63547	4.364529

8F: Response of YSP to Cholesky One S.D. SEC Innovation



VII. The Impact of Securitization on the Availability of Credit

A. Introduction

Given the current credit crisis and the ongoing debate on the role and future of securitization, it is important to evaluate how the secondary market affects the amount of mortgage financing available to households, especially in underserved areas and also examine the role of the agency and non-agency sectors under different business and macroeconomic conditions.

Few academic articles have empirically examined the effects of securitization on availability of credit, and the ones that did focused on the role of the Government-Sponsored Enterprises ("GSEs"). For example, Ambrose and Thibodeau (2004) assess whether the affordable housing goals set for GSEs have actually resulted in greater availability of credit. They examine whether borrowers in underserved areas receive more mortgage credit, measured as the dollar volume of originated loans between 1995 and 1999, after controlling for various local economic factors. [163] They find that lenders seem to have increased the supply of mortgage credit in metropolitan areas with higher proportions of borrowers from underserved tracts, though the result seems driven mainly by 1998 data.

Similarly, Bostic and Gabriel (2005) examine the effect of the GSE's purchase activity on local housing markets in California. Their findings suggest the importance of GSE purchases among low-income neighborhoods in achieving higher home ownership rate, although these GSE purchases may have to pass a certain threshold for their impact to materialize. Passmore, Sparks, and Ingpen (2002) find that GSEs generally lower mortgage rates in the primary markets.

In this study, we examine the effect of secondary market activity on the amount of mortgage credit available. Our study contributes to the current literature in several ways. First,

[163] The U.S. Department of Housing and Urban Development ("HUD") currently assigns underserved designations as part of its GSE housing goals to census tracts that meet either of the following criteria: (i) median income at or below 120% of the median income of the metropolitan area and a minority population of 30% or larger, or (ii) median income at or below 90% of median income of the metropolitan area. See HUD's "2006 Underserved Areas File" within the Geographically Targeted Goal Data available here: <http://www.huduser.org/datasets/gse.html>

we delineate the effects of agency and non-agency purchase activity on credit availability. We understand there are no prior empirical studies which examine the impact of the non-agency activity on credit availability. As of 2006, the non-agency sector accounted for over 70% of secondary market purchases.[164] Second, we construct a unique panel database using data from HMDA, the census, LoanPerformance and other sources to take into account the credit characteristics of the borrowers as well as demographic and housing characteristics for each metropolitan statistical area from 2000 to 2006. Finally, our study uses a more recent time period than existing literature on this subject. Thus the findings would be more relevant in today's environment, as compared to the existing studies which use data from the 1990s.

Our empirical analysis shows that increases in secondary market activity helps increase the amount of mortgage credit per capita, with the non-agency sector displaying a stronger impact in recent years. Our fixed-effects panel regressions control for the volatility of housing prices, mortgage yield spreads, shares of jumbo loans, new homes, no fees loans, credit characteristics of the borrowers using FICO scores and demographics including age, income and unemployment. The model suggests that a 10% increase in the secondary market purchase rate would increase mortgage loans per capita by 6.43% for a given Treasury rate of 4.5%, for example. The results also suggest that secondary market activities help increase credit availability to a greater extent in lower interest rate environments. Our results are robust to using a two-stage specification to address the potential endogeneity of the yield spreads and loan volume.

In addition to econometric analysis, we also document the growth in the dollar volume of loans originated in underserved areas as well as the growth in the share of underserved loans sold to the secondary market.

Section B details the key variables and methodology utilized in the study and Section C lists the model specifications. Section D describes the key results and their meaning in light of the crisis and is followed by the conclusion. The appendices provide summary tables of the variables and a brief overview of the main sources used.

[164] See Appendix VII.B – the share of non-agency purchasers of total loans sold to the secondary market has grown from 40% in 1990 to 74% in 2006. This represents a dollar volume increase from $57 billion to $1,225 billion.

B. Data and Methodology

Because there is no single data source for the information required in this study, it is necessary to compile data from various sources. We collect data on mortgage lending from various sources including the Home Mortgage Disclosure Act ("HMDA"), the Monthly Interest Rate Survey by the Federal Housing Finance Board ("FHFB"), the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, the U.S. Department of Housing and Urban Development ("HUD"), the Office of Federal Housing Enterprise Oversight ("OFHEO"), LoanPerformance and others. The variables are collected at the Metropolitan Statistical Area ("MSA") level.[165] The final dataset that we construct incorporates key information for each MSA, such as average mortgage amount, mortgage rates, loan characteristics, borrower characteristics, as well as income and age, during the period 2000 to 2006. It is a unique database that we constructed for this study.

A summary of all the data variables and their sources is in Appendix VII.C. Appendix VII.D details the overall summary statistics of these variables. A brief overview of HMDA, the primary source of many variables, is provided in Appendix VII.F. For more details on the matching of data from different sources at the MSA level, see Appendix VII.G.

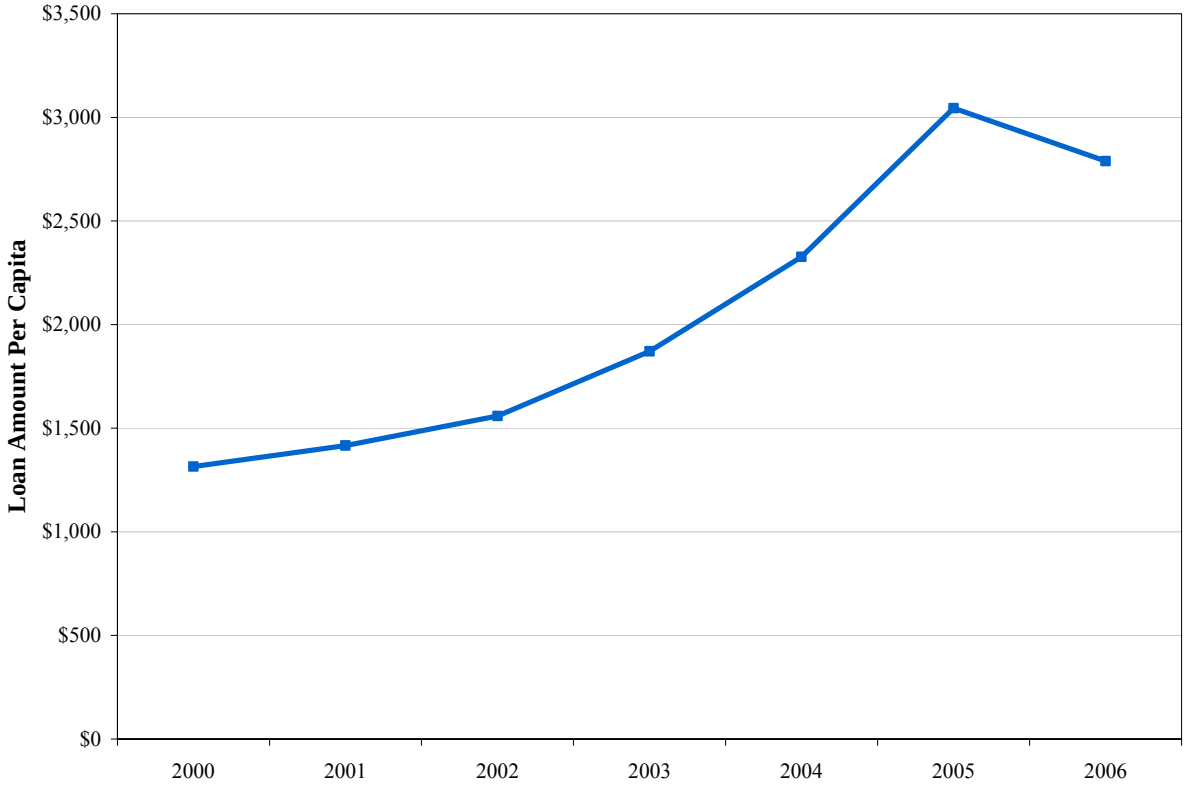
Descriptions of the main variables used in the study follow.

The loan amount per capita. This is the dependent variable. It is calculated as the total loan volume originated in each MSA (obtained from the HMDA database), divided by the MSA population (obtained from the U.S. Census Bureau).[166] This per capita measure of credit availability is intended to control for the difference in size across MSAs. The yearly averages of the loan amounts per capita are shown below.

[165] See OMB Bulletin No. 03-04, released June 6, 2003; <http://www.whitehouse.gov/omb/bulletins/b03-04.html>.

[166] The MSA total loan volume was calculated from HMDA based on conventional, single-family home purchases (i.e., excluding refinancing and home improvement loans) with amounts between the 1st and 99th percentiles of the loan amount distribution. These parameters are incorporated at the loan level in the creation of all HMDA variables.

Figure VII.1. Loan Amount Per Capita by Year (Averaged Across All MSAs), 2000 - 2006



The independent variables are the following:

Secondary Market Purchase Rate. The loan volume sold to the secondary market (in the same calendar year) as defined by HMDA in each MSA is divided by the total loan amount originated in the same MSA to obtain the purchase rate.

Agency Purchase Rate. Apart from the overall secondary market activity, we review the individual contributions of the agency and non-agency sectors. Agency-purchased loans in HMDA are identified as those with purchaser codes for Fannie Mae, Freddie Mac, Farmer Mac, or Ginnie Mae. Again, the share of these agency-purchased loans as a percentage of the total loan volume in each MSA is used to calculate the agency purchase rate.

Non-Agency Purchase Rate. The non-agency purchase rate is based on HMDA loan volume associated with all purchasers other than those assigned to an agency (purchaser categories include private securitization, commercial bank, savings bank or savings association, life insurance company, credit union, mortgage bank, finance company, or affiliate institution).

To alleviate simultaneity concerns, we use lagged purchase rates; thus, we are assessing the impact of last year's purchase rates on this year's mortgage credit extended per capita.

As we expect the secondary market purchase rates to vary in different interest rate environments, we add an interaction term between the lagged secondary market purchase rates and the current year's average annual 10-year Constant-Maturity Treasury Rate.

The Effective Mortgage Rate. The mortgage rate is a key determinant of credit quantity. We use the effective mortgage rate, instead of the contract rate, to take into account points and fees in addition to the interest rate on the loan and make loans with different rate terms comparable. We use the effective rate per MSA per year.[167]

The Mortgage Yield Spread. This is the difference between mortgage rates and comparable government securities. The yield spread controls for business cycles and rate movements that are solely attributable to changes in the overall interest rate environment. More specifically, the yield spread is calculated as the difference between each MSA's effective mortgage rate for each year and the average annual 10-year Constant-Maturity Treasury Rate (obtained from the Federal Reserve).

Share of Borrowers in Underserved Areas. Another factor affecting the quantity of credit is the underserved status of the area. HUD designates an underserved status to certain geographic areas that are targeted as part of the affordable housing goals set for GSEs. As part of these goals, GSEs are tasked with meeting certain levels of mortgage purchases from loans originated in underserved areas as a way of encouraging mortgage lending in those areas. As such, growth in mortgage credit available in an MSA can be partially attributed to the share of loans originated in underserved areas. We identify HMDA loans as originating in an underserved area if they are from a census tract designated by HUD as underserved.

Local, demographic and economic conditions also affect the lending decision and therefore need to be controlled for in our model. For example, in areas with strong economic prospects and high household income levels, lenders tend to be more willing to extend credit

[167] Effective mortgage rates are obtained from the Federal Housing Finance Board's ("FHFB") Monthly Interest Rate Survey ("MIRS"). The average rate per MSA is calculated using weights assigned by the FHFB based on the lender type and geographic composition in HMDA.

than areas with fluctuating housing markets and low household income levels. We use the several variables to control for demographics, including:

MSA Median Family Income. Income is a key factor in determining the amount of mortgage credit extended, as it represents the ability of borrowers to repay the loans. In areas with high average income, it is expected that more credit could be extended. We use the annual estimates of median family income for each MSA as provided by HUD.

MSA Median Age. Age is an important demographic factor in the housing purchase decision and thus could help explain the quantity of mortgage credit. We calculate the median age of an MSA using the annual American Community Survey (from the U.S. Census Bureau).[168]

MSA Unemployment Rate. The local unemployment rate serves as an important indication of the economic well-being of the area and should impact the amount of credit lenders would be willing to supply. We review monthly data on the labor force and unemployment levels for each MSA from the Bureau of Labor Statistics ("BLS") to calculate an annual unemployment rate for each MSA.

Annual Growth in the Housing Price Index ("HPI"). The Office of Federal Housing Enterprise Oversight ("OFHEO") provides quarterly data on home prices at the MSA-level. The area's home price appreciation is another key indicator of the underlying economic conditions and thus would impact the amount of credit available. We calculate the annual growth rates of the OFHEO's HPI as the Q4-to-Q4 change in the index for each MSA.

Housing Price Volatility. While annual housing price appreciation indicates economic growth, volatility in housing price indicates the degree of fluctuation in economic activities, and hence uncertainty about the economic prospects of an MSA. To capture this uncertainty, which factors into lending decisions, we calculate housing price volatility as the standard deviation of an MSA's annual HPI growth rate over the preceding 10 years.

Number of Jumbo Loans. Every year, a conforming loan limit is set for loans eligible for purchase by Fannie Mae and Freddie Mac. Loans exceeding this limit are considered

[168] For certain MSAs that are not recorded in the American Community Survey prior to 2005, median ages are calculated from the Decennial Census 2000.

"jumbo." The number of jumbo loans in an MSA affects the average loan amount. We combine the annual conforming loan limits as published by Fannie Mae with the HMDA data to identify jumbo loans originated in each MSA every year.

Number of New-Home Loans. It is expected that more credit would be available in areas with a higher proportion of newly constructed home loans. We calculate the number of new-home loans for each MSA based on the FHFB's loan-level MIRS data.[169]

Number of No-Fee Loans. Loans with no fees cost less per dollar and could partially explain differences in average loan sizes. We determine the number of no-fee loans from FHFB for each MSA.[170]

MSA Average FICO Score. The FICO scores are used to determine the overall credit quality of borrowers and thus affect the average loan amount supplied. The overall weighted average FICO score for each MSA for each year is calculated from MSA-level data provided by LoanPerformance.

C. Regression Models

We construct an unbalanced panel dataset with each observation representing an MSA and year. The dataset contains characteristics of about 231 to 331 MSAs for each year from 2000 to 2006:

[169] The count of loans is weighted using FHFB-assigned weights that are based on the lender type and geographic composition in HMDA.

[170] In FHFB's MIRS, loans are determined to be "no-fee" if they have no fee percentage and no fee amount associated with them.

Figure VII.2. Number of MSAs in Each Year

Year	MSA Count
2000	231
2001	236
2002	249
2003	257
2004	260
2005	331
2006	331

For each MSA, *i,* in every year, *t,* our basic model is represented by:

Model 1.

$$\text{Ln(loan amount per capita}_{it}) = a + b_1*\text{Ln(yield spread}_{it}) + b_2*(\text{secondary market purchase}_{i(t-1)}) + b_3*[\text{secondary market purchase}_{i(t-1)} * \text{Ln(10-year Treasury Rate}_t)] + b_4*(\text{MSA Median Age}_{it}) + b_5*\text{Ln(MSA Median Family Income}_{it}) + b_6*(\text{Share of Underserved Borrowers}_{it}) + b_7*(\text{Unemployment Rate}_{it}) + b_8*(\text{Housing Price Volatility}_{it}) + b_9*(\text{Housing Price Growth}_{it}) + b_{10}*\text{Ln(Share of Jumbo Loans}_{it}) + b_{11}*\text{Ln(Share of New Home Loans}_{it}) + b_{12}*\text{Ln(Share of No Fee Loans}_{it}) + e_{it}$$

where $i=1, 2,\ldots 331$ and $t=2000, 2001,\ldots 2006$.

Model 2 replaces the overall secondary market purchase rate with its component pieces: agency and non-agency purchase rates (this model employs two interaction terms with the 10-year treasury rate, one for each purchaser type).

1. Endogeneity

Price and quantity, in our case yield spreads and loan amounts per capita, are endogenous to each other. To determine if such a situation existed in our panel dataset, we conduct a Hausman Test for endogeneity. The results are shown in Appendix VII.E.

The two step process involves first estimating the reduced form with the yield spread as the dependent variable. All independent variables are included as well as one instrument, average FICO scores per MSA. The vector of residuals is then used as a regressor in the main equation with the log of loan amount per capita as the dependent variable. If the assumption of

no correlation holds between the yield spread and the error term of the main equation, the residuals from the reduced form equation should not be significant.

As is evident from Appendix VII.E, the residuals from the reduced form equation are not significant at the 5% level but significant at the 10% level.[171] To ensure the consistency of our results, we also run a two-stage least squares ("2SLS") model to correct for any potential endogeneity. In the first stage of the 2SLS, we use FICO as an instrument for the yield spread variable. These fitted values are then employed in the main structural equation for loan amount per capita.

D. Results

1. Findings

The fixed-effects regression for Models 1 and 2 are shown in Figure VII.3. The results indicate that higher secondary market purchase rates in the previous year correspond to higher loan amounts per capita, all else equal. This is evident from the positive and significant coefficients on the purchase rate variables. The economic importance of this finding can be illustrated using a hypothetical MSA in an overall market environment where the Treasury rate is 4.5%: if the purchase rate increased 10% (e.g., the purchase rate rose from 50% to 55%).

We also find a negative and significant coefficient on the interaction term with Treasury rates. This indicates that the impact of the purchase rates is lower in higher interest rate environments. That is, for the same increase in purchase rate from 50% to 55% but with a higher interest rate, say 6.5%, the increase in the loan amount per capita would be 4.58%.

The other control variables generally have the expected signs. Our price variable, the yield spread, has a negative and significant coefficient. This indicates that MSAs with higher yield spreads, which tend to indicate the higher degree of credit risk, generally have lower average loan amounts per capita, all else equal. Also, higher incomes, lower unemployment rates, older demographic, higher shares of borrowers from underserved areas and strong home price growth all correspond to higher loan amounts per capita.

[171] The commonly used level of statistical significance is the 5% level.

In addition, MSAs with more jumbo loans have higher average loan amounts per capita, as do MSAs with more new-home loans. As discussed above, new homes represent higher quality collateral and thus allow for higher loan amounts. The impact of no-fee loans was not significant. Finally, higher housing price volatility seemed to correspond to higher loan amounts per capita, an unexpected result.

The results are consistent between the models. However, when we run the regressions for agency and non-agency separately, we find that the impact of non-agency purchase rates is larger than that of the agency rates. In the hypothetical MSA where the agency purchase rate increased from 50% to 55% (with an overall treasury rate of 4.5%), the loan amount per capita would be expected to increase by 2.38%, all else equal. In contrast, if the non-agency purchase rate increased from 50% to 55%, the loan amount per capita would be expected to increase by 8.26%. Again, these effects would be lower in higher interest rate environments.

Figure VII.3. Fixed Effects Panel Regression Results

	Dependent Variable: Ln (Loan Amt. Per Capita)			
	Model 1		Model 2	
Independent Variables	Coefficient	P-Value	Coefficient	P-Value
Intercept	-9.6570 *	0.0000	-5.7906 *	0.0000
Ln (Yield Spread)	-0.2196 *	0.0000	-0.2283 *	0.0000
Secondary Market Purchase Rate (Lagged)	2.6765 *	0.0000		
Interaction: Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)	-0.9513 *	0.0000		
Agency Purchase Rate (Lagged)			2.2373 *	0.0000
Interaction: Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)			-1.1752 *	0.0000
Non-Agency Purchase Rate (Lagged)			3.3574 *	0.0000
Interaction: Non-Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)			-1.1771 *	0.0000
Median Age	0.0529 *	0.0000	0.0387 *	0.0000
Ln (Median Family Income)	1.3692 *	0.0000	1.0581 *	0.0000
Underserved Share	0.7458 *	0.0000	0.3986 *	0.0000
Unemployment Rate	-6.0823 *	0.0000	-4.5504 *	0.0000
HPI Volatility	3.7542 *	0.0000	2.3006 *	0.0000
1-Yr. HPI Growth Rate	1.2129 *	0.0000	1.3729 *	0.0000
Ln (Number of Jumbo Loans)	0.0766 *	0.0000	0.0863 *	0.0000
Ln (Number of New-Home Loans)	0.0115 *	0.0270	0.0160 *	0.0008
Ln (Number of No-Fee Loans)	-0.0057	0.4504	-0.0013	0.8462
MSA Dummies	+		+	
Overall R-Sq.	0.68		0.73	
Number of Obs.	1,851		1,851	

Notes & Sources:

Loan volume per capita is based on the total loan volume originated in an MSA (from the Home Mortgage Disclosure Act ("HMDA")), divided by the MSA population (from the Census Bureau). The volume was calculated for all single-family, home-purchase (i.e. excluding refinancing and home-improvement loans), conventional loans with loan amounts between the 1st and 99th percentiles of the loan amount distribution. Effective mortgage rates are derived from the Federal Housing Finance Board's Monthly Interest Rate Survey ("MIRS").

As discussed in the previous section, there is some evidence for potential endogeneity of our price and quantity variables (yield spread and loan amount per capita, respectively). As a result, we also conduct the regressions using 2SLS. The results are shown in Figure VII.4 below. The second stage results use fitted values for the yield spread. These fitted values are determined from the first stage, where the yield spread is the dependent variable and the instrument is the FICO score. The goal of the first stage regression is only to create fitted values and as such, interpretations of the coefficients for the first stage are not discussed.

The second stage results are similar in magnitude and significance to those shown before; the impact of secondary market purchases (and the higher impact of non-agency over agency) is robust with and without the 2SLS treatment.

Figure VII.4. Fixed Effects Panel Regression: Two-Stage Least Squares Results

Independent Variables	Second Stage: Dependent: Ln (Loan Amt. Per Capita)			
	Model 1		Model 2	
	Coefficient	P-Value	Coefficient	P-Value
Intercept	-7.5800 *	0.0000	-4.5622 *	0.0000
Ln (Yield Spread)[1]	-0.5853 *	0.0000	-0.4423 *	0.0003
Secondary Market Purchase Rate (Lagged)	2.2283 *	0.0000		
Interaction: Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)	-0.7298 *	0.0000		
Agency Purchase Rate (Lagged)			1.8847 *	0.0000
Interaction: Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)			-0.9864 *	0.0000
Non-Agency Purchase Rate (Lagged)			3.2102 *	0.0000
Interaction: Non-Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)			-1.1187 *	0.0000
Median Age	0.0482 *	0.0000	0.0357 *	0.0000
Ln (Median Family Income)	1.2207 *	0.0000	0.9704 *	0.0000
Underserved Share	0.7565 *	0.0000	0.4017 *	0.0000
Unemployment Rate	-6.1495 *	0.0000	-4.5695 *	0.0000
HPI Volatility	4.4097 *	0.0000	2.6915 *	0.0000
1-Yr. HPI Growth Rate	1.0746 *	0.0000	1.2859 *	0.0000
Ln (Number of Jumbo Loans)	0.0572 *	0.0000	0.0748 *	0.0000
Ln (Number of New-Home Loans)	0.0057	0.3236	0.0125 *	0.0154
Ln (Number of No-Fee Loans)	0.0029	0.7312	0.0037	0.6239
MSA Dummies	+		+	
Overall R-Sq.	0.69		0.73	
Number of Obs.	1,851		1,851	

Independent Variables	First Stage: Dependent: Ln (Yield Spread)			
	Model 1		Model 2	
	Coefficient	P-Value	Coefficient	P-Value
Intercept	3.7209 *	0.0000	3.8097 *	0.0000
Secondary Market Purchase Rate (Lagged)	-1.5965 *	0.0000		
Interaction: Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)	0.8445 *	0.0000		
Agency Purchase Rate (Lagged)			-2.2600 *	0.0000
Interaction: Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)			1.2693 *	0.0000
Non-Agency Purchase Rate (Lagged)			-0.7812 *	0.0017
Interaction: Non-Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)			0.3440 *	0.0248
Median Age	-0.0120 *	0.0001	-0.0137 *	0.0000
Ln (Median Family Income)	-0.3839 *	0.0000	-0.3947 *	0.0000
Underserved Share	0.0822	0.0912	0.0548	0.2792
HPI Volatility	1.6028 *	0.0000	1.6193 *	0.0000
1-Yr. HPI Growth Rate	-0.3815 *	0.0000	-0.4217 *	0.0000
Unemployment Rate	-1.3005 *	0.0025	-1.1706 *	0.0069
FICO	0.0026 *	0.0000	0.0027 *	0.0000
Ln (Number of Jumbo Loans)	-0.0237 *	0.0002	-0.0236 *	0.0003
Ln (Number of New-Home Loans)	-0.0123 *	0.0003	-0.0126 *	0.0003
Ln (Number of No-Fee Loans)	0.0159 *	0.0016	0.0158 *	0.0017
MSA Dummies	+		+	
Overall R-Sq.	0.25		0.23	
Number of Obs.	1,851		1,851	

Notes & Sources:

Loan volume per capita is based on the total loan volume originated in an MSA (from the Home Mortgage Disclosure Act ("HMDA")), divided by the MSA population (from the Census Bureau). The volume was calculated for all single-family, home-purchase (i.e. excluding refinancing and home-improvement loans), conventional loans with loan amounts between the 1st and 99th percentiles of the loan amount distribution. Effective mortgage rates are derived from the Federal Housing Finance Board's Monthly Interest Rate Survey ("MIRS").

[1] Ln (Yield Spread) is instrumented in the First Stage and its fitted values are used.

2. Our Findings in Light of the Credit Crisis

The predictions of our model on the availability of credit are not inconsistent with the levels of originations and credit available per capita in 2007.[172] Total mortgage originations dropped from a trillion dollars in 2006 to $733 billion in 2007, a 28% decline in originations. At the same time, non-agency purchases dropped from $570 to $306 billion, a 46% decline, while agency purchases increased from $217 to $232 billion. Total secondary market activities declined by a third. It is clear that the increase in agency purchases was insufficient to counter the impact of non-agency purchases.

Figure VII.5. Total Loan Originations and Secondary Market Purchases ($ billions)

			Secondary Market Activity			
Year	Total Loan Origination	Percent Change	Agency Purchases	Non-Agency Purchases	Total Purchases	Percent Change
(1)	(2)	(3) [{(2)/prev(2)} - 1]	(4)	(5)	(6) [(4) + (5)]	(7) [{(6)/prev(6)} - 1]
2000	487		153	160	313	
2001	531	9%	188	175	363	16%
2002	624	18%	230	217	446	23%
2003	755	21%	247	300	547	23%
2004	945	25%	236	462	698	28%
2005	1,133	20%	221	655	876	26%
2006	1,022	-10%	217	570	787	-10%
2007	733	-28%	232	306	538	-32%

Notes and Sources:

[1] Loan originations and secondary market purchases by year are from the Home Mortgage Disclosure Act ("HMDA") - Loan Application Registers. HMDA originations utilized include only single-family, home-purchase (i.e. excluding refinancing and home-improvement loans), conventional loans with loan amounts between the 1st and 99th percentiles of the loan amount distribution.

Our model which controls for the volatility of housing prices, yield spreads, demographics and credit characteristics predicted an average drop in credit available per capita of 7% while the actual drop in credit available in 2007 was 19%. Although the model predicted a negative impact on credit available to consumers resulting from the decline in secondary market activities, it did not predict the extent of the decline. One possible reason is that the model does not control for the disappearing liquidity and the extreme risk aversion by investors that started in 2007 and continued up until this point. Our model also predicted that the non-agency purchases have a greater impact on availability of credit in recent times which is consistent with the 2007 data.

[172] Data on originations and secondary market purchases are not available for 2008.

Figure VII.6. Percent Change in Loan Amount per Capita from 2006 to 2007 – Predicted vs. Actual

Statistic	Predicted	Actual
(1)	(2)	(3)
Average	-7%	-19%
Median	-7%	-17%
Standard Deviation	10%	14%
Minimum	-33%	-68%
Maximum	34%	12%
Number of MSAs	291	291
Pct. of MSAs < 0%	81%	93%

Notes and Sources:

Predictions for total loan originations by MSA are based on the fixed effects regression results using the overall secondary market purchase rates.

Actual loan originations by year are from the Home Mortgage Disclosure Act ("HMDA") data.

HMDA originations utilized include all single-family, home-purchase (i.e. excluding refinancing and home-improvement loans), conventional loans with loan amounts between the 1st and 99th percentiles of the loan amount distribution.

E. Originations & Secondary Market Purchases in Underserved Areas

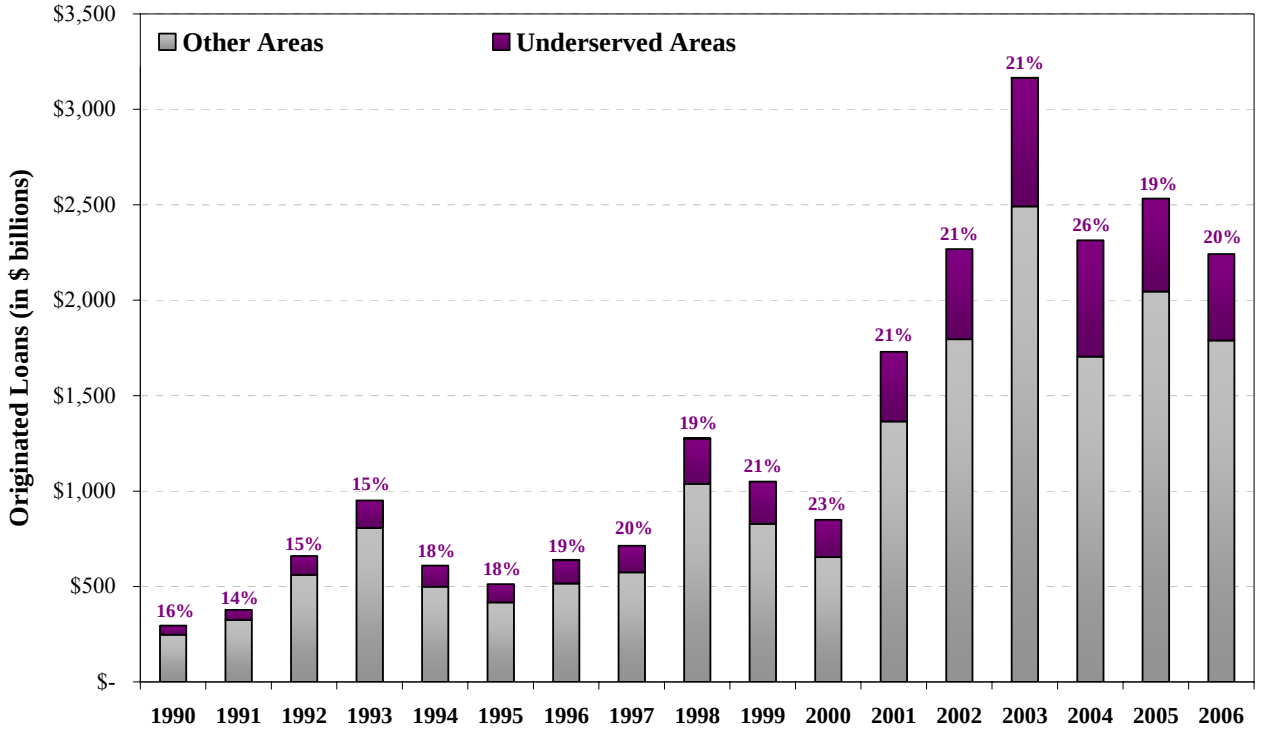
In the course of the analysis, we also document the increase in both the share of loans originated in underserved areas and the share of underserved loans sold to the secondary market. Figure VII.7 below shows the loan volume originated in underserved areas as a percentage of total originations. Both the dollar volume of originations in underserved areas, as well as the share have increased since 1990 from $47 billion (16% of total originations) to as high as $609 billion in 2004 (26% of all originations).

Similarly, the amount and share of loans originated in underserved areas that are sold to the secondary market have grown. Figure VII.8 below shows the growth in loan volume sold to the secondary market and the component share of loans originated in underserved areas that

have been sold. In 1990, $23 billion of loans originated in underserved areas were sold to the secondary market. In 2006, there was $335 billion from underserved areas sold to the secondary market.

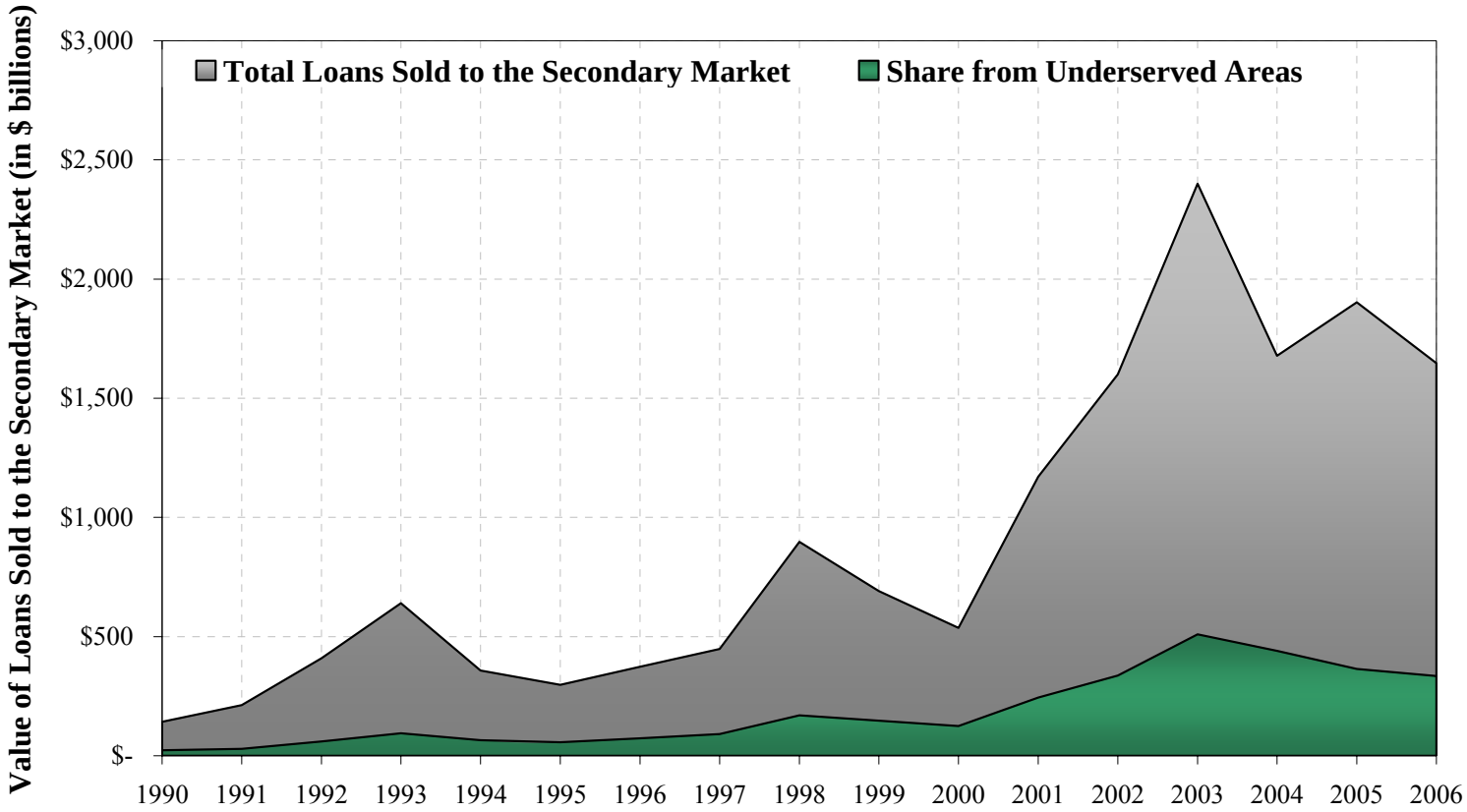
Based on the regression results shown in Figures VII.3 and VII.4, the larger presence of underserved areas in an MSA corresponds to larger amounts of credit available per household; this finding is consistent with that of Ambrose and Thibodeau (2004) and lends support for the efficacy of affordable housing goals applied to the GSEs.

Figure VII.7. Loans Originated from Underserved Areas as a Percentage of All Originations, 2000 - 2006



Notes & Sources:
Home Mortgage Disclosure Act Data, Loan Application Registers.
Institutions reporting to HMDA disclose both originated and purchased loans. For purposes of this analysis, only loans originated are used.
Underserved areas are designated by HUD.
Loan sizes greater than the 99th percentile of the loan amount distribution (i.e. $634,000) are excluded, as are loans smaller than $1,000.

Figure VII.8. Loans Sold to the Secondary Market from Underserved Areas as a Share of All Loans Sold, 2000 - 2006



Notes & Sources:

Home Mortgage Disclosure Act Data, Loan Application Registers.

Institutions reporting to HMDA disclose both originated and purchased loans. For purposes of this analysis, only loans originated are used.

All loans sold to the secondary market are based on loans originated in the same calendar year.

Underserved areas are designated by HUD.

Loan sizes greater than the 99th percentile of the loan amount distribution (i.e. $634,000) are excluded, as are loans smaller than $1,000.

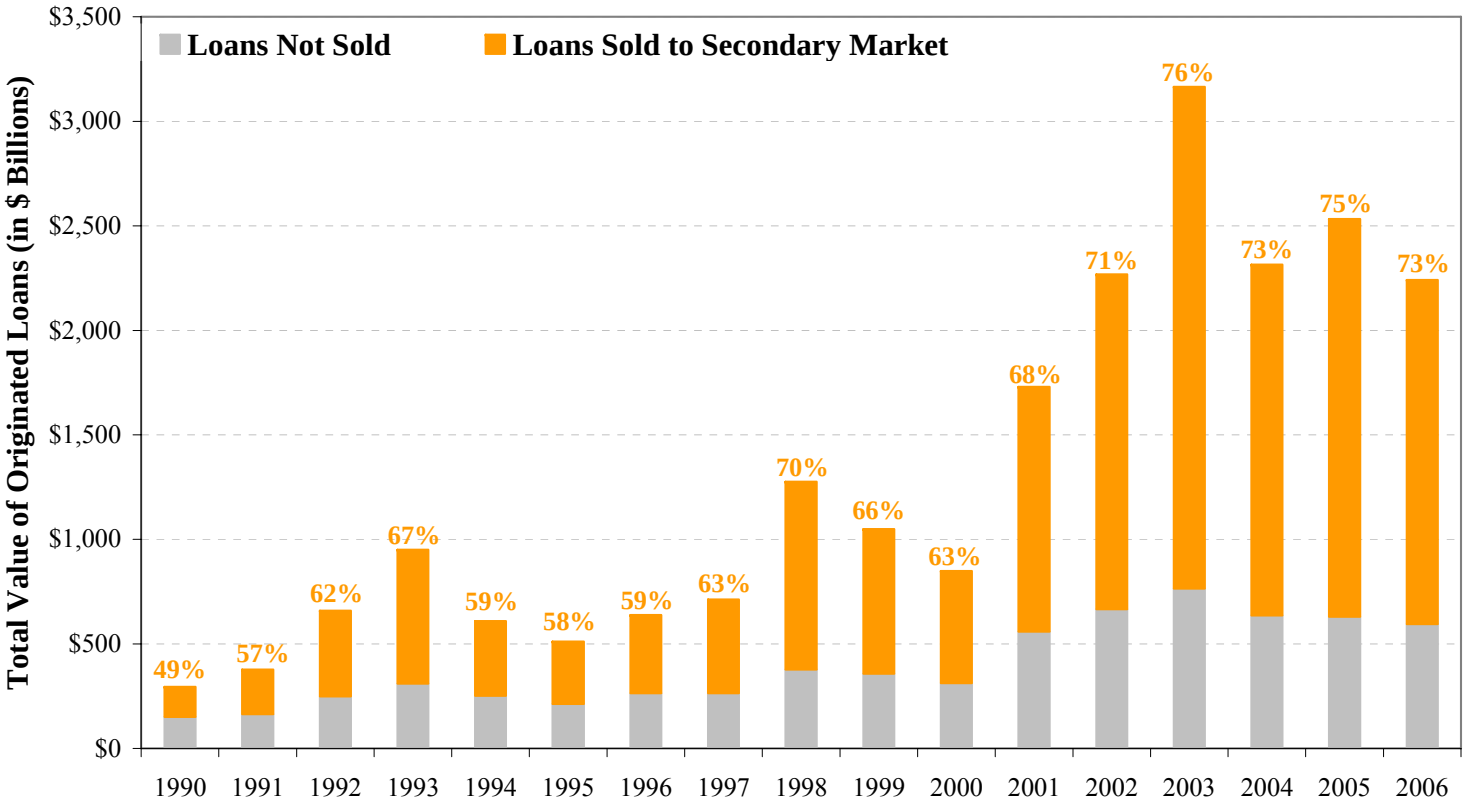
F. Conclusion

This study estimates the impact of secondary market activity on credit availability per capita in different geographical areas over time. In addition, we document the changes in credit availability and the extent of secondary market purchases in underserved areas.

Our analysis documents the increase in the share of mortgage loans in underserved areas from 16% in 1990 to as high as 26% in 2004, as well as the increase in the share of secondary market purchases in underserved areas during the period 1990-2006.

We also find that secondary market purchases, whether overall or divided into agency and non-agency rates, have a positive and significant impact on the amount of mortgage loans per capita during the period 2000-2006. The effect of non-agency purchases is more pronounced on increasing mortgage loan availability. Finally, the impact of secondary market purchases is greater in lower interest-rate environments. These results are robust to correcting for endogeneity.

Appendix VII.A. Share of Originated Loans Sold to the Secondary Market in the Origination Year



Notes & Sources:

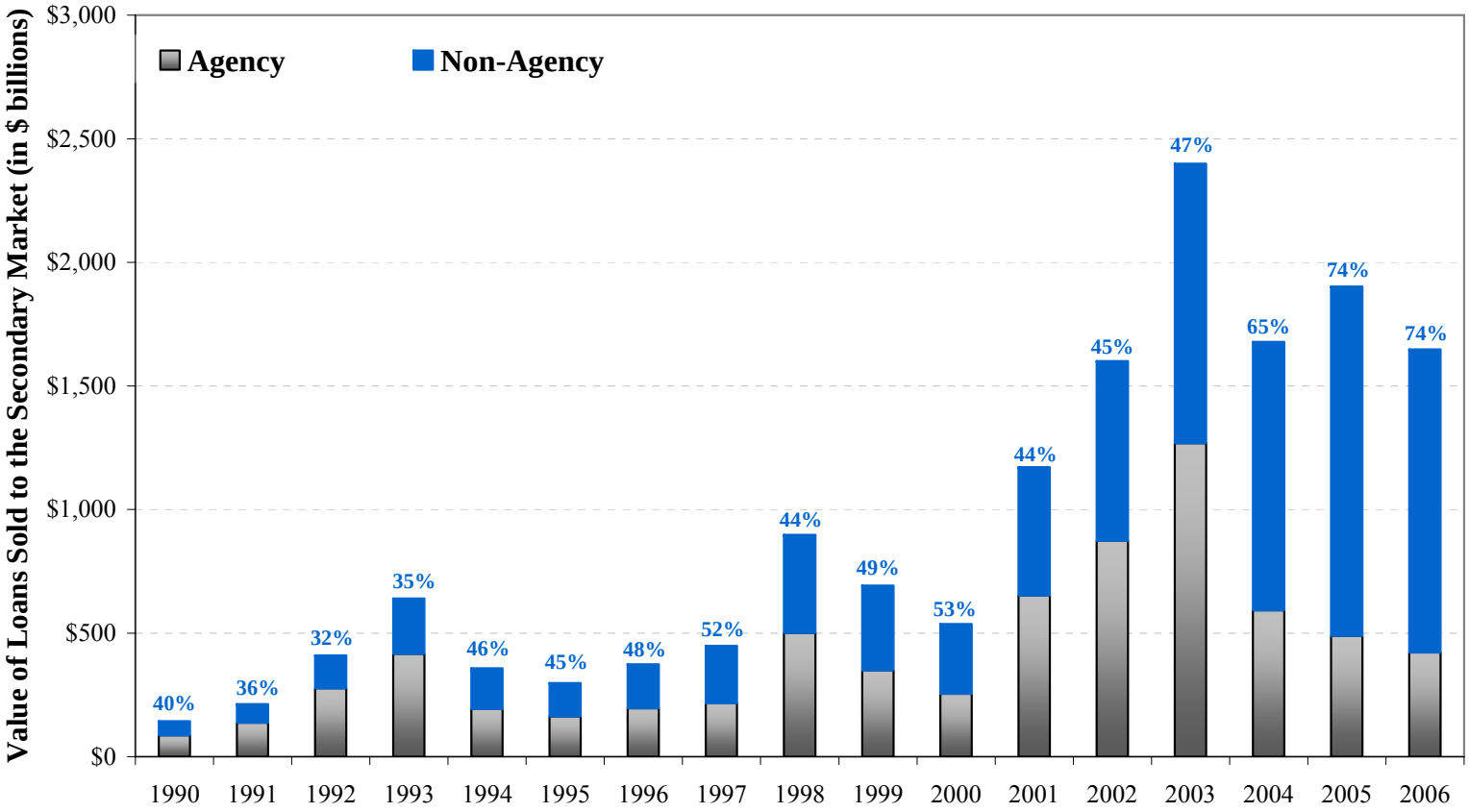
Home Mortgage Disclosure Act Data, Loan Application Registers.

Institutions reporting to HMDA disclose both originated and purchased loans. For purposes of this analysis, only loans originated are used.

All loans sold to the secondary market are based on loans originated in the same calendar year.

Loan sizes greater than the 99th percentile of the loan amount distribution (i.e. $634,000) are excluded, as are loans smaller than $1,000.

Appendix VII.B. Agency & Non-Agency Shares of All Loans Sold to the Secondary Market



Notes & Sources:

Home Mortgage Disclosure Act Data, Loan Application Registers.

Institutions reporting to HMDA disclose both originated and purchased loans. For purposes of this analysis, only loans originated are used.

All loans sold to the secondary market are based on loans originated in the same calendar year.

Loan sizes greater than the 99th percentile of the loan amount distribution (i.e. $634,000) are excluded, as are loans smaller than $1,000.

Appendix VII.C. Variable Descriptions

Variable	Description	Source
(1)	(2)	(3)
Loan Characteristics		
loan_amt	Total Loan Amount Originated	HMDA
loanamt_capita	Average Loan Amount per Capita (loan_amt / population)	HMDA / Census
undservshare_count	Share of Total Loan Count Originated in Underserved Census Tracts	HUD / HMDA
wa_eff_rate[1]	Weighted Average Effective Mortgage Rate	FHFB
yld_spread	Yield Spread: Effective Mortgage Rates Over 10-Yr Constant Maturity Treasury Rates (effrate - 10yrtrate)	FHFB / Fed
jumbo_count_hmda	Count of Jumbo Loans	HMDA
count_newhome_mirs[1]	(Weighted) Count of Loans for New Home Purchases	FHFB
count_nofee_mirs[1]	(Weighted) Count of Loans with No Associated Fees	FHFB
Secondary Market Characteristics[2]		
purch_shareamt	Share of Total Loan Amount Sold to the Secondary Market	HMDA
GSE_purch_shareamt	Share of Total Loan Amount Purchased by Agencies	HMDA
nonGSE_purch_shareamt	Share of Total Loan Amount Purchased by Non-Agencies	HMDA
Population Characteristics		
population	Total Population	Census
med_fam_inc	Estimated Median Family Income	HUD
nera_medage	Median Age	Census
Area Characteristics		
lp_fico	Weighted Average Fico Score at Origination	LoanPerformance
unemp_rate	Unemployment Rate	BLS
gr_HPI	1-Year HPI Growth Rate	OFHEO
HPI_10yr_stdev	HPI Volatility (10-Year Standard Deviation of gr_HPI)	OFHEO
trate_10yr	Yield on 10-Year Constant Maturity Treasury Bill	Federal Reserve

Notes:

All variables shown are per MSA, per year.

HMDA records include only those loans that are (i) conventional, (ii) for home purchase, and (iii) for 1-4 family homes.

[1] Weighted averages determined by FHFB-assigned weights to loan-level MIRS data based on geographic and lender-type composition of HMDA.

[2] Agencies include Ginnie Mae, Fannie Mae, Freddie Mac, and Farmer Mac. Non-agencies are all other purchasers.

Appendix VII.D. Summary Statistics (2000 – 2007)

Variable	Year	MSA Count	Mean	Median	Standard Deviation	Minimum	Maximum
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loan Originated ($ thousands)	2000	231	743,981	318,430	1,382,477	36,340	11,520,446
	2001	236	810,921	341,572	1,534,880	46,277	12,688,415
	2002	249	888,997	358,083	1,759,514	47,097	14,030,537
	2003	257	1,069,641	399,391	2,159,727	34,461	16,815,746
	2004	260	1,371,216	459,191	2,846,860	47,979	22,521,328
	2005	331	1,912,144	567,794	4,206,584	58,097	36,569,857
	2006	331	1,752,584	568,899	3,718,159	57,650	32,415,294
	2007	331	1,249,377	430,840	2,329,689	45,610	17,424,906
	2000-2006	1,895	1,281,813	414,920	2,891,188	34,461	36,569,857
	2000-2007	2,226	1,276,990	420,044	2,814,348	34,461	36,569,857
Loan Amount per Capita ($)	2000	231	1,315	1,174	693	301	5,505
	2001	236	1,416	1,231	781	344	5,913
	2002	249	1,558	1,333	902	381	6,321
	2003	257	1,871	1,606	1,104	326	6,928
	2004	260	2,327	1,896	1,575	457	9,990
	2005	331	3,044	2,217	2,272	558	13,543
	2006	331	2,788	2,272	1,725	556	11,568
	2007	331	2,118	1,916	1,027	511	7,843
	2000-2006	1,895	2,133	1,650	1,608	301	13,543
	2000-2007	2,226	2,131	1,696	1,536	301	13,543
Overall Purchase Rate	2000	231	0.623	0.625	0.105	0.368	0.862
	2001	236	0.666	0.673	0.090	0.386	0.919
	2002	249	0.685	0.691	0.086	0.398	0.905
	2003	257	0.693	0.695	0.082	0.399	0.873
	2004	260	0.717	0.728	0.081	0.451	0.900
	2005	331	0.742	0.759	0.073	0.470	0.894
	2006	331	0.736	0.743	0.071	0.512	0.887
	2007	331	0.727	0.739	0.071	0.416	0.874
	2000-2006	1,895	0.699	0.712	0.092	0.368	0.919
	2000-2007	2,226	0.703	0.719	0.090	0.368	0.919
Agency Purchase Rate	2000	231	0.343	0.339	0.073	0.145	0.552
	2001	236	0.396	0.400	0.083	0.179	0.636
	2002	249	0.412	0.412	0.072	0.212	0.639
	2003	257	0.383	0.379	0.074	0.165	0.658
	2004	260	0.336	0.341	0.074	0.059	0.591
	2005	331	0.281	0.284	0.083	0.030	0.509
	2006	331	0.280	0.286	0.080	0.047	0.505
	2007	331	0.348	0.351	0.077	0.135	0.580
	2000-2006	1,895	0.341	0.341	0.093	0.030	0.658
	2000-2007	2,226	0.342	0.343	0.090	0.030	0.658
Non-Agency Purchase Rate	2000	231	0.279	0.268	0.082	0.096	0.482
	2001	236	0.270	0.260	0.091	0.069	0.491
	2002	249	0.273	0.265	0.089	0.086	0.495
	2003	257	0.309	0.306	0.096	0.096	0.575
	2004	260	0.381	0.377	0.104	0.153	0.647
	2005	331	0.461	0.456	0.117	0.199	0.784
	2006	331	0.456	0.446	0.112	0.195	0.762
	2007	331	0.379	0.386	0.089	0.159	0.591
	2000-2006	1,895	0.358	0.351	0.130	0.069	0.784
	2000-2007	2,226	0.361	0.358	0.125	0.069	0.784

1-Yr Growth Rate in the HPI	2000	231	0.050	0.044	0.032	-0.003	0.253
	2001	236	0.060	0.055	0.024	0.005	0.180
	2002	249	0.050	0.041	0.031	0.008	0.177
	2003	257	0.055	0.043	0.041	-0.013	0.209
	2004	260	0.085	0.058	0.070	0.001	0.387
	2005	331	0.110	0.077	0.086	-0.011	0.408
	2006	331	0.063	0.056	0.049	-0.046	0.236
	2007	331	0.018	0.027	0.053	-0.201	0.188
	2000-2006	1,895	0.069	0.052	0.058	-0.046	0.408
	2000-2007	2,226	0.062	0.049	0.060	-0.201	0.408
HPI Volatility (10-yr std.dev. of 1-yr growth rate)	2000	231	0.025	0.022	0.013	0.006	0.087
	2001	236	0.025	0.022	0.014	0.007	0.088
	2002	249	0.026	0.023	0.015	0.007	0.085
	2003	257	0.027	0.023	0.016	0.007	0.082
	2004	260	0.029	0.021	0.022	0.005	0.112
	2005	331	0.037	0.025	0.029	0.005	0.120
	2006	331	0.038	0.027	0.027	0.006	0.113
	2007	331	0.041	0.028	0.032	0.007	0.146
	2000-2006	1,895	0.030	0.023	0.022	0.005	0.120
	2000-2007	2,226	0.032	0.024	0.024	0.005	0.146
Effective Mortgage Rates (%)	2000	231	8.14	8.16	0.24	6.91	8.86
	2001	236	7.08	7.06	0.17	6.77	8.53
	2002	249	6.61	6.60	0.16	6.13	7.26
	2003	257	5.81	5.81	0.19	5.15	6.67
	2004	260	5.88	5.85	0.23	5.20	6.85
	2005	331	5.97	5.96	0.22	5.43	7.04
	2006	331	6.65	6.62	0.21	6.16	7.41
	2007	331	6.57	6.55	0.22	5.91	7.53
	2000-2006	1,895	6.54	6.50	0.76	5.15	8.86
	2000-2007	2,226	6.54	6.52	0.71	5.15	8.86
10-Year Treasury Rate (%)	2000	231	6.03	6.03	0.00	6.03	6.03
	2001	236	5.02	5.02	0.00	5.02	5.02
	2002	249	4.61	4.61	0.00	4.61	4.61
	2003	257	4.01	4.02	0.00	4.02	4.02
	2004	260	4.27	4.27	0.00	4.27	4.27
	2005	331	4.29	4.29	0.00	4.29	4.29
	2006	331	4.79	4.79	0.00	4.79	4.79
	2007	331	4.63	4.63	0.00	4.63	4.63
	2000-2006	1,895	4.68	4.61	0.59	4.02	6.03
	2000-2007	2,226	4.68	4.63	0.54	4.02	6.03
Number of New Home Loans	2000	231	1,200	436	1,884	0	12,347
	2001	236	924	321	1,459	0	9,900
	2002	249	792	265	1,303	0	9,024
	2003	257	773	191	1,654	0	12,460
	2004	260	853	216	1,621	0	11,214
	2005	331	1,408	261	3,603	0	30,180
	2006	331	1,342	187	3,820	0	33,075
	2007	331	1,306	128	3,868	0	37,549
	2000-2006	1,895	1,068	251	2,553	0	33,075
	2000-2007	2,226	1,103	237	2,788	0	37,549
Number of No-Fee Loans	2000	231	2,660	1,118	4,336	14	35,818
	2001	236	3,439	1,372	5,742	35	45,251
	2002	249	3,811	1,519	6,303	34	46,702
	2003	257	2,728	1,049	4,515	10	37,512
	2004	260	2,314	897	4,047	17	32,594
	2005	331	3,059	958	5,569	0	38,466
	2006	331	2,849	941	5,243	34	37,125
	2007	331	3,033	811	5,548	10	37,935
	2000-2006	1,895	2,973	1,065	5,193	0	46,702
	2000-2007	2,226	2,982	1,020	5,246	0	46,702

Number of Jumbo Loans	2000	231	378	79	1,088	3	11,590
	2001	236	261	46	806	2	9,380
	2002	249	307	51	1,128	2	15,372
	2003	257	342	51	1,348	1	19,242
	2004	260	509	71	2,079	2	29,881
	2005	331	817	75	2,800	0	27,803
	2006	331	393	36	1,369	0	15,029
	2007	331	222	29	691	0	6,555
	2000-2006	1,895	446	58	1,719	0	29,881
	2000-2007	2,226	413	53	1,610	0	29,881
Median Family Income	2000	231	48,133	48,000	7,159	27,900	68,600
	2001	236	49,920	49,550	7,732	29,100	74,700
	2002	249	51,304	50,400	8,472	29,100	76,700
	2003	257	52,763	52,200	7,545	28,700	75,300
	2004	260	53,363	52,800	7,132	30,000	76,100
	2005	331	55,234	54,500	8,429	30,000	93,900
	2006	331	56,465	55,700	8,678	30,800	97,100
	2007	331	55,931	55,000	8,806	27,700	94,500
	2000-2006	1,895	52,813	52,300	8,402	27,900	97,100
	2000-2007	2,226	53,277	52,700	8,534	27,700	97,100
Median Age	2000	231	35	35	4	23	54
	2001	236	35	35	4	23	54
	2002	249	35	35	4	23	54
	2003	257	35	35	4	23	54
	2004	260	35	35	4	23	54
	2005	331	36	36	4	25	53
	2006	331	36	36	4	24	51
	2007	331	36	37	4	24	51
	2000-2006	1,895	35	36	4	23	54
	2000-2007	2,226	35	36	4	23	54
Population	2000	231	469,838	275,720	574,717	66,566	4,281,957
	2001	236	468,024	272,934	582,721	66,909	4,436,353
	2002	249	456,329	252,022	582,685	67,509	4,564,540
	2003	257	451,279	243,224	586,249	68,185	4,687,191
	2004	260	456,054	245,003	594,918	68,989	4,822,140
	2005	331	478,567	227,969	693,642	69,655	5,352,569
	2006	331	485,013	229,326	708,803	70,401	5,539,949
	2007	331	491,759	231,523	721,224	71,750	5,628,101
	2000-2006	1,895	467,604	246,405	626,949	66,566	5,539,949
	2000-2007	2,226	471,196	243,391	641,726	66,566	5,628,101
Underserved Share	2000	231	0.2687	0.2480	0.1055	0.0527	0.7085
	2001	236	0.2517	0.2271	0.1068	0.0468	0.7133
	2002	249	0.2525	0.2353	0.1038	0.0527	0.7202
	2003	257	0.2515	0.2329	0.1040	0.0594	0.7402
	2004	260	0.2649	0.2450	0.1105	0.0565	0.7617
	2005	331	0.3098	0.2802	0.1192	0.0776	0.7821
	2006	331	0.3187	0.2905	0.1192	0.0932	0.7707
	2007	331	0.3033	0.2764	0.1133	0.0770	0.7317
	2000-2006	1,895	0.2775	0.2554	0.1141	0.0468	0.7821
	2000-2007	2,226	0.2813	0.2592	0.1144	0.0468	0.7821
Unemployment Rate	2000	231	0.0405	0.0371	0.0163	0.0200	0.1649
	2001	236	0.0477	0.0438	0.0161	0.0223	0.1645
	2002	249	0.0563	0.0543	0.0166	0.0276	0.1664
	2003	257	0.0583	0.0549	0.0170	0.0306	0.1676
	2004	260	0.0549	0.0525	0.0156	0.0298	0.1545
	2005	331	0.0521	0.0498	0.0160	0.0262	0.1600
	2006	331	0.0475	0.0454	0.0156	0.0229	0.1527
	2007	331	0.0467	0.0443	0.0160	0.0204	0.1732
	2000-2006	1,895	0.0511	0.0484	0.0171	0.0200	0.1676
	2000-2007	2,226	0.0504	0.0476	0.0170	0.0200	0.1732

Appendix VII.E. Hausman Test of Endogeneity

Independent Variables	Step 1: Dependent: Ln (Effective Interest Rate) Coefficient		P-Value	Step 2: Dependent: Ln (Loan Amt. Per Capita) Coefficient		P-Value
Intercept	3.8097	*	0.0000	-4.5622	*	0.0000
Ln (Yield Spread)				-0.4423	*	0.0002
Agency Purchase Rate (Lagged)	-2.2600	*	0.0000	1.8847	*	0.0000
Interaction: Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)	1.2693	*	0.0000	-0.9864	*	0.0000
Non-Agency Purchase Rate (Lagged)	-0.7812	*	0.0017	3.2102	*	0.0000
Interaction: Non-Agency Purchase Rate (Lagged) * Ln (10-Yr. Treasury Rate)	0.3440	*	0.0248	-1.1187	*	0.0000
Median Age	-0.0137	*	0.0000	0.0357	*	0.0000
Ln (Median Family Income)	-0.3947	*	0.0000	0.9704	*	0.0000
Underserved Share	0.0548		0.2792	0.4017	*	0.0000
Unemployment Rate	-1.1706	*	0.0069	-4.5695	*	0.0000
HPI Volatility	1.6193	*	0.0000	2.6915	*	0.0000
1-Yr. HPI Growth Rate	-0.4217	*	0.0000	1.2859	*	0.0000
Ln (Number of Jumbo Loans)	-0.0236	*	0.0003	0.0748	*	0.0000
Ln (Number of New-Home Loans)	-0.0126	*	0.0003	0.0125	*	0.0140
Ln (Number of No-Fee Loans)	0.0158	*	0.0017	0.0037		0.6191
FICO	0.0027	*	0.0000			
Residuals from Yield Spread Equation				**0.2329**		**0.0620**
MSA Dummies	+			+		
Number of Obs.	1,851			1,851		

Notes & Sources:

* indicates significance at the 5% level.

Appendix VII.F. Home Mortgage Disclosure Act ("HMDA")

HMDA was enacted by Congress in 1975 and requires most mortgage lenders located in metropolitan areas to collect data about their housing-related lending activity, report the data annually to the government, and make the data publicly available.

Initially, HMDA required reporting of the geographic location of originated and purchased home loans. In 1989, Congress expanded HMDA data to include information about denied home loan applications, and the race, sex, and income of the applicant or borrower. In 2002, the Federal Reserve Board amended the regulation that implements HMDA (Regulation C) to add new data fields, including price data for some loans.

Mortgage lenders report HMDA information to their regulatory agency. The codes for each agency are:

1 - Office of the Comptroller of the Currency (OCC)

2 - Federal Reserve System (FRS)

3 - Federal Deposit Insurance Corporation (FDIC)

4 - Office of Thrift Supervision (OTS)

5 - National Credit Union Administration (NCUA)

7 - Department of Housing and Urban Development (HUD)

The OCC oversees the national banks and federal branches and agencies of foreign banks. The FRS oversees state member banks of the Federal Reserve System, bank holding companies, and non-banking activities of foreign banks. The FDIC oversees nonmember state banks that are federally insured. The OTS oversees savings and loan associations. The NCUA oversees federal credit unions and the HUD oversees the GSEs and some independent mortgage companies.

Appendix VII.G. Matching by MSA Codes

This study utilizes data at the MSA level. MSA codes changed from 4-digit to 5-digit based on designations provided by the Office of Management and Budget ("OMB"). To ensure unique identification of MSAs throughout all the years in the database, matching of 4-digit to 5-digit codes was necessary. For HMDA, the matching was done directly from HUD using the state, MSA, county, and census tract data. Certain data sources only provided data for 4-digit MSA codes while others provided them for 5-digit codes.

Our main source of conversion was HUD's Geographically Targeted Goal data from 2004, which provided both the 4-digit and 5-digit MSA codes. As MSA designations have also changed through the years, there is not a 1:1 match between the 4- and 5-digit MSA codes. Some MSAs can be split into different MSAs in later years (or the reverse). MSAs as defined in recent years (i.e. 5-digit MSA codes) could be traced to parts of multiple MSAs as defined in previous years (i.e. 4-digit MSA codes). Multiple 4-digit MSA codes that were assigned to the same 5-digit code were allowed but the same 4-digit code for multiple 5-digit codes was removed as this created the same MSA listing for multiple records in the same year.

Finally, after the initial match using the HUD key, the identified 5-digit codes were matched to the HMDA 2006 MSA list to keep "valid" 5-digit codes that existed in HMDA, the source of a majority of the variables. All other variables from different sources, once aggregated to the MSA level, were then matched to each other using either the 4- or 5-digit MSA codes – ultimately all MSA data were identified by 5-digit codes.

VIII. The Impact of Securitization on the Dispersion of Risk

A. Introduction

According to the U.S Flow of Funds Accounts data, the U.S economy has seen an enormous expansion of the securitization market since 1990. Banks that securitize are able to convert the relatively illiquid loan receivables into cash, and therefore have access to an additional source of funding when needed. This additional source of funding may also protect banks from unfavorable interest rate movements. As interest rates rise, the cost of obtaining external funding increases. Banks that securitize could, in theory, utilize their internal resources without suffering a decline in lending activities. In other words, securitization provides banks with greater access to capital and allows banks to hedge their exposure to changes in the interest rate environment. [173]

The goals of our study are to: 1) show how banks have been able to diversify the regional composition of their mortgage assets; 2) illustrate that a variety of institutions other than government agencies and banks have played a growing role as purchasers of loans; 3) quantify how securitization has reduced the impact of interest rate shocks. We quantify the effects of securitization on bank loan originations, especially its effects on bank lending decisions under unfavorable interest rate environments; and finally 4) quantify how securitization has affected capital requirements, taking into account the off-balance sheet positions of banks.

An empirical study conducted by Loutskina (2005) examines the relationship between securitization and liquid assets among commercial banks. The ability to securitize existing assets allows banks to convert less liquid receivables into cash, which provides additional sources of funding that can be utilized to originate more loans. This additional source of funding may help mitigate the effect of an interest rate shock. When faced with a sudden interest rate hike, banks that securitize will be able to dig into the cheaper, internal source of funding rather than borrow at a high cost in order to maintain their lending activities.

[173] Elena Loutskina, "Does Securitization Affect Bank Lending? Evidence from Bank Responses to Funding Shocks," September 2005, pp. 1-4.

Consistent with this theory, the Loutskina study finds that banks with more loans that are "securitizable" are more liquid and therefore less sensitive to fund shocks that arise from changes in monetary policy. Loutskina's methodology is the starting point for our study. We analyze the effects of securitization on bank lending activities in an unfavorable interest rate environment using updated data from the period 1990 to 2006. We then broaden the study to examine how commercial banks' ability to securitize their assets impacts their capital ratios.

A number of studies examined the relationship between securitization and banks' capital ratios. Dionne and Harchaoui (2003) document a negative relationship between securitization and tier 1 capital, as well as total capital, for the Canadian financial sector over the 1988 to 1998 period. Similarly, Uzun and Webb (2006) also find that securitization is negatively related to the bank's capital ratio, a measure of banks' risk, for US banks, although their result is mainly driven by the securitization of credit card receivables. These results are consistent with the argument by Greenbaum and Thakor (1987) that securitization helps reduce banks' risk as assets are removed from the banks' balance sheet. On the other hand, studies such that Cantor and Rouyer (2000) argue that, depending on the assets being securitized, banks may end up with higher-risk assets on their balance sheet and thus securitization may increase banks' risk, instead of reducing it. Our study explores the relationship between securitization and banks' capital ratios using the Call Reports data for US commercial banks over the 1996 to 2006 period. The capital ratios are defined as capital divided by risk-adjusted assets, which take into account off-balance sheet activities.

Our results indicate that securitization is an additional source of funding for banks and contributes to total loan growth. Our study also illustrates that securitization provides banks with protection against unfavorable interest rate shocks. For example, a bank with a high potential to securitize its loan portfolios, measured by the securitization index, will be less sensitive to interest rate tightening. Hence, it will experience a smaller contraction in lending activities.

In terms of securitization's impact on capital ratios, our time series analysis indicates that there is a negative, although not statistically significant relationship between securitization and banks' capital ratios.

We describe the construction of the dataset in Section B. Section C focuses on the econometric models. We present our main results, how they relate to the credit crisis and conclusion in Section D.

B. Methodology and Data Description

1. Data

We rely on data from various sources in compiling a database for this study. We collect data on all insured commercial banks, using the Federal Reserve's quarterly Report of Condition and Income releases ("Call Reports") from the first quarter 1990 to the fourth quarter of 2006. Appendix I describes the construction of key variables in detail.

When constructing the database, we calculate loan and asset growth adjusted for inflation as measured by the absolute percentage change from one quarter to the next. In the event that there is an inconsistency in the bank-quarters (e.g., 1992 Q3 followed 1993 Q1), no growth rate is calculated for the non-sequential bank-quarter in question.

Loan growth measure. We face various problems with outliers in the call reports data. We exclude any bank-quarter for which loan growth, asset growth, or liquidity ratio is missing for any of the loan categories analyzed.[174] We then test the remaining observations to identify bank-quarters with abnormal loan or asset growth (or loss). All bank-quarters for which loan growth (or loss) exceeds 100%, asset growth (or loss) exceeds 50%, loan-to-asset ratio is below 10%, or a minimum credit-card-to-loan ratio exceeds 50% are removed from the database. An exception to the loan growth exclusion criterion arise in cases where the total loan growth of a given quarter does not exceed 100% over the previous quarter, while one of the individual loan categories does. In these cases, we retain the bank-quarter.[175] To account for mergers and acquisitions which can potentially distort the balance sheet ratios, we remove the quarters

[174] The NERA report focuses on the following loan categories: "total loans," "home mortgage loans," "farm mortgage loans," "multi-family mortgage loans," "consumer credit loans," "commercial mortgage loans," and "commercial and industrial loans."

[175] Some of these "retained" bank quarters are later excluded by the last set of exclusions that NERA makes, in the process of creating independent variables comprised of lags on the securitization index. In constructing these lags, NERA sets to missing, any quarter for which an individual loan category showed loan growth exceeding 100%. These missing values propagated additional missing bank quarter values (and excludable bank quarters) as a result of the lagging process.

before and after a merger for the acquiring banks. Bank merger data used in this analysis are compiled from the Federal Reserve National Information Center.

In order to analyze the effects of securitization across banks with difference sizes, we conduct our analysis on three groups of datasets: all banks, large banks, and small banks. Total assets adjusted for inflation are used as a measurement of the size of a bank. The group of large banks is defined as having real total assets in the top 5th percentile of the size distribution, while the group of small banks has real total assets in the bottom 75th percentile.

Monetary policy measures. We use the spread between the 3-month commercial paper rates and the 3-month treasuries as a proxy for monetary policy. Accordingly, changes in monetary policy are measured as changes in the quarterly average of the weekly differences between the 3-month commercial paper rates and the 3-month Treasury bill rates.[176,177] The data are structured in a way so that an increase in the paper-bill spread represents monetary tightening.

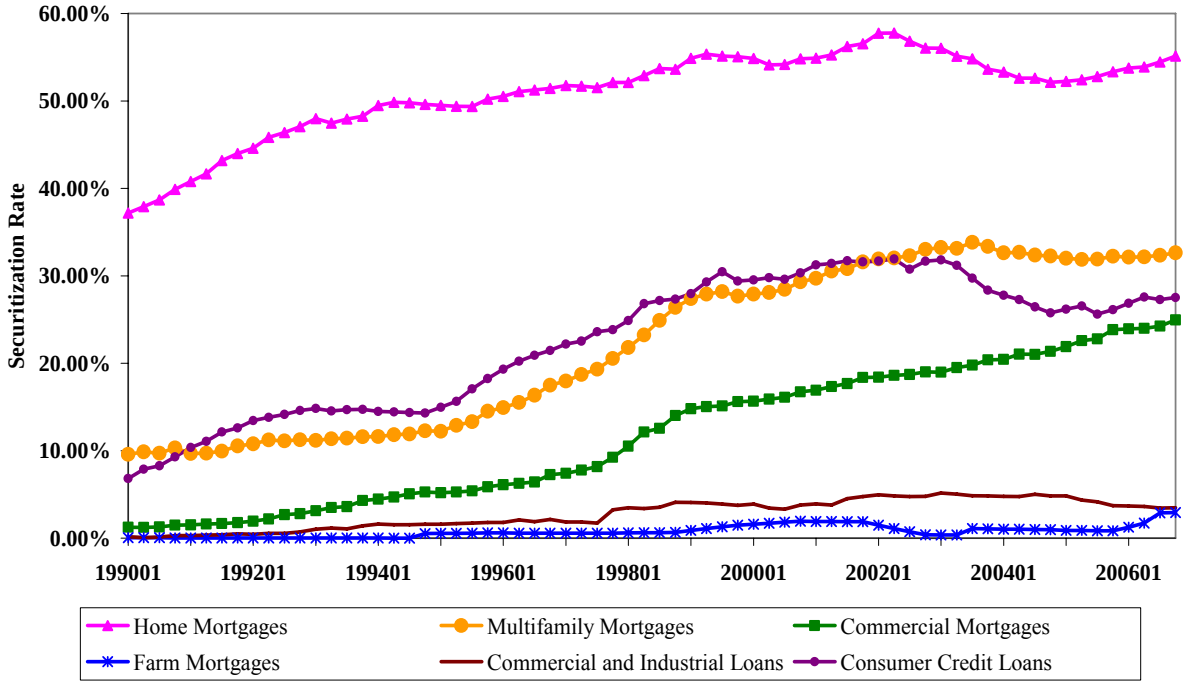
Securitization levels in the U.S. We gather information on market securitization level in the U.S economy from the Flow of Funds Accounts. Quarterly data on total amounts of loans outstanding and securitized are aggregated for six loan categories: i) home mortgages ii) multi-family residential mortgages iii) commercial mortgages iv) consumer credit v) commercial and industrial loans and vi) farm mortgages. Using this information, we are able to compute quarterly securitization rates for each of the loan categories, as shown in Figure VIII.1. See Appendix VIII.A for details on the construction of each variable.

[176] The Federal Reserve Board of Governors (FRB) used to publish average dealer offering rates for 1-month, 3-month and 6-month Commercial Papers. It discontinued these series at the end of August 1997, and started separate series of average dealer offering rates for non-financial and financial commercial papers from January 1997. Starting in January 1997, we switch from the 3-month commercial paper rates to the 3-month financial commercial paper rates in order to create a continuous data series.

[177] NERA compares the daily 3-month Treasury bill rates published on the same dates for which the weekly 3 month Treasury bill auction occurred and the weekly 3-month Treasury bill rates released on the settlement date of the same week for each week in a given quarter. A week is counted in a given quarter if the comparison day falls within that quarter.

Figure VIII.1

Securitization Rates in Different Loan Categories Based on U.S. Flow of Funds Data
1990 to 2006



Notes and Sources:
Data from the Federal Reserve's US Flows of Funds Accounts (Table L2, L125, L126) for the period Q1, 1990 - Q4, 2006.
Share securitized is calculated as the percentage of loans securitized outstanding over total loans outstanding.

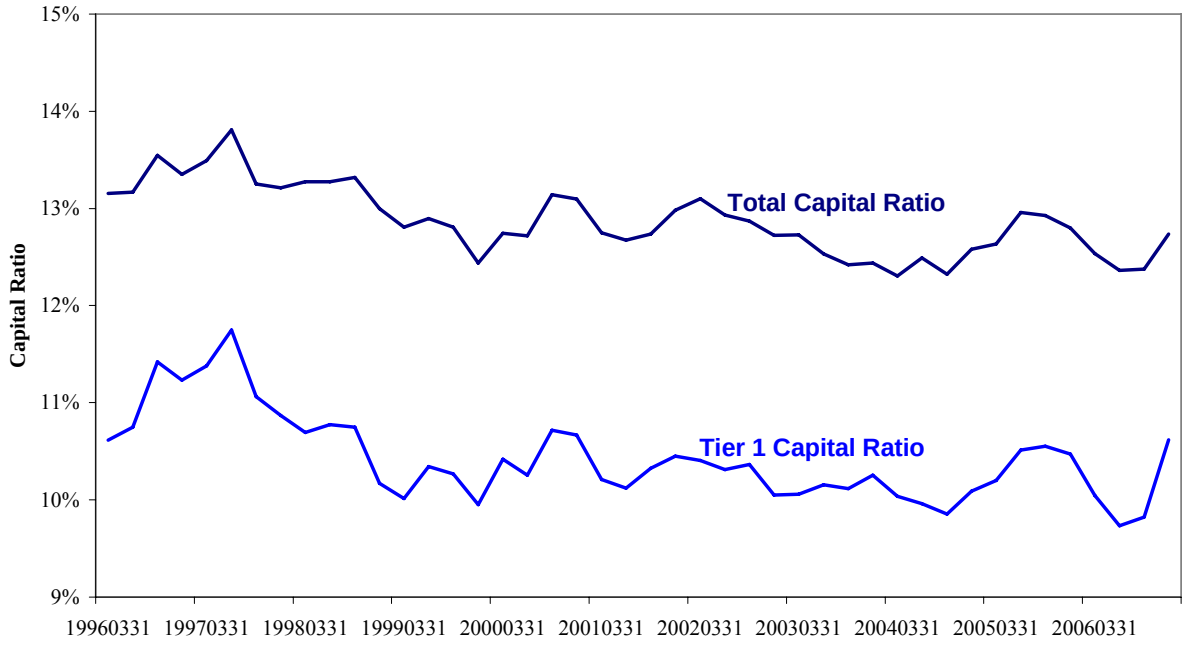
Interaction of Securitization and Monetary Policy Measures. Since an increase in the interest rate will increase banks' borrowing cost of external funding, we expect banks to lower their lending activities in response to such a monetary shock. Hence, the monetary policy measure will have a negative impact on total loan growth. On the other hand, we also expect that securitization will offset some of the negative effect of a monetary tightening. The intuition is that banks can use the sales proceeds from securitizing their receivables to finance loan originations, instead of borrowing from external sources at a higher cost. To quantify the interaction between the securitization level and monetary policy, we multiply the securitization index with the three-month commercial paper-Treasury bill spread.

GDP Growth. We obtain quarterly real GDP data covering the period of 1990 to 2006 from the U.S Bureau of Economic Analysis.

Tier-1 capital and total capital ratios. We calculate these ratios based on tier-1 capital and total capital, as well as total risk-adjusted assets, reported by banks in the call reports. The ratios are calculated as tier-1 capital (or total capital) divided by total-risk adjusted assets. These are the main dependent variables in our capital ratio study. Figure VIII.2 below shows the average capital ratios, calculated as the ratio of aggregate capital to aggregate risk-adjusted assets.

Figure VIII.2

Weighted Average Capital Ratios



2. Methodology

The ability to securitize existing loans adds sources to a bank's liquidity, and hence increases its ability to originate more loans. To quantify a bank's potential to securitize or sell its loan portfolio, we follow Loutskina's methodology and construct an index that captures the characteristics of an individual bank's loan structure as well as market securitization level in the U.S economy. This is achieved by first breaking down a bank's loan portfolio into six categories: i) home mortgages ii) multi-family residential mortgages iii) commercial mortgages

iv) consumer credit v) commercial and industrial loans vi) farm mortgages. Next, we sum the ratios from each loan category multiplied by the corresponding securitization rates observed in the U.S economy. The computation is as follows:

$$Index_{it} = \sum_{j=1}^{6}\left(\frac{Market\text{ - }level\ Securitized\ Loans\ of\ Type\ j\ at\ Time\ t}{Market\text{ - }level\ Total\ Loans\ Outstanding\ of\ Type\ j\ at\ Time\ t}\right)\times\left(Ratio\ of\ Type\ j\ Loans\ in\ Bank\ i'\ s\ Portfolio\ at\ Time\ t\right)$$

The intuition behind the methodology is that a bank with a high percentage of its loans in home mortgages will have an easier time securitizing/selling its loans, thus a higher securitization index, than a bank that specializes in farm mortgages. This is due to the fact that over the years, mortgage loans have been more liquid and tend to have a higher securitization rate in the U.S economy. Therefore, our model captures both time and institutional variations that affect an individual bank's securitization level.

C. Econometric Analysis

To assess the effects of securitization on bank lending activities, especially in times of interest rate shocks, we regress the log of real loan growth (total loan growth adjusted for inflation) on various explanatory variables including measures of liquidity, monetary policy, growth in the real GDP, banks and years fixed effects as well as an indicator for the repeal of the Glass-Steagall act in 1999.

We include a bank's previous quarter liquidity ratio and securitization index as variables which would affect the bank's source of funding. The Federal Reserve is able to affect a bank's cost of funds through monetary policy. In an environment of monetary tightening, the Federal Reserve sells bonds in the open market, which results in a rise in the interest rates on Treasuries. This leads to an increase in the financing costs for banks as Treasury rates are used as benchmarks for all other lending. The increasing marginal cost of obtaining funding causes banks to reduce their lending activity. To account for the effect, we include several lags of the monetary policy indicator measured by the commercial paper-treasury bill spread. We lag the monetary policy indicator to mitigate the potential impacts that an endogenous relationship between loan growth and monetary policy (occurring in the same quarter) might have on the observed results.

More frequently in the years 2000-2006, however, banks had been able to offset the effect of monetary tightening by securitizing their loan portfolios. The additional source of funding provided by securitization allows banks to experience a smaller contraction in their lending activity in times of an interest rate shock. To test this hypothesis, we use an interactive term using a monetary policy indicator and the corresponding securitization index. We add lags of this interactive term to our regression model.

In addition, we incorporate four lags of the log of real GDP growth since the health of the U.S economy affects many economic activities, including bank lending. We use a binary financial modernization variable to account for the repeal (through legislation such as the Gramm-Leach-Bliley Act in November 1999) of Glass-Steagall provisions which prohibited banks from owning other financial companies. Last, we include a year variable and bank-specific fixed effects to account for variations in business cycles, bank structure and management decisions.

$$\begin{aligned}\ln(\textit{Real Loan Growth})_{it} = {} & \beta_1 \textit{Liquidity}_{it-1} + \beta_2 \textit{Securitization Index}_{it\text{-}1} \\ & + \sum_{j=1}^{4} \beta_{j+2} \textit{Monetary Policy Indicator}_{t-j} \\ & + \sum_{j=1}^{4} \beta_{j+6} \textit{Monetary Policy Indicator}_{t-j} \times \textit{Securitization Index}_{it\text{-}1} \\ & + \sum_{j=1}^{4} \beta_{j+10} \textit{GDP Growth}_{t-j} + \beta_{15} \textit{Financial Modernization Variable}_{t} + \varepsilon_{it}\end{aligned}$$

For our study of the relationship between securitization and banks' capital ratio, we also use the securitizability index developed above. The hypothesis is, if banks find it easy to securitize their assets, they may not need to be as conservative in their capital management, and thus could afford to hold less capital. However, there are other factors that are also believed to affect the level of capital holding, such as profitability, loan growth, risk of loan portfolio and the shape of the yield curve. It can be argued that in times of good profitability and loan growth, banks would be more optimistic and could afford to reduce their capital ratios. Likewise, when the differential between the long-term and the short-term interest rates increases, banks would be more profitable (as they borrow short and lend long), and thus capital ratios may be reduced. Capital ratios may be increased, however, when the risk of the

loan portfolio is high, in order to protect the banks from potential credit crisis should loans default. Finally, we also control for business cycle – when the economy is contracting, it is expected that banks would hold more capital to guard themselves from credit crisis.

Our time series model for the capital ratio study is thus constructed as follows:

$$\begin{aligned} Capital\ Ratio_{it} = {} & \beta_0 + \beta_1 Securitization\ Index_{it} + \beta_2 Net\ Income\ Growth_{it} + \beta_3 Loan\ Growth_{it} \\ & + \beta_4 Loss\ Reserves_{it} + \beta_5 Rate\ Differential_t + \beta_6 MZMGrowth_t + \varepsilon_{it} \end{aligned}$$

where: (1) *Loss Reserves* is the ratio between loan loss reserve (reported by banks in their Call Reports) and total loans, weighted across banks for each quarter by total assets; (2) *Rate Differential* is the difference between the 10-year and the 2-year Treasury rates; (3) *MZM Growth* is the growth in the Money Zero Maturity, a measure of the liquid money supply in the economy. It should be noted that bank-specific factors, such as securitization index, net income growth, loan growth and loan loss reserves, are weighted by banks' total assets to derive the time-series observation for each quarter.

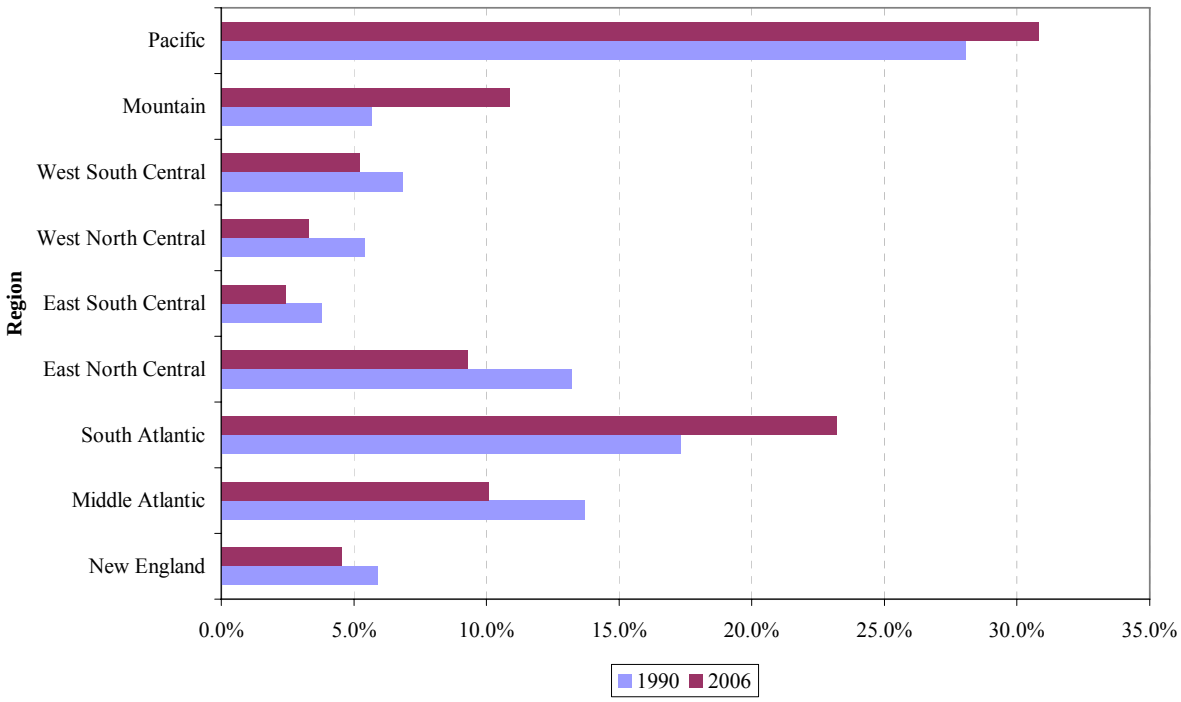
D. Findings

1. Banks Have Been Able to Diversify the Regional Composition of their Mortgage Assets

Using data from HMDA, we show the geographic composition of loans purchased in the secondary market by various participants over time. See Figure VIII.3.

Figure VIII.3

Geographic Composition of Loans Purchased in Secondary Market by Non-Agency, Non-Bank Institutions

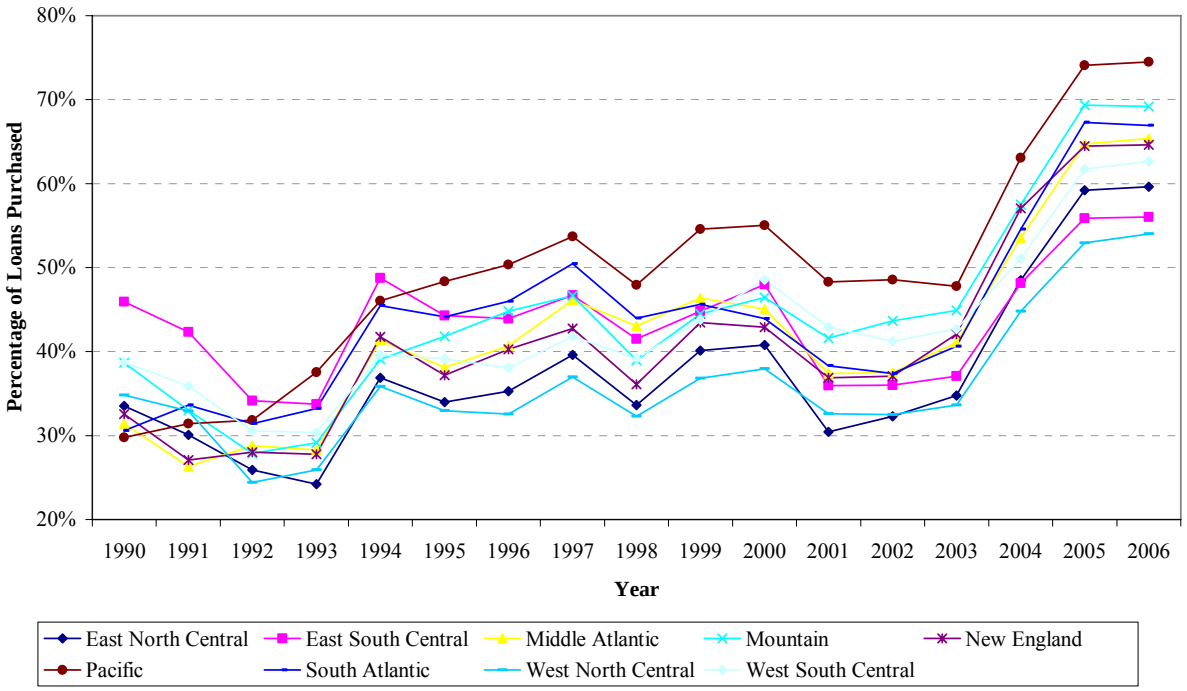


2. A Variety of Institutions Other than Government Agencies and Banks Have Played a Growing Role as Purchasers of Mortgage Loans

The securitization of mortgages has enabled a more varied group of institutions to obtain exposure to the sector. Using the HMDA data, we are able to document an ever increasing share of institutions other than government agencies and commercial banks in secondary market purchase activity. See Figure VIII.4.

Figure VIII.4

Percentage of Loans Purchased in Secondary Market by Non-Agency, Non-Bank Institutions



3. Higher Levels of Securitizable Assets Increase the Rate of Real Loan Growth

Figure VIII.5 presents the results from our fixed-effects regression analysis. It shows that across all banks, as well as the groups of small and large banks, the total loan growth (adjusted for inflation) is positively affected by the securitization rate of a bank's loan portfolio and the level of liquid assets during the time period 1990 to 2006. The monetary policy variable measurement alone has a negative and significant effect on a bank's total loan growth. This is consistent with our hypothesis that banks tend to reduce lending activities as borrowing from external financing becomes increasingly more expensive. When interacting the monetary measurement with the securitization index, we get positive and significant results for both the entire sample and the group of small banks. This shows the fact that securitization is able to mitigate some of the negative impact of monetary policy on bank lending activities.

Figure VIII.5

Summary of Regression Results for Total Loan Growth
1990 to 2006

Bank Group	Dependent Variable	Monetary Measure	Lagged Securitization Estimate / *P-Value*	Lagged Liquidity Estimate / *P-Value*	Sum of Monetary Shock Lags/ *P-Value*	Sum of the Estimates of Monetary Shock and Lagged Securitization Interactive Terms / *P-Value*	R-Square	Number of Observations
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Banks	Total Loan Growth	Paper Bill Spread Over Treasuries	0.02094 *0.00000*	0.08208 *0.00000*	(0.04430) *0.00000*	0.01362 *0.02169*	0.1515	426,109
Small Banks [1]	Total Loan Growth	Paper Bill Spread Over Treasuries	0.03283 *0.00000*	0.08981 *0.00000*	(0.04861) *0.00000*	0.02152 *0.00273*	0.1535	319,606
Large Banks [2]	Total Loan Growth	Paper Bill Spread Over Treasuries	0.04876 *0.00467*	0.10001 *0.00000*	(0.03701) *0.00616*	(0.02017) *0.49204*	0.2018	21,275

Notes:

The dependent variable is the log of real loan growth. The independent variables are one lag of liquidity, one lag of securitization index, four lags of real GDP growth (1-4), four lags of change in monetary policy indicator (1-4), four lags of the cross effects between monetary indicator (1-4) and securitization index (1-4), plus bank specific effects, financial modernization act and linear year trend.

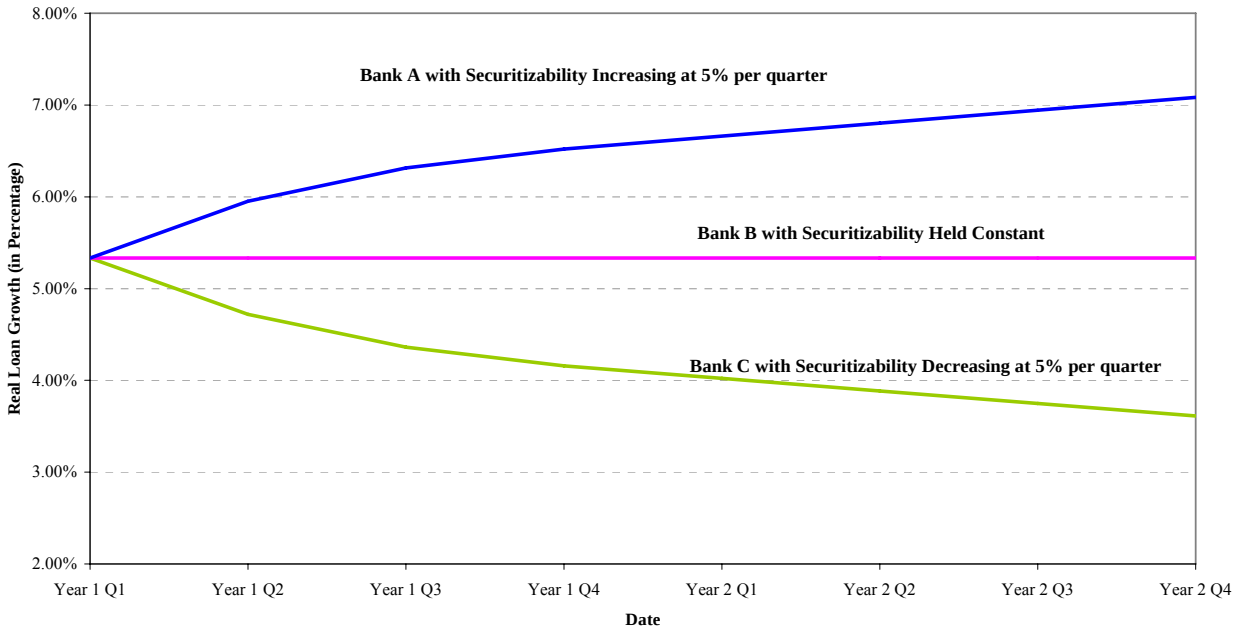
[1] Small banks are defined as having real assets ranked in the bottom 75 percentile among all banks.

[2] Large banks are defined as having real assets ranked in the top 5 percentile among all banks.

To illustrate the impact of the securitization level on bank lending decisions, we assume a constant commercial paper-Treasury bill spread of 40 basis points, a constant liquidity ratio of 20%, and an annual GDP growth of 3%. Under these assumptions, our regression model predicts that a constant securitization level of 40% will lead to a stable growth of 5.3% in total loans every quarter. The quarterly total loan growth will increase from 5.3% to 7.1%, if we allow the securitization level to increase at 5% per quarter to 75% of a bank's loan portfolio. In comparison, if the securitization level was to decline at 5% per quarter to only 5% of a bank's loan portfolio, we will see a decrease in the quarterly total loan growth from 5.3% to roughly 3.6%. The results illustrate that the ability to securitize existing loans provides banks with an additional source of funding, without draining their liquid assets, and contributes to the growth in loan originations. See Figure VIII.6.

Figure VIII.6

Higher Levels of Securitizable Assets Increase the Rate of Real Loan Growth



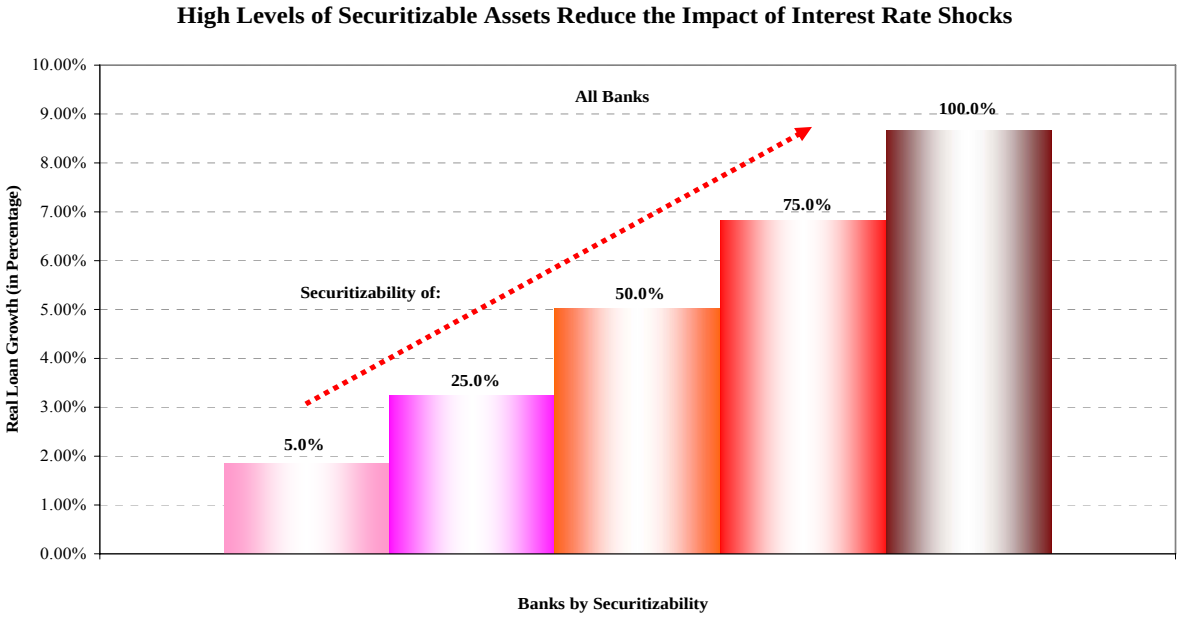
Notes:
The initial securitizability is 40%.

4. Higher Levels of Securitizable Assets Reduce the Impact of Interest Rate Shock under Certain Conditions

Monetary policy tightening reduces the availability of insured deposits and ultimately increases a bank's funding cost. In response to such an interest rate shock, banks tend to experience a contraction in their lending activities. This is confirmed by the negative sum of coefficients on the monetary policy indicators. On the other hand, our model also indicates that the presence of securitization will alleviate the negative impact of an interest rate shock on bank lending, which is evident from the positive sum of coefficients on the interaction terms between monetary policy and securitization index.

In a scenario where we assume a constant liquidity ratio of 20%, an annual GDP growth of 3%, and an initial commercial paper-Treasury bill spread of 50 basis points that is widening at the rate of 10 basis points per quarter, a bank will exhibit about 1.9% growth in total loans after four quarters of rising paper-bill spread if it is able to securitize/sell only 5% of its loan portfolio. This quarterly growth rate will increase to 8.7% when a bank is able to securitize/sell 100% of its loan portfolio. See Figure VIII.7.

Figure VIII.7

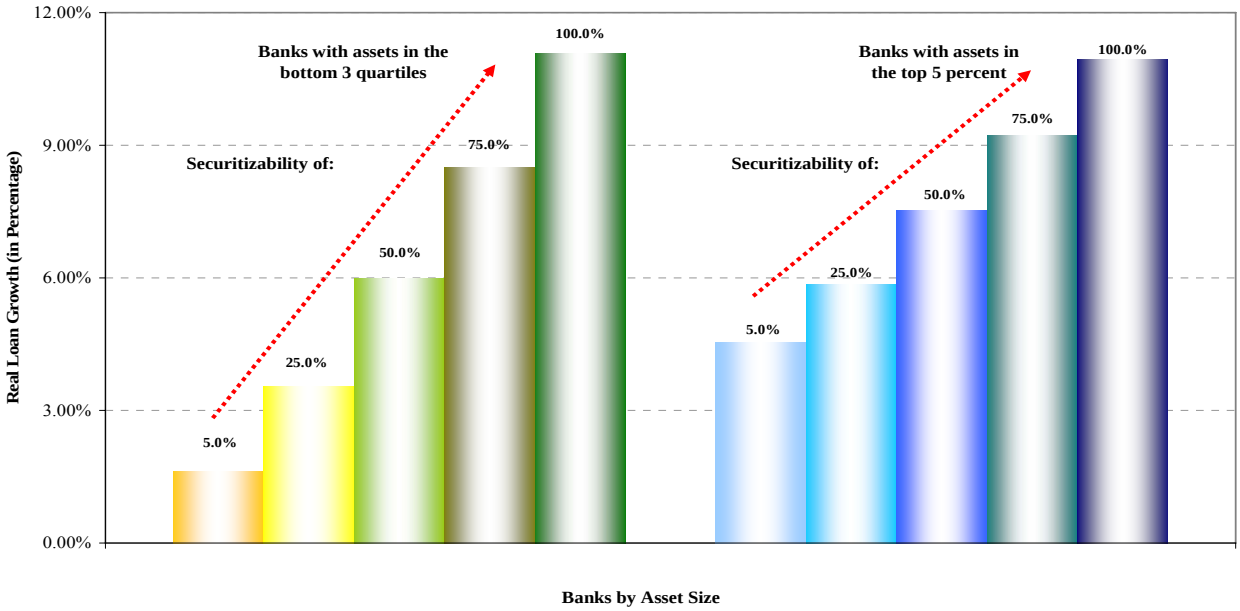


Notes:
Interest rate shock is measured by an increase in the spreads between the 3-month commercial paper rate and the 3-month T-bill rate.
The real loan growth calculation captures the cumulative effects of interest rate shock in the previous 4 quarters.

To further assess the effects of securitization and interest rate shocks on banks of different sizes, we apply the previous scenario on the groups of large and small banks. Figure VIII.8 shows that in the event of tightening monetary policy (positive interest rate shock), higher levels of securitization have a more pronounced effect on small banks than on large banks. This is possibly due to the fact that large banks have greater access to the capital market, and generally have lower credit risks. Thus, when facing a monetary tightening, large banks are still able to obtain external funding at a relatively low cost.

Figure VIII.8

Higher Levels of Securitization Have a More Pronounced Effect on Banks with Assets in the Bottom Three Quartiles than on Banks with Assets in the Top Five Percent



Notes:
Interest rate shock is measured by an increase in the spreads between the 3-month commercial paper rate and the 3-month T-bill rate.
The real loan growth calculation captures the cumulative effects of interest rate shock in the previous 4 quarters.

5. Securitization and Capital Requirement

The results of our capital requirement analysis are presented in Figure VIII.9. Since the tier 1 capital ratio and the total capital ratio yield qualitatively similar results, we only show here the model using tier 1 capital ratio as the dependent variable. To overcome the non-stationarity issue associated with the capital ratio variable, we run the model using first differences of variables, except for net income growth, loan growth and growth in the money supply[178] (MZM Growth), which essentially are already in "first difference" form.

[178] We use the Federal Reserve of St. Louis zero maturity money supply published weekly and available through Bloomberg, L.P. as a measure of the money supply.

Figure VIII.9

Summary of Time-series Regression Result
Dependent Variable: Tier 1 Capital Ratio

Variable	Coefficient	t stat	p-value
Intercept	-0.0021	-2.14	0.0392
Securitizability Index (first difference)	-0.0664	-1.44	0.1589
Net Income Growth	0.0196	2.27	0.0290
Loan Growth	0.1540	3.44	0.0015
Loan Loss Reserve (first difference)	-15.1162	-4.16	0.0002
Rate Differential (first difference)	0.0026	1.53	0.1336
MZM Growth	0.0290	0.95	0.3463

The results indicate that securitizability is negatively correlated with capital ratios but is not statistically significant. Thus we do not find evidence that securitizable assets affect capital ratios. Our findings are not consistent with Dionne and Harchaoui's (2003) study which shows that securitization helps banks to reduce capital. The positive correlation coefficients on net income growth, loan growth and the differential between 10-year and 2-year Treasury rates – variables correlated with the profitability of banks – while contrary to our expectations, are in line with the results by d'Avack and Levasseur (2007). They attribute this positive relationship to the possibility that banks use profits to build up their capital holding. The positive impact of the MZM growth variable indicated that banks hold more capital during periods of economic contraction.

Overall, our study shows the importance and benefits of securitization for banks' lending activities. We quantify a bank's ability to securitize existing loans by constructing an index, which captures the structure of an individual bank's loan portfolio as well as the securitization level in the overall U.S market. The results show that securitization, as an additional source of liquid funding, increases a bank's lending activities. High levels of securitization also provide a shield against unfavorable interest rate shocks, i.e. a tightening in monetary policy. Traditionally, banks may experience a decline in loan originations when the Federal Reserves raises interest rates. The access to securitization market can potentially offset this negative impact by supplying an alternative source of funding at a relatively low cost. We also find a negative relationship between securitization and bank capital holding but it is not

statistically significant. Our analysis does not support the hypothesis that securitization could afford banks the opportunity to hold less capital.

6. Our Results and the Current Credit Crisis

The analysis of the growth of banks' loans and securitization activity in 2007 and 2008 is challenging. Various market indicators during the 2007 to the present time indicate extreme risk aversion by investors and the reluctance of banks to lend even for the short-term. As we write this study, global indices have been declining substantially, lending for all credit levels and not just subprime remains anemic, and most of the major economies have now entered recession.

Banks remain reluctant to lend despite the various government stimulus packages. The yield on the Treasury bills has been on a declining slope since January 2007 and dipped significantly to almost zero around the collapse of Bear Stearns in March 2008 and then again in September. This level of market stress indicates the extent of the current financial crisis and panic.

During the same time period, securitization has almost come to a halt. The issuance of asset backed securities decreased from $323 billion in the first quarter of 2007 to $4.5 billion in the fourth quarter 2008, a 99% decline [179] Also, the issuance of mortgage-backed securities including those of Fannie Mae and Freddie Mac dropped from $540 billion in the first quarter of 2007 to $222 billion in the fourth quarter of 2008, a 59% decline.

Our models predict that the drop in securitization activities would have a negative impact on all types of loans, not just mortgages. However, the ongoing risk aversion made banks simply unwilling to lend and all markets including corporate debt, commercial papers and others have suffered accordingly. As liquidity makes its way back to the markets, we expect a significant negative impact on banks' loans if securitization remains at its current levels. Without securitization to transfer the loans (illiquid assets) into securities, it will not be possible for banks to return to prior loan growth levels, as banks would have lost a key source of funding for their operations.

[179] SIFMA. <http://www.sifma.org/research/pdf/Overall_Issuance.pdf>.

Appendix VIII.A. Selection of Key Variables

Bank Level Data

The following variables are taken or computed from the data items filed in the Report of Condition and Income:

Entity: each bank's unique identifier is taken from item RSSD9001.

Date: the report date is taken from item RSSD9999.

Federal Reserve Physical District Code: the district code is taken from item RSSD9170.

Total Loans: total loans are taken from item RCFD1400. (This item includes lease-financing receivables)

Total Mortgages: this variable is taken from item RCFD1410.

Home Mortgages: home mortgages are taken from item RCON1430. (This item is the "Secured by 1-4 family residential properties" reported in schedule RC-C, which is calculated as the sum of items RCON1797, RCON5367, and RCON5368)

Multifamily Residential Mortgages: this variable is taken from item RCON1460.

Commercial Mortgages: commercial mortgages are taken from item RCON1480.

Farm Mortgages: farm mortgages are taken from item RCON1420.

Total Assets: total assets are taken from item RCFD2170.

Commercial and Industrial loans: we use item RCFD 1600 since it includes item RCFD1766 and acceptances of other banks – RCFD1755. When RCFD1600 is zero or missing, we calculate this variable as the sum of items RCFD1763, RCFD1764, and RCFD1755.

Consumer Loans: this variable is taken from item RCFD1975. (This item is the "loans to individuals for household, family, and other personal expenditures" reported in schedule RC-C, which is calculated as the sum of items RCFDB538, RCFDB539, and RCFD2011)

Deposit: total deposits are taken from item RCFD2200.

Total Equity: total equity is taken from item RCFD3210.

Income: net income it taken from item RIAD4340.

Non-Performing Loans: this variable is calculated as the sum of loans over 90 days late (RCFD1407) and loans not accruing (RCFD1403).

Credit Card Loans: this variable is taken from item RCFD2008, which is computed as the sum of RCFDB538 and RCFDB539. Both items are reported in schedule RC-C.

Standby Letters of Credit: we calculate the standby letter of credit as the sum of:

- RCFD3375 (or sum of RCFD3376 and RCFD3377 if RCFD3375 is missing or zero)
- RCFD3819 (replaced by RCFD3820 if RCFD3819 is missing or zero)
- RCFD3821 (replaced by RCFD3822 if RCFD3821 is missing or zero)

Total Investment Securities: this variable is taken from item RCFD0390.

Fed Funds Sold and Securities Purchased under Agreements to Resale: this variable is taken from item RCFD1350. When this variable is missing or zero, we replace it by the sum of item RCFDB989 and item RCONB987.

Assets Held in Trading Account: this variable is taken from item RCFD2146.

Securities Held to Maturity: this variable is taken from item RCFD1754.

Total Trading Assets: this variable is taken from item RCFD3545.

Liquid Assets are calculated as the sum of total investment securities, federal funds sold and bought under agreement to resell, and assets held in a trading account for the period of 1990 to 1Q1993. From 2Q1993 to 1Q2002, liquid assets are calculated as the sum of federal funds sold and bought under agreements to resell, securities held to maturity, securities available for sale, and total trading assets. From 2Q2002, liquid assets are calculated as the sum of federal funds sold, federal funds bought under agreement to resell, securities held to maturity, securities available for sale, and total trading assets.

Flow of Funds Accounts of the U.S

The degree of securitization for six loan categories is computed as the ratio of loans securitized to total loans outstanding. All data are taken from the Flow of Funds Accounts of the US.

Home Mortgages: total mortgages outstanding are taken from item FL193165105.Q, the amount securitized is calculated as the sum of items FL413065105.Q and FL673065105.Q.

Multifamily Residential Mortgages: the amount outstanding is taken from item FL383165405.Q, and the amount securitized is computed as the sum of items FL413065405.Q and FL673065405.Q.

Commercial Mortgages: total mortgages outstanding are taken from item FL193165505.Q, while the amount securitized is computed as the sum of items FL413065505.Q and FL673065505.Q.

Farm Mortgages: total mortgages outstanding are taken from item FL893065600.Q, while the amount securitized is taken from item FL413065605.Q.

Commercial and Industrial Loans: the total amount outstanding is calculated as the sum of items FL383169255.Q, FL193168005.Q, FL263168005.Q, and FL263169255.Q. Total amount securitized is taken from item FL673069505.Q.

Consumer Credit: total mortgages outstanding are taken from item FL153166000.Q, and the amount securitized is taken from item FL673066000.Q.

IX. The Impact of Securitization on Liquidity

A. Introduction

The securitization process is theoretically structured with internal checks and balances such that each participant would have an incentive to monitor the performance of others. Originators and servicers are expected to have consistent standards that are monitored and enforced by the other participants in the process who have every economic incentive to do so. The performance of the underlying collateral, which is monitored closely by investors, serves as an objective measure of the quality and consistency of origination and servicing.

In this study, we document the growth in originators and servicers with the increased use of securitization, examine the performance of securitized loans as a subset of all mortgages, assess the growth in the amount, type and proportion of mortgages that are securitized and sold, and conduct an empirical analysis of the volatility of yield spreads of mortgage backed securities ("MBS") and commercial mortgage backed securities ("CMBS") to examine whether they have traded in a narrower range as investors have gained confidence in their ability to price these assets.

In the examination of performance, we test whether the distribution of delinquency rates for all loans and only securitized loans are the same. We find that while the delinquency rates for securitized loans are different than that of all mortgages for certain products in recent years, they have been the same over a longer time frame. In addition, delinquency rates for securitized subprime loans do not seem distinct from the larger sample of all subprime loans even in the recent years.

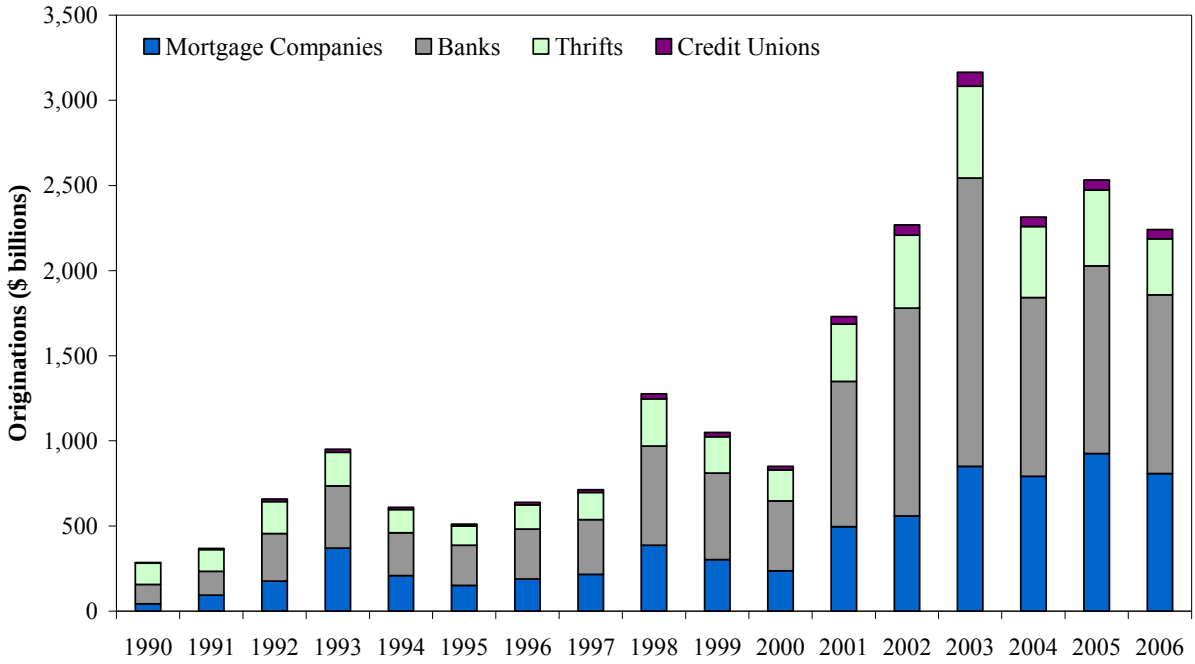
The next sections explore (i) the growth in originations and servicing, (ii) performance of securitized mortgages against mortgages as a whole, (iii) liquidity and growth in various mortgage products, and (iv) the volatility in the yield spreads of securities backed by mortgages over a Treasury benchmark.

B. Growth in Originations and Servicing

Investors in securitized mortgages (many of whom are originators and/or servicers themselves) have a direct economic interest in the quality and consistency of origination and servicing standards. As a consequence, they are expected to monitor the performance of these originators and servicers. The growth of securitization has led to growth in the supply of originators of mortgages.

Figure IX.1 illustrates the share of mortgages by lender type. Using data from HMDA on reporting agencies, we classify lenders into one of the following four categories based on the agencies to which they report: (i) banks, (ii) mortgage companies, (iii) thrifts, and (iv) credit unions. Mortgage lenders other than banks have represented both a growing volume and share of originations since 1990. In fact, originations by non-bank lenders have grown from $172 billion in 1990 to $1,193 billion in 2006, a growth of 593%. Originations by mortgage companies have increased from approximately $43 billion in 1990 to $809 billion in 2006, which represents an increase in share of total originations from 15% to 36%.

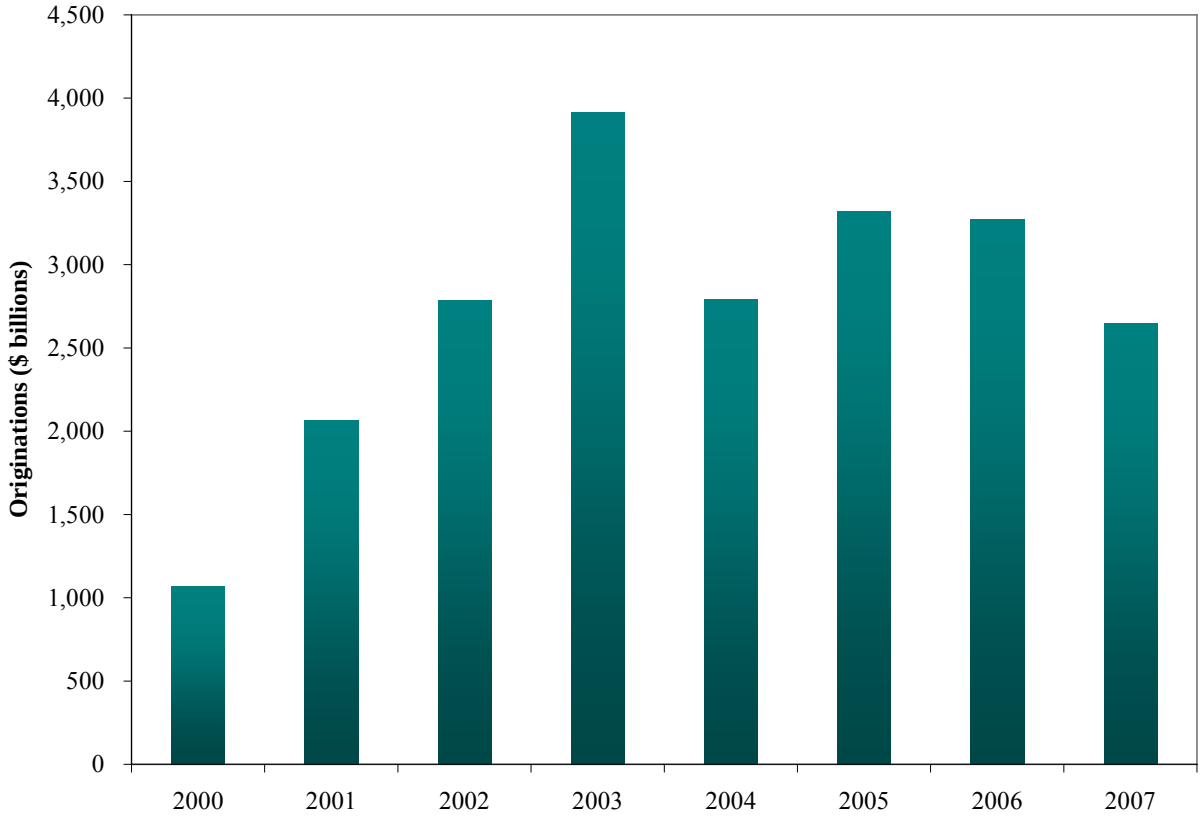
Figure IX.1. Originations by Type of Lender, 1990 – 2006



Notes & Sources:
Home Mortgage Disclosure Act Data - Loan Application Registers.
Lender type was determined by the agency to whom each lender reports:
Lenders reporting to the Office of the Comptroller of the Currency, the Federal Reserve System, or the Federal Deposit Insurance Corporation are classified as "banks."
Lenders reporting to the Office of Thrift Supervision are categorized as "thrifts." Lenders under the National Credit Union Administration are labeled "credit unions," and those reporting to the Department of Housing and Urban Development are considered "mortgage companies."

Originations by the top 100 originators (by volume) in the mortgage market have increased from $1,067 billion in 2000 to over $2,650 billion in 2007. This growth is apparent in Figure IX.2 below.

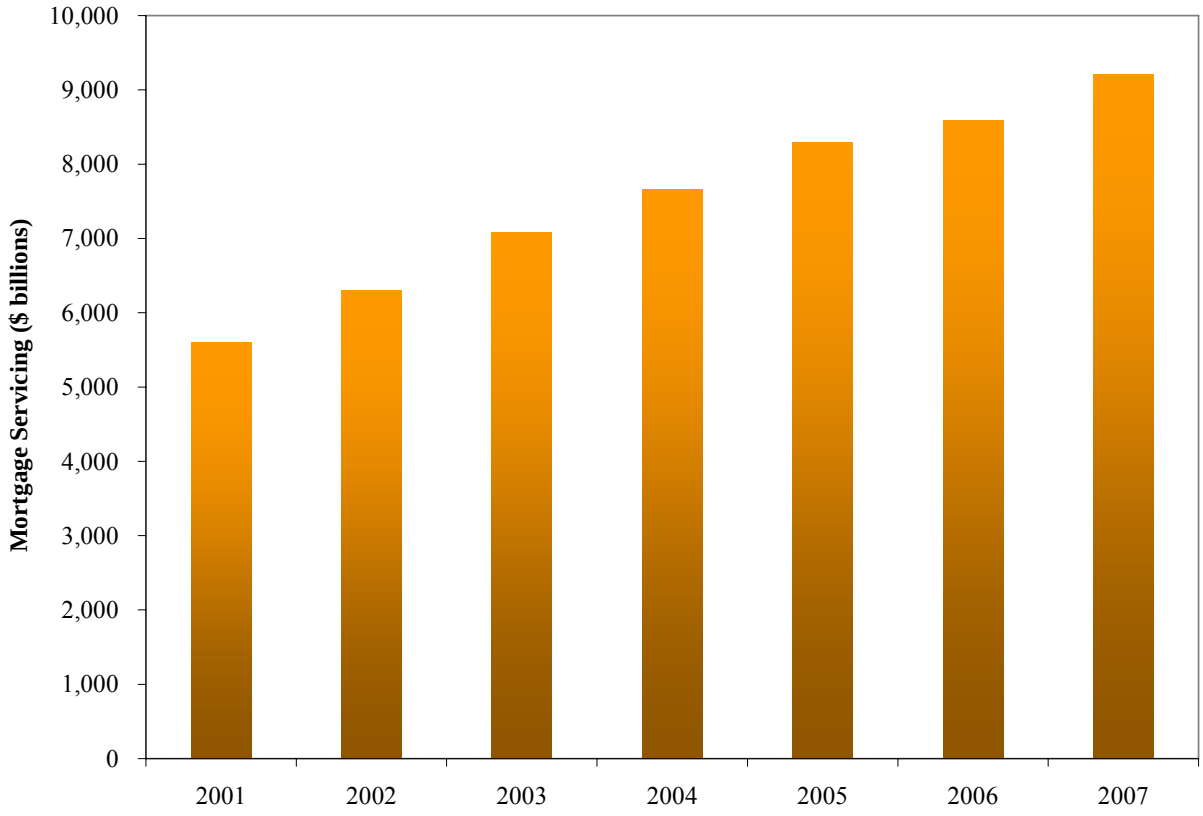
Figure IX.2. Originations by the Top 100 Originators, 2000 - 2007



Notes & Sources:
SourceMedia.

Similarly, the last two decades have witnessed rapid growth in servicers. Figure IX.3 presents the volume of mortgages serviced by the top 100 mortgage servicers (by volume). In 2001, the top 100 largest servicers in that year serviced approximately $5,600 billion in mortgages. In contrast, the top 100 largest servicers in 2007 represent $9,206 billion, a 64% increase.

Figure IX.3. Mortgage Servicing by the Top 100 Mortgage Servicers, 2001 – 2007

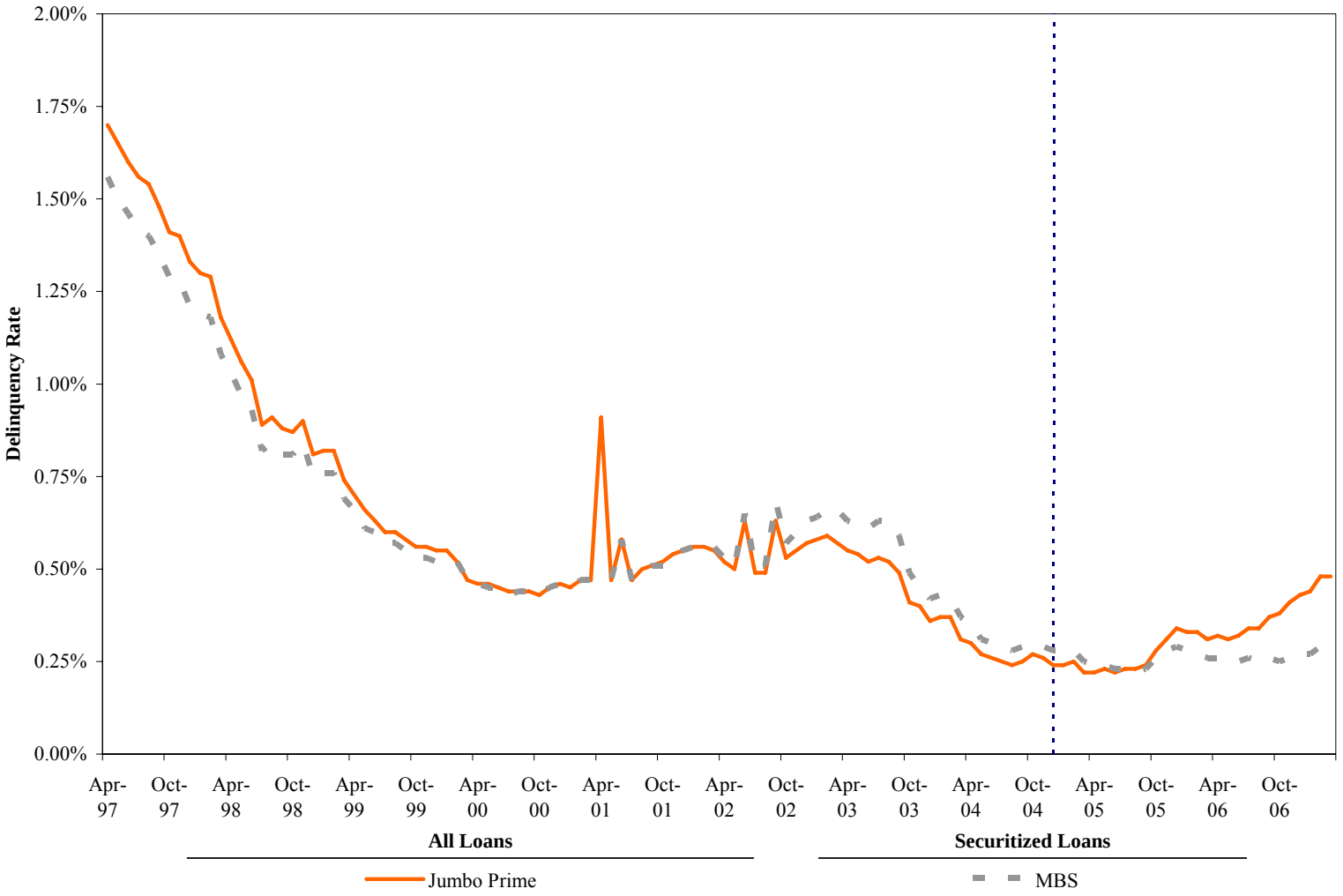


Notes & Sources:
SourceMedia.

C. Performance of Mortgage Loans

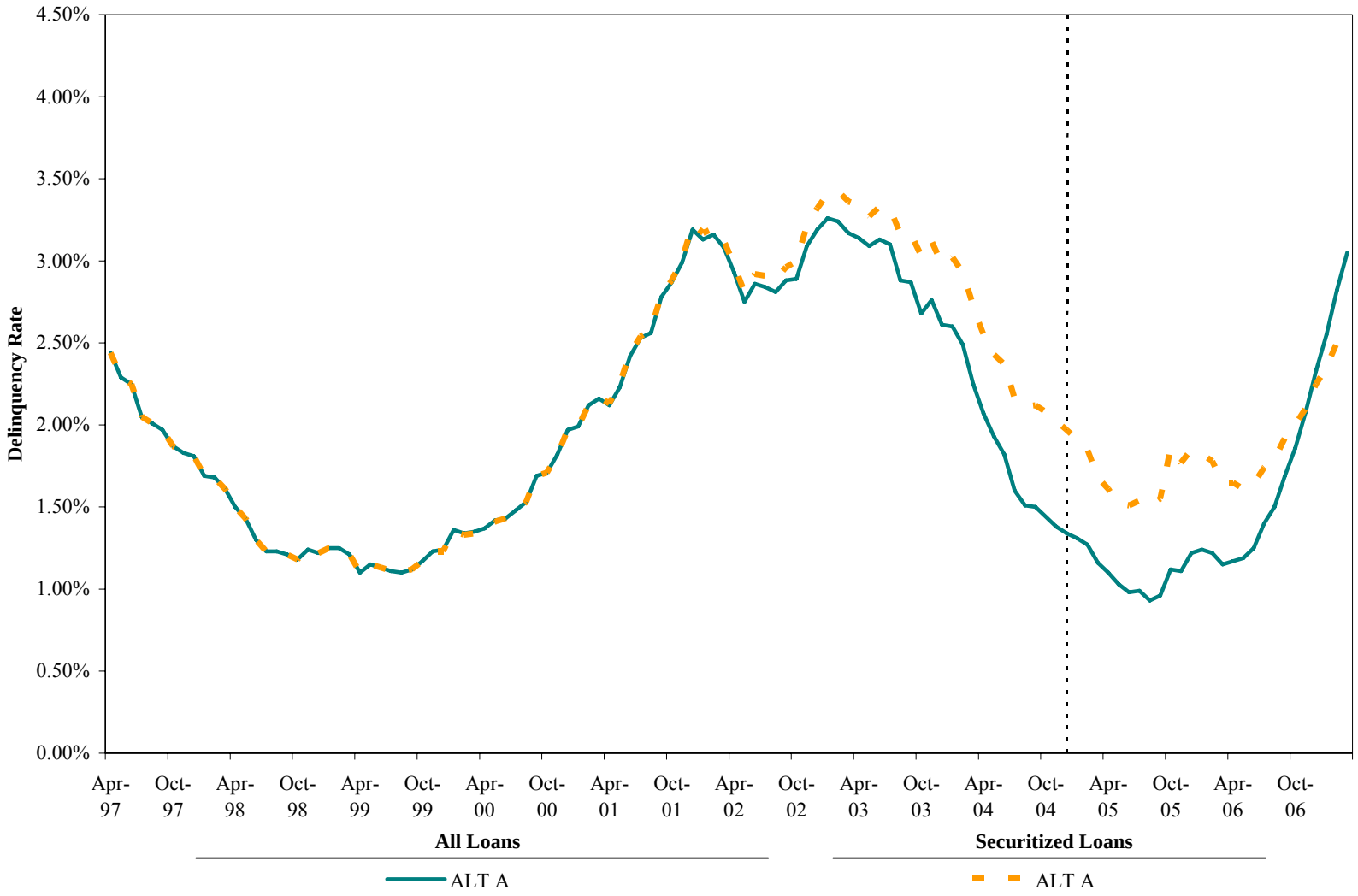
We examine performance of mortgage loans to assess differences, if any, that exist when comparing all loans to securitized ones. We use delinquency rates by loan type (jumbo, subprime, Alt-A) from LoanPerformance for all loans and for loans that are securitized during the time period April 1997 to March 2007. The delinquency rates for the different loan types are presented in Figures IX.4-IX.6 below.

Figure IX.4. Delinquency Rates for All Jumbo Loans and Securitized Jumbo Loans, Apr. 1997 – Mar. 2007



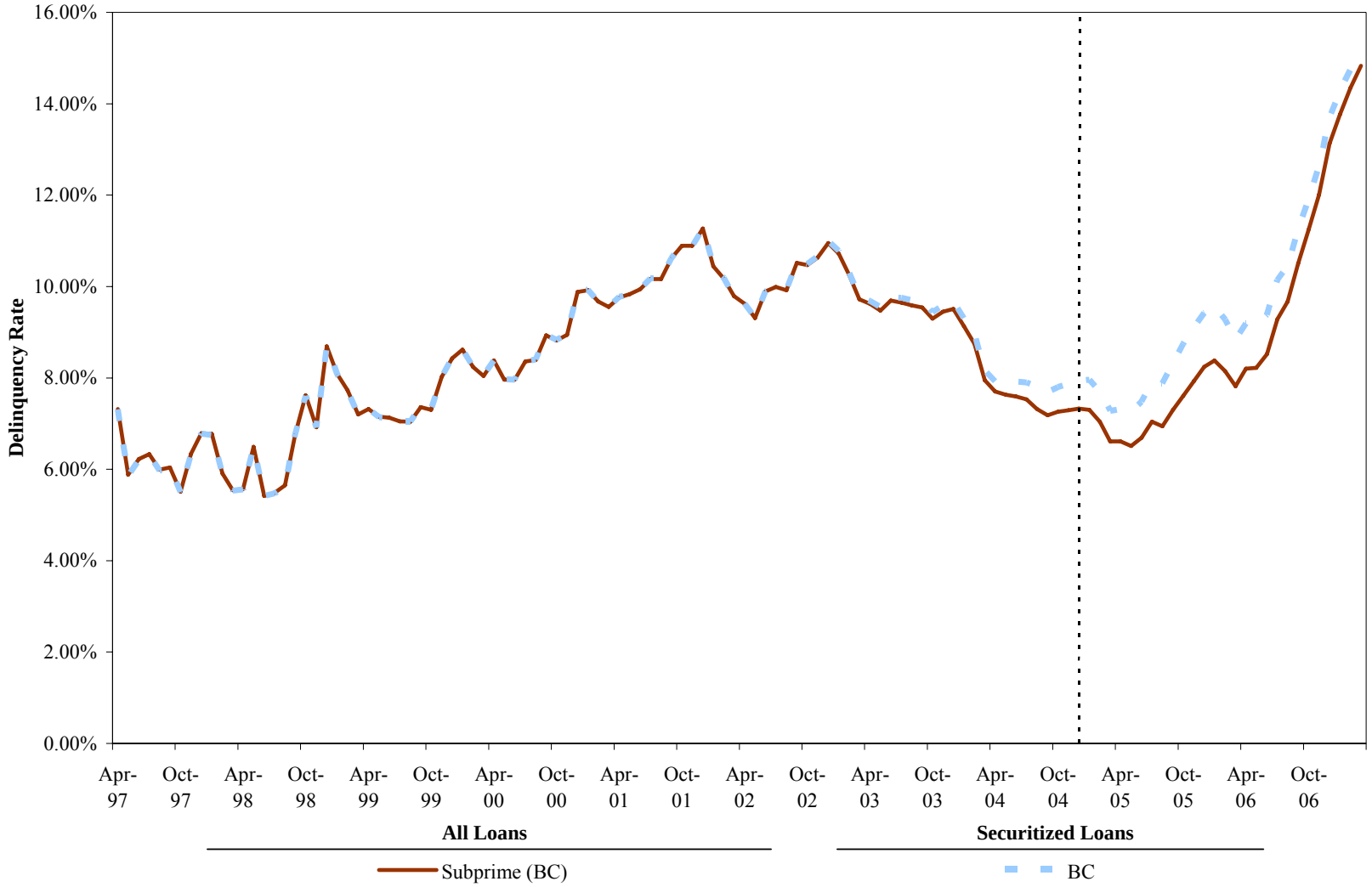
Sources: LoanPerformance

Figure IX.5. Delinquency Rates for All Alt-A Loans and Securitized Alt-A Loans, Apr. 1997 – Mar. 2007



Source: LoanPerformance

Figure IX.6. Delinquency Rates for All Subprime Loans and Securitized Subprime Loans, Apr. 1997 – Mar. 2007



Source: LoanPerformance

Figure IX.7 below captures the results of distribution tests on the delinquency rates between all loans and only securitized loans for the three markets: jumbo, Alt-A, and subprime. We review delinquency rates during three time periods: (i) April 1997 to March 2007, (ii) April 1997 to December 2004, and (iii) January 2005 to March 2007. The t-test and the Kolmogorov-Smirnov test examine whether the distributions of all loans and only securitized loans are the same. The null hypothesis is that the two samples are drawn from the same distribution.

Figure IX.7. Distribution Tests of All Loans and Securitized Loans by Loan Type

Loan Type	Date Range		Test	P-Value	Reject Null?
	From	To			
Jumbo	April-97	March-07	T-Test (Pooled - Equal Variances)	0.5669	No
			T-Test (Satterthwaite - Unequal Variances)	0.5669	No
			Kolmogorov-Smirnov Test	0.3056	No
	April-97	December-04	T-Test (Pooled - Equal Variances)	0.7682	No
			T-Test (Satterthwaite - Unequal Variances)	0.7682	No
			Kolmogorov-Smirnov Test	0.8815	No
	January-05	March-07	T-Test (Pooled - Equal Variances)	0.0004	**Yes**
			T-Test (Satterthwaite - Unequal Variances)	0.0008	**Yes**
			Kolmogorov-Smirnov Test	0.0000	**Yes**
Alt-A	April-97	March-07	T-Test (Pooled - Equal Variances)	0.0686	No
			T-Test (Satterthwaite - Unequal Variances)	0.0686	No
			Kolmogorov-Smirnov Test	0.0244	**Yes**
	April-97	December-04	T-Test (Pooled - Equal Variances)	0.3021	No
			T-Test (Satterthwaite - Unequal Variances)	0.3021	No
			Kolmogorov-Smirnov Test	0.5335	No
	January-05	March-07	T-Test (Pooled - Equal Variances)	0.0060	**Yes**
			T-Test (Satterthwaite - Unequal Variances)	0.0067	**Yes**
			Kolmogorov-Smirnov Test	0.0000	**Yes**
Subprime	April-97	March-07	T-Test (Pooled - Equal Variances)	0.3372	No
			T-Test (Satterthwaite - Unequal Variances)	0.3372	No
			Kolmogorov-Smirnov Test	0.3876	No
	April-97	December-04	T-Test (Pooled - Equal Variances)	0.7927	No
			T-Test (Satterthwaite - Unequal Variances)	0.7927	No
			Kolmogorov-Smirnov Test	0.8815	No
	January-05	March-07	T-Test (Pooled - Equal Variances)	0.2275	No
			T-Test (Satterthwaite - Unequal Variances)	0.2275	No
			Kolmogorov-Smirnov Test	0.0996	No

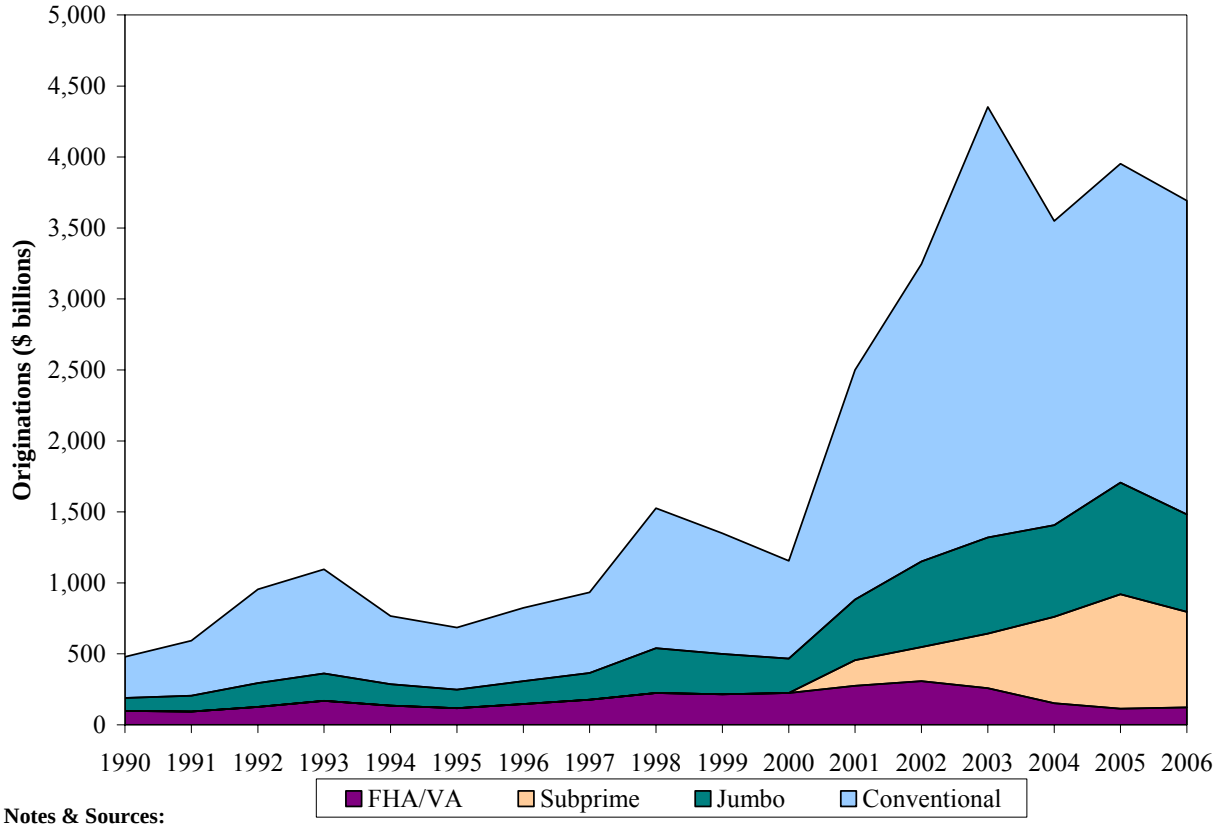
Notes & Sources:
Delinquency rates are from LoanPerformance.
Within each type of loan, delinquency rates of all loans (as obtained from the LoanPerformance servicing database) are tested against delinquency rates of only securitized loans (as obtained from the LoanPerformance securities database).
Delinquency rates from the securities database are for "traditional" products – those that are not interest-only or option-ARM loans.
A significance level of 5% is used to assess whether the null hypothesis is rejected.

For subprime loans, we cannot reject the null hypothesis that the delinquency rates are the same for securitized and all types of loans. The results are mixed for Alt-As and Jumbo loans, especially for the most recent time period 2005 to 2007. For all three types of loans, in the early period of April 1997 to December 2004, we cannot reject the null that the delinquency rates for all versus the securitized loans are the same. For jumbo and Alt-A loans, the more recent period of January 2005 to March 2007 indicates a difference between the two groups, as the null is rejected by all three tests.

D. Liquidity

Securitization has led to a deep and liquid market in which mortgage loans can be sold. Because this market has the benefit of economies of scale, it is more efficient than individual loan sales. As discussed above, there has been a significant growth in securitized mortgages recently and an increased number of products as illustrated in Figure IX.8.

Figure IX.8. Originations by Product Type, 1990 – 2006



Notes & Sources:
OFHEO and SourceMedia. "Conventional" represents conventional non-jumbo originations. "Jumbo" represents conventional jumbo originations.

E. Volatility of MBS/CMBS Yield Spreads

We examine whether securitized mortgages have traded in a narrower range as investors have gained confidence in their ability to price these assets by studying whether the volatility of yield spreads of securitized assets decreased over time. We focus on a number of mortgage backed securities ("MBS") and commercial mortgage backed securities ("CMBS") indices, in particular the Merrill Lynch MBS Master Index, Merrill Lynch CMBS Fixed Rate AAA Index, Merrill Lynch CMBS Fixed Rate Large Cap Index, and a few other indices.[180] Figure IX.9 lists all these indices. To control for the effect of the Treasury market on the mortgage backed securities, we define our dependent variable as an annualized monthly volatility of the daily

[180] All data are from Bloomberg, LP.

spread between the yields on a mortgage backed securities index and a Treasury benchmark.[181] We use monthly volatilities from January 1997 through December 2006 in our study. Figure IX.10 and Figure IX.11 show the change in yield spread volatility over time for two selected series.

We define spread volatility as an annualized end-of-month standard deviation of the difference between the yields on a mortgage backed securities index and a Treasury benchmark. (Standard deviation for a given month is calculated over the period of that month.) The spread volatility of a mortgage backed securities index over a Treasury benchmark is then modeled as a function of a linear time trend ("trend"), quadratic time trend and a time-independent average ("constant").[182] We apply a standard OLS approach. The results are presented in Figure IX.12 (columns (5) – (8)). We use the Newey-West technique to adjust our OLS estimation of standard errors for possible serial correlation in error terms (i.e., dependence of a current error term on its past values), which is common in time series data. The adjusted standard errors and corresponding statistics are shown in columns (9) – (11) in Figure IX.12.[183]

The results show that a linear trend is mostly statistically insignificant (at the 5% statistical significance level[184]) for the securitized assets indices in our study. For two MBS indices, it is positive. We find the quadratic trend to be either statistically insignificant (at the 5% statistical significance level,[185] mostly for CMBS indices) or negative (for most of the MBS indices). Thus, the results of our volatility study are inconclusive: the volatility of mortgage

[181] As a Treasury benchmark, we use 10-Year Constant Maturity Treasury yield.

[182] We also control for a possible effect of the Asian-Russian financial crises in the late 1990s, and a crash of technology stocks and accounting scandals in March 2000 – October 2002 by including dummy variables in the model equation.

[183] The OLS estimation technique assumes that errors (i.e., the residuals unexplained by the model factors) are not serially correlated and have a constant variance. If any of these assumptions are violated, the OLS estimates of standard errors on coefficients are generally invalid. It is possible to correct OLS standard errors for both possible serial correlation and heteroskedasticity (i.e., non-constant variance) using the computation technique developed by Newey and West (1987, in Wooldridge (2003)). However, for small sample sizes, the Newey-West estimation of standard errors may be unreliable. Therefore, we present standard errors estimated using both the standard OLS approach and the Newey-West method.

[184] This is the most conventional level of statistical significance. If a factor in the model (linear trend, in this case) is statistically significant at 5% level, there is only 5% chance that the estimated effect on volatility is zero.

[185] This is the most conventional level of statistical significance. If a factor in the model (quadratic trend, in this case) is statistically significant at 5% level, there is only 5% chance that the estimated effect on volatility is zero.

backed securities yield spreads tended to remain relatively stable over time[186] over the period from the late 1990s to 2006.

Figure IX.9. Description of Mortgage-Backed Securities Indices[1]

Merrill Lynch Mortgage-Backed Securities (MBS) Master Index tracks the performance of US dollar denominated 30-year, 15-year and balloon pass-through mortgage securities having at least $150 million outstanding per generic production year.

Merrill Lynch MBS Large Cap Index tracks the performance of US dollar-denominated 30-year, 15-year and balloon pass-through mortgage securities having at least $500 million outstanding per generic production year.

Merrill Lynch MBS 15-Year Maturity Index includes mortgages with 15-year maturities.

Merrill Lynch MBS 30-Year Maturity Index includes mortgages with 30-year maturities.

Merrill Lynch Commercial Mortgage Backed Securities (CMBS) Fixed Rate AAA Index includes fixed rate AAA-rated commercial mortgage-backed securities.

Merrill Lynch Commercial Mortgage Backed Securities (CMBS) Fixed Rate BBB Index includes fixed rate BBB-rated commercial mortgage-backed securities.

Merrill Lynch CMBS Fixed Rate "10+"-Year Maturity Index includes fixed rate commercial mortgage-backed securities with maturities of 10 years and over.

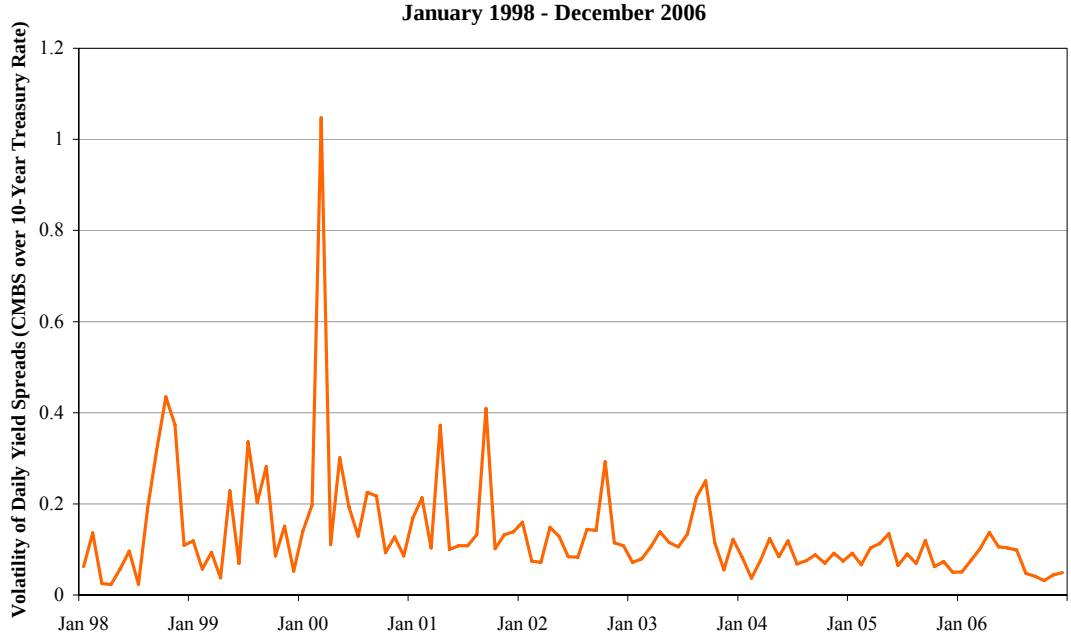
Merrill Lynch CMBS Fixed Rate Large Cap Index includes fixed rate commercial mortgage-backed securities having at least $500 million outstanding per generic production year.

[1]Data are from Bloomberg, LP.

[186] In a few cases of the MBS indices, the volatility of mortgage backed securities yield spreads actually increased linearly but decreased quadratically.

Figure IX.10

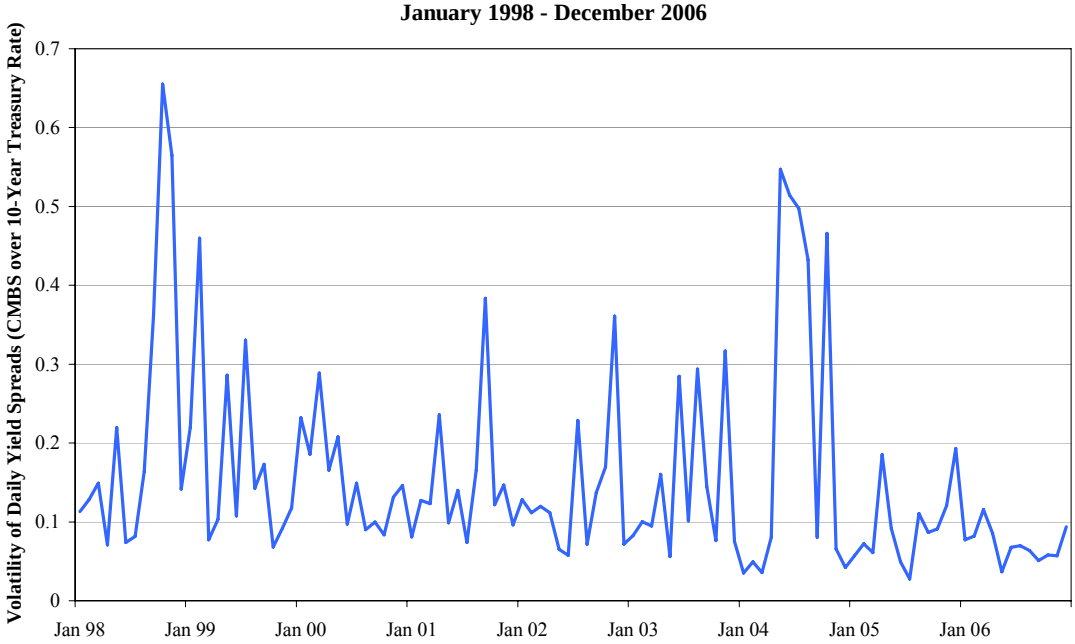
Merrill Lynch CMBS Fixed Rate AAA Index and 10-Year Constant Maturity Treasury
Volatility of Daily Yield Spreads
January 1998 - December 2006



Notes & Sources:
Bloomberg, LP and the Federal Reserve Board.

Figure IX.11

Merrill Lynch CMBS Fixed Rate "10+"-Year Maturity Index and 10-Year Constant Maturity Treasury
Volatility of Daily Yield Spreads
January 1998 - December 2006



Notes & Sources:
Bloomberg, LP and the Federal Reserve Board.

Figure IX.12

Summary of OLS and Newey-West Regressions of Volatility of Spreads of Merrill Lynch MBS and CMBS Indices[1] over a Treasury Benchmark

					OLS			OLS with Newey-West Standard Errors[2]		
Index	Period	Number of Observations	R-squared	Coefficient Estimate	Standard Error	T-Statistic	P-Value	Standard Error	T-Statistic	P-Value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Merrill Lynch MBS Master Index										
Time Indicator	January 1997 - December 2006	120	0.3174	0.0142	0.0022	6.53	0.000	0.0042	3.43	0.001
Squared Time Indicator				-0.0001	0.0000	-6.68	0.000	0.0000	-3.58	0.000
Constant				-0.0662	0.0588	-1.13	0.263	0.0948	-0.70	0.486
Merrill Lynch MBS 30-Year Maturity Index										
Time Indicator	January 1997 - December 2006	120	0.2840	0.0163	0.0027	6.01	0.000	0.0049	3.32	0.001
Squared Time Indicator				-0.0001	0.0000	-6.13	0.000	0.0000	-3.43	0.001
Constant				-0.0869	0.0731	-1.19	0.237	0.1072	-0.81	0.419
Merrill Lynch MBS 15-Year Maturity Index										
Time Indicator	January 1997 - December 2006	120	0.0824	0.0055	0.0043	1.28	0.204	0.0031	1.76	0.082
Squared Time Indicator				-0.0001	0.0000	-1.52	0.131	0.0000	-2.24	0.027
Constant				0.1095	0.1153	0.95	0.344	0.0726	1.51	0.134
Merrill Lynch MBS Large Cap Index										
Time Indicator	September 2000 - December 2006	76	0.3759	0.0039	0.0056	0.69	0.490	0.0065	0.60	0.553
Squared Time Indicator				-0.0001	0.0001	-2.49	0.015	0.0001	-2.06	0.043
Constant				0.4507	0.1423	3.17	0.002	0.1766	2.55	0.013
Merrill Lynch CMBS Fixed Rate AAA Index										
Time Indicator	January 1998 - December 2006	108	0.1349	-0.0008	0.0022	-0.38	0.703	0.0025	-0.34	0.734
Squared Time Indicator				0.0000	0.0000	-0.11	0.911	0.0000	-0.11	0.912
Constant				0.1743	0.0561	3.11	0.002	0.0693	2.52	0.013
Merrill Lynch CMBS Fixed Rate BBB Index										
Time Indicator	January 1998 - December 2006	108	0.1432	-0.0015	0.0022	-0.69	0.493	0.0020	-0.77	0.443
Squared Time Indicator				0.0000	0.0000	-0.05	0.961	0.0000	-0.06	0.951
Constant				0.2629	0.0569	4.62	0.000	0.0653	4.03	0.000
Merrill Lynch CMBS Fixed Rate "10+"-Year Maturity Index										
Time Indicator	January 1998 - December 2006	108	0.1106	0.0037	0.0023	1.59	0.116	0.0028	1.31	0.194
Squared Time Indicator				0.0000	0.0000	-2.07	0.041	0.0000	-1.80	0.075
Constant				0.1260	0.0602	2.09	0.039	0.0585	2.15	0.033
Merrill Lynch CMBS Fixed Rate Large Cap Index										
Time Indicator	January 1998 - December 2006	108	0.1418	-0.0005	0.0019	-0.24	0.813	0.0021	-0.22	0.829
Squared Time Indicator				0.0000	0.0000	-0.30	0.767	0.0000	-0.30	0.764
Constant				0.1628	0.0500	3.26	0.002	0.0605	2.69	0.008

Notes and Sources:

Data from Bloomberg, LP and Federal Reserve Board.

[1] The dependent variable used in the regressions is the monthly volatility of the daily spreads of the MBS/CMBS yields over the 10-Year Constant Maturity Treasury yield. Mathematically, the volatility is calculated as: *volatility = standard deviation (daily spread) * annualizing factor*, where *the daily spread = MBS/CMBS yield - 10-Yr Treasury Yield* for each day and *the annualizing factor = sqrt(days in the year / days in the month)*.

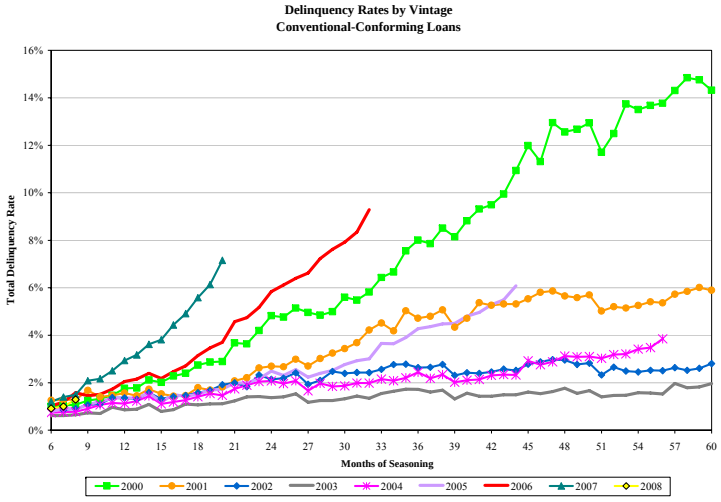
[2] OLS with Newey-West standard errors assume 4 lags.

F. Findings and the Current Credit Crisis

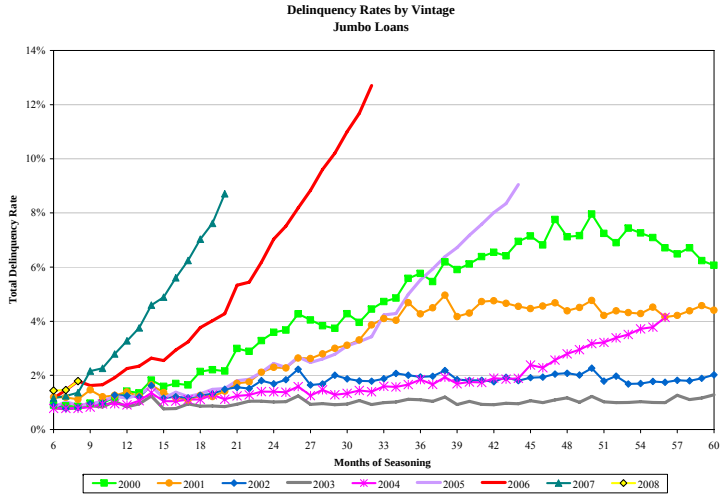
There is an ongoing controversy in recent working papers as to the impact of securitization on quality of the loans and transparency. Some academics argue that securitization led to lax underwriting standards and the originate-to-distribute model led to lack of incentives. Others argue that the recent spike in delinquencies is a result of refinancing activities or the inability of borrowers to obtain cheaper loans as housing prices decline.

The data analysis illustrate that securitized loans do not necessarily perform worse than all loans. In addition, recent data show that the delinquency of loans which were originated in 2006, 2007 and 2008 are on a trajectory to surpass the delinquency rates of all other recent vintages. This is true for all types of mortgages and not just subprime. See Figure IX.13.

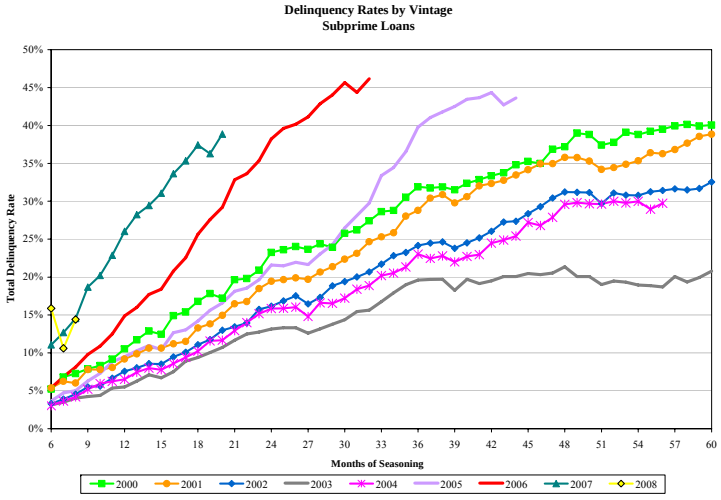
Figure IX.13. Delinquency Rates by Vintage



Notes and Sources: LoanPerformance. Delinquency status for each vintage is through August 2008.
Total delinquency rates are calculated as the sum of 30-, 60-, 90-, and 120- days delinquent balances divided by the total balance outstanding.



Notes and Sources: LoanPerformance. Delinquency status for each vintage is through August 2008.
Total delinquency rates are calculated as the sum of 30-, 60-, 90-, and 120- days delinquent balances divided by the total balance outstanding.



Notes and Sources: LoanPerformance. Delinquency status for each vintage is through August 2008.
Total delinquency rates are calculated as the sum of 30-, 60-, 90-, and 120- days delinquent balances divided by the total balance outstanding.

We discuss above the various possible contributing factors including evidence of lax underwriting standards and the inability of borrowers to refinance as housing prices started to decline by mid 2006. The impact of securitization on the quality of the loans remains controversial and requires additional research.

X. Summary of Market Participant Interviews

As a part of the study, we conducted interviews with market participants in the securitization process. It is important to note that these interviews occurred prior to the current financial crisis and as such, reflect sentiments that may no longer represent the current environment.

The goal of the interviews was to better understand the specific role played by the interviewees and the benefits and costs of securitization from their perspectives. We completed 24 interviews with market participants that include originators, issuers, master servicers, attorneys, accountants, regulators, and investors. We summarized the benefits of and concerns regarding securitization as expressed from several perspectives: the sell-side, the buy-side, and the regulatory-side. The sell-side generally consists of parties involved in creating and marketing the security such as originators and issuers while the buy-side consists of investors that purchase them. The regulatory-side consists of governmental entities involved in overseeing the securitization process.[187]

There was general agreement from all parties that securitization creates an alternative and less expensive way of financing. It increased liquidity and provides a stronger, more efficient flow of capital into all asset classes. This benefit in turn lowered the cost of borrowing for consumers and provides credit to borrowers in areas of the United States that had traditionally had limited access to credit markets. Securitization had fostered growth in homeownership and car ownership rates.

On the sell-side, securitization allowed originators to isolate their assets and achieve a strong credit position for issuing investment grade securities out of non-investment grade collateral. The process of securitization was seen as an important method for obtaining the necessary liquidity and capital in order to achieve the firm's funding goals and grow its business.

[187] We interviewed economists and policy advisors from the Federal Reserve Board, the Office of Federal Housing Enterprise Oversight, and the FDIC.

Securitization also enabled Wall Street to deliver highly tailored investment opportunities to investors, thereby increasing the number of investors in the market.

Some interviewees argued that securitization has facilitated the provision of information to a third party. Because sell-side companies were required to provide information on their securitized assets to investors, they developed a better understanding about their business, clients, and markets in the process of collecting the data. This standardization and distribution of information had given rise to greater transparency.

On the contrary, some interviewees expressed concerns that originators had failed to pay sufficient attention to the ability of borrowers to repay the loans before originating them. Others argued that securitization had led to lax underwriting guidelines and a loss of internal controls on the sell-side. Because securitization had segmented the lending process from traditional savings and loans institutions that originate and keep the mortgage on their books into a complex web of participants securitizing these loans, the lending process was stretched out to other market participants, which had loosened the underwriting guidelines.

On the buy-side, securitization had given investors access to an expanded array of investment opportunities. The increase in the range of asset classes that were securitized had broadened the variety of investors who bore the risks. If risk could be spread more broadly, then that could bring down the risk premium, which could then lower rates for borrowers.

Some interviewees were concerned that securitization could inhibit an investor's ability to differentiate between assets, as all AAA-rated securities were taken as being the same. Issuers had also created securities that were complex to understand and required a significant amount of energy and resources to analyze. As a result, some believed that investors had been purchasing various tranches of securities without understanding what they were buying and how these securities compared to their risk profiles. Others had voiced the concern that securitization had created too much liquidity at times, and there was too much money chasing too few profitable investments.

Last, on the regulatory-side, securitization was seen as having improved capital market rigor because the number of participants involved had added perspectives to make people more disciplined. Regulators had also seen great advancement in the discipline of risk management.

Despite these progresses, they argued that good underwriting was still important. Regardless of how the risk was disseminated, if the assets being distributing were bad, the performance would inevitably be bad. Though securitization had provided some resiliency, it had not eliminated risk entirely.

There is a still the need to create the right level of data transparency in the market. Regulators had also seen the cheapness of credit increase the general indebtedness of Americans. They also believed securitization created serious credit issues for companies that were excessively dependent on it as their sole source of funding.

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