

MPRA

Munich Personal RePEc Archive

Explaining the Housing Bubble

Levitin, Adam and Wachter, Susan

12 April 2012

Online at <https://mpra.ub.uni-muenchen.de/41920/>
MPRA Paper No. 41920, posted 05 Nov 2012 14:29 UTC

Explaining the Housing Bubble

ADAM J. LEVITIN & SUSAN M. WACHTER^{*}

There is little consensus as to the cause of the housing bubble that precipitated the financial crisis of 2008. Numerous explanations exist: misguided monetary policy; a global savings surplus; government policies encouraging affordable homeownership; irrational consumer expectations of rising housing prices; inelastic housing supply. None of these explanations, however, is capable of fully explaining the housing bubble.

This Article posits a new explanation for the housing bubble. First, it demonstrates that the bubble was a supply-side phenomenon, attributable to an excess of mispriced mortgage finance: mortgage-finance spreads declined and volume increased, even as risk increased—a confluence attributable only to an oversupply of mortgage finance.

Second, it explains the mortgage-finance supply glut as resulting from the failure of markets to price risk correctly due to the complexity, opacity, and heterogeneity of the unregulated private-label mortgage-backed securities (PLS) that began to dominate the market in 2004. The rise of PLS exacerbated informational asymmetries between the financial institutions that intermediate mortgage finance and PLS investors. These intermediation agents exploited informational asymmetries to encourage overinvestment in PLS that boosted the financial intermediaries' volume-based profits and enabled borrowers to bid up housing prices.

This Article proposes the standardization of PLS as an information-forcing device. Reducing the complexity and heterogeneity of PLS would facilitate accurate risk pricing, which is necessary to rebuild a sustainable, stable housing-finance market.

TABLE OF CONTENTS

^{*} Professor of Law, Georgetown University Law Center, and Richard B. Worley Professor of Financial Management, Professor of Real Estate and Finance, The Wharton School, University of Pennsylvania, respectively. © 2012, Adam J. Levitin & Susan M. Wachter. The authors would like to thank Tom Adams, William Bratton, Greg Klass, Mike Konczal, Sarah Levitin, Susan Webber, and Robin West, for their comments and encouragement; Manuel Adelino, for sharing proprietary data; and Arthur Acoca-Pidolle, Igor Kleyman, Crystal Lu, Grant MacQueen, Anthony W. Orlando, Michael Shaheen, Eric Virbitsky, and the Georgetown University Law Library, for their research assistance. Susan Wachter thanks the Research Sponsor Program of the Zell/Lurie Real Estate Center at the Wharton School of the University of Pennsylvania for its support. This Article has benefited from presentations at the Federal Reserve Bank of Philadelphia's conference on Reinventing Older Communities, the Tobin Project's Workshop on Behavioral/Institutional Research and Financial Institutions, the Georgetown Contemporary Legal Scholarship Seminar, the Tel Aviv University Law and Economics workshop, and the American Association of Law Schools Annual Convention.

INTRODUCTION	2
I. THE U.S. HOUSING-FINANCE MARKET	9
A. AGENCY SECURITIZATION.....	9
B. PRIVATE-LABEL SECURITIZATION	11
C. A TALE OF TWO BOOMS.....	14
D. FUELING THE PLS BOOM: THE RISE OF NONTRADITIONAL MORTGAGES	17
II. A SUPPLY-SIDE EXPLANATION OF THE HOUSING BUBBLE.....	22
A. EVIDENCE FROM PLS-YIELD SPREADS	22
B. TIMING THE BUBBLE	25
1. 1997–2000.....	26
2. 2001–2003.....	27
3. 2004–2006.....	28
III. ALTERNATIVE THEORIES OF THE HOUSING BUBBLE	29
A. DEMAND-SIDE THEORIES	30
1. Mass Psychology and Irrational Exuberance	30
2. Fundamentals of Housing Supply	31
B. SUPPLY-SIDE THEORIES	32
1. Government Fair-Lending and Affordable-Housing Policy	32
2. Monetary Policy and the Global Supply of Credit.....	39
3. Market Relaxation of Underwriting Standards	43
IV. EXPLAINING THE OVERSUPPLY OF UNDERPRICED MORTGAGE CREDIT.....	44
A. ECONOMIC AGENTS EXPLOITING INFORMATION ASYMMETRIES	44
B. FAILURE OF NORMAL MARKET CONSTRAINTS	48
1. Credit Ratings	48
2. Subordinated-Debt Investors.....	51
V. STANDARDIZATION AS AN INFORMATIONAL PROXY.....	64

INTRODUCTION

This Article explains the historic U.S. housing bubble. From 1997 to 2006, nominal U.S. housing prices rose 188%.¹ By mid-2009, however, housing prices had fallen by 33% from peak.² As the United States attempts to rebuild its housing-finance system, it is of paramount importance to understand what caused the housing bubble. Until we understand how and why the housing bubble occurred, we cannot be certain that a reconstructed housing-finance system will not again produce such a devastating bubble.

There is little consensus about what caused the bubble,³ or even what part of the housing-price appreciation between 1997 and 2006 was in fact a bubble.⁴ Some explanations, based on

¹ See *S&P/Case–Schiller Housing Price Indices*, STANDARD & POORS, <http://www.standardandpoors.com/indices/sp-case-shiller-home-price-indices/en/us/?indexId=spusa-cashpidff--p-us---> (download file in the “Home Price Index Levels” row, “Seasonally Adjusted” column; view the “Composite-10 CSXR-SA” column in the spreadsheet) (last visited Jan. 9, 2012). When adjusted for inflation, the increase in housing prices was still an astounding 135%.

² See *id.* On an inflation-adjusted basis, the peak-to-trough price decline was 38%.

³ See Edward L. Glaeser, Joshua D. Gottlieb & Joseph Gyourko, *Can Cheap Credit Explain the Housing Boom?* 1 (Nat’l Bureau of Econ. Research, Working Paper No. 16230, 2010).

macroeconomics, posit that the bubble was caused by excessively easy monetary policy. Thus, some scholars have argued that the bubble was the result of the Federal Reserve holding interest rates too low for too long, resulting in artificially cheap mortgage credit and stoked housing demand.⁵ Other scholars have pointed to the global savings glut that pushed down interest rates.⁶ Several commentators have fingered federal-government fair-lending and affordable-housing policies as encouraging mortgage lending to less creditworthy consumers.⁷ Other scholars have emphasized the sharp deterioration in lending standards as contributing to the rise in housing prices,⁸ as well as the importance of changes to the mortgage-market institutional structure.⁹

⁴ See *infra* section II.B; cf. FIN. CRISIS INQUIRY COMM'N, THE FINANCIAL CRISIS INQUIRY REPORT: FINAL REPORT OF THE NATIONAL COMMISSION ON THE CAUSES OF THE FINANCIAL AND ECONOMIC CRISIS IN THE UNITED STATES 124–25 (2011) [hereinafter FIN. CRISIS INQUIRY COMM'N FINAL REPORT], available at <http://www.gpo.gov/fdsys/pkg/GPO-FCIC/content-detail.html> (never expressing an official view of when the bubble began but implying that it started after the Federal Reserve lowered interest rates in 2001); *id.* at 417–18, 424 (Keith Hennessey, Douglas Holtz-Eakin & Bill Thomas, dissenting) (arguing the bubble began in the late 1990s); *id.* at 445 (Peter J. Wallison, dissenting) (identifying the housing bubble as occurring between 1997 and 2007).

⁵ See JOHN B. TAYLOR, GETTING OFF TRACK: HOW GOVERNMENT ACTIONS AND INTERVENTIONS CAUSED, PROLONGED, AND WORSENERED THE FINANCIAL CRISIS 1–6 (2009).

⁶ See Ricardo J. Caballero & Arvind Krishnamurthy, *Global Imbalances and Financial Fragility*, 99 AM. ECON. REV. 584, 584 (2009); Ben S. Bernanke et al., *International Capital Flows and the Returns to Safe Assets in the United States, 2003–2007*, at 1–3 (Bd. of Governors of the Fed. Reserve Sys., Int'l Fin. Discussion Papers No. 1014, 2011) [hereinafter Bernanke, *International Capital Flows*], available at

<http://www.federalreserve.gov/pubs/ifdp/2011/1014/ifdp1014.htm>; Steven Dunaway, *Global Imbalances and the Financial Crisis*, Council on Foreign Relations, Council Special Report No. 44 (2009); Ben S. Bernanke, Chairman, Fed. Reserve Sys., Bundesbank Lecture: Global Imbalances: Recent Developments and Prospects (Sept. 11, 2007) [hereinafter Bernanke, *Global Imbalances*], available at

<http://www.federalreserve.gov/newsevents/speech/bernanke20070911a.htm>; Ben S. Bernanke, Chairman, Fed. Reserve Sys., Sandridge Lecture at the Virginia Association of Economists: The Global Saving Glut and the U.S. Current Account Deficit (Mar. 10, 2005) [hereinafter Bernanke, *Global Saving Glut*], available at

<http://www.federalreserve.gov/boarddocs/speeches/2005/200503102/>;

⁷ See, e.g., THOMAS SOWELL, THE HOUSING BOOM AND BUST 30–56 (2009); FIN. CRISIS INQUIRY COMM'N FINAL REPORT, *supra* note 4, at 444 (Peter J. Wallison, dissenting) (“[T]he *sine qua non* of the financial crisis was U.S. government housing policy, which led to the creation of 27 million subprime and other risky loans—half of all mortgages in the United States—which were ready to default as soon as the massive 1997–2007 housing bubble began to deflate. If the U.S. government had not chosen this policy path—fostering the growth of a bubble of unprecedented size and an equally unprecedented number of weak and high risk residential mortgages—the great financial crisis of 2008 would never have occurred.”); PETER J. WALLISON, AM. ENTER. INST., CAUSE AND EFFECT: GOVERNMENT POLICIES AND THE FINANCIAL CRISIS 2 (2008),

http://www.aei.org/files/2008/11/25/20081203_1123724NovFSOg.pdf; Edward Pinto, Op-Ed., *Acorn and the Housing Bubble*, WALL ST. J. (Nov. 12, 2009, 7:10 PM),

<http://online.wsj.com/article/SB10001424052748703298004574459763052141456.html> (“The flood of CRA and affordable-housing loans with loosened underwriting standards, combined with declining mortgage interest rates . . . resulted in a massive increase in borrowing capacity and fueled a house price bubble of unprecedented magnitude over the period 1997–2006.”); Peter J. Wallison, *The True Origins of This Financial Crisis*, AM. SPECTATOR, Feb. 2009, available at <http://spectator.org/archives/2009/02/06/the-true-origins-of-this-finan/print>.

⁸ See Yuliya Demyanyk & Otto Van Hemert, *Understanding the Subprime Mortgage Crisis*, 24 REV. FIN. STUDIES 1848, 1852 (2011); Kurt Eggert, *The Great Collapse: How Securitization Caused the Subprime Meltdown*, 41 CONN. L. REV. 1257, 1257 (2009) (arguing that securitization encouraged market participants to weaken underwriting standards); Patricia A. McCoy, Andrey D. Pavlov & Susan M. Wachter, *Systemic Risk Through Securitization: The Result of Deregulation and Regulatory Failure*, 41 CONN. L. REV. 1327, 1366–67 (2009) (arguing the ability to pass off risk allowed lenders who lowered standards to gain market share and crowd out competing lenders who did not weaken credit standards); Giovanni Dell’Ariccia, Deniz Igan & Luc Laeven, *Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market 1* (Int’l Monetary Fund, Working Paper No. WP/08/106, 2008), available at www.imf.org/external/pubs/ft/wp/2008/wp08106.pdf (noting that “lending standards declined more in

Other explanations of the bubble have been demand-side explanations, meaning that the bubble was caused by excessive consumer demand for housing. One leading explanation argues that the bubble was the result of irrational demand encouraged by a belief that housing prices could only move upwards.¹⁰ Other research points to the fundamentals of housing markets, particularly population growth, placing upward pressures on housing prices in markets with inelastic housing supply, thereby explaining some of the geographic variation in the housing bubble.¹¹

In this Article, we challenge the existing explanations of the housing bubble as, at best, incomplete. While we recognize the bubble as multicausal, we set forth a new and, we believe, more convincing explanation of what was the primary driver of the bubble. We argue that the bubble was, in fact, primarily a *supply-side* phenomenon, meaning that it was caused by excessive supply of housing finance. The supply glut was not due to monetary policy or government affordable-housing policy, although the former did play a role in the development of the bubble. Instead, the supply glut was the result of a fundamental shift in the structure of the mortgage-finance market from regulated to unregulated securitization.

The unregulated, private securitization market is rife with information asymmetries between financial institutions and investors. These asymmetries were exploited by financial institutions at the expense of investors (which often included other units of the same institutions), who underpriced for risk and thus oversupplied mortgage credit, while the financial institutions siphoned away profit on every transaction. The primary cause of the housing bubble was the shift from regulated, government-sponsored securitization to unregulated, private securitization as the principal method of funding mortgage loans.

We do not claim that the shift in the securitization market was the sole cause of the housing bubble; other factors undoubtedly contributed in important ways. We do claim, however, that this market shift from a regulated to an unregulated financing market was the leading cause of the bubble, and that without it there would not have been a bubble. In other words, the

areas with higher mortgage securitization rates”); cf. Christopher L. Peterson, *Predatory Structured Finance*, 28 CARDOZO L. REV. 2185, 2188–90 (2007) (describing how securitization facilitated predatory lending).

⁹ See Benjamin J. Keys et al., *Did Securitization Lead to Lax Screening? Evidence from Subprime Loans*, 125 Q.J. ECON. 307, 307–310 (2010) [hereinafter Keys et al., *Did Securitization Lead to Lax Screening?*]; Benjamin J. Keys et al., *Financial Regulation and Securitization: Evidence from Subprime Loans*, 56 J. MONETARY ECON. 700, 702 (2009) [hereinafter Keys et al., *Financial Regulation and Securitization*]; Atif Mian & Amir Sufi, *The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis*, 124 Q.J. ECON. 1449, 1449–50 (2009) [hereinafter Mian & Sufi, *The Consequences of Mortgage Credit Expansion*] (finding correlation, unassociated with income growth, between an increase in mortgage securitization and the expansion of mortgage credit in subprime ZIP codes); Atif R. Mian & Amir Sufi, *Household Leverage and the Recession of 2007 to 2009*, at 6–7 (Nat’l Bureau of Econ. Research, Working Paper No. 15896, 2010) [hereinafter Mian & Sufi, *Household Leverage and the Recession of 2007 to 2009*] (finding that home-equity borrowing was responsible for a large share of the rise in household leverage during the bubble, as well as for a large portion of the defaults).

¹⁰ See generally ROBERT J. SHILLER, *IRRATIONAL EXUBERANCE* (2d ed. 2005) (arguing this thesis). An alternative demand-side theory looks to behavioral economics and suggests that consumers’ cognitive failure to disentangle real and nominal interest rates results in an overestimation of the value of real estate in times of falling inflation. See Markus K. Brunnermeier & Christian Julliard, *Money Illusion and Housing Frenzies*, 21 REV. FIN. STUD. 135, 135–36 (2008) (arguing that consumers cannot disentangle real and nominal changes in interest rates and rents, which results in their failing to recognize that when expected inflation falls, future price and rent appreciation—and not just nominal interest rates—also fall).

¹¹ See Edward L. Glaeser, Joseph Gyourko & Albert Saiz, *Housing Supply and Housing Bubbles*, 64 J. URB. ECON. 198, 198–99 (2008); Thomas Davidoff, *Supply Elasticity and the Housing Cycle of the 2000s*, at 1–4 (Soc. Sci. Research Network, Working Paper No. 1562741, 2010), <http://ssrn.com/abstract=1562741>.

explanation we present of the housing bubble is deregulation of housing finance. This was not primarily deregulation through legislation.¹² Instead, the critical deregulation was the failure to ensure that existing regulatory schemes applied to the mortgage products irrespective of their financing channel.

From 1997, when housing prices began to rise, through 2003, the appreciation in the housing market can be explained by fundamental economic values—the cost of purchasing a home relative to renting and interest rates. These fundamentals suggest that house prices were not overvalued. After 2003 and 2004, however, fundamentals cease to explain housing prices. The market shifted from financing mortgages with regulated securitization to using unregulated securitization. The unregulated securitization market featured complex, opaque, and heterogeneous products with serious informational asymmetries between financial intermediaries and investors. Because of the nature of these products, investors underpriced risk, overvalued securities, and oversupplied mortgage finance. The oversupply of mortgage credit enabled borrowers to bid up housing prices, thereby fueling a bubble as higher housing prices enabled a greater supply of credit for refinanced mortgages by increasing the apparent value of the collateral. This cycle of higher home prices and refinancing boosted financial intermediaries' volume-based profits, which encouraged them to continue the cycle.

Securitization—the pooling of loans and the issuance of securities backed by the cash flow from those loans—provides the financing for the vast majority of mortgages in the United States. Mortgage securitization involves a chain of financial institutions intermediating between two parties: capital markets, which supply mortgage credit, and borrowers, who consume mortgage credit. The financial institutions that originate and securitize loans serve as economic (but not legal) agents for the end borrowers and lenders. In their intermediation role, these financial institutions do not hold more than a temporary interest in the mortgages they facilitate, so they have incentives different from (and often adverse to) borrowers and investors, the economic principals in mortgage transactions.

Prior to 2003 and 2004, most mortgage-backed securities (MBS) were issued by regulated government-sponsored entities¹³ (GSEs) Fannie Mae¹⁴ and Freddie Mac¹⁵ and the federal agency Ginnie Mae¹⁶ (collectively the Agencies). In 2003 and 2004, the market shifted radically toward MBS issued by unregulated “private-label” securitization conduits, typically operated by investment banks. The shift from regulated Agency to unregulated private-label securitization

¹² See FIN. CRISIS INQUIRY COMM'N FINAL REPORT, *supra* note 4, at 74–80. Deregulatory legislation, such as the Commodities Futures Modernization Act of 2000, Pub. L. No. 106-554, app. E, § 407, 114 Stat. 2763A-365, 2763A-461 (codified in scattered sections of 7 U.S.C.) (excluding covered-bank swap agreements from Commodity Futures Trading Commission jurisdiction) and the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005, Pub. L. No. 109-8, §§ 901–07, 119 Stat. 23, 146–83 (codified in scattered sections of 11 U.S.C.) (broadening financial-contract safe harbors in bankruptcy) did contribute to the housing bubble, as did the failure of the Federal Reserve to act on its existing authority under the Home Owners Equity Protection Act (HOEPA) to rein in predatory lending. See also Donald P. Morgan, Benjamin Iverson & Matthew Botsch, *Subprime Foreclosures and the 2005 Bankruptcy Reform*, FRBNY ECON. POL'Y REV., forthcoming, available at <http://www.newyorkfed.org/research/epr/forthcoming/1102morg.pdf> (arguing that the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 made it more difficult for debtors to free up income to pay their mortgages by discharging unsecured debt, thereby contributing to subprime-mortgage foreclosures).

¹³ Historically, the GSEs were federal agencies. Since 1968, they have been privately owned but chartered by the federal government and subject to federal regulation.

¹⁴ Fannie Mae is a portmanteau for Federal National Mortgage Association.

¹⁵ Freddie Mac is a portmanteau for the Federal Home Loan Mortgage Corporation.

¹⁶ Ginnie Mae is a portmanteau for the Government National Mortgage Association.

created a “shadow-GSE” sector, just as the highly regulated banking sector was displaced by an unregulated “shadow-banking” sector.¹⁷

The shift in securitization channels occurred as financial institutions sought to maintain earnings levels that had been elevated between 2001 and 2003, when historically low interest rates created an unprecedented refinancing boom. Earnings depended on volume, so maintaining elevated earnings levels necessitated expanding the borrower pool by using lower underwriting standards and new products that the Agencies would not (initially) securitize. Thus, the shift from Agency securitization to private-label securitization also corresponded with a shift in mortgage product—from traditional, amortizing, fixed-rate mortgages (FRMs) to nontraditional, structurally riskier, nonamortizing, adjustable-rate mortgages (ARMs)—and with the start of a sharp deterioration in mortgage-underwriting standards.

The growth of private-label securitization resulted in the oversupply of underpriced housing finance. As we demonstrate empirically, starting in 2003 and 2004, risk premiums for housing finance fell, and the market expanded even as market risk was rapidly rising. This set of circumstances—a decrease in risk-adjusted price coupled with an increase in quantity—can occur only because of an increase in the supply of housing finance that outpaces any increase in demand. In other words, demand-side factors like irrational consumer demand and inelastic housing supply may have played a role in the bubble, but their total effect on increased consumer demand was less than the increase in the supply of housing finance.

Private-label mortgage-backed securities (PLS) facilitated overinvestment because they are informationally opaque.¹⁸ PLS and the nontraditional mortgages they finance are heterogeneous, complex products.¹⁹ The structure of these products made it very difficult to gauge accurately, and hence price, their risk. The heterogeneity of the PLS made PLS illiquid and prevented price discovery through market trades. In the presence of such informational opacity, informational asymmetries between the financial-institution sellers of PLS and PLS investors abounded.

Financial institutions exploited these informational asymmetries to boost mortgage-origination and securitization volume and thus their profits, which are derived from fees taken at every stage of the origination and securitization process. In this fee-driven business model,

¹⁷ Cf. ZOLTAN POZSAR ET AL., FED. RESERVE BANK OF N.Y., SHADOW BANKING 1–4 (2010), available at http://www.ny.frb.org/research/staff_reports/sr458.pdf (describing shadow banking as a financing system relying on short-term debt obligations other than insured deposits).

¹⁸ Cf. Steven L. Schwarcz, *Rethinking the Disclosure Paradigm in a World of Complexity*, 2004 U. ILL. L. REV. 1, 19 (arguing that many securities transactions are “so complex that less than a critical mass of investors can understand them in a reasonable time period . . . [so that] the market will not reach a fully informed price equilibrium, and hence will not be efficient”).

¹⁹ See Gillian Tett, *Credit Rating Groups Under Microscope*, AUSTRALIAN, (Apr. 10, 2007, 12:00 AM), <http://www.theaustralian.com.au/archive/business-old/credit-rating-groups-under-microscope/story-e6frg90x-111113311477> (“[S]tructured products such as collateralised debt obligations and collateralised loan obligations are unusually opaque products and investors cannot see through to the credit quality of the underlying borrowers making interest and principal repayments on those securities. . . . Because of the opacity and complexity of these debt instruments, investors such as pension schemes are more dependent on guidance from rating agencies.”); Joseph R. Mason & Joshua Rosner, *Where Did the Risk Go? How Misapplied Bond Ratings Cause Mortgage Backed Securities and Collateralized Debt Obligation Market Disruptions* 3, 5, 18 (Soc. Sci. Research Network, Working Paper No. 1027475, 2007), <http://ssrn.com/abstract=1027475> (noting that “changes in origination and servicing practices, along with the existing complexity of RMBS, results in greater opacity in the RMBS market”; “increased grading of risk induced increased complexity, and therefore increased opacity”; and “the lack of liquidity, transparency, history and available data coupled with unprecedented complexity has made it difficult for all but the most well funded, well staffed and most sophisticated to analyze the markets or assets”).

increased volume meant increased profit, so financial institutions were incentivized to make and securitize as many mortgages as possible.

Increasing the total value of mortgages for securitization necessitated expanding the pool of mortgage borrowers. This required lowering underwriting standards and promoting nontraditional mortgage products with initially affordable payments. The easy-mortgage credit that resulted from the growth of PLS enabled housing prices to be bid up, thereby creating a bubble that collapsed, like a pyramid scheme, once the market could no longer be expanded.

Correcting the informational failures in housing finance is critical for preventing future bubbles. Real estate is an area that is uniquely prone to bubbles because of the lack of short pressure. For either markets or regulators to prevent bubbles, real-time information about the cost of credit is required because asset bubbles are built on the shoulders of leverage. The cost of credit is determined by the interest rate and the risk premium. The former is easily observable but the latter—which includes underwriting standards—cannot be observed in real time. For markets and regulators to prevent bubbles, they must be able to observe the credit risks in financing.

Greater disclosure is insufficient by itself to reveal the character of credit in the housing-finance market because of the difficulties in modeling credit risk for heterogeneous, complex products that have only a short track record. Correcting the informational failures in housing finance requires not only better disclosure about the mortgage loans backing MBS, but also substantive regulation—including standardization of mortgage-underwriting practices, mortgage forms, and MBS credit structures—in order to make disclosures effective. Put differently, disclosure-based regulation in the housing-finance market can only be effective when it is coupled with regulation of substantive terms in order to make risks salient and therefore priceable. Product standardization makes risks salient by focusing analysis on narrow parameters for variation.

Standardization of MBS would not mean that financial institutions could not offer nontraditional mortgages, only that they could not sell them into capital markets. There are appropriate niches for nontraditional products, but the informational asymmetries and principal-agent problems endemic to securitization counsel for restricting these exotic products to banks' books. Instead, secondary-market standardization facilitates the transparency of the character of credit and therefore is critical to preventing future real-estate bubbles and ensuring a stable and sustainable housing-finance system.

It bears emphasis that we are not propounding a monocausal explanation of the bubble; the bubble was the product of numerous factors. Rather, our claim is that the bubble was primarily a supply-side phenomenon and the supply-side glut was driven first and foremost by information failures resulting from the proliferation of PLS. Our explanation is consistent with arguments that there was an increase for demand in housing. We claim only that the supply grew faster than the demand and that this supply growth was fueled by the change in the financing channel. Moreover, explaining the oversupply of mortgage credit as being primarily a result of information failures does not deny the role of agency problems or even affordable-housing policy. Without the shift in the securitization market and the resulting oversupply of housing finance, however, there would never have been a bubble of anything close to the magnitude of the bubble between 2004 and 2007.

This Article proceeds as follows. Part I considers the changes in the securitization market that begat the housing bubble, particularly the rise of PLS and nontraditional mortgage products.

Part II of the Article presents a new explanation of the housing bubble. It demonstrates that the bubble was a supply-side phenomenon that began in 2003 and 2004 and that it corresponded with a shift in the mortgage-securitization market from Agency securitization of traditional FRMs to private-label securitization of nontraditional ARMs. Section II.A presents new data on PLS pricing that shows that risk-adjusted spreads on PLS over Treasuries declined during the bubble even as PLS volume rose. In other words, the price of mortgage finance decreased while the quantity was increasing. This phenomenon is only consistent with an outward (rightward) shift in the housing-finance supply curve that outstripped any shift in the demand curve.

Section II.B turns to the timing of the bubble, a matter of some controversy, and a critical shibboleth for any theory of the bubble. We argue that the best evidence points to the bubble as a short-lived phenomenon that began in 2003 and 2004 and ended by 2007. The combination of the supply-side nature of the bubble and the timing of the bubble aligns with the timing of the growth and expansion of private-label securitization.

Part III turns to a consideration of theories of the housing bubble: irrational exuberance; inability of consumers to distinguish real and nominal interest rates, resulting in excess consumer demand; housing-supply inelasticity; affordable-housing policies; and monetary policy and global savings imbalances. It shows that they are, at best, incomplete and, at worst, contrary to all evidence.

Part IV explains why the oversupply of mispriced mortgage finance was the result of the shift to unregulated private-label securitization. A shift in financing channels does not itself make a bubble, but the shift to private-label securitization enabled the financial institutions involved in PLS to exploit informational asymmetries between securitizers and investors. The result was investors mispricing risk and oversupplying mortgage capital, thereby boosting the profits of financial-institution intermediaries and encouraging further expansion of the PLS market.

Part IV also shows how, in the PLS market, the normal market constraints on declining mortgage quality and MBS underwriting quality—credit ratings, debt-market discipline (including limited risk appetite from savvy, subordinated-debt investors), and short pressures—all failed, thereby enabling a bubble.

Part V concludes with a call for standardization of MBS as an information-forcing device, and a proposal for restricting securitization to a limited set of proven, traditional mortgage products.

Our Article makes five novel contributions to the literature on the housing bubble and the financial crisis. First, we present new empirical evidence that proves the bubble was a supply-side, rather than a demand-side, phenomenon. Pinpointing the cause of the housing bubble is critical for evaluating whether and how future asset bubbles, particularly in housing, can be prevented.

Second, we present a failure-to-regulate theory of the housing bubble that explains the oversupply of underpriced mortgage credit. The bubble grew because housing finance was permitted to shift from a regulated to an unregulated space, where financial institutions were able and incentivized to exploit informational asymmetries. The bubble was not the result of regulation, but of a *lack* of regulation. Our theory explains why normal market constraints on excessive risk failed, why the bubble grew when it did, and why it collapsed when it did. Existing theories of the housing bubble have thus far been incapable of explaining the timing of the bubble or of accounting for the dramatic shift in the mortgage market's structure.

Third, our Article represents the first foray of legal literature into a consideration of the institutional and regulatory structure for the secondary housing market. There is little written

about this market, even though mortgage-related securities are the largest single asset class in the United States economy. What limited literature there is focuses on the regulation of certain segments of the market; we know of no prior work that addresses larger questions of institutional and market structure and the place for regulation.

Our focus on a lack of regulation is, in some ways, a departure from the general mien of legal scholarship, which focuses on an analysis of regulation, not the absence thereof. Lack of regulation, however, is itself a regulatory choice, making the study of the lack of regulation squarely within the purview of legal analysis. In essence, then, our argument emphasizes the need for law throughout the secondary housing-finance market. In our conclusion, we argue for regulation of the housing-finance market and explain how we think such regulation should proceed.

Fourth, our Article is the first to present a systematic analysis of the housing bubble that evaluates the competing theories and presents a coherent, empirically driven narrative of the bubble's development and collapse. The existing literature is comprised of expositions of various theories that largely ignore competing theories,²⁰ arguments that debunk theories but do not propound alternative theories,²¹ or empirical studies that attempt to establish micropoints but do not attempt to present a larger theory of the housing bubble.²²

Finally, our Article presents a clear prescription for ensuring future stability in housing finance, which has profound implications for the restructuring of the housing-finance market and the fate of the government-sponsored entities Fannie Mae and Freddie Mac.

I. THE U.S. HOUSING-FINANCE MARKET

A. AGENCY SECURITIZATION

Most U.S. mortgages are financed through securitization.²³ Mortgage securitization involves the pooling of numerous mortgage loans, which are then sold to a special-purpose vehicle, typically a trust. The trust pays for the loans by issuing debt securities. The debt service on these securities is paid for by the cash flow from the mortgages. Thus, the securities are called mortgage-backed securities (MBS).²⁴

Securitization, in its modern form, had been used since before 1971 for housing finance.²⁵ In the early 1990s, the secondary market at the time consisted primarily of the GSEs, Fannie Mae

²⁰ See, e.g., FIN. CRISIS INQUIRY COMM'N FINAL REPORT, *supra* note 4, at 444 (Peter J. Wallison, dissenting); TAYLOR, *supra* note 5; WALLISON, *supra* note 7; Pinto, *supra* note 7.

²¹ See, e.g., Ben S. Bernanke, Chairman, Fed. Reserve Sys., Speech at the Annual Meeting of the American Economic Association: Monetary Policy and the Housing Bubble (Jan. 3, 2010), available at <http://www.federalreserve.gov/newsevents/speech/bernanke20100103a.htm>; Glaeser et al., *supra* note 3, at 1–2.

²² See, e.g., Keys et al., *Did Securitization Lead to Lax Screening?*, *supra* note 9; Mian & Sufi, *The Consequences of Mortgage Credit Expansion*, *supra* note 9; Atif Mian & Amir Sufi, *The Great Recession: Lessons from Microeconomic Data*, 100 AM. ECON. REV. PAPERS & PROCEEDINGS 1, 2 (2010).

²³ See INSIDE MORTG. FIN., 2010 MORTGAGE MARKET STATISTICAL ANNUAL (2010) (Microsoft Excel supplemental files). About 60% of outstanding mortgages, by dollar amount, are securitized, but the securitization rate in recent years has been around or above 90%. *Id.*

²⁴ For a more detailed explanation of mortgage securitization, see Anna Gelpern & Adam J. Levitin, *Rewriting Frankenstein Contracts: Workout Prohibitions in Residential Mortgage-Backed Securities*, 82 S. CAL. L. REV. 1075, 1080–87 (2009).

²⁵ See Kenneth A. Snowden, *Mortgage Securitization in the United States: Twentieth Century Developments in Historical Perspective*, in ANGLO-AMERICAN FINANCIAL SYSTEMS: INSTITUTIONS AND MARKETS IN THE TWENTIETH

and Freddie Mac, and Ginnie Mae. The GSEs are privately owned corporations, chartered and regulated by the federal government.²⁶ Fannie and Freddie were regulated entities and would purchase (until the bubble years) only mortgages that conformed to their underwriting standards, which generally required prime, amortizing mortgages. Ginnie Mae is a U.S.-government agency involved in the securitization of mortgages insured by the Federal Housing Administration (FHA) or guaranteed by the Veterans Administration (VA).²⁷ Moreover, statutes limited the GSEs' exposure on any particular loan to the conforming-loan limit and restricted the GSEs to purchasing only loans with loan-to-value (LTV) ratios—the ratio of the loan amount to the property's value—under 80%, absent private mortgage insurance or seller risk retention.²⁸ Further, the GSEs were expected (although not mandated) to operate nationally, creating geographic diversification in their underwriting. Likewise, the FHA and VA mortgages that went into Ginnie Mae pools were required to conform to FHA and VA underwriting standards and were geographically diverse.

The GSEs securitize most of the mortgages they purchase, meaning that they sell the mortgages to legally separate, specially created trusts, which pay for the mortgages by issuing MBS. The GSEs and Ginnie Mae guarantee timely payment of principal and interest to investors.²⁹ Fannie, Freddie, and Ginnie MBS (Agency MBS) thus link mortgage borrowers with capital-market investors.

For Agency MBS, investors assumed the interest-rate risk on the underlying mortgages, while the GSEs or U.S. government assumed the mortgages' credit risk. Investors in Agency MBS did incur credit risk—that of the GSEs or of the U.S. government, for Ginnie Mae MBS. For GSE MBS, investors also indirectly assumed the credit risk on the mortgages, because the GSEs' financial strength was heavily dependent upon the performance of the mortgages. Because the GSEs were perceived as having an implicit guarantee from the federal government,³⁰ however, investors were generally unconcerned about the credit risk of the GSEs, and hence of their MBS.³¹ This meant that investors did not need to worry about the quality of the GSE

CENTURY 261, 261–64 (Michael D. Bordo & Richard Sylla eds., 1995). *See generally* William N. Goetzmann & Frank Newman, *Securitization in the 1920's* (Nat'l Bureau of Econ. Research, Working Paper No. 15650, 2010) (discussing mortgage securitization in the 1920s).

²⁶ The GSEs originated as part of the federal government but were privatized in 1968.

²⁷ In addition to Fannie Mae and Freddie Mac, there were twelve Federal Home Loan Banks, which comprised a smaller GSE system. *See* Mark J. Flannery & W. Scott Frame, *The Federal Home Loan Bank System: The "Other" Housing GSE*, *ECON. REV.*, Third Quarter 2006, at 33, 33 (examining the structure, activities, and risks of the Federal Home Loan Bank system).

²⁸ *See* 12 U.S.C. §§ 1454(a)(2), 1717(b)(2) (2006).

²⁹ FHA and VA guarantee repayment of principal and accrued interest but not necessarily in a timely fashion. FHA and VA only pay out after foreclosure, which can mean that the insurance payments are considerably delayed.

³⁰ *See* Brent W. Ambrose & Arthur Warga, *Measuring Potential GSE Funding Advantages*, 25 *J. REAL EST. FIN. & ECON.* 129, 146 (2002) (finding the GSE-to-Treasuries spread was 25–29 basis points less than AA-rated banking-sector bonds); Frank E. Nothaft, James E. Pearce & Stevan Stevanovic, *Debt Spreads Between GSEs and Other Corporations*, 25 *J. REAL EST. FIN. & ECON.* 151, 151 (2002) (finding that GSEs had a funding advantage of 22–30 basis points relative to AA-rated bonds). The GSEs are now in federal conservatorship, and their obligations carry an "effective guarantee" from the federal government but do not enjoy a "full faith and credit" backing. *See* Dawn Kopecki, *Fannie, Freddie Have 'Effective' Guarantee, FHFA Says*, *BLOOMBERG* (Oct. 23, 2008, 14:06 EDT), <http://www.bloomberg.com/apps/news?pid=20601087&sid=a05XSFgEISZA&refer=home> (referencing the director of the Federal Housing Finance Agency as saying that GSEs have an "effective" federal guarantee); 12 U.S.C. § 1719(e) (2006) (explicitly stating that GSE debts are not government debts). The difference, if any, between "full faith and credit" and an "effective guarantee" is unclear.

³¹ Investors would be concerned only to the extent that defaults affected prepayment speeds.

underwriting. Therefore, investors did not need information about the default risk on the mortgages; what they cared about was information that could help them anticipate prepayment speeds so they could gauge the MBS' convexity risk—the risk of losses resulting from adverse changes in MBS' market price relative to their yield.³² This information was fairly easy to obtain, particularly on standardized mortgage products, and modeling and pricing the interest-rate risk was a far simpler task than modeling the credit risk and the interest-rate risk.

Historically, because the GSEs bore the credit risk on the mortgages, they were incentivized to insist on careful underwriting.³³ Moreover, the GSEs were subject to regulatory oversight and statutory constraints on underwriting. By statute, the GSEs were limited to purchasing only loans with less than 80% LTV ratios unless there was private mortgage insurance on the loan.³⁴ The competition for market share was primarily between GSEs, and consistently applied regulatory standards ensured that neither could increase market share by lowering underwriting standards. Thus, as long as GSE securitization dominated the mortgage market, credit risk was kept in check through underwriting standards, and there was not much of a market for nonprime, nonconforming, conventional loans.

B. PRIVATE-LABEL SECURITIZATION

Beginning in the 1990s, a new, unregulated form of securitization began to displace GSE securitization. This was private-label securitization (PLS), which was supported by a new class of specialized mortgage lenders and securitization sponsors.³⁵

Whereas the GSEs would only purchase loans that conformed to their underwriting guidelines, there were no such guidelines for the investment banks that served as PLS conduits. The only constraint was whether a buyer could profitably be found. Thus, PLS created a market for nonprime, nonconforming conventional loans.³⁶

³² Admittedly, defaults affect prepayment speed, but, in GSE securitized pools, the GSEs replace defaulted loans with performing ones so prepayment speed should be largely unaffected.

³³ The possibility of a federal bailout by virtue of being too big to fail raised moral-hazard problems for the GSEs and could have undermined their underwriting quality. The GSEs only invested in highly rated tranches of subprime and alt-A MBS, and these tranches were vulnerable to ratings downgrades. As AAA-subprime MBS were downgraded, the GSEs were forced to recognize large losses in their trading portfolios. Because the GSEs were highly leveraged, these losses ate heavily into the GSEs' capital, which undermined their MBS guarantee business (the GSEs' guarantee is only valuable to the extent that the GSEs are solvent).

³⁴ See 12 U.S.C. §§ 1454(a)(2), 1717(b)(2).

³⁵ We use the term PLS here to refer to residential mortgage-backed securities (RMBS) that lack a guarantee from the federal government or the GSEs. Although PLS can trace their pedigree back to a 1977 deal by Bank of America, see Bank of Am. Nat'l Trust & Sav. Assoc., SEC No-Action Letter, 1977 SEC No-Act. LEXIS 1343 (May 19, 1977), they remained a niche market for years because of their unproven risk profile. Gretchen Morgenson and Joshua Rosner cite a 1993 United Companies Financial securitization as the first securitization of nonprime mortgages. GRETCHEN MORGENSON & JOSHUA ROSNER, RECKLESS ENDANGERMENT: HOW OUTSIZED AMBITION, GREED, AND CORRUPTION LED TO ECONOMIC ARMAGEDDON 48–50 (2011). The nonprime securitization market, however, predates this deal. See, e.g., ANTHONY LEMBKE & PETER DiMARTINO, "B" AND "C" BORROWERS: A NEW FRONTIER IN THE NONAGENCY MARKET 8 (1994), available at http://www.greeradvisors.com/Research_files/B_and_C_Borrowers_-_A_New_Frontier_in_the_Nonagency_Market.pdf (citing 1992 deals).

³⁶ Financial institutions' ability to make nontraditional loans was facilitated by federal legislation and regulations. Congressional legislation began the deregulation of mortgages in the 1980s with two key federal statutes: the Depository Institutions Deregulation and Monetary Control Act of 1980, 12 U.S.C. § 1735f-7a (2006), and the Alternative Mortgage Transaction Parity Act of 1982, 12 U.S.C. § 3803(a)(3) (2006). These statutes preempted state usury laws for first-lien mortgages and state regulation of nontraditional mortgages. Federal regulatory

As with GSE securitization, PLS involved the pooling of thousands of mortgage loans that were then sold to specially created trusts that would issue MBS to pay for the mortgage loans. Unlike the GSEs, however, the PLS sponsors did not guarantee timely payment of interest and principal on the PLS. PLS investors, therefore, assumed both credit and interest-rate risk on the MBS, in contrast to GSE MBS, for which investors assumed only interest-rate risk.

Investors in PLS were familiar with interest-rate risk on mortgages, but not with credit risk. Thus, the PLS market initially developed with low credit-risk products, particularly jumbo mortgages—loans that were larger than the GSEs’ conforming-loan limit. Jumbos were essentially prime, conventional mortgages for larger amounts than conforming loans. Although PLS investors did face credit risk on jumbos, it was low, in part because only high-quality jumbos were securitized because credit-rating agencies initially insisted that jumbo securitizations follow GSE underwriting guidelines in order to be rated.³⁷ Loss rates on jumbos since 1992 have been less than 0.5%.³⁸

Credit risk for jumbos was mitigated on both the loan level—through high down payments (low LTVs) and private mortgage insurance—and at the MBS level—through credit enhancements, particularly credit tranching in a senior–subordinate structure. Jumbo PLS settled on a largely standardized form—the “six-pack” structure, in which six subordinated tranches supported a senior, AAA-rated tranche that comprised well over 90% of the MBS by dollar amount.³⁹ Indeed, jumbo PLS became sufficiently standardized to trade in the To-Be-Announced (TBA) market, in which mortgages are sold even before they are actually originated because it is sufficiently easy to find a mortgage that meets the sale delivery requirements.⁴⁰ This is only possible when there is a liquid secondary market for the mortgages with sufficient mortgage standardization.

The success of PLS depended heavily on the ability to achieve high investment-grade ratings for most securities because fixed-income investor demand is highest for high investment-grade

agencies expanded the scope of federal preemption of state regulations again without substituting federal regulation. See Adam J. Levitin, *Hydraulic Regulation: Regulating Credit Markets Upstream*, 26 YALE J. ON REG. 143, 154 (2009). The Federal Reserve also failed to act on its regulatory authority under the Home Ownership and Equity Protection Act (HOEPA) to regulate high-cost mortgages. See McCoy et al., *supra* note 8, at 1334.

³⁷ See DAVID MURPHY, UNRAVELLING THE CREDIT CRUNCH 133 (2009) (“[T]he first private label MBS deals were backed by very high quality mortgages: it took some years for investors to become comfortable with lower quality pools.”).

³⁸ See *MBS Basics*, NOMURA FIXED INCOME RES. (Nomura, New York, N.Y.), Mar. 31, 2006, at 22 exhibit 12, http://www.securitization.net/pdf/Nomura/MBSBasics_31Mar06.pdf.

³⁹ See *id.* at 22–23.

⁴⁰ In the TBA market, a mortgage originator enters into a forward contract with a GSE or Ginnie Mae in which the originator promises to deliver, in the future, a package of loans meeting the GSE’s or Ginnie Mae’s requirements in exchange for GSE or Ginnie Mae MBS being identified in the future. See OFFICE OF FED. HOUS. ENTER. OVERSIGHT, MORTGAGE MARKET NOTE 08-3, A PRIMER ON THE SECONDARY MORTGAGE MARKET (2008), available at <http://www.fhfa.gov/webfiles/1242/MMNOTE083.pdf>. Because the originator is able to resell the loan to the GSE or Ginnie Mae for a guaranteed rate before the closing of the loan, the originator is not exposed to interest-rate fluctuations between the time it quotes a rate and closing. Without the TBA market, originators would have to bear the risk that the market value of the loan would change before closing due to fluctuations in market rates. The commodity nature of GSE and Ginnie Mae MBS means that they are sufficiently liquid to support a TBA market that allows originators to offer borrowers locked-in rates in advance of closing. Originators of nonconforming (non-GSE-eligible) loans, particularly prime jumbos, are able to piggyback on the TBA market to hedge their interest-rate risk by purchasing in the TBA market.

products.⁴¹ For jumbos, it was relatively easy to achieve AAA ratings because of the solid underlying collateral.⁴² As the PLS market later moved into nonprime mortgages, however, greater credit enhancements and structural creativity were necessary to obtain the credit ratings that made the securities sufficiently marketable. For example, the mean number of tranches in nonprime PLS in 2003 was approximately ten, compared with seven for jumbo six-packs. By 2007, the mean number of tranches for PLS had increased to over fourteen.⁴³ Other types of internal and external credit enhancements were also much more common in nonprime PLS: overcollateralization,⁴⁴ excess spread,⁴⁵ shifting interest,⁴⁶ reserve accounts,⁴⁷ and pool and bond insurance.⁴⁸ Nonprime PLS thus involved inevitably more complex and heterogeneous deal structures to compensate for the weaker quality of the underlying assets.⁴⁹

⁴¹ See Ricardo J. Caballero, *The "Other" Imbalance and the Financial Crisis* 13–14 (Nat'l Bureau of Econ. Research, Working Paper No. 15636, 2010), <http://www.nber.org/papers/w1536>.

⁴² For example, for the Wells Fargo Mortgage Backed Securities 2003-2 Trust, a jumbo deal consisting mainly of prime or near-prime (alt-A) jumbos, 98.7% of the securities, by dollar amount, were rated AAA. See Wells Fargo Asset Sec. Corp., Mortgage Pass-Through Certificates, Series 2003-2 (Form 424(b)(5)) (Feb. 27, 2003), available at <http://www.secinfo.com/dsVsn.2h2.htm>.

⁴³ Manuel Adelino, *Do Investors Rely Only on Ratings? The Case of Mortgage-Backed Securities* 42 (Nov. 24, 2009) (unpublished manuscript), <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.156.989&rep=rep1&type=pdf>.

⁴⁴ Overcollateralization means that the initial principal balance of the mortgages supporting the MBS is greater than the principal balance on the MBS. See Richard J. Rosen, *The Role of Securitization in Mortgage Lending*, CHI. FED. LETTER (Fed. Reserve Bank of Chi., Chi., Ill.), Nov. 2007 (noting that 61% of private-label PLS issued in 2006 were overcollateralized). The cash flows generated by a larger pool balance are available to absorb losses from mortgage defaults. Overcollateralization is an expensive form of credit enhancement because it ties up collateral that could otherwise be used for other deals, so PLS indentures sometimes provide for the periodic release of collateral if performance thresholds are met. Note that pool overcollateralization is in addition to the overcollateralization of mortgages with <100% LTV ratio.

⁴⁵ Excess spread is the difference between the income of the SPV in a given period and its payment obligations on the MBS in that period—essentially the SPV's periodic profit. Excess spread is accumulated to supplement future shortfalls in the SPV's cash flow but is periodically released to the residual tranche holder. Excess spread generally cannot be released if certain triggers are tripped, such as a decline in the amount of excess spread trapped during a specified period.

⁴⁶ Shifting interest involves the reallocation of subordinate tranches' share of prepayments (both voluntary prepayments and the proceeds of involuntary liquidations) to senior tranches. Shifting-interest arrangements are often stepped down over time, with a decreasing percentage of prepayments shifted. See Sunil Gangwani, *MBS Structuring: Concepts and Techniques*, SECURITIZATION CONDUIT, Autumn 1998, at 26, 33. The effect is to make senior tranches' share of a securitization larger at the beginning of the deal and smaller thereafter. See Manus J. Clancy & Michael Constantino, III, *Understanding Shifting Interest Subordination*, in THE HANDBOOK OF NONAGENCY MORTGAGE-BACKED SECURITIES 39, 42 exhibit 4 (Frank J. Fabozzi et al. eds., 2d ed. 2000).

⁴⁷ A reserve account is a segregated trust account, typically invested in highly liquid, investment-grade investments (for example, commercial paper). It provides a cushion for losses caused by defaults on the underlying mortgage loans. Reserve accounts come in two types: prefunded cash reserves and excess spread. Prefunded reserve accounts are funded in full at the closing of the deal; the arranger of the deal typically funds the account with a share of the deal proceeds. The reserve account thus is a holdback or discount on the SPV's purchase price of the loans. This type of prefunded reserve account is known as a cash collateral account. Reserve accounts either are required to be maintained at a specified level regardless of losses or are permitted to be drained in accordance with losses. In the former case, the credit enhancement of the reserve account actually *increases* as the principal and interest due on the PLS decreases.

⁴⁸ Pool-level insurance either covers losses or provides cash-flow maintenance up to specified levels for the entire pool owned by the SPV. Pool-level insurance is typically provided by private mortgage-insurance companies. Bond-level insurance involves a monoline bond insurer guaranteeing the timely payment of principal and interest on a tranche of bonds. See Gangwani, *supra* note 46, at 35.

⁴⁹ See GARY B. GORTON, *SLAPPED BY THE INVISIBLE HAND: THE PANIC OF 2007*, at 87 (2010)

C. A TALE OF TWO BOOMS

Nonprime PLS remained a small share of the mortgage-finance market from their origins in 1977 through the 1990s. As of 2003, nonprime first-lien loans were only 10% of all mortgage originations and subprime–Alt-A PLS were only 10% of all MBS issuance.⁵⁰ Nonprime PLS did not take off until 2004, at which point they grew rapidly until the bursting of the housing bubble (see Figures 1 and 2). The inflection point came with the introduction and spiraling growth of nonprime mortgages in 2003 and 2004, as PLS jumped from being 22% of MBS issued by dollar volume in 2003 to 46% in 2004 (see Figures 1 and 2).

Figure 1. Share of MBS Issuance by Securitization Type⁵¹

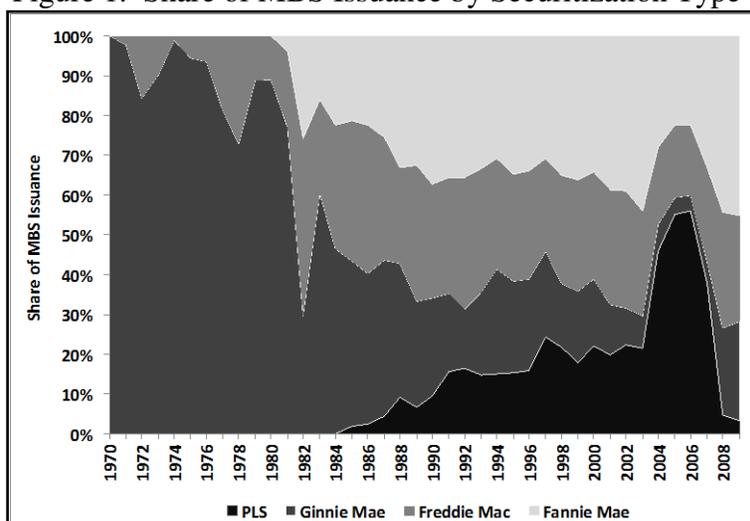
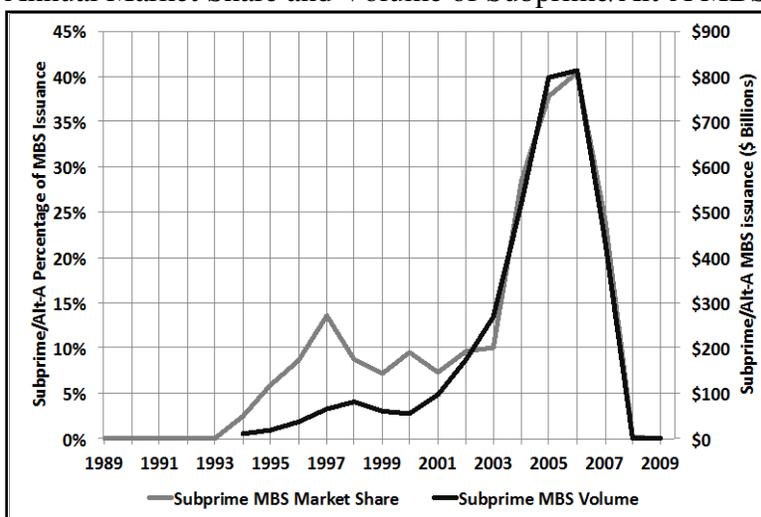


Figure 2. Annual Market Share and Volume of Subprime/Alt-A MBS Issuance⁵²



⁵⁰ See INSIDE MORTG. FIN., *supra* note 23.

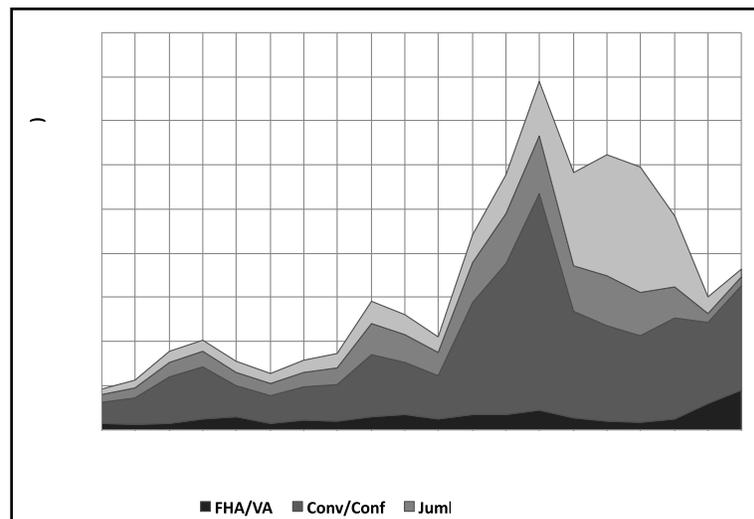
⁵¹ See *id.*

⁵² See *id.*

The nonprime-mortgage market (and nonprime PLS market) boomed as a consequence of the tapering off of a preceding prime refinancing boom. From 2001 to 2003, historically low interest rates brought on an orgy of refinancing. In 2003, mortgage originations peaked with 72% of originations (by dollar volume) as refinancings (see Figure 3).⁵³ Virtually all of the refinancing activity from 2001 to 2003 was in prime, fixed-rate mortgages (see Figure 3).⁵⁴ The prime refinancing boom meant that mortgage originators and securitizers had several years of increased earnings.

By 2003, however, long-term interest rates had started to rise (short-term rates moved up starting in 2004) (see Figure 4), and the prime refinancing boom ended. This meant that the mortgage industry was hard pressed to maintain its 2001–2003 earnings levels.⁵⁵ The solution post-2003 was to find more product to move in order to maintain origination volumes and hence earnings. What followed was a second mortgage boom, but it was qualitatively different in terms of loan underwriting and products than the 2001-2003 boom. Because the prime borrowing pool was exhausted, it was necessary to lower underwriting standards and look more to marginal borrowers to support origination volume levels. This meant a growth in subprime and alt-A (limited documentation) mortgages, as well as in second mortgages (home-equity loans and lines of credit) (see Figures 3 and 5). As a result, loan-to-value ratios increased and borrowers' income was more poorly documented, if at all (see Figure 6).

Figure 3. Origination Volume by Mortgage Type, 1990–2009⁵⁶



⁵³ See *id.*

⁵⁴ See *id.*

⁵⁵ See William W. Bratton & Michael L. Wachter, *The Case Against Shareholder Empowerment*, 158 U. PA. L. REV. 653, 719 n.198 (2010).

⁵⁶ See INSIDE MORTG. FIN., *supra* note 23.

Figure 4. Selected Interest Rates, 1995–2010⁵⁷

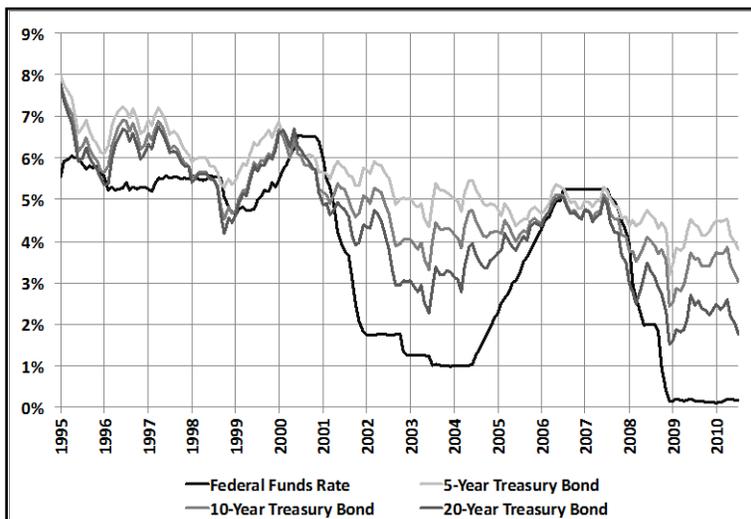


Figure 5. Origination Volume by Mortgage Type, 1990–2009⁵⁸

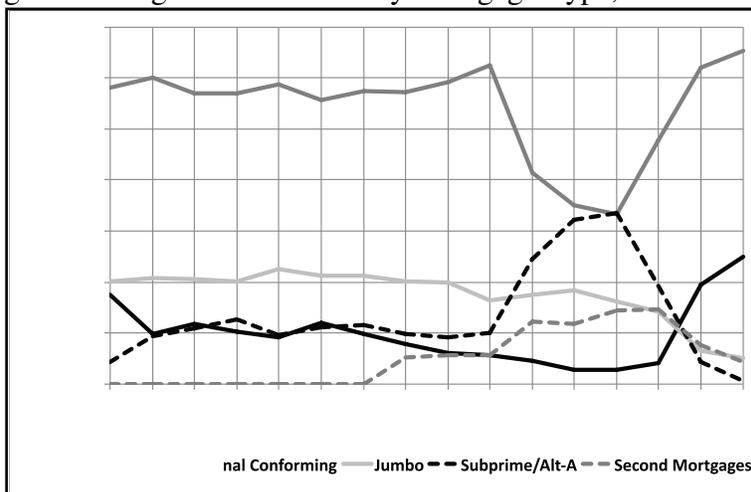
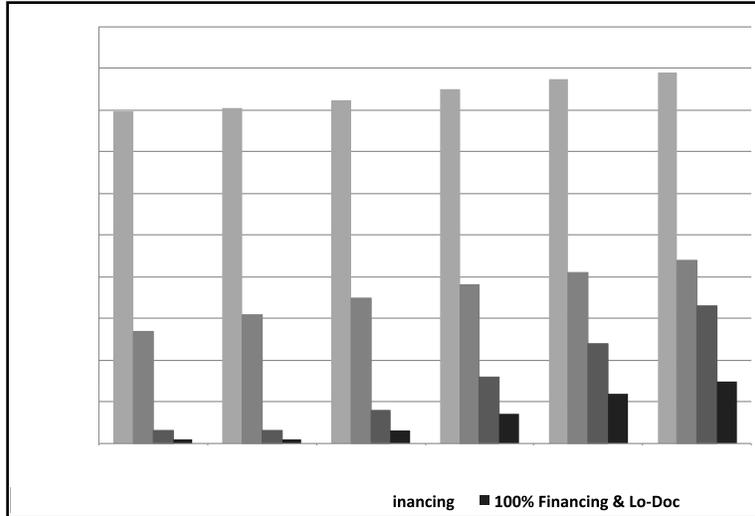


Figure 6. Erosion of Residential Mortgage Underwriting⁵⁹

⁵⁷ Federal Reserve Statistical Release H.15, available at <http://www.federalreserve.gov/releases/h15/data.htm>.

⁵⁸ See INSIDE MORTG. FIN., *supra* note 23.

⁵⁹ See T2 PARTNERS LLC. These figures reflect all mortgages, not just subprime. The LTVs are arguably understated relative to fundamentals because of the housing-price inflation of the bubble. Determining true LTVs, however, is impossible due to the endogeneity problem.



D. FUELING THE PLS BOOM: THE RISE OF NONTRADITIONAL MORTGAGES

The decline in underwriting standards was also reflected in a shift in mortgage products. Nontraditional mortgage products are generally structured for initial affordability; the costs are backloaded, either with balloon payments or increasing interest rates. Table 1, below, illustrates the relative initial affordability of various mortgage products. It shows that adjustable-rate-mortgage (ARM) products, particularly nontraditional ARMs with balloon payments due to limited or extended amortization, could drastically reduce initial monthly payments for borrowers.

Table 1. Relative Affordability of Mortgage Products⁶⁰

Mortgage Product	Initial Monthly Payment	Payment as Percentage of Fixed-Rate-Mortgage (FRM) Payment
FRM	\$1,079.19	100%
ARM	\$903.50	83.7%
Extended-Amortization ARM	\$799.98	74.1%
Interest-Only ARM	\$663.00	61.4%

⁶⁰ Bernanke, *supra* note 21, at fig. 7. These figures assume a prime borrower with a \$180,000 mortgage securing a \$225,000 property (20% down), 6% APR FRM, and 4.42% APR.

Negative-Amortization ARM	\$150.00	13.9%
Payment-Option ARM	<\$150.00	<13.9%

During this same time in 2004 and 2005, the yield curve—the relationship between interest rates and loan maturities—was flattening. When the yield curve is upward sloping—meaning that the cost of long-term borrowing is greater than the cost of short-term borrowing, as reflected by initial rates—ARMs are rationally chosen by borrowers because it costs more to borrow with a fixed-rate-mortgage (FRM). As Figure 7 shows, in 2000, the yield curve was flat and shifted to an upward slope from 2001 to 2003. As Figures 7 and 8 show, the yield curve began to flatten out in 2004 and 2005 and was flat in 2006 and 2007.

Figure 7. Annualized Treasury Yield Curves, 2000–2004⁶¹

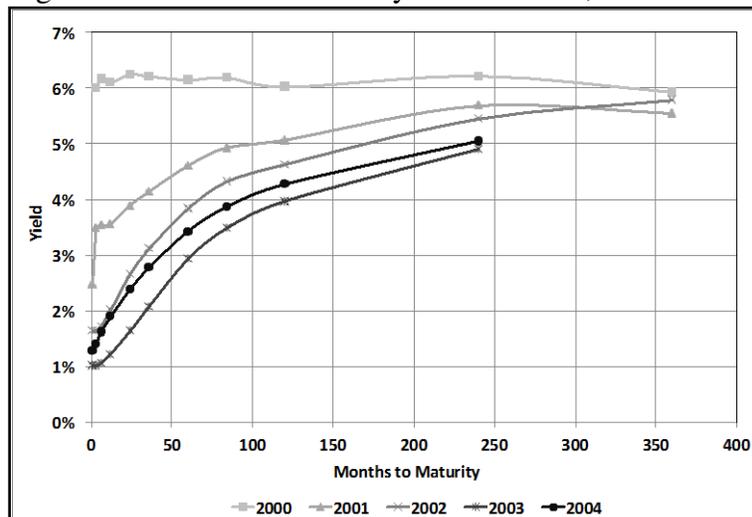
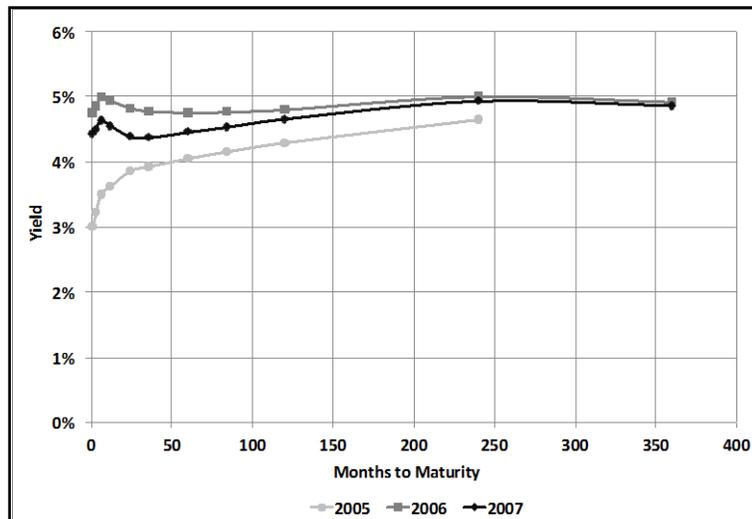


Figure 8. Annualized Treasury Yield Curves, 2005–2007⁶²

⁶¹ Curves were calculated by taking the average daily yield over each year for each duration.

⁶² Curves were calculated by taking the average daily yield over each year for each duration.



Prior to 2005, borrowers have shifted from ARMs to FRMs at every point in recent history when yield curves flattened in order to lock in lower long-term rates.⁶³ Despite the flat yield curve during the peak of the housing bubble, borrowers increasingly chose ARMs.

The explanation for the shift to ARMs cannot be found in the cost charged over the full term of the mortgage; rationally, borrowers considering the full-term cost would have gravitated to FRMs. Instead, the explanation lies in the relatively low initial payments of the ARMs.

This means that there were two possible, nonexclusive reasons for the expansion of ARM market share. First, ARM market-share growth could be explained by a drop in the price of the implicit put option on nonrecourse mortgages. The implicit put option refers to homeowners' ability to walk away from a nonrecourse (or functionally nonrecourse) mortgage without personal liability by surrendering the house. If the cost of the put option—included in the cost of mortgage finance—was getting cheaper relative to renting, it would mean that consumers were more willing to speculate on rising housing prices with nonrecourse mortgages.⁶⁴ Thus, cheaper mortgage credit made it easier to gamble on housing. Second, ARM share growth could be because ARMs were affordability products, into which financial institutions were able to underwrite weaker borrowers.

There is reason to believe that both explanations are correct. The phenomenon of house flipping—treating houses as pure (or primarily) investments, rather than mixed investment and consumption assets—became pronounced during the bubble. A cheaper put option due to underpriced mortgages would have encouraged this sort of investment.

There is also reason to believe that the growth in ARMs reflected their role as an affordability product that enabled market expansion, both in terms of the number of borrowers and the size of loans. Deterioration of underwriting standards and the shift in mortgage products had the same effect as falling interest rates—all of these factors reduced the initial cost of mortgage credit, thereby increasing the quantity of mortgage credit consumed.⁶⁵ The annual

⁶³ See Michael Tucker, *Adjustable-Rate and Fixed-Rate Mortgage Choice: A Logit Analysis*, 4 J. REAL EST. RES. 81, 86 (1989) (“Higher T-bill rates are associated with a decrease in the probability of borrowers selecting ARMs.”).

⁶⁴ See Andrey Pavlov & Susan Wachter, *Mortgage Put Options and Real Estate Markets*, 38 J. REAL EST. FIN. & ECON. 89, 92 (2009).

⁶⁵ Between 2004 and 2006, the Federal Reserve forced up the cost of short-term credit, but the effect on mortgage lending was offset by the shift in the product mix and the decline in underwriting standards. Although the Federal

price of housing finance has two components: a cost of funds and a risk premium. The cost of funds is a function of long-term interest rates, whereas the risk premium is a function of underwriting (including product type). A decline in either component reduces the cost of housing finance and thus allows borrowers to borrow more and bid up home prices.⁶⁶

Much of the growth in mortgages was in nontraditional products⁶⁷ such as interest-only mortgages;⁶⁸ payment-option mortgages;⁶⁹ 40-year, extended-amortization balloon mortgages;⁷⁰ and hybrid ARMs⁷¹ (see Figure 9). Borrowers were generally approved based on their ability to pay the initial below-market teaser rate, rather than their ability to pay for the product through its full term.

Figure 9. Growth of Nontraditional Mortgage Products⁷²

Reserve could observe rates in real time, neither it nor anyone else could observe, in real time, the decline in underwriting and the shift in product mix. The deterioration in lending standards also left the housing-finance system vulnerable to correlated shocks; any decline in housing prices would inevitably result in a market crash because of an increased reliance in the credit model on housing-price appreciation.

⁶⁶ Although housing economists have noted that interest-rate changes do not explain the bubble, they neglect to fully explore the impact of the decline in underwriting standards. *See, e.g.,* Glaeser et al., *supra* note 3, at 2–3. Glaeser et al. examine underwriting in a very cursory fashion; their finding that loan approval rates were constant during the bubble ignores the dramatic rise in loan-application volume. *See id.* at 6, 26. This problem can also be seen in Charles Himmelberg et al., *Assessing High House Prices: Bubbles, Fundamentals and Misperceptions*, J. ECON. PERSP., Fall 2005, at 67, 68, which argues that, as of 2004, there was no housing bubble. Although Himmelberg et al. note that housing prices are not the same as the annual cost of owning a house, *id.*, they neglect to consider whether the shift in mortgage-product mix was reducing the (initial) affordability of housing.

⁶⁷ *Cf.* Christopher Mayer et al., *The Rise in Mortgage Defaults*, J. ECON. PERSP., Winter 2009, at 27, 36 (noting that three nontraditional mortgage products “might be responsible for at least part of the delinquency rise”).

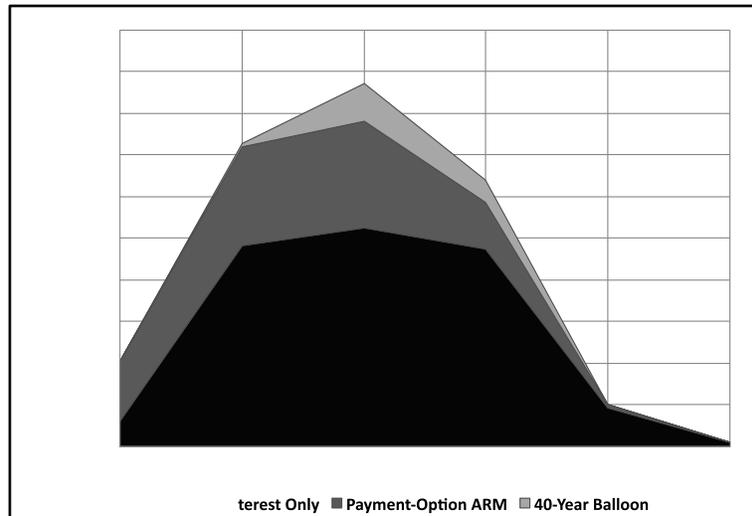
⁶⁸ Interest-only mortgages have nonamortized periods during which the borrower pays only interest; the principal balance is not reduced. The interest-only period can range from a few years to the full term of the loan. Once the interest-only period expires, the principal is then amortized over the remaining (shorter) period, meaning that monthly mortgage payments increase substantially upon the expiration of the interest-only period, including the possibility of a “bullet” payment of the entire principal balance at the end of the mortgage term.

⁶⁹ Payment-option mortgages permit borrowers to choose among monthly payment options. Typically, the choices are payments based on fifteen-year and thirty-year amortizations of the mortgage, a nonamortizing interest-only payment, and a negative-amortization payment that does not even cover the interest accrued in the past period. Because of the negative-amortization option, the balance owed on a payment-option mortgage can actually increase. Payment-option mortgages generally have a negative-amortization limit; once too much negative amortization has accrued, the loan resets to being fully amortized over the remaining term. Likewise, the pick-a-pay-period option is often restricted to a limited number of years, after which the loan resets to being fully amortized over the remaining term. Both types of resets can result in significant increases in monthly payments.

⁷⁰ A forty-year balloon mortgage, or “40/30,” is a thirty-year loan that is amortized over forty years, meaning there is a balloon payment due at the end of the thirtieth year. The mismatch between the term and amortization periods reduces monthly payments before the balloon payment.

⁷¹ A hybrid ARM has an initial fixed-rate period, usually at a teaser rate that is lower than those available on standard FRMs. After the expiration of the fixed-rate teaser period, the loan resets to an adjustable rate. Typically, these loans were structured as 2/28s or 3/27s, with two- or three-year fixed-rate periods and twenty-eight- or twenty-seven-year adjustable-rate periods. The new rate after the expiration of the teaser can result in substantial increases in monthly payments.

⁷² *See* INSIDE MORTG. FIN., *supra* note 23.



For banks, nontraditional mortgages were gifts that kept giving. The back-loaded cost structure of these mortgages created an incentive for borrowers to refinance when monthly payments increased, thereby generating future refinancing origination business. In essence, then, the exotic products that marked the housing bubble were just the reincarnation of pre-New Deal bullet loans—nonamortizing products designed to be refinanced frequently.

Nontraditional products also fueled their own proliferation as part of a homebuyers' arms race. The expansion of the borrower base and borrower capacity because of loosened underwriting standards also increased demand for housing supply and drove real-estate prices upwards. As housing prices rose, nontraditional affordability products became increasingly attractive to borrowers who saw their purchasing power diminish. Thus, nontraditional mortgage products generated additional origination business. The growth of nontraditional products suggests the shift to ARMs was driven by their use as initial affordability for market expansion.

Private-label securitization was the dominant funding mechanism for nontraditional mortgages.⁷³ PLS made the expansion in the nontraditional mortgage market possible, and nontraditional mortgages made the expansion of the PLS market possible. Without PLS, most nontraditional mortgages would not have been originated because banks would simply have been unwilling to carry the risks from nontraditional mortgages on their balance sheets. Similarly, without nontraditional mortgages, PLS would have remained a market of under \$300 billion in issuance per year, rather than one that grew to nearly \$1.2 trillion. The GSEs' economies of scale and implicit government guarantee gave them operating efficiencies that PLS could not match for traditional, conventional conforming loans; but for the growth of nontraditional mortgages, the only market left for PLS would have been in financing conventional jumbo mortgages.⁷⁴

Ultimately, the expansion of PLS and nontraditional mortgages was its own undoing. PLS based on nontraditional mortgages enabled more mortgage credit, which bid up housing prices, and those increased housing prices then became part of the underwriting that enabled further expansion of mortgage credit. During the bubble, however, housing-price appreciation depended on the continued expansion of the borrower base, much like a pyramid scheme. Not all

⁷³ Some nontraditional mortgages, especially payment-option ARMs, stayed on balance sheets.

⁷⁴ A jumbo mortgage is a loan that is larger than the conforming-loan limit—the maximum size the GSEs are permitted, by statute, to purchase.

consumers were looking to purchase homes, and the increase in house prices eventually priced out other potential homeowners, even with loosened (or fraudulent) underwriting standards.⁷⁵ The inability to keep expanding the borrower base made price increases unsustainable. Without home-price appreciation, homeowners could not refinance their way out of highly leveraged, nontraditional mortgages when payment shocks—large increases in monthly mortgage payments upon the expiration of teaser interest rates—occurred. Moreover, without the continued, expected price appreciation, prices did not just level off but collapsed because part of the high prices was due to the expected future increase in prices.⁷⁶ The recognition that this was so may also have played a part in the bubble’s collapse because mortgage credit tightened, becoming a self-fulfilling prophecy. The result was a cycle of declining housing prices and foreclosures: the bubble had burst.

II. A SUPPLY-SIDE EXPLANATION OF THE HOUSING BUBBLE

What caused the bubble? In this Part, we demonstrate two critical facts any explanation of the bubble must address. First, in section II.A, we show that the bubble was primarily a supply-side event, meaning that it was driven by an oversupply of housing finance rather than an excess of demand for housing. Second, in section II.B, we examine the timing of the bubble. We argue that the bubble was limited in duration and that it began in 2003 and 2004. Taken together, the supply-side explanation and the timing of the bubble are the key evidence that points to the change in housing financing from GSE securitization to private-label securitization as the crucial event in the creation of the bubble.

A. EVIDENCE FROM PLS-YIELD SPREADS

We believe that the cause of the bubble is to be found in the changes in the structure of the housing-finance market in 2003 and 2004, as the market moved from agency securitization of traditional FRMs to private-label securitization of nontraditional ARMs. It is unquestioned that securitization was the funding mechanism for the housing bubble, but no previous work has examined the pricing of PLS in relation to the bubble. We examined the pricing of PLS deals from 2003 to 2007. Our data reveals a remarkable trend: even as mortgage risk and PLS issuance volume *increased*, the spread on PLS over maturity-matched Treasuries that represents their additional risk premium *decreased* (see Figures 10 and 11).

Figures 10 and 11 only show the nominal spreads between PLS and Treasuries; they do not show the increase in risk on PLS. If one were to adjust for changes in credit risk for PLS, the risk-adjusted yield on PLS would have had to increase substantially. The movement in spreads is generally opposite that which one would have expected in a perfect market.

Figure 10. PLS Issuance and Weighted Average Spreads, 2003–2007⁷⁷

⁷⁵ This may be the reason that homeownership actually peaked early in the bubble, in 2004. See Paul S. Calem et al., *Implications of the Housing Market Bubble for Sustainable Homeownership*, in *THE AMERICAN MORTGAGE SYSTEM: CRISIS AND REFORM* 87, 87 (Susan M. Wachter & Marvin M. Smith eds., 2011).

⁷⁶ See Himmelberg et al., *supra* note 66, at 74.

⁷⁷ Adelino, *supra* note 43, at 42 tbl.1. Adelino’s data does not cover the entire universe of PLS issuance, so issuance numbers are necessarily lower than industry-wide figures from Inside Mortgage Finance’s *Mortgage Market Statistical Annual*. The mean spread is to maturity-matched Treasuries.

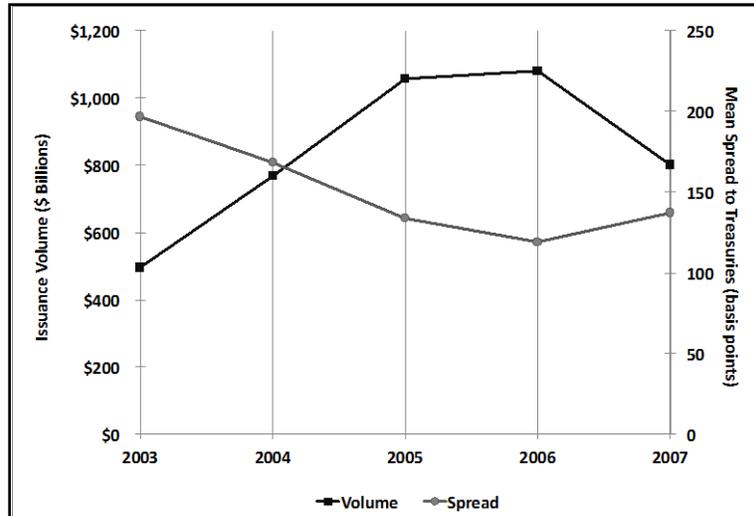
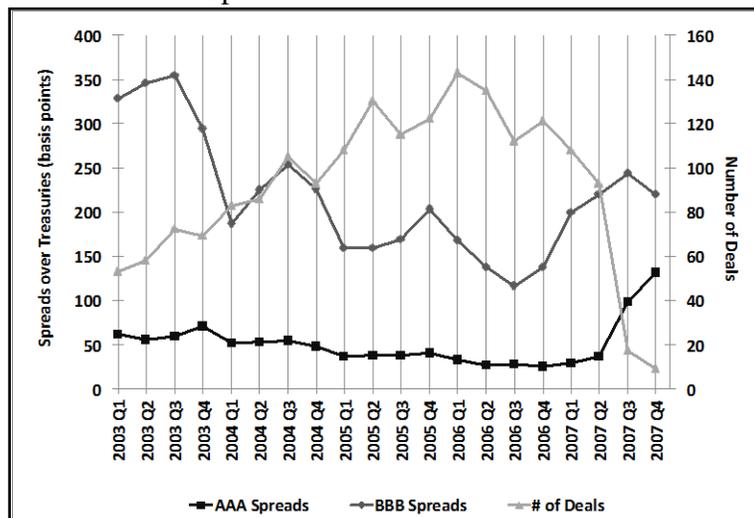


Figure 11. PLS Issuance and Spreads for AAA- and BBB-Rated Tranches, 2003–2007⁷⁸



Normally, when the risk of an asset class increases, the yield on the asset class increases as well. Therefore, as mortgage-underwriting standards deteriorated, the yield on PLS should have increased and thus the spread between PLS and Treasury yields should have increased. Instead, the spread decreased. Put differently, declining PLS spreads meant that investors were willing to accept more risk for lower returns. Housing finance was becoming relatively cheaper and more abundant, even as it became riskier. This is strong evidence that PLS were being mispriced by the market between 2004 and 2007.

Figure 12 shows an even more remarkable market development. Figure 12 compares spreads over Treasuries for AAA-rated PLS and AAA-rated corporate bonds. This comparison lets us test whether movement in PLS spreads was unique to PLS or whether it merely reflected market-wide trends.

⁷⁸ See e-mail from Manuel Adelino, Assistant Professor of Bus. Admin., Tuck School of Business, Dartmouth Coll., to author (on file with authors).

Figure 12. Comparison of AAA PLS- and Corporate-Yield Spreads over Maturity-Matched Treasuries⁷⁹

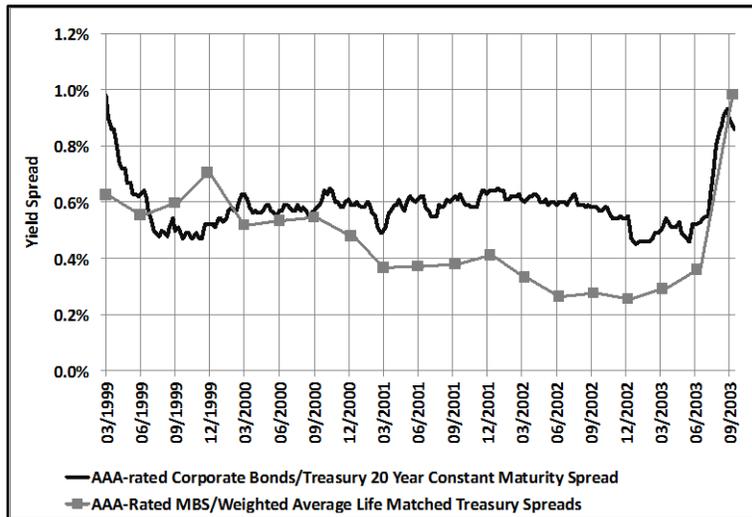


Figure 12 shows that between 2004 and 2007, non-risk-adjusted spreads on AAA-rated PLS fell, while spreads on AAA-rated corporate bonds held steady. Thus, starting in early 2004, spreads on AAA-rated PLS were actually trading through—in other words, were less than—AAA-rated corporate bonds. This shows that the change in spreads was specific to PLS and did not reflect a general movement in the AAA-rated bond market.

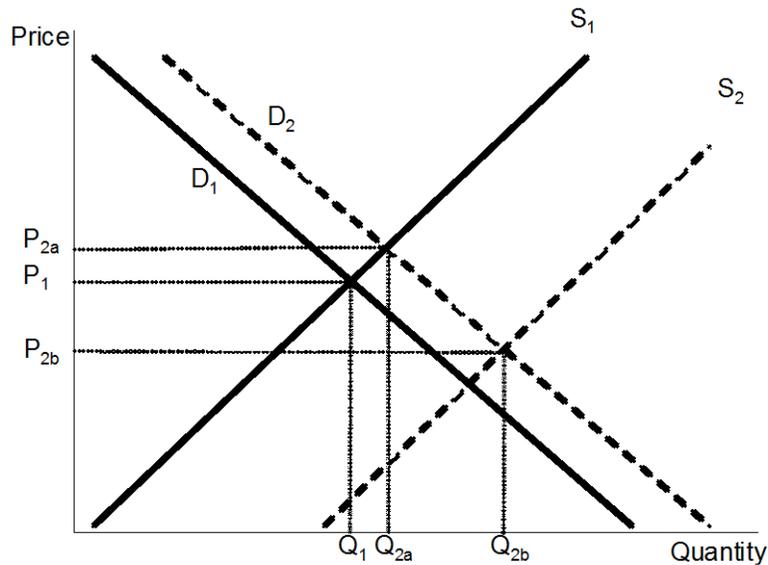
The difference in movement in PLS and corporate-bond spreads is all the more remarkable because the credit risk on virtually all PLS was increasing at an astonishing rate, while there was no such general increase in risk for corporate debt.⁸⁰ The point here is not absolute spreads but the directional movement of PLS spreads compared with corporate-bond spreads.

The movement in PLS spreads and volume—that spreads fell and volume increased even as risk increased, that the spreads fell below corporate-bond spreads, and that PLS spreads fell while corporate-bond spreads remained static—points to a supply-side explanation of the housing bubble, rather than a demand-side explanation. Simultaneously falling price (spreads) and increasing quantity (volume) means that there had to be an outward (rightward) shift in the housing financing supply curve (from S_1 to S_2 , in Figure 13).

Figure 13. Shifts in Housing-Finance Supply and Demand Curves

⁷⁹ See *Selected Interest Rates (Daily)*—H.15, BD. OF GOVERNORS OF THE FED. RESERVE SYS., <http://www.federalreserve.gov/releases/h15/data.htm> (under the “Instruments” column, browse to “U.S. government securities,” “Treasury constant maturities,” “Nominal,” and “20-year,” and select the “Monthly” link in the corresponding “Frequency” column) (documenting interest rates for 20-year, constant-maturity Treasuries) (last updated Apr. 13, 2011); *id.* (under the “Instruments” column, browse to “Corporate bonds,” “Moody’s seasoned,” and “Aaa,” and select the “Monthly” link in the corresponding “Frequency” column) (documenting interest rates for corporate AAA securities); e-mail from Manuel Adelino to author, *supra* note 78 (providing the spreads between AAA MBS and weighted-average life Treasuries).

⁸⁰ See *Corporate Default and Recovery Rates, 1920–2008*, MOODY’S GLOBAL CREDIT POL’Y (Moody’s Investors Serv., New York, N.Y.), Feb. 2009, at 4–5, available at <http://www.moodys.com/sites/products/DefaultResearch/2007400000578875.pdf>.



There may also have been an outward (rightward) shift in the housing-finance demand curve (from D_1 to D_2 , in Figure 13), as irrationally exuberant consumers sought ever more financing to cope with escalating prices. Such a shift would have resulted both in greater supply (Q_{2a}) and higher prices (P_{2a}), and thus larger PLS spreads. But PLS spreads decreased, even as supply increased. This means that the housing-finance supply curve must have shifted outwards (from S_1 to S_2) enough to offset any outward shift of the demand curve in terms of an effect on price ($P_{2b} < P_{2a}$). Put differently, even if there was an increase in housing-finance demand, there was a greater increase in housing-finance supply. Investors' demand for PLS was outstripping the supply of mortgages.⁸¹ The reasons for this demand are explored in sections III.B.2 and IV.B.2.

B. TIMING THE BUBBLE

Our supply-side explanation of the bubble is also consistent with evidence regarding the bubble's timing. Determining when the real-estate bubble began is critical for evaluating competing explanations. There is little consensus among commentators. National housing prices marched upwards from 1997 to 2006. Thus, some commentators place the start of the bubble in 1997, when the period of unabated appreciation began.⁸² Others place the start of the bubble in 2001 and 2002, when the Federal Reserve lowered short-term interest rates significantly.⁸³

⁸¹ See MICHAEL LEWIS, *THE BIG SHORT: INSIDE THE DOOMSDAY MACHINE* 143 (2010) ("There weren't enough Americans with shitty credit taking out loans to satisfy investors' appetite for the end product." (emphasis removed)).

⁸² See, e.g., FIN. CRISIS INQUIRY COMM'N FINAL REPORT, *supra* note 4, at 445 (Peter J. Wallison, dissenting); Dean Baker, *East Asia's Economic Revenge*, *GUARDIAN* (U.K.), (Mar. 9, 2009, 12:00 EDT), <http://www.guardian.co.uk/commentisfree/cifamerica/2009/mar/09/usa-useconomy>; Pinto, *supra* note 7 ("Most agree that the housing bubble started in 1997."). Robert Shiller argues that there were regional housing bubbles as early as 1998, but how these regional bubbles would have become national bubbles is not clear. See Robert J. Shiller, *Understanding Recent Trends in House Prices and Homeownership*, in *HOUSING, HOUSING FINANCE, AND MONETARY POLICY* 89, 89 (2007), available at <http://www.econ.yale.edu/~shiller/pubs/understanding2007.pdf>.

⁸³ See, e.g., Lawrence H. White, *Federal Reserve Policy and the Housing Bubble*, 29 *CATO J.* 115, 115–19 (2009) (describing the bubble as the result of Federal Reserve policy in 2001 and beyond); James R. Hagerty, *Who's To*

We believe the actual bubble was much shorter: it began in 2004 or possibly 2003 and burst in 2006. Housing prices might have been inflated between 2001 and 2003, but the period from 2004 to 2006 represents a bubble distinct from any that might have existed between 2001 and 2003. Irrespective of whether there was a bubble between 2001 and 2003, this period was marked by a real-estate boom in traditional prime-mortgage refinancing. The uptick in market volume during this period contributed to the 2004–2006 bubble by placing pressure on participants throughout the mortgage industry to maintain the elevated earnings from 2001 through 2003, which led to a decline in mortgage-underwriting standards starting around 2004 (see Figures 5–6).

The question remains, though, when did the bubble start? Simply defining a bubble is a challenge. From a classical-economics perspective, the concept of a bubble is nonsensical: the value of an asset is simply its market price. This tautological valuation precludes the possibility of a bubble; according to classical economics, there are only market fluctuations.

Although classical economics does not contemplate bubbles, it is possible to posit a definition of a bubble in a situation in which asset prices deviate substantially upward from the consumption value—the fundamental value—of an asset. Thus, some economists define an asset bubble as when an asset’s price, driven by expectations of future prices, exceed the asset’s fundamental value.⁸⁴ Under this definition, at what point did housing prices depart from fundamentals?

Although there was significant housing-price appreciation from 1997 to 2003, that appreciation can be explained relative to fundamentals: the cost of home ownership relative to renting and interest rates. Only starting in 2004 do fundamentals lose their explanatory power for housing prices.

1. 1997–2000

Although housing prices began to appreciate in 1997, that alone does not necessarily indicate a bubble. To get a true sense of the bubble, we need to examine inflation-adjusted housing prices, presented in Figure 14, rather than the nominal housing prices that are typically reported by housing-price indices shown in Figure 15. Figure 14 shows that while housing prices moved upwards from 1997 until 2007, inflation-adjusted housing prices did not pass their previous peak level until 2000. The increase in housing prices from 1997 to 2000 was within the regular, historic range of inflation-adjusted housing-price fluctuations, indicating that they were not necessarily part of a bubble.

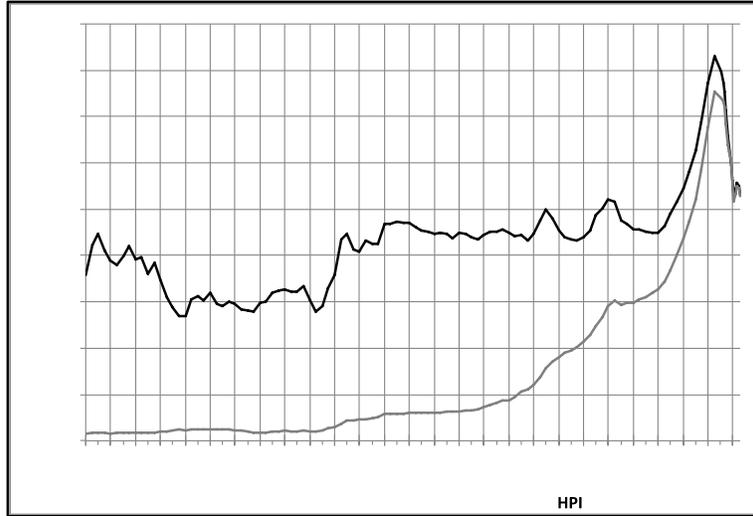
Figure 14. U.S. Nominal and Inflation-Adjusted Housing Price Indexes⁸⁵

Blame for the Housing Bubble?, WALL ST. J. DEV. BLOG (Nov. 16, 2009, 1:57 PM), <http://blogs.wsj.com/developments/2009/11/16/whos-to-blame-for-the-housing-bubble> (citing Tom Lawler, a housing economist, as positing 2002 as the start of the bubble); Ironman, *A Better Method of Detecting Housing Bubbles*, SEEKING ALPHA (Feb. 25, 2010), <http://seekingalpha.com/article/190753-a-better-method-of-detecting-housing-bubbles> (noting that housing prices in specific U.S. cities began to increase 2001).

⁸⁴ See Joseph E. Stiglitz, *Symposium on Bubbles*, J. ECON. PERSP., Spring 1990, at 13, 13. Stiglitz defines a bubble as follows:

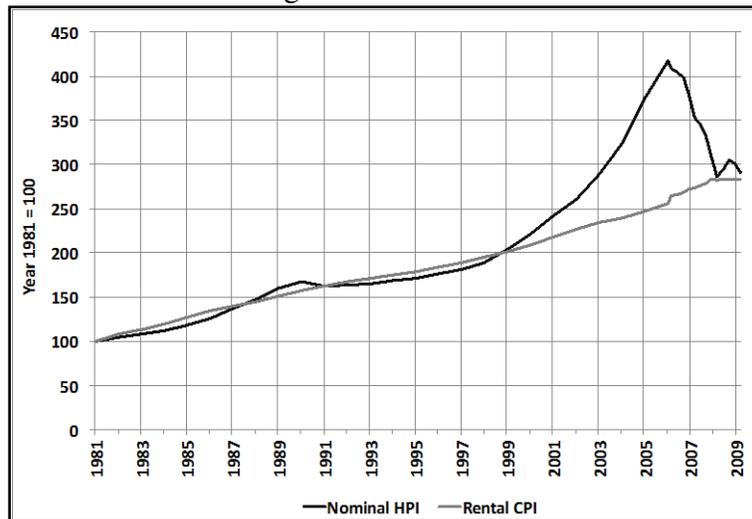
[I]f the reason that the price is high today is *only* because investors believe that the selling price will be high tomorrow—when “fundamental” factors do not seem to justify such a price—then a bubble exists.

⁸⁵ See ROBERT J. SHILLER, *IRRATIONAL EXUBERANCE* (2d ed. 2005), <http://www.econ.yale.edu/~shiller/data/fig2-1.xls> (online supplement with historical housing-market data). The inflation adjustment is based on the Consumer



Housing prices also kept pace with rental prices during the period from 1997 to 2000, as Figure 15 shows. The rate of appreciation of both housing and rental costs remained basically identical, as they had since at least 1981, when the Bureau of Labor Statistics began to compile a rental-price index. This indicates that into 2000, housing prices were not straying from fundamental values.

Figure 15. Nominal U.S. Housing Price Index and Rental Consumer Price Index⁸⁶



2. 2001–2003

Starting in 2000, housing prices began to appreciate at a much faster rate than rental prices, as Figure 15 shows. This divergence in rates of appreciation does not, however, necessarily

Price Index. Shiller's Housing Price Index is a combination of the S&P/Case–Schiller Housing Price Index for 1987 through the present and four other sources for historical data.

⁸⁶ See *S&P/Case–Schiller Housing Price Indices*, *supra* note 1; U.S. BUREAU OF LABOR STATISTICS, RENT OF PRIMARY RESIDENCE.

indicate the existence of a bubble. Instead, the years from 2001 to 2003 were marked by historically low interest rates. Low interest rates explain the faster increase in housing prices relative to rental prices from 2001 to 2003.

With fully amortized FRMs—the overwhelming bulk of the mortgage market prior to 2004—the cost of financing a home was heavily dependent upon interest rates.⁸⁷ With low mortgage interest rates during this period, the cost of homeownership fell relative to the cost of renting. Accordingly, it followed that housing prices would rise faster than rental prices. Indeed, real-estate economists Charles Himmelberg, Chris Mayer, and Todd Sinai have argued that the increase in housing prices through 2004 was not a bubble but in fact reflected fundamentals, as shown by the imputed annual rental cost of owning a house.⁸⁸

We cannot rule out the possibility that a bubble was already forming between 2001 and 2003; to the extent there was a bubble, however, it was much smaller than what developed between 2004 and 2006, and its causes were fundamentally different. Further, it was driven by interest rates and monetary policy, which cannot explain the growth of housing prices from 2004 to 2006. Thus, while we are skeptical of there being a bubble between 2001 and 2003—in the sense of asset prices becoming untethered from fundamentals—we believe that if there had been a bubble during this time that it would have been distinct from the much more destructive bubble that followed.

3. 2004–2006

From 2004 onwards, real-estate fundamentals did not support any further price increases, as interest rates rose, thereby reducing the attractiveness of homeownership relative to renting. Nonetheless, home prices went up. Corresponding with this, Figure 12 shows PLS spreads diverging downward from corporate-bond spreads as of late 2004, while Figure 1 shows a massive expansion of PLS occurring in 2004. This indicates that a supply glut was only forming as of 2004; before then, mortgage credit was properly priced in light of interest rates, and housing prices reflected fundamentals. It is possible, however, that the bubble actually started in 2003 because mortgage originations predate PLS issuance, and mortgage originations increased significantly in 2003 and 2004 in regions with heavy subprime concentration.⁸⁹ Indeed, in prior work one of us (with finance professor Andrey D. Pavlov) has shown that in areas where subprime-mortgage credit increased, property prices increased *as a result*.⁹⁰

⁸⁷ From 2000 to 2003, fixed-rate mortgages made up over 75% of conventional loans. See INSIDE MORTG. FIN., *supra* note 23. In 2004, fixed-rate mortgages dropped to 66% of market share. See *id.*

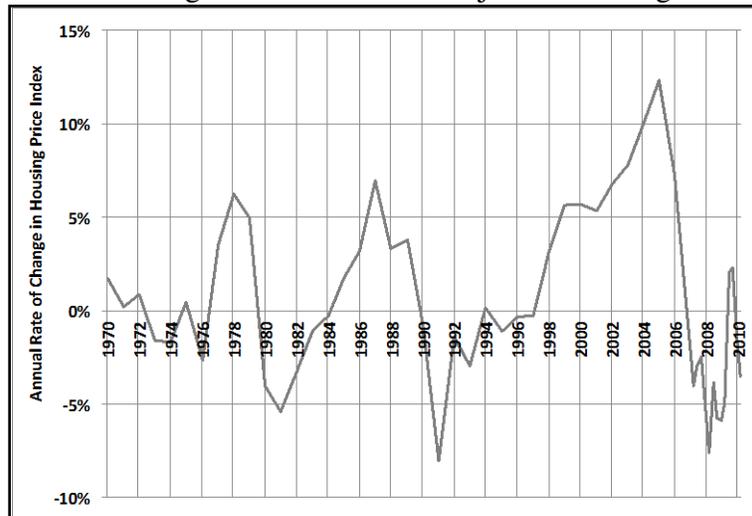
⁸⁸ See Himmelberg et al., *supra* note 66. Himmelberg et al. compared imputed rental costs with ownership costs, which they acknowledge are not the same as housing prices. *Id.* With a nontraditional mortgage, ownership costs of housing could be quite low, even with high housing prices. Cf. Chris Mayer & Todd Sinai, *Bubble Trouble? Not Likely*, WALL ST. J., Sept. 19, 2005, at A16 (noting that the ratio of the cost of owning to renting in 2004 was insignificant). Himmelberg, Mayer, and Sinai’s argument assumes continuation of housing-price appreciation at historic rates. In 2004, although many market participants and economists believed that prices would continue to go up, some did not because prices were at an all-time high relative to imputed rents. Prices obviously did eventually decline. See generally Kristopher S. Gerardi et al., *Reasonable People Did Disagree: Optimism and Pessimism About the U.S. Housing Market Before the Crash*, in THE AMERICAN MORTGAGE SYSTEM: CRISIS AND REFORM, *supra* note 75, at 26, 27 (noting commonly held assumptions among economists prior to the bubble).

⁸⁹ See generally Andrey Pavlov & Susan Wachter, *Subprime Lending and Real Estate Prices*, 39 REAL EST. ECON. 1 (2011) (arguing that “aggressive lending instruments magnif[y] real estate market cycles”).

⁹⁰ See *id.* at 2.

The annual rate of change in inflation-adjusted housing prices, displayed in Figure 16, also shows that 2003 and 2004 was an inflection point. Although the rate of change of housing-price appreciation jumps positive starting in 1997, it stayed steady at around 6% until 2001.⁹¹ The years 2001 and 2002 saw slightly higher rates of housing-price appreciation, but the extraordinary jump in appreciation rates occurred from 2003 to 2005. By 2005, the rate of appreciation more than doubled, to over 12%, only falling negative again in 2007. The 2005 peak surpassed all levels of housing-price appreciation since 1946, when housing prices soared as rapid demographic growth from GIs returning home to a baby boom ran up against a housing supply that had been frozen during WWII.

Figure 16. Annual Rate of Change in U.S. Inflation-Adjusted Housing Price Index, 1970–2010⁹²



Ultimately, a bubble is marked by a rise and subsequent collapse in an asset price. The collapse of housing prices after 2006 might not yet be complete (or it might be an overcorrection). Based on current market prices, however, prices have returned not to 1997 levels, or even 2000 levels, but to 2003 levels (see Figures 14 and 15). This too suggests that the housing bubble only began in 2003 and 2004.

The weight of the evidence shows that the housing bubble was a supply-side phenomenon that began in 2003 and 2004. The movement of yield spreads on PLS can only be explained if the bubble was a supply-side driven phenomenon because fundamentals explain housing-price increases until around 2004, thereby precluding the existence of a bubble. This timing is critical both because it helps rule out alternative explanations of the bubble, as discussed in Part III, and because it points to the factors behind the oversupply of mortgage credit, as explored in Part IV.

III. ALTERNATIVE THEORIES OF THE HOUSING BUBBLE

There are several theories on the cause of the housing bubble, but there is little consensus about their explanatory power.⁹³ Some theories are demand-side theories, meaning that the

⁹¹ In the recent historical context, this level of annual appreciation was unremarkable; it has occurred twice since 1970 and nine other times in the twentieth century. See Figure 15 (for post-1970) and SHILLER, *supra* note 85, and authors' inflation-adjustment calculations (for the remainder of the twentieth century).

⁹² For data, see SHILLER, *supra* note 85, and authors' inflation-adjustment calculations.

housing bubble was caused by a growth in consumer demand for housing, which pushed up housing prices. Others are supply-side theories, meaning that the housing bubble was caused by a growth in the supply of housing finance, thereby enabling consumers to make more heavily leveraged bids for housing and bid up home prices.⁹⁴

This Part reviews the leading theories of the housing bubble and points out their deficiencies. It is important to underscore that we believe there were multiple contributing factors to the housing bubble. Monetary policy, irrational consumer behavior, inelastic housing supply, and regulatory policy all contributed in some way to the bubble. None of these factors alone, or even in combination, however, can provide a sufficient explanation for the bubble. At best, the previous explanations of the bubble are incomplete and, in the case of arguments about the Community Reinvestment Act, demonstrably wrong.

A. DEMAND-SIDE THEORIES

1. Mass Psychology and Irrational Exuberance

The dominant explanations of the housing bubble have been demand-side explanations. Robert Shiller has argued that the bubble was driven by consumers' belief that real-estate prices would continue to appreciate, stoking the demand for housing finance.⁹⁵

We do not question the existence of irrational consumer expectations and behavior. There was undoubtedly a great deal of irrational or misguided consumer behavior in real-estate investment. But this behavior required readily available financing. Shiller's demand-side theory cannot explain the movement in PLS-yield spreads during the bubble and is, therefore, an incomplete explanation. Credit relationships are two-sided relationships, and the evidence from PLS spreads indicates that any increase in housing-finance demand was outstripped by an increase in housing-finance supply.⁹⁶

⁹³ Glaeser et al., *supra* note 3, at 1.

⁹⁴ Prior to 2008, a third type of explanation of housing price increases could be found, namely that they were reflecting fundamentals. *See, e.g.*, Hearing Before the Joint Economic Committee of Congress, June 9, 2005 "The Economic Outlook" (testimony of Alan Greenspan, Chairman, Board of Governors of the Federal Reserve System) (justifying higher debt burdens because of "productivity improvements"); Hearing Before the Joint Economic Committee of Congress, Oct. 20, 2005 "The Economic Outlook" (testimony of Ben S. Bernanke, Chairman, President's Council of Economic Advisers) (noting that "House prices have risen by nearly 25 percent over the past two years. Although speculative activity has increased in some areas, at a national level these price increases largely reflect strong economic fundamentals, including robust growth in jobs and incomes, low mortgage rates, steady rates of household formation, and factors that limit the expansion of housing supply in some areas.").

⁹⁵ *See* SHILLER, *supra* note 10; *see also* Ernan Haruvy et al., *Traders' Expectations in Asset Markets: Experimental Evidence*, 97 AM. ECON. REV. 1901, 1901 (2007) ("We find that individuals' beliefs about prices are adaptive, and primarily based on past trends in the current and previous markets in which they have participated. Most traders do not anticipate market downturns the first time they participate in a market, and, when experienced, they typically overestimate the time remaining before market peaks and downturns occur."); Glaeser et al., *supra* note 3, at 39 (concluding that Shiller's explanation has merit).

⁹⁶ An alternative psychological theory has been presented by Markus Brunnermeier and Christian Julliard. *See* Brunnermeier & Julliard, *supra* note 10. They argue that consumers are incapable of sorting between real and nominal changes in interest rates and rents. Therefore, consumers account for low nominal rates when making mortgage decisions but fail to account for the future appreciation of prices and rents falling commensurately with anticipated inflation. The result is that consumers overestimate the value of real estate when inflation is declining. *Id.* Brunnermeier and Julliard's theory may well be correct, but it too cannot explain the movement in MBS-yield

2. Fundamentals of Housing Supply

Another demand-side quasi-hypothesis for the housing bubble, presented by urban economists Edward Glaeser, Joseph Gyourko, and Albert Saiz, emphasizes the geographic variation in the housing bubble.⁹⁷ There was considerable regional and local variance; some regions and even states, such as Texas, did not experience a bubble, while others experienced bubbles of greater or lesser size. With an increasing demand based on growth in population and income, house prices increased with inelastic supply.⁹⁸

Glaeser, Gyourko, and Saiz explain the variation in house-price outcomes based in part on variations in the elasticity of housing supply. In some parts of the country, local regulations and urban growth have been on a collision course for several decades. In these cases, with the inability of supply to expand, increased demand for real estate only resulted in higher prices.⁹⁹ In other words, Glaeser, Gyourko, and Saiz contend that in inelastic housing markets, the housing-demand curve shifted rightwards. And because most consumers finance the purchase of their homes, the rightward shift in the housing-demand curve would have also resulted in a rightward shift in the mortgage-finance demand curve.

Glaeser, Gyourko, and Saiz do not present supply constraints as the explanation for the bubble, although others do.¹⁰⁰ At most, Glaeser, Gyourko, and Saiz see supply inelasticity as affecting variations in how the bubble played out regionally. They argue that regions with inelastic supply were more likely to experience greater price volatility and bubbles and that the extent of the bubble was determined to some degree by housing-supply inelasticity.¹⁰¹

Economists Atif Mian and Amir Sufi have verified Glaeser, Gyourko, and Saiz's elasticity argument, showing that housing price appreciation remained flat and close to the rate of inflation in regions with the most elastic housing supply.¹⁰² Mian and Sufi note, however, that the expansion of subprime credit occurred nationwide.¹⁰³ Even in these regions with the most elastic housing supply, subprime mortgage credit increased in ZIP codes with declining incomes, something that had never occurred in the previous two decades.¹⁰⁴ Thus, while elastic housing supply was able to absorb excess housing demand in some areas, Mian and Sufi's research points to an oversupply of mortgage credit relative to fundamentals.

spreads during the bubble. Therefore, their theory, like Shiller's, is at best an incomplete explanation of the bubble, as the yield-spread movement shows that any growth in demand was exceeded by a growth in supply.

⁹⁷ Glaeser et al., *supra* note 11.

⁹⁸ See, e.g., *id.*

⁹⁹ *Id.*

¹⁰⁰ See Randal O'Toole, *How Urban Planners Caused the Housing Bubble*, POL'Y ANALYSIS (Cato Inst., Wash., D.C.), Oct. 1, 2009, at 1.

¹⁰¹ See Edward L. Glaeser & Joseph Gyourko, *Arbitrage in Housing Markets*, in HOUSING MARKETS AND THE ECONOMY: RISK, REGULATION, AND POLICY 113, 124 (Edward L. Glaeser and John M. Quigley eds., 2009) (noting that home mortgage-interest tax deduction pushes up housing prices in supply-constrained markets). It is notable, though, that the bubble was more extreme in highly supply-elastic markets like Phoenix and Las Vegas. See Davidoff, *supra* note 11, at 2; Richard K. Green et al., *Metropolitan-Specific Estimates of the Price Elasticity of Supply of Housing, and Their Sources*, 95 AM. ECON. REV. 334, 336–37 (2005).

¹⁰² Mian & Sufi, *The Consequences of Mortgage Credit Expansion*, *supra* note 9, at 1487.

¹⁰³ *Id.* at 1450.

¹⁰⁴ *Id.* at 1453, 1455, 1487.

B. SUPPLY-SIDE THEORIES

1. Government Fair-Lending and Affordable-Housing Policy

Several conservative commentators have pointed to federal fair-lending and affordable-housing policies as being critical in inflating the housing bubble by encouraging financial institutions to lend improvidently to low- or moderate-income consumers.¹⁰⁵ These commentators focus on both the Community Reinvestment Act of 1977 (CRA) and the GSEs' affordable-housing goals. Generally, these two distinct policies are lumped together in arguments, but they merit separate consideration.

a. The Community Reinvestment Act. Claims about the CRA's role in the bubble have been thoroughly considered elsewhere and largely debunked,¹⁰⁶ but because the role of the CRA is such a politically charged issue, it is worth presenting the evidence in a concise fashion.

The CRA was passed in 1977 in response to concerns about the discriminatory lending practice known as redlining—the practice of not offering financial services in minority or low-income neighborhoods, sometimes indicated with a red line on a map. The “CRA encourages federally insured banks and thrifts to meet the credit needs of the entire communities that they serve, including low- and moderate-income areas, consistent with safe and sound banking practices.”¹⁰⁷ The CRA does not require covered financial institutions to make loans. Rather, covered financial institutions are evaluated by regulators on how well they serve the needs of low-to-moderate income borrowers in their CRA geographic assessment area. The evaluations are used as a factor in determining whether to approve the institutions' mergers with and acquisitions of other depository institutions, as well as whether to approve the expansion of bank holding companies into other types of financial activities.¹⁰⁸ The “basic CRA rules [and] the enforcement process” related to subprime lending activity have remained constant since 1995.¹⁰⁹

¹⁰⁵ See *supra* note 7.

¹⁰⁶ See FIN. CRISIS INQUIRY COMM'N, PRELIMINARY STAFF REPORT: THE COMMUNITY REINVESTMENT ACT AND THE MORTGAGE CRISIS 6 (2010); Neil Bhutta & Glenn B. Canner, *Did the CRA Cause the Mortgage Market Meltdown?*, COMMUNITYDIVIDEND (Fed. Reserve Bank of Minn., Minneapolis, Minn.), Mar. 1, 2009, available at http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=4136; Elizabeth Laderman & Carolina Reid, *CRA Lending During the Subprime Meltdown*, in REVISITING THE CRA: PERSPECTIVES ON THE FUTURE OF THE COMMUNITY REINVESTMENT ACT 115, 124 (Prabal Chakrabarti et al. eds., 2009), available at http://www.frbsf.org/publications/community/cra/revisiting_cra.pdf (finding that CRA-subject institutions were less likely to make subprime loans in California, and that subprime loans made by CRA-subject institutions in CRA assessment areas outperformed these institutions' subprime loans made outside CRA-assessment areas); Memorandum from Glenn Canner & Neil Bhutta to Sandra Braunstein, Dir., Consumer & Cmty. Affairs Div., Bd. of Governors of the Fed. Reserve Sys. 3 (Nov. 21, 2008) [hereinafter Memorandum from Canner & Bhutta], available at http://www.federalreserve.gov/newsevents/speech/20081203_analysis.pdf; Ellen Seidman, *No, Larry, CRA Didn't Cause the Sub-Prime Mess*, LADDER BLOG (Apr. 15, 2008, 9:55 AM), <http://www.newamerica.net/blog/asset-building/2008/no-larry-cra-didn-t-cause-sub-prime-mess-3210>.

¹⁰⁷ Michael S. Barr, *Credit Where It Counts: The Community Reinvestment Act and Its Critics*, 80 N.Y.U. L. REV. 513, 517 (2005).

¹⁰⁸ See 12 U.S.C. § 1831u(b)(3) (2006) (establishing the requirements for CRA interstate mergers); see also *id.* § 1831y (detailing the CRA sunshine requirements); *id.* § 1843(l)(2) (detailing the requirements for CRA subsidiaries engaging in expanded financial activities).

¹⁰⁹ Memorandum from Canner & Bhutta, *supra* note 106, at 2.

There is little evidence that the CRA contributed directly to the bubble. CRA-subject institutions made a disproportionately small share of subprime-mortgage loans.¹¹⁰ Moreover, to qualify for CRA credit, a loan must be made to lower-income borrowers in the financial institution's geographic assessment area. Relatively few subprime loans even qualified for CRA credit, either because they were made outside CRA assessment areas or were made to higher income borrowers. As a Federal Reserve Staff study found, only 10% of all loans made by CRA-subject institutions in their CRA assessment area were to low-income borrowers and "only 6 percent of all higher-priced loans in 2006 were made by CRA-covered institutions or their affiliates to lower-income borrowers or neighborhoods in their assessment areas"¹¹¹ (see Figures 17 and 18). Census tracts served disproportionately by CRA-covered lenders had less risky loans and lower delinquency rates than those served disproportionately by non-CRA lenders.¹¹² Similarly, there is no evidence of a change in riskiness of loans or loan performance at the discontinuity threshold for CRA (or GSE affordable-housing goal) eligibility.¹¹³ It is possible, however, that depositories were driven to purchase a greater volume of loans originated by independent mortgage companies in order to gain CRA credit; sufficient data do not exist on this point.

Figure 17. Mortgage Lending of CRA- and Non-CRA-Subject Institutions¹¹⁴

¹¹⁰ See Robert B. Avery et al., *The 2007 HMDA Data*, FED. RES. BULL. (Bd. of Governors of the Fed. Reserve Sys., Wash., D.C.), Dec. 2008, at A107, A124 tbl.11.

Critically, not all financial institutions are subject to the CRA; only federally insured banks and thrifts fall within its ambit. Depositories' uninsured subsidiaries and affiliates are not subject to the CRA, but insured institutions are permitted to count their subsidiaries' and affiliates' activities toward their own CRA credit. Independent mortgage companies are not covered by CRA whatsoever.

The variation in CRA coverage enables a comparison of the mortgage lending of CRA-subject institutions with that of other institutions. Bank regulators do not specifically track subprime lending, but, under the Home Mortgage Disclosure Act of 1975 (HMDA), they track so-called HOEPA loans, which are high-interest-rate loans, as defined by the Home Owners Equity Protection Act of 1994, and which provide a good proxy for subprime lending. See 12 U.S.C. §§ 2801–2811 (2006) (identifying the HMDA reporting requirements for depositories and other lenders); 12 C.F.R. §§ 203.4(a)(12)–(13) (specifying HMDA and other high-price loan reporting requirements). A HOEPA loan is a closed-end, nonpurchase money mortgage (excluding reverse mortgages) secured by a consumer's principal residence, which has an APR of more than 800 basis points above comparable-maturity Treasury securities (for first liens) or 1,000 basis points above comparable-maturity Treasury securities (for junior liens), or that has total points and fees payable by the consumer at or before closing that exceed the greater of 8% of the total loan amount or an annually adjusted dollar amount. See 15 U.S.C. § 1602(aa) (2006) (defining HOEPA loans); 12 C.F.R. § 226.32(a) (2011) (identifying the requirements for closed-end mortgages).

CRA-subject institutions made only a small percentage of HOEPA loans between 2004 and 2007. See Avery et al., *supra*. Although depositories made over 40% of loans, they made less than 30% of HOEPA loans. *Id.* When their subsidiaries and affiliates are included, the market share of all loans was around 70% though HOEPA loan share was only around 50%. *Id.* In comparison, independent mortgage companies made up about 30% of the mortgage lending market and around 50% of the HOEPA market. *Id.* HOEPA lending was concentrated in institutions not subject to the CRA. *Id.*

¹¹¹ Memorandum from Canner & Bhutta, *supra* note 106; see also *id.* at 7 (only 10% of all loans made by depositories and their affiliates to lower-income individuals qualified for CRA credit).

¹¹² See Robert B. Avery & Kenneth P. Brevoort, *The Subprime Crisis: Is Government Housing Policy To Blame?* 15–76 (Soc. Sci. Research Network, Working Paper No. 1726192, 2011), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1726192.

¹¹³ See *id.* at 22.

¹¹⁴ See Memorandum from Canner & Bhutta, *supra* note 106, at 7.

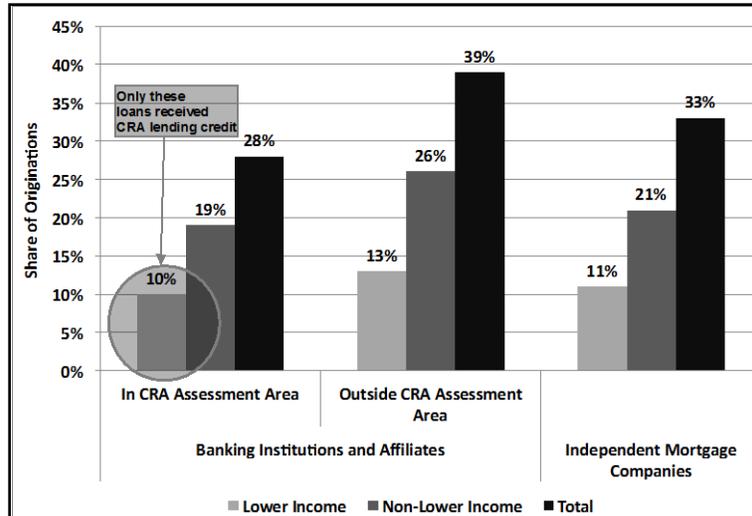
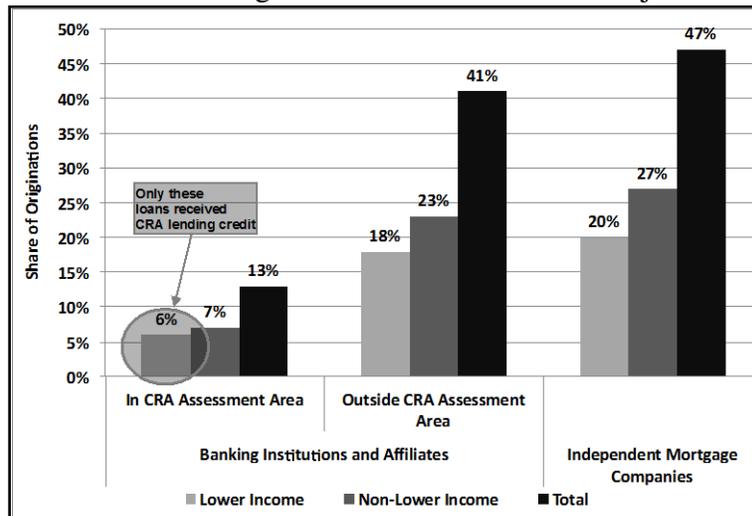


Figure 18. HOEPA Lending of CRA- and Non-CRA-Subject Institutions¹¹⁵



Ultimately, though, blaming the housing bubble on the CRA suffers from two logical flaws. First, the residential-housing bubble was mirrored almost exactly by a commercial real-estate (CRE) bubble (see Figure 19). While there is some interlinkage between residential and commercial real-estate prices,¹¹⁶ the CRE bubble cannot be attributed to the residential

¹¹⁵ *Id.*

¹¹⁶ See Joseph Gyourko, *Understanding Commercial Real Estate: Just How Different from Housing Is It?* (Nat'l Bureau of Econ. Research, Working Paper No. 14708, 2009), <http://www.nber.org/papers/w14708> (finding a 40% price correlation between residential and commercial real estate between 1978 and 2008); Adam J. Levitin & Susan M. Wachter, *The Commercial Real Estate Bubble* (Soc. Sci. Research Network, Working Paper No. 1978264, 2012), <http://ssrn.com/abstract=1978264> (finding a 13% historical correlation between residential and commercial real-estate prices between 1987 and 2002, but 83% correlation between 2003 and 2011); see also Jennifer Roback, *Wages, Rents, and the Quality of Life*, 90 J. POL. ECON. 1257 (1982) (positing a long-term correlation in commercial and residential real-estate prices because of shared fundamentals); Sherwin Rosen, *Wage-Based Indexes of Urban Quality of Life*, in CURRENT ISSUES IN URBAN ECONOMICS 74, 74–102 (Peter Mieszkowski & Mahlon Straszheim eds., 1979) (“explor[ing] some possibilites for imputing an index of the ‘quality of life’ among metropolitan areas from wage data”).

bubble.¹¹⁷ As the CRA does not apply to commercial real-estate lending, it cannot explain the existence of the CRE bubble. Yet the synchronous growth and collapse of the residential and commercial real-estate bubbles cannot be coincidental. In sum, the case that the CRA drove banks to improvident lending is not tenable.¹¹⁸

Figure 19. Commercial and Residential Real-Estate Bubbles¹¹⁹



Second, the timing of the bubble vitiates the CRA explanation. The CRA greatly predates the bubble, so it is difficult to attribute housing-price rises between 2004 and 2007 to a 1977 statute with a regulatory implementation that was last revised in 1995.¹²⁰ Although one would expect some time lag before seeing the result of the CRA, the time lag is simply too long to make the connection plausible.

b. GSE Affordable-Housing Goals. In addition to the CRA, some commentators have argued that the GSEs’ affordable-housing goals also fueled imprudent provision of credit and thus drove the housing bubble.¹²¹ Thus, Edward Pinto has claimed that the affordable-housing goals

¹¹⁷ See Levitin & Wachter, *supra* note 116.

¹¹⁸ The strongest argument that we can make about the role of the CRA is an indirect and nonfalsifiable one, not one that we are prepared to endorse or reject—that government policy, including the CRA, sent a clear signal to the financial-services industry that increases in homeownership were valued. Financial institutions took this as cover to loosen their underwriting standards across the board and develop economies of scale in subprime lending because they knew regulators were cheering on looser lending practices. This sort-of role for the CRA in the housing bubble is quite different from the government-made-banks-lend-to-unqualified-borrowers type of argument. In our argument, CRA provides the cover for activities that financial institutions wished to engage in themselves. Again, we can neither endorse nor reject this theory.

¹¹⁹ See *S&P/Case–Schiller Housing Price Indices*, *supra* note 1; *Moody’s/REAL Commercial Property Price Index (CPPI)*, MIT CENTER FOR REAL EST., <http://web.mit.edu/cre/research/credl/rca.html> (browse to the “Downloads” subheading; select “Click here to download returns data for all indexes”; open downloaded file; select “National Indices” folder and open “Quarterly Returns National – Property Types.csv”) (last visited Jan. 12, 2012) (identifying the national quarterly returns since 2001).

¹²⁰ See Memorandum from Canner & Bhutta, *supra* note 106, at 2. Proponents of a CRA-induced bubble must, therefore, date the bubble to 1997. This, however, would attribute *any* housing-price appreciation to the CRA, and clearly not all housing-price appreciation is a bubble.

¹²¹ See, e.g., WALLISON, *supra* note 7; Pinto, *supra* note 7; Peter J. Wallison, Op-Ed., *The Price for Fannie and Freddie Keeps Going Up*, WALL ST. J. (Dec. 29, 2009, 8:18 PM), <http://online.wsj.com/article/SB10001424052748703278604574624681873427574.html>.

“signaled to the GSEs that they should accept down payments of 5% or less, ignore impaired credit if the blot was over one year old, and otherwise loosen their lending guidelines.”¹²²

The GSEs have been subject to affordable-housing goals since 1993.¹²³ These goals, set by the Department of Housing and Urban Development, are designed “to facilitate credit access and homeownership among lower-income and minority households.”¹²⁴ If a GSE fails to meet the affordable-housing goals and does not present and pursue an acceptable remedial plan, monetary penalties and injunctive relief are available to the regulator.¹²⁵ The housing goals consist of low-to-moderate-income, special-affordable, and underserved-area goals, as well as subgoals for special-affordable multifamily units and home purchases (as opposed to refinancing).¹²⁶ The goals are measured as the ratio of qualifying mortgages financed to total mortgages financed. High-priced “HOEPA” mortgages¹²⁷ are disqualified from counting toward affordable-housing goals, as are mortgages for second residences, “[m]ortgages with unacceptable terms”—those with excessive fees, prepayment penalties, credit life insurance, or those that do not adequately consider the borrower’s ability to pay.¹²⁸

The GSE affordable-housing goals were raised in 1997, 2001, and 2005.¹²⁹ The GSEs have met the goals some of the time.¹³⁰ In order to do so, the GSEs increased their proportion of loans made to target populations¹³¹ and expanded their underwriting criteria to enable the purchase of

¹²² Pinto, *supra* note 7.

¹²³ See Housing and Community Development Act of 1992, Pub. L. No. 102-550, § 1331, 106 Stat. 3672, 3956 (codified at 12 U.S.C. § 4561 (2006)). From 1993 to 2008, the affordable-housing goals were supervised by the HUD Secretary; in 2010, they came under the supervision of the Federal Housing Finance Agency. See Housing and Economic Recovery Act of 2008, Pub. L. No. 110-289, § 1128(b), 122 Stat. 2654, 2696 (codified at 12 U.S.C. § 4561 (2006)).

¹²⁴ Xudong An & Raphael W. Bostic, *GSE Activity, FHA Feedback, and Implications for the Efficacy of the Affordable Housing Goals*, 36 J. REAL EST. FIN. & ECON. 207, 207–08 (2008).

¹²⁵ See 12 U.S.C. § 4566(c)(1) (Supp. III 2010).

¹²⁶ See 12 U.S.C. §§ 4562–4565 (Supp. III 2010).

¹²⁷ See *supra* note 110 for a discussion of the definition of HOEPA loans.

¹²⁸ See 24 C.F.R. § 81.2 (2011) (defining “HOEPA mortgage” and “Mortgages with unacceptable terms or conditions or resulting from unacceptable practices”); *id.* § 81.16(b)(8)–(c)(12) (listing the exceptions to the counting requirements for affordable-housing loans).

¹²⁹ See Interim Housing Goals, 58 Fed. Reg. 53,048 (Oct. 13, 1993) (establishing interim GSE affordable-housing goals for 1993 and 1994); Continuation of Federal Home Loan Mortgage Corporation and Federal National Mortgage Association Housing Goals, 59 Fed. Reg. 61,504 (proposed Nov. 30, 1994) (to be codified at 24 C.F.R. pt. 81) (temporarily extending the 1994 GSE affordable-housing goals into 1995); The Secretary of HUD’s Regulation of the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac), 60 Fed. Reg. 61,846 (proposed Dec. 1, 1995) (to be codified at 24 C.F.R. pt. 81) (setting GSE affordable-housing goals for 1996 through 1999); HUD’s Regulation of the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac), 65 Fed. Reg. 65,044 (proposed Oct. 31, 2000) (to be codified at 24 C.F.R. pt. 81) (setting affordable-housing goals for 2001 through 2003 and a default goal for 2004); HUD’s Housing Goals for the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac) for the Years 2005–2008 and Amendments to HUD’s Regulation of Fannie Mae and Freddie Mac, 69 Fed. Reg. 63,580 (proposed Nov. 2, 2004) (to be codified at 24 C.F.R. pt. 81) (establishing GSE affordable-housing goals for 2005 through 2008).

¹³⁰ See U.S. DEP’T OF HOUS. & URBAN DEV., OVERVIEW OF THE GSEs’ HOUSING GOAL PERFORMANCE, 1996–2003 (2005), available at <http://www.huduser.org/Datasets/GSE/gse2003.pdf>.

¹³¹ See Harold L. Bunce & Randall M. Scheessele, *The GSEs’ Funding of Affordable Loans* 4 (U.S. Dep’t of Hous. & Urban Dev., Working Paper No. HF-001, 1996), available at <http://www.huduser.org/Publications/pdf/gsewp.pdf>; Harold L. Bunce, *The GSEs’ Funding of Affordable Loans: A 2000 Update* 30 (U.S. Dep’t of Hous. & Urban Dev., Working Paper No. HF-013, 2002), available at <http://www.huduser.org/Publications/pdf/workpapr13.pdf>; Paul B. Manchester, *Characteristics of Mortgages Purchased by Fannie Mae and Freddie Mac: 1996–97 Update* 5 (U.S.

riskier loans.¹³² Yet there is little evidence that the GSE affordable-housing goals increased the total amount of credit available to underserved communities.¹³³

One possible explanation is that GSE activity crowded out the FHA for lending to underserved borrowers. Economists Xudong An and Raphael Bostic argue that the GSEs' affordable lending merely substituted for FHA affordable lending.¹³⁴ If so, the primary accomplishment of the GSE affordable-housing goals was not to increase total mortgage credit but to beggar the FHA.

The GSEs are permitted, however, to count their purchases of private-label MBS for affordable-housing goals.¹³⁵ If the underlying mortgages in a PLS would count for affordable-housing goal credit, the PLS can also count. This raises the possibility that the GSEs' pursuit of affordable-housing goals fueled the market for PLS, driving down yields. The GSEs' enormous investment portfolios included sizeable holdings of subprime and alt-A PLS, and their holdings undoubtedly contributed to the bubble by adding to demand for PLS and by legitimizing PLS as an investment for other investors.¹³⁶ But it is notable that the size of the subprime MBS in the GSEs' portfolios, as well as their portfolios' absolute share of the subprime PLS market, decreased after 2004 because PLS-yield spreads declined.¹³⁷ This means that other investors were more than substituting for GSE demand of PLS.¹³⁸

c. Alternative Factors That May Explain GSE Behavior. The GSEs certainly contributed to the housing bubble as they were active purchasers of mortgages and MBS, but we do not know how much, and their contribution may have been due to factors other than the affordable-housing goals, most notably competition with PLS,¹³⁹ attempts to maximize short-term executive

Dep't of Hous. & Urban Dev., Working Paper No. HF-006, 1998), available at http://www.huduser.org/publications/pdf/wkp_006.pdf.

¹³² See Xudong An & Raphael W. Bostic, *Policy Incentives and the Extension of Mortgage Credit: Increasing Market Discipline for Subprime Lending*, 28 J. POL'Y ANALYSIS & MGMT. 340, 345–46 (2009); David Listokin & Elvin K. Wyly, *Making New Mortgage Markets: Case Studies of Institutions, Home Buyers, and Communities*, 11 HOUSING POL'Y DEBATE 575, 637 (2000); Kenneth Temkin et al., *The Impact of Secondary Mortgage Market Guidelines on Affordable and Fair Lending: A Reconnaissance from the Front Lines*, REV. BLACK POL. ECON., Fall 2000, at 29, 35.

¹³³ See Stuart A. Gabriel & Stuart S. Rosenthal, *Government-Sponsored Enterprises, the Community Reinvestment Act, and Home Ownership in Targeted Underserved Neighborhoods*, in HOUSING MARKETS AND THE ECONOMY, *supra* note 101, at 202, 205 (finding “essentially no evidence” that GSE affordable-housing goals increased lending or homeownership); Brent W. Ambrose & Thomas G. Thibodeau, *Have the GSE Affordable Housing Goals Increased the Supply of Mortgage Credit?*, 34 REGIONAL SCI. & URB. ECON. 263, 271 (2004); An & Bostic, *supra* note 124, at 208; An & Bostic, *supra* note 132, at 346; Raphael W. Bostic & Stuart A. Gabriel, *Do the GSEs Matter to Low-Income Housing Markets? An Assessment of the Effects of the GSE Loan Purchase Goals on California Housing Outcomes*, 59 J. URB. ECON. 458, 474 (2006).

¹³⁴ An & Bostic, *supra* note 124, at 208.

¹³⁵ See 24 C.F.R. § 81.16(c)(2) (2011).

¹³⁶ See Joshua Brockman, *With Freddie's Help, Big Lenders Charge into Subprime Business*, AM. BANKER, Sept. 10, 1999, 1999 WLNR 2765773 (quoting a trader who claimed that “Fannie and Freddie are ‘very, very big investors’ that buy AAA securities backed by B&C loans . . . [which allows them to have] a much greater impact than their involvement as a credit provider, or wrap provider”).

¹³⁷ The reduction of PLS in the GSE portfolios is partially attributable to consent agreements with OFHEO after the revelation of GSE accounting irregularities. See FIN. CRISIS INQUIRY COMM'N, *supra* note 106, at 13.

¹³⁸ Therefore, the 2005 increase in GSE affordable-housing goals did not result in an increase in the size of the GSEs' subprime MBS portfolio. Data is not available on GSE alt-A MBS holdings but, based on available evidence, affordable-housing goals do not appear to have driven GSE investment strategy.

¹³⁹ As long as the securitization field consisted predominantly of the GSEs and Ginnie Mae, a race to the bottom in underwriting standards was avoided. It is possible that the growth of PLS, however, pushed the GSEs to lower their

compensation,¹⁴⁰ and an attempt to recapitalize themselves following losses incurred during the refinancing wave from 2001 to 2003.¹⁴¹

Regardless of the cause, the GSEs' underwriting standards did loosen in the years leading up to the financial crisis. With loosened underwriting standards, the GSEs ended up partially replicating the PLS market,¹⁴² and they paid dearly for it. The GSEs were insufficiently transparent either for their regulator, the Office of Federal Housing Enterprise Oversight (OFHEO—now rebranded as the Federal Housing Finance Agency (FHFA)), or their shareholders and creditors to monitor their activities and discipline them for these changes.¹⁴³ Moreover, the moral hazard from the implicit (and ultimately explicit) government guarantee of GSE debt meant that the GSEs' creditors had reduced incentives to monitor the GSEs' risk, although equity holders still had this incentive.

The point here is not to prove what happened with the GSEs. Instead, it is to note that even if the GSEs were assuming greater risks during the bubble years, it could well have been for

underwriting standards in an attempt to reclaim lost market share in order to please their private shareholders. Shareholder pressure may have pushed the GSEs into competition with PLS for market share, with the GSEs loosening their guarantee-business underwriting standards in order to compete. In contrast, the wholly public FHA and Ginnie Mae maintained their underwriting standards and ceded market share.

If so, the situation resembles the classic insurance-regulation problem of a rate war for market share that results in all participants becoming insufficiently capitalized by failing to charge adequate premiums for the risk they assume. The GSEs' guarantee business is nothing more than an insurance operation, yet it was not regulated like a classic insurer, for which regulators approve rate schedules (to prevent rate wars) and require mandatory reserving. Instead, the GSEs were free to set their guarantee fees as they wished and to be highly leveraged, dividing out their guarantee-business income to shareholders rather than holding it in reserve against losses.

¹⁴⁰ See William K. Black, *Fannie and Freddie Fantasies*, NEW ECON. PERSP. BLOG (Dec. 29, 2011), <http://neweconomicperspectives.blogspot.com/2011/12/fannie-and-freddie-fantasies.html> (arguing that executive compensation drove the GSEs into nonprime mortgages).

¹⁴¹ A third possibility, consistent with both competition for market share and executive compensation, is that the GSEs weakened their underwriting standards in a gamble on resurrection as they attempted to recapitalize themselves after being devastated by the refinancing wave of 2001 through 2003. *See id.* (referencing Fannie Mae's ill-fated gamble on interest-rate directions during this period).

In addition to securitizing and guaranteeing mortgages, the GSEs also hold whole loans in portfolio, which they finance through the issuance of corporate debt. Prior to 2001, most GSE corporate debt was noncallable—the GSEs did not have the right to prepay the debt if interest rates fell. GSE mortgages, however, are prepayable. Thus, when interest rates plummeted in 2001, the GSEs found themselves facing an enormous problem. Their assets were refinanced to pay a lower rate, but they could not refinance their own debt. The result was the decapitalization of the GSEs.

The GSEs' accounting scandals that emerged in 2004 prevent us from seeing the full picture of their finances, but, if the GSEs were significantly decapitalized, they might have been tempted to gamble on resurrection—to assume greater risks in order to recapitalize themselves—which would explain the GSEs' assuming more risk in all three of their lines of business. It would also have strong parallels to the savings-and-loan (S&L) crisis in the 1980s. In the late 1970s and early 1980s, interest rates rose dramatically. The result was that S&Ls had to offer ever higher interest rates to retain their deposit base, particularly in the face of new money-market funds. The rate on the S&Ls' assets—long-term, fixed-rate mortgages—did not rise correspondingly. The result was a decapitalization of the S&Ls. S&L deregulation enabled the S&Ls to invest in new asset classes, and zombie S&Ls promptly chased after high-yielding, riskier assets, with the result that they were decapitalized further when the risks on these assets materialized. The increased risk profile of the GSEs' business during the bubble could have been the result of a doubling down of their bets in an attempt to recapitalize after the refinancing wave of 2001 through 2003.

¹⁴² See FED. HOUS. FIN. AGENCY, CONSERVATOR'S REPORT ON THE ENTERPRISES' FINANCIAL PERFORMANCE: THIRD QUARTER 2010, at 4–5 (2010), *available at* http://www.fhfa.gov/webfiles/19585/Conservator%27s_Report112910.ppd.

¹⁴³ Moreover, even if shareholders had been able to discipline the GSEs for lowering underwriting standards, that might have been offset by shareholder discipline for loss of market share.

reasons unrelated to government affordable-housing policy. Regulation of GSE securitization failed to function during the housing bubble, and informational failures and moral hazard prevented market discipline from exerting itself. The GSEs' contribution to the bubble stemmed in part from regulatory and information failures that existed irrespective of the role of affordable-housing goals.¹⁴⁴

2. Monetary Policy and the Global Supply of Credit

Macroeconomist John B. Taylor, the inventor of the eponymous Taylor Rule for setting monetary policy,¹⁴⁵ has argued that the housing bubble was the inevitable consequence of mishandled monetary policy.¹⁴⁶ Taylor's contention is that, after 2000, the Federal Reserve held interest rates too low for too long. Low rates produced artificially cheap mortgage credit, which led to excessive demand for mortgages. Because mortgages are the largest form of leverage for consumers, housing was the asset class in which a bubble was most likely to form. Because consumers were able to incur greater leverage for lower cost, their purchasing power increased, and therefore housing prices were bid up.¹⁴⁷ Taylor's counterfactual regressions suggest that housing prices would have been far less inflated if the Fed had adhered more closely to the Taylor Rule in the wake of the 2000 stock-market crash and the 9/11 attacks.

Monetary policy played a role in the housing bubble, but it is an incomplete explanation for several reasons. First, short-term interest rates only have a weak effect on housing prices in a market predominated by fixed-rate mortgages.¹⁴⁸ The federal-funds rate—the rate that the Fed controls—is a short-term rate, which differs from the long-term rate that is charged on mortgages.¹⁴⁹ Thus, previous declines in the federal-funds rate have not produced housing bubbles. For example, between late 1990 and 1993, the effective federal-funds rate fell from around 8% to 3%, a similar-sized drop to the one between late 2000 and 2003, when the rate declined from around 6% to 1%. Yet no housing bubble ensued in the early 1990s. Likewise, the timing of the bubble does not track with interest rates. The bubble continued to grow even once the Federal Reserve started to raise rates in 2005¹⁵⁰ (see Figure 20).

¹⁴⁴ The explanatory power of the affordable-housing theory must also be questioned because it cannot explain the commercial real-estate bubble. There was a negligible amount of CRE in multifamily housing, which the GSE do purchase. See Levitin & Wachter, *supra* note 116.

¹⁴⁵ See John B. Taylor, *Discretion Versus Policy Rules in Practice*, 39 CARNEGIE-ROCHESTER CONF. SERIES ON PUB. POL'Y 195, 202 (1993).

¹⁴⁶ See TAYLOR, *supra* note 5, at 4; John B. Taylor, *Housing and Monetary Policy* 2–3 (Nat'l Bureau of Econ. Research, Working Paper No. 13682, 2007), <http://www.nber.org/papers/w13682>.

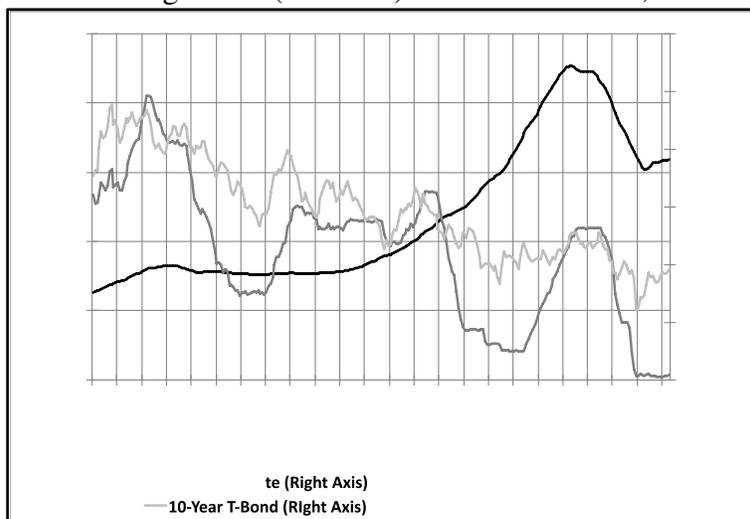
¹⁴⁷ See Taylor, *supra* note 146; see also Pavlov & Wachter, *supra* note 89, at 15 (showing how lower underwriting standards caused by financial innovation and deregulation can lead to higher housing prices).

¹⁴⁸ See Marco Del Negro & Christopher Otrok, *99 Luftballons: Monetary Policy and the House Price Boom Across U.S. States*, 54 J. MONETARY ECON. 1962, 1965 (2007); Marek Jarociński & Frank R. Smets, *House Prices and the Stance of Monetary Policy*, 90 FED. RES. BANK OF ST. LOUIS REV. 339, 362 (2008); Glaeser et al., *supra* note 3, at 3–4.

¹⁴⁹ See Bernanke, *supra* note 21. Bernanke also contests Taylor's counterfactual regressions and argues that the Federal Reserve actually adhered closely to the Taylor Rule because it should be applied to account for anticipated, rather than actual, inflation. See *id.*

¹⁵⁰ Depending on the application of the Taylor Rule, the federal-funds rate was either too low or was more or less correct during this period. *Id.*

Figure 20. Housing Prices (Nominal) and Interest Rates, 1987–2010¹⁵¹



Second, while long-term interest rates do have an effect on housing prices, the decline in long-term rates was insufficient to explain the entirety of the bubble.¹⁵² A 1% decline in the long-term rate results in roughly an 8% increase in housing prices.¹⁵³ As ten-year Treasuries fell from a height of 6.66% in January 2000 to a low of 3.33% in June 2003, that would predict a 26% increase in housing prices (the actual increase was 38%). And Taylor cannot explain the further 52% price increase that occurred once long-term rates started to rise (to 4.99% at the peak of the bubble).

Nor does a monetary-policy explanation show why underwriting standards deteriorated or the product mix changed. Monetary policy might have made mortgage credit cheap, but declines in underwriting standards and shifts to initial-affordability products made it even cheaper.

Finally, monetary policy does not explain the occurrence of mortgage bubbles in some countries but not in others. Adherence to or divergence from the Taylor Rule seems to have had little impact on which developed countries experienced bubbles and which did not.¹⁵⁴ Countries like Canada, with very similar monetary policy to the U.S., did not have bubbles,¹⁵⁵ while

¹⁵¹ See *S&P/Case–Schiller Housing Price Indices*, *supra* note 1; BD. OF GOVERNORS OF THE FED. RESERVE SYS., *supra* note 79 (under the “Instruments” column, browse to “Federal funds (effective)” and select the “Annual” link in the corresponding “Frequency” column) (documenting the federal-funds rate); *id.* (under the “Instruments” column, browse to “U.S. government securities,” “Treasury constant maturities,” “Nominal,” and “10-year,” and select the “Annual” link in the corresponding “Frequency” column) (documenting interest rates for ten-year Treasury bonds).

¹⁵² See Edward L. Glaeser, Joshua Gottlieb & Joseph Gyourko, *Did Credit Market Policies Cause the Housing Bubble?*, POL’Y BRIEFS (Rappaport Inst. & Taubman Ctr., Cambridge, Mass.), May 2010, at 1, 4, http://www.hks.harvard.edu/var/ezp_site/storage/fckeditor/file/pdfs/centers-programs/centers/taubman/PB_housing_2010_final.pdf.

¹⁵³ *Id.*

¹⁵⁴ Bernanke, *supra* note 21.

¹⁵⁵ See DAVID MIN, CTR. FOR AM. PROGRESS, TRUE NORTH: THE FACTS ABOUT THE CANADIAN MORTGAGE BANKING SYSTEM 1 (2010), http://www.americanprogress.org/issues/2010/08/pdf/canadian_banking.pdf.

countries like Spain and Ireland that saw a decrease in lending controls similar to the U.S. also had significant bubbles.¹⁵⁶

Monetary policy helps explain the refinancing boom that occurred between 2001 and 2003 and why housing-price appreciation exceeded rental-cost appreciation.¹⁵⁷ But it comes up short in explaining the rest of the housing bubble.

A related macroeconomic explanation comes from Federal Reserve Chairman Ben Bernanke and is endorsed by one of the dissents from the Financial Crisis Inquiry Commission's Final Report.¹⁵⁸ Bernanke has argued that an increase in the savings rate in many emerging market countries had led to a "global saving glut."¹⁵⁹ These foreign, emerging market countries, particularly China, were running massive current-account surpluses and lacked sufficiently appealing domestic investment opportunities. As a result, savings flowed to the United States for investment, which held down long-term interest rates, thereby contributing to the housing bubble.¹⁶⁰

Bernanke argues that these foreign-capital inflows from global savers were invested in the safest U.S. assets such as Treasuries and Agency securities (including GSE MBS).¹⁶¹ Very little investment from emerging market countries was invested in private-label MBS irrespective of rating; less than 1.4% of investment in PLS in 2007 was from global savings glut countries.¹⁶² Nonetheless, the global savers' appetite for the safest U.S. securities "most likely helped push down yields on MBS relative to other assets, as most MBS were either guaranteed by the Agencies or sold as tranches carrying AAA credit ratings."¹⁶³ The mechanism for this, Bernanke explains is that "the strong preference of the GSG countries for Treasuries and Agencies appears to have pushed Europeans and other advanced-economy investors, including U.S. investors, into apparently safe "private-label" MBS."¹⁶⁴ In other words, while global savers did not themselves dive into PLS, they displaced US and European investors from Treasuries and Agencies into PLS, as "Investors were willing to reach for some additional yield by purchasing AAA-rated

¹⁵⁶ See Richard Green et al., *Housing Finance in Developed Countries in a Time of Turmoil* (Aug. 2010) (unpublished paper) (on file with authors) (examining why some developed countries experienced housing bubbles but not others).

¹⁵⁷ See *supra* section II.B.

¹⁵⁸ See FIN. CRISIS INQUIRY COMM'N FINAL REPORT, *supra* note 4, at 419–20 (Keith Hennessey, Douglas Holtz-Eakin & Bill Thomas, dissenting).

¹⁵⁹ Bernanke, *International Capital Flows*, *supra* note 6, at 4; Bernanke, *Global Imbalances*, *supra* note 6; Bernanke, *Global Saving Glut*, *supra* note 6. See also Dunaway, *supra* note 6.

¹⁶⁰ See Bernanke, *International Capital Flows*, *supra* note 6; see also Caballero & Krishnamurthy, *supra* note 6, at 588 (explaining that foreign demand for riskless debt raises the value of domestic, risky assets). But see Maurice Obstfeld & Kenneth Rogoff, *Global Imbalances and the Financial Crisis: Products of Common Causes*, Oct. 2009, at http://www.economics.harvard.edu/faculty/rogoff/files/Global_Imbalances_and_Financial_Crisis.pdf (arguing that "the global imbalances did not cause the leverage and housing bubbles, but they were a critically important codeterminant."); Claudio Borio & Piti Disyatat, *Global imbalances and the financial crisis: Link or no link?* Bank for Int'l Settlements Working Paper No. 346, May 2011 (arguing that "'excess elasticity' of the international monetary and financial system" not "excess savings" was behind the financial crisis).

¹⁶¹ Bernanke, *International Capital Flows*, *supra* note 6, at 7–8. See also Gary B. , *Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007* (May 11-13, 2009) (unpublished manuscript), available at <http://www.frbatlanta.org/news/Conferen/09fmc/gorton.pdf> (discussing investor demand for "informationally insensitive" financial assets).

¹⁶² *Id.* at 20 (table 1).

¹⁶³ *Id.* at 2.

¹⁶⁴ *Id.* at 3.

MBS rather than Agency debt (or sovereign bonds at home)”¹⁶⁵ (see Figure 21). For investors seeking AAA-rated assets, there were few options other than sovereign, Agency, and structured products. As Lloyd Blankfein, CEO of Goldman Sachs noted, “In January 2008, there were 12 triple A-rated companies in the world. At the same time, there were 64,000 structured finance instruments . . . rated triple A.”¹⁶⁶

Figure 21. PLS, CMBS, and ABS Share of Nonsovereign AAA-Rated Securities Outstanding¹⁶⁷

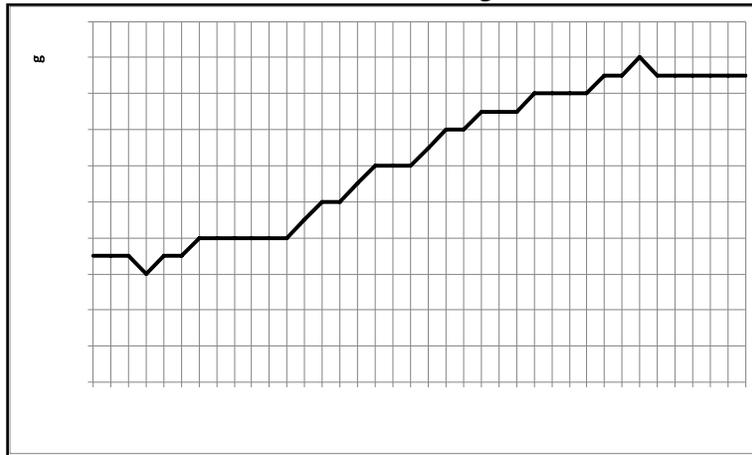
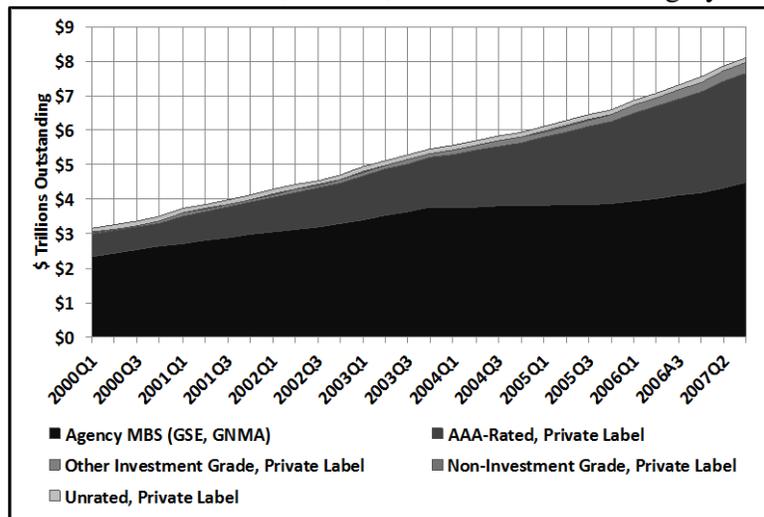


Figure 22. Volume of PLS, CMBS, and ABS Outstanding by Rating¹⁶⁸



Bernanke’s explanation of global-savings-glut investors’ appetite for ultra-safe Treasury and Agency securities pushing European and US investors into MBS would explain part of the supply of mortgage credit; the overwhelming majority of MBS were AAA rated (see Figure 22). But Bernanke’s explanation overlooks a critical detail: the only way that subprime mortgages could be converted into AAA-rated bonds was through structured finance. Structured finance

¹⁶⁵ *Id.* at 14.

¹⁶⁶ Lloyd Blankfein, *Do Not Destroy the Essential Catalyst of Risk*, FIN. TIMES (U.K.) (Feb. 8, 2009, 16:53), <http://www.ft.com/intl/cms/s/0/0a0f1132-f600-11dd-a9ed-0000779fd2ac.html#axzz1dRTq3ev>.

¹⁶⁷ See Bernanke, *International Capital Flows*, *supra* note 6, at 32.

¹⁶⁸ *Id.* at 28.

did not eliminate risk; it merely concentrated it in the junior tranches in PLS deals. The creation of AAA-rated PLS necessitated the creation also of noninvestment-grade PLS. While the vast majority of the PLS were AAA-rated, the economics behind the deals was simply not workable unless there were also buyers for the noninvestment-grade pieces at reasonable yields. If one looks only at PLS, not at MBS overall, roughly 15% were rated lower than AAA in 2007, reflecting \$458 billion in investment.¹⁶⁹ As discussed *infra* in sections IV.B.2–3, the catalyst for the oversupply of underpriced mortgage credit was the demand for the noninvestment-grade PLS. Absent this demand, PLS would not have been economically viable and the global savings glut would have had to find a home in other asset classes.

Moreover, neither Bernanke nor Taylor explains why lenders mispriced mortgage-credit risk or why there was a compression of default risk premia for PLS but not for corporate securities. The cost of credit is always the risk-free rate—set by the Fed for short-term rates—*plus* a risk premium. Even if the risk-free rate was historically low, the risk premium should not have changed. Why would yield spreads (the risk premium) drop even when risk was rising? Finally, neither Bernanke nor Taylor explains the concomitant explosion of this form of credit relative to GDP—rather than corporate debt relative to GDP, which stayed in relative fixed proportion to output.¹⁷⁰

3. Market Relaxation of Underwriting Standards

A number of studies present what might be called a latent supply-side theory that emphasizes easier credit not because of monetary policy but because of changes in the mortgage market, particularly the growth of securitization. We call this a latent supply-side theory because it has yet to be fully articulated; it is often more implied than emphasized. Some of these studies merely point to relaxation of credit terms as critical in inflating the bubble, but they fail to explain *why* credit terms were relaxed.¹⁷¹ A number of other studies point to securitization as being critical to the relaxation of credit terms and emphasize the principal–agent problem inherent in securitization.¹⁷² These studies, however, do not attempt to provide complete explanations of the housing bubble but instead test more focused propositions about whether securitization facilitated laxer lending standards. Accordingly, they do not explain the timing of the bubble and do not integrate the institutional changes in the mortgage market. These studies also do not explain *why* securitization led to laxer lending standards or why normal market discipline failed.

¹⁶⁹ *Id.* at 20 (table 1).

¹⁷⁰ See Susan M. Wachter, *The Ongoing Financial Upheaval: Understanding the Sources and Way Out* 6–7 (Univ. of Pa. Law Sch. Inst. for Law & Econ., Research Paper No. 09-30, 2009), <http://ssrn.com/abstract=1464791>.

¹⁷¹ See Jack Favilukis, Sydney C. Ludvigson & Stijn Van Nieuwerburgh, *The Macroeconomic Effects of Housing Wealth, Housing Finance, and Limited Risk-Sharing in General Equilibrium* 1–2 (Soc. Sci. Research Network, Working Paper No. 1602163, 2011), <http://ssrn.com/abstract=1602163> (arguing that the boom was in part a response to a relaxation of credit constraints and a decline in transaction costs for home purchases and refinancings); Amir E. Khandani, Andrew W. Lo & Robert C. Merton, *Systemic Risk and the Refinancing Ratchet Effect* 1–3 (Nat'l Bureau of Econ. Research, Working Paper No. 15362, 2009) (finding that easy refinancing facilitated widespread home-equity extraction, which resulted in a leverage-and-default cycle among homeowners).

¹⁷² See Keys et al., *Financial Regulation and Securitization*, *supra* note 9, at 701; Mian & Sufi, *The Consequences of Mortgage Credit Expansion*, *supra* note 9, at 1450–51; Mian & Sufi, *Household Leverage and the Recession of 2007 to 2009*, *supra* note 9, at 1–3.

Our supply-side theory extends the latent-relaxation-of-underwriting-standards argument into a patent, formal explanation of the housing bubble. It does so by connecting the relaxation of underwriting standards to the change in mortgage products and the mortgage market's institutional shift from regulated agency securitization to unregulated PLS securitization and explains, in the next section, why this shift in products and securitization channels resulted in a bubble.

IV. EXPLAINING THE OVERSUPPLY OF UNDERPRICED MORTGAGE CREDIT

A. ECONOMIC AGENTS EXPLOITING INFORMATION ASYMMETRIES

Evidence from PLS spreads makes clear that the bubble was a supply-side bubble because housing prices were bid up due to an oversupply of underpriced mortgage finance. It is also clear that there was only a bubble for a relatively short window, from 2003 or 2004 until 2006. But what led to the oversupply of underpriced mortgage credit?

The answer, we believe, is the shift in the securitization market from regulated Agency MBS to unregulated PLS. The housing bubble was marked by the extraordinary growth of two types of interrelated, complex, heterogeneous products: nontraditional mortgages and PLS. The market share of both expanded dramatically in 2004 and continued to grow up to the height of the bubble in 2006. The growth of these products was inextricably linked because PLS provided the funding for nontraditional mortgages. Nontraditional mortgages enabled the expansion of the mortgage borrower pool and thereby enabled more securitization.

PLS are unusually complex, heterogeneous products. Any particular securitization is supported by a unique pool of collateral and has its own set of credit enhancements and payment structure. Complexity and heterogeneity shrouded the risks inherent in PLS. Moreover, the heterogeneity of PLS meant that there was not a liquid secondary market in PLS, so no market-pricing mechanism existed.¹⁷³

As a result, investors failed to properly price for risk because they did not perceive the full extent of the risk involved. The structure of PLS (including the underlying mortgages) allowed investors to underestimate the risks involved and therefore underprice the PLS by demanding insufficiently large yield spreads. The housing bubble was fueled by mispriced mortgage finance, and the mispricing occurred because of information failures. Thus, at the core of the housing bubble was an information failure. Investors lacked adequate information about the risks involved with PLS.

When markets work, costs and risks are signaled through prices and rates, which allows for efficient resource allocation. In markets in which information flows are shrouded or blocked, prices do not reflect costs, and risks and resources are allocated inefficiently. Complexity and heterogeneity shroud information and thereby make it more difficult to evaluate investments. Complexity overwhelms the computational capacity of the human brain and even standard pricing models, while heterogeneity defeats cross-product comparisons, an inductive method upon which much of our pricing behavior relies.¹⁷⁴ Therefore, as complexity and heterogeneity

¹⁷³ The development of the ABX index, considered in section IV.B.2.d, *infra*, addressed this issue problematically.

¹⁷⁴ See Xavier Gabaix & David Laibson, *Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets*, 121 Q.J. ECON. 505, 506–07 (2006) [hereinafter Gabaix & Laibson, *Shrouded Attributes*] (arguing that firms can sometimes reveal exploitation by other companies “and win over customers”); Marisa J. Mazzotta & James J. Opaluch, *Decision Making When Choices Are Complex: A Test of Heiner’s Hypothesis*, 71

increase, mispricing becomes increasingly likely. Moreover, informationally shrouded markets also tend to create informational asymmetries that can be exploited by informationally advantaged parties to take advantage of mispricing by informationally disadvantaged parties.¹⁷⁵

Information failures exist in both the mortgage market and the MBS market. Both sides of the mortgage-finance system are subject to informational asymmetries and principal-agent problems. In the mortgage market, there are lender and broker information advantages over borrowers, as well as borrower information advantages over lenders. Information asymmetries occur between the borrower and broker or lender because the borrower lacks information on the loan product's risk, and the broker or lender has incentives to steer him toward a riskier loan that will be more profitable because of the greater yield spread or servicing-release premium paid upon the sale of the loan. At the same time, however, the broker or lender lacks information about the risk posed by the borrower. These asymmetries can feed on each other to result in borrowers receiving unsuitable loans.¹⁷⁶

Information asymmetries also exist in the MBS market. Both mortgage borrowers and mortgage lenders have informational advantages over securitizers, and they ultimately all have informational advantages over investors, because not all information on mortgage risk is embedded in the disclosures to investors. PLS are sold without having to reveal the full nature of the underlying mortgages. Indeed, disclosure for many PLS took the form of disclosing the *lack* of information on loans bundled in these securities, such as listing the percentage of low- or no-document loans (often not even broken down separately). On top of this, there is no independent verification of the disclosures.¹⁷⁷

Principal-agent conflicts are rife in these informationally asymmetric markets. Mortgage brokers, perceived by many borrowers as their legal agents or at least owing them duties,¹⁷⁸ were compensated in part with “yield spread premiums”—payments made by the lender to the broker based on the difference between the yield on the mortgage the broker placed and the yield on the

LAND ECON. 500, 513 (1995) (finding that individuals resort to simplified decision-making rules when choices reach a certain level of complexity); Xavier Gabaix & David Laibson, Competition and Consumer Confusion 1 (Apr. 30, 2004) (unpublished paper presented to the 2004 N. Am. Summer Meeting of the Econometric Soc’y), *available at* <http://www.google.com/url?sa=t&rct=j&q=xavier%20gabaix%20%26%20david%20laibson%2C%20competition%20and%20consumer%20confusion&source=web&cd=2&ved=0CDEQFjAB&url=http%3A%2F%2Fciteserx.ist.ps.u.edu%2Fviewdoc%2Fdownload%3Fdoi%3D10.1.1.167.8583%26rep%3Drep1%26type%3Dpdf&ei=KlQQT7KvL6ns0gHIoYCcAw&usq=AFQjCNGiCVxCaAKE1EoDqnYxB5fNt30r0w&sig2=pwmkuAYbhiinAg0TNKvXaw> (arguing that firms with lower intrinsic quality utilize excess complexity to confuse consumers and thereby increase market share).

¹⁷⁵ See Gabaix & Laibson, *Shrouded Attributes*, *supra* note 174, at 509.

¹⁷⁶ See Adam B. Ashcraft & Til Schuermann, *Understanding the Securitization of Subprime Mortgage Credit*, 2 FOUND. & TRENDS FIN. 191, 203–05, 212–13 (2006); Oren Bar-Gill, *The Law, Economics and Psychology of Subprime Mortgage Contracts*, 94 CORNELL L. REV. 1073, 1080–83 (2009).

¹⁷⁷ Intentional falsification of information in disclosures would violate securities laws, but the heightened-pleading requirement makes it very difficult for investors to bring suit over such a problem. See 15 U.S.C. § 78u-4(b)(1) (2006). Investors would have to plead fraud with specific factual allegations, and it would be hard for investors to obtain such facts absent discovery, which they could get only if their pleading were sufficient. *Id.* PLS trustees could, in theory, bring suit, and they would have greater access to information, *id.* § 78u-4(b)(2)(B), but PLS trustees have no incentive to bring suit. Without the ability to plead specific facts, it is unlikely that PLS investors could force the trustee to bring suit. Tort reform has thus created a Catch-22 for PLS investors.

¹⁷⁸ See DEBBIE GRUENSTEIN BOCIAN ET AL., CTR. FOR RESPONSIBLE LENDING, UNFAIR LENDING: THE EFFECT OF RACE AND ETHNICITY ON THE PRICE OF SUBPRIME MORTGAGES 21 (2006), *available at* http://www.responsiblelending.org/mortgage-lending/research-analysis/rr011-Unfair_Lending-0506.pdf.

lowest rate mortgage for which the borrower qualified—which incentivized brokers to steer borrowers toward more expensive (and ultimately riskier) loans.¹⁷⁹

Likewise, securitization sponsors are incentivized to do a greater number of and larger deals because their income comes from fees based on deal volume and size, not the loans' performance. As James Grant has written, the securitization process “is a wondrous kind of machine that spits out fees for its owners at every step of the manufacturing process.”¹⁸⁰ The bonus-driven incentives of employees at the entire spectrum of financial intermediaries, from mortgage brokers to securitization sponsors to monoline insurance companies underwriting CDS, all exacerbated this focus on short-term profits.

Securitization's fee-based business model and its inherent information asymmetries create a potential “lemons” problem because securitizers are tempted to push ever more questionable product on investors.¹⁸¹ If investors underprice, they will overpurchase. Thus, the information asymmetries between securitizers and investors allow securitizers to maximize volume and therefore fee income in the short term. To be sure, the long-term implications of a short-run income-maximization strategy were apparent, but preserving long-term reputation did little to address immediate earnings pressures and was viewed by management as their successors' problem. Moreover, once one firm adopted this strategy, it placed competitive pressure on other firms to follow suit.¹⁸²

Increasing fee revenue necessitated more deals, which necessitated greater production of mortgages. Indeed, the need for mortgage products to securitize led the investment banks that served as securitization conduits to purchase mortgage originators in order to guarantee a supply of product for securitization.¹⁸³ As John Kriz of Moody's noted, “If you have a significant distribution platform, there are many things you can do to move those assets—through securitizations and outright resale, among other things. *What you need is product to feed the machine.*”¹⁸⁴ The fee-based business model of private-label securitization encouraged greater supply of mortgage credit in order to generate mortgages for securitization to generate fee income for financial-institution intermediaries.

Financial institutions play the role of economic (but not legal) agents in their intermediation between mortgage borrowers and capital-market mortgage funders. Potential principal-agent problems exist both between mortgage borrowers and financial intermediaries and between mortgage investors and the intermediaries. The financial intermediaries involved in the origination of loans may not have a similar stake to the borrowers in the loans' ultimate

¹⁷⁹ See Howell E. Jackson & Laurie Burlingame, *Kickbacks or Compensation: The Case of Yield Spread Premiums*, 12 STAN. J.L. BUS. & FIN. 289, 310–11 (2007). Yield-spread premiums are now illegal. See 12 C.F.R. § 226.36(e) (2012). The servicing-release premiums paid to originators by secondary-market institutions might also incentivize the steering of borrowers to riskier loans.

¹⁸⁰ JAMES GRANT, MR. MARKET MISCALCULATES: THE BUBBLE YEARS AND BEYOND 170 (2008).

¹⁸¹ The potential for a lemons problem in securitization has long been noted. See Claire A. Hill, *Securitization: A Low-Cost Sweetener for Lemons*, 74 WASH. U. L.Q. 1061, 1065–66 (1996). The bubble and its aftermath play out George Akerlof's lemons problem exactly as predicted. See George A. Akerlof, *The Market for “Lemons”*: *Quality Uncertainty and the Market Mechanism*, 84 Q.J. ECON. 488, 495 (1970) (explaining how dishonest brokers can drive out high-quality goods from the marketplace). Once a market becomes a market for lemons, it contracts, which happened in the fall of 2007 as the weakness of the mortgage market became apparent.

¹⁸² See Andrey Pavlov & Susan M. Wachter, *The Inevitability of Marketwide Underpricing of Mortgage Default Risk*, 34 REAL EST. ECON. 479, 494 (2006).

¹⁸³ See Todd Davenport, *What's Behind Wall Street Players' Mortgage Deals*, AM. BANKER (Aug. 14, 2006, 1:00 AM), www.americanbanker.com/issues/171_158/-286097-1.html.

¹⁸⁴ *Id.* (emphasis added) (quoting John Kriz).

performance; instead, if the originators make fee income from origination or are able to sell the loans without effective recourse from the buyer, the originator will maximize its short-term income by simply maximizing origination volume. Similarly, the financial intermediaries involved in the securitization of mortgages did not always maintain a stake in the mortgages they securitized. When they did, it was often because the investment desk of the financial intermediary (operated and compensated separately from the securitization desk) was independently among the buyers of the PLS. Like the mortgage originators, the securitizers received fee income and sale income with little functional recourse (except for warranty and representation violations, and in some cases for “early payment defaults”—defaults within the first several months or year after origination). Thus, the short-term compensation of the financial intermediaries involved in securitization was not aligned with the interests of the PLS investors.

Regulatory standards, so long as they were in place, kept both types of principal-agent problems in check for Agency securitization. While the GSEs were not subject to many “hard” statutory requirements beyond the conforming-loan limits and LTV requirements absent private mortgage insurance, they were subject to some oversight by OFHEO. Moreover, prior to an aggressive preemption campaign by the Office of the Comptroller of the Currency and Office of Thrift Supervision,¹⁸⁵ the types of mortgages the GSEs were able to purchase and securitize were limited by state-law restrictions on mortgages. The GSEs also bore the credit risk on the mortgages they purchased and securitized; this eliminated the second principal-agent problem, as the financial intermediary was the investor for credit risk. This in turn kept the principal-agent problem on the origination side in check because products that are bad for consumers also pose risks to long-term investors, and the GSEs refused to purchase excessively risky loans or loans with some particularly consumer-unfriendly features like long-term prepayment penalties or prepaid credit life insurance.¹⁸⁶

Perhaps most importantly, though, for a long time, the GSEs and Ginnie Mae were the only show in town. As long as the secondary market consisted only of the GSEs and Ginnie Mae, relatively few nontraditional mortgages could be originated because the originators of nonprime mortgages did not want to hold the credit risk on these mortgages. The size of the nonprime mortgage-origination market—and the scale of the principal-agent problems on the origination end—was necessarily limited prior to the development of a private-label securitization market for nontraditional mortgages.

The combination of information asymmetries on both sides of the housing-finance market meant that borrowers were entering into overly leveraged purchases, at rates that underpriced risk, while investors were making the leverage available too cheaply. The result was the growth of an unsustainable housing-price bubble as artificially cheap credit from investors’ mispricing increased mortgage demand, and as increased mortgage quantity pushed up prices. Housing-price appreciation concealed the risk in the lending by temporarily preventing defaults and deflating LTV ratios—which made PLS look like safer investments—fueling the cycle.¹⁸⁷

¹⁸⁵ See Levitin, *supra* note 36, at 163–88.

¹⁸⁶ See Kevin Donovan, *The Freddie Mac T-Series Wrap: A Service or Disservice to Mortgage-Related ABS?*, ASSET SECURITIZATION REPORT, June 11, 2001, <http://www.highbeam.com/doc/1G1-75428784.html>; Patrick Sheehy, *Subprime Lending Moves to More Solid Ground*, ALLBUSINESS.COM, <http://www.allbusiness.com/finance/3594590-1.html#ixzz1iK0yJzkR> (last visited Jan. 13, 2012).

¹⁸⁷ See THORSTEIN VEBLÉN, *THE THEORY OF BUSINESS ENTERPRISE* 105-106, 112-113 (1904) (noting a cycle in which an increase in collateral value increases credit availability, which then further increases collateral value) Nobuhiro Kiyotaki & John Moore, *Credit Cycles*, 105 J. POL. ECON. 211 (1997) (theorizing cycle in which increasing collateral value increase credit availability, which then further increases collateral value); Mian & Sufi,

B. FAILURE OF NORMAL MARKET CONSTRAINTS

The Fundamental Theorem of Asset Pricing teaches that if an asset is overvalued, then investors will be against it, resulting in the asset's price falling.¹⁸⁸ Why didn't investors recognize PLS as overvalued, and why didn't they bet against them on a sufficiently wide scale to raise the yields on PLS and thus on mortgage credit?

Some investors certainly believed that PLS were overpriced. There were several potential market constraints on the level of default risk in PLS that could have assisted investors in ensuring proper valuation for PLS: credit ratings, subordinated-debt investors, and short investors. As this section explains, these constraints all failed due to PLS's complexity and problems with market structures. In fact, rather than instilling market discipline, short investors became subordinated-debt investors in order to push the market to take greater risks.

1. Credit Ratings

An initial constraint on default risk in PLS should have been credit ratings.¹⁸⁹ Most investors looked to rating agencies to serve as information proxies regarding credit risk. Credit-rating agencies rate individual securities, such as distinct PLS tranches. The rating is an indication of default risk or loss risk, depending on the agency.¹⁹⁰ There are three major credit-rating agencies, and most PLS were rated by at least one, if not two, agencies.

Approximately 90% of PLS bore AAA ratings, meaning that the risk of default or loss was negligible.¹⁹¹ Investors in the AAA-rated securities market do not appear to have been informationally sensitive.¹⁹² A study by economist Manuel Adelino found that investors in

The Consequences of Mortgage Credit Expansion, *supra* note 9, at 1490-92 (finding support for the Kiyotaki & Moore model in housing price and credit growth).

¹⁸⁸ See Stephen A. Ross, *The Arbitrage Theory of Capital Asset Pricing*, 13 J. ECON. THEORY 341, 341-43 (1976).

¹⁸⁹ For background information on the credit-rating agencies, see Efraim Benmelech & Jennifer Dlugosz, *The Alchemy of CDO Credit Ratings*, 56 J. MONETARY ECON. 617 (2009) (documenting the credit-rating process); John C. Coffee, Jr., *Ratings Reform: The Good, the Bad, and the Ugly*, 1 HARV. BUS. L. REV. 231, 234 (2011) (discussing the need for competition among ratings agencies); Frank Partnoy, *The Siskel and Ebert of Financial Markets?: Two Thumbs Down for the Credit Rating Agencies*, 77 WASH. U. L.Q. 619, 711 (1999) (noting that "the reputational capital view of credit rating agencies is not supported by history or economic analysis"); Frank Partnoy, *Overdependence on Credit Ratings Was a Primary Cause of the Crisis* 11 (Univ. of San Diego Sch. of Law, Research Paper No. 09-015, 2009), <http://papers.ssrn.com/sol3/papers.cfm?abstractid=1430653> (arguing that market participants relied too heavily on ratings).

¹⁹⁰ Fitch ratings measure the likelihood of default by evaluating borrowers' ability to meet their financial obligations. Ratings range from AAA, which is given to companies with the "lowest expectation of default risk," to C and D ratings, assigned to companies that have defaulted or where "[d]efault is imminent or inevitable." See FITCH RATINGS, DEFINITIONS OF RATINGS AND OTHER FORMS OF OPINION 9-10 (2011), available at http://www.fitchratings.com/web_content/ratings/fitch_ratings_definitions_and_scales.pdf. In contrast, Moody's ratings reflect "expected loss," which is an assessment of the risk of default plus the severity of the loss upon default. Ratings range from Aaa, which is given to companies with "minimal credit risk," to a C rating, which is given to companies "typically in default" and from which there is "little prospect for recovery of principal or interest." See MOODY'S INVESTORS SERV., RATING SYMBOLS AND DEFINITIONS 4 (2011), available at http://www.moody.com/researchdocumentcontentpage.aspx?docid=PBC_79004.

¹⁹¹ See Adelino, *supra* note 43, at 13, 44; see also *supra* Figure 20 (plotting PLS, CMBS, and ABS shares of outstanding AAA-rated securities).

¹⁹² See Adelino, *supra* note 43, at 31-34. Even very sophisticated AAA investors seemed to have purchased by rating, rather than by risk. In 2006, Daniel Mudd, the CEO of Fannie Mae, explained that Fannie, one of the most

AAA-rated PLS did not demand higher yields for what turned out to be riskier deals.¹⁹³ In other words, AAA-rated PLS investors were not themselves capable of sorting between deals and determining which ones were riskier within the AAA-rating. Instead, these investors were simply purchasing the rating as a proxy for credit risk. Rating agencies thus played a critical informational intermediary role for the PLS market.

As it turned out, the rating agencies were inadequate informational proxies; many AAA-rated PLS were subsequently downgraded.¹⁹⁴ Several factors contributed to the failure of the rating agencies in the PLS market. Many commentators have pointed to the rating agencies' lack of liability for misrating and lack of financial stake in any particular rating, beyond its long-term reputational effect.¹⁹⁵ While these factors surely contributed to the ratings problem, they are not unique to PLS.

PLS ratings, however, differ from corporate bonds, because corporate bonds are largely homogeneous products for which the ratings agencies have time-tested models going back over a century.¹⁹⁶ PLS, however, lacked multicycle experience and are heterogeneous products; no two deals are alike. The underlying collateral, borrower strength, and credit enhancements vary across deals. The novelty, heterogeneity, and complexity of structured-finance products made ratings much more speculative.

The rating agencies also played a different role in structured-finance ratings than in corporate-bond ratings. The rating agencies were not merely objective commentators on structured-finance products. They were also intimately involved in the structuring of individual deals. Professor Joseph Mason and analyst Joshua Rosner have explained, “[I]n structured finance, the rating agency is an active part of the structuring of the deal.”¹⁹⁷ There is an “iterative and interactive” dialogue between the securitization arranger and the rating agency about how the issuer may attain the desired ratings.¹⁹⁸

sophisticated entities in the entire mortgage investment world, could not price the risks involved in private-label securities. Mudd noted “that the credit characteristics reflected in the layering of products—products that typically get distributed through the private-label securities market—have risks that are difficult to quantify.” See Paul Muolo, *Fannie’s Mudd Is Wary of Exotics*, NAT’L MORTGAGE NEWS (July 24, 2006, 1:00 AM), http://www.nationalmortgagenews.com/nmn_issues/30_41/443044-1.html (quoting Daniel Mudd). Mudd made this comment at a time when Fannie Mae held over \$85 billion in PLS, almost all of which were AAA rated. See Fed. Nat’l Mortg. Assoc., Annual Report (Form 10-K) 120 tbl.34 (Dec. 31, 2006), available at http://www.fanniemae.com/ir/pdf/sec/2006/form10k_120606.pdf.

¹⁹³ See Adelino, *supra* note 43, at 33–34.

¹⁹⁴ See *id.* at 14–15, 43.

¹⁹⁵ See, e.g., Jerome S. Fons, *Rating Competition and Structured Finance*, J. STRUCTURED FIN., Fall 2008, at 7, 11–14; Joseph R. Mason, *The (Continuing) Information Problems in Structured Finance*, J. STRUCTURED FIN., Spring 2008, at 7, 7–11; Mason & Rosner, *supra* note 19, at 8–15; Matthew Richardson & Lawrence J. White, *The Rating Agencies: Is Regulation the Answer?*, in RESTORING FINANCIAL STABILITY: HOW TO REPAIR A FAILED SYSTEM 101, 104–15 (Viral V. Acharya & Matthew Richardson eds., 2009).

¹⁹⁶ See generally Mason & Rosner, *supra* note 19, at 34–66 (discussing the unique problems that MBS pose for the bond-rating model).

¹⁹⁷ *Id.* at 13.

¹⁹⁸ *Id.* (quoting *The Structured Finance Rating Process*, TAIWAN RATINGS, http://www.taiwanratings.com/en/criteria/SF_ratingprocess.asp (last visited Jan. 13, 2012)) (internal quotation marks omitted). The ratings agencies also made their models available to investment banks, which then designed their products to game the ratings models. See Gretchen Morgenson & Louise Story, *Rating Agency Data Aided Wall Street in Deals*, N.Y. TIMES, Apr. 24, 2010, at A1, available at <http://www.nytimes.com/2010/04/24/business/24rating.html?dbk>.

This iterative and interactive rating process exists in structured finance because structured-finance ratings are statistically rather than empirically driven. The ratings agencies' statistical models, however, turned out to be deeply flawed. These models had never been tested in a period of sustained economic volatility or stress.¹⁹⁹ The models failed to account for correlations between PLS and exogenous macroeconomic conditions (rather than enterprise-specific conditions).²⁰⁰ The connections in particular between home prices and defaults and availability of credit were not made, and the models did not account for the possibility of a national housing-price decline.²⁰¹ The ratings agencies did not analyze the underlying collateral of the PLS to identify the probability of default or price fluctuation.²⁰² A basic assumption of the ratings agencies was that housing prices represented fundamentals. This is implicit in the use of appraised values of collateral, which are based on comparable properties.

Finally, the ratings agencies, like other participants in the market, were heavily dependent on fees from structured finance. Structured-finance ratings commanded premium prices. By 2007, structured products like PLS accounted for 40% of the rating agencies' total revenue and 50% of their ratings revenue²⁰³ (see Figure 23).

Figure 23. Moody's Annual Revenue by Source²⁰⁴

¹⁹⁹ See Mason & Rosner, *supra* note 19, at 25–28. CDO ratings depended on “key-person” ratings of the CDO management, but the rating agencies had no history with such ratings. *Id.* at 28.

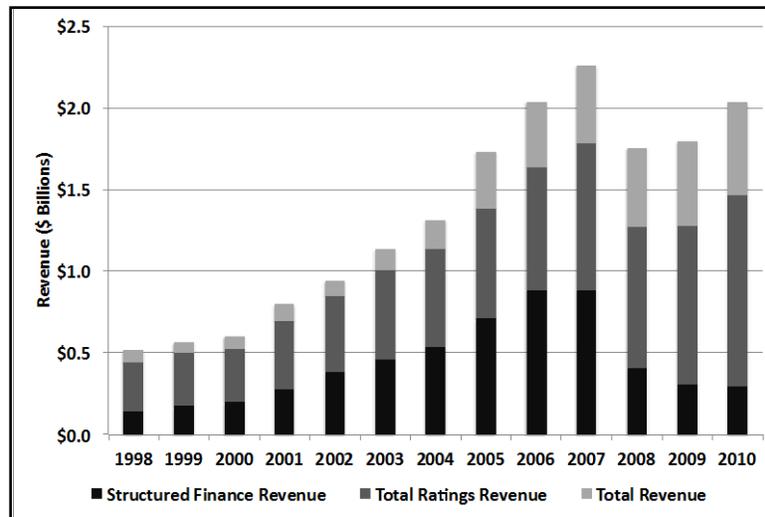
²⁰⁰ See *id.* at 25. Another problem was that mortgage-servicer ratings were included as a component of RMBS ratings, but servicer performance and RMBS performance are inexorably intertwined. The costs of servicing rise with defaults. Servicer performance also depends heavily on servicer liquidity, which may itself be tied to mortgage-market performance. Many servicers have mortgage-origination affiliates. If the origination business is in trouble, it can impact the liquidity of the servicing business and hence the performance of the servicer. This, then, impacts risks for other lenders whose loans are serviced by the servicers. Using servicer rating as part of the RMBS rating process has an endogeneity problem and effectively double counts servicer risks. See *id.* at 27.

²⁰¹ See, e.g., GARY SHORTER & MICHAEL V. SEITZINGER, CONG. RESEARCH SERV., R40613, CREDIT RATING AGENCIES AND THEIR REGULATION 5–6, 11 (2009). Ratings methodologies changed frequently for structured-finance products and were not always consistent between existing and new issues. Mason & Rosner, *supra* note 19, at 19, 21, 22 n.75. These models also failed to incorporate much of the available mortgage data (or lack thereof), such as debt-to-income ratio, appraisal type, and lender identity. *Id.* at 23–24.

²⁰² See GRANT, *supra* note 180, at 183.

²⁰³ See Gretchen Morgenson, *Debt Watchdogs: Tamed or Caught Napping?*, N.Y. TIMES, Dec. 7, 2008, at A1, available at <http://www.nytimes.com/2008/12/07/business/07rating.html?pagewanted=all>; Joshua D. Coval et al., *The Economics of Structured Finance* 4 (Harvard Bus. Sch., Working Paper 09-060, 2008), available at <http://www.hbs.edu/research/pdf/09-060.pdf>. Because the issuers of structured products were looking to manufacture as much investment-grade paper as possible, the rating agencies were under pressure to award investment-grade ratings, even if it meant making “out of model adjustments.” See Kia Dennis, *The Ratings Game: Explaining Rating Agency Failures in the Build Up to the Financial Crisis*, 63 U. MIAMI L. REV. 1111, 1137–38 (2009) (quoting U.S. SEC. & EXCH. COMM’N, SUMMARY REPORT OF ISSUES IDENTIFIED IN THE COMMISSION STAFF’S EXAMINATIONS OF SELECT CREDIT RATING AGENCIES 14 (2008), available at <http://www.sec.gov/news/studies/2008/craexamination070808.pdf>). As Patrick Bolton, Xavier Freixas, and Jacob Shapiro have theorized, it is much easier for a rating agency to inflate ratings in a boom market because there is less of a chance of a rating being wrong in the short term and the benefits of new business generation are larger. See Patrick Bolton et al., *The Credit Ratings Game* 13–15 (Nat’l Bureau of Econ. Research, Working Paper No. 14712, 2009).

²⁰⁴ MOODY’S INVESTORS SERV., ANNUAL REPORTS.



The ratings agencies' problems went beyond misaligned incentives and flawed models. PLS heterogeneity and complexity also enabled issuers to shop for ratings in a way that was not possible for corporate bonds. As economists Vasiliki Skreta and Laura Veldkamp have argued, increased complexity in products makes ratings more variable between agencies, and this encourages issuers to shop for the most favorable rating.²⁰⁵ Given the iterative and interactive nature of structured-finance ratings, such shopping was easy to do.

The ratings agencies were beset by a variety of problems that made them ineffective informational proxies for investors. While there were serious incentive problems for rating agencies, their involvement in the structuring of structured financial products and the inadequacy of their structured-finance ratings models were key. Even if incentive alignment had been better, the rating agencies still would likely have failed in their PLS ratings. The informational problems with PLS affected ratings agencies as well as investors.

2. Subordinated-Debt Investors

Any consideration of an oversupply of mortgage finance raises the question of why investors were purchasing the assets in first place. As Bernanke and the Financial Crisis Inquiry Commission Republican dissent rightly noted, there was a global savings glut that contributed to increased demand for all assets.²⁰⁶ This analysis explains the heightened demand for AAA-rated

²⁰⁵ See Vasiliki Skreta & Laura Veldkamp, *Ratings Shopping and Asset Complexity: A Theory of Ratings Inflation* 16–20 (Soc. Sci. Research Network, Working Paper No. 1295503, 2008), available at <http://ssrn.com/abstract=1295503>. For more information about ratings shopping in the context of commercial mortgage-backed securities, see Andrew Cohen, *Rating Shopping in the CMBS Market* (Sept. 2011) (unpublished paper), <http://www.federalreserve.gov/events/conferences/2011/rsr/papers/Cohen.pdf>; Timothy J. Riddiough & Jun Zhu, *Shopping, Relationships, and Influence in the Market for Credit Ratings* (Nov. 2009) (unpublished paper), <http://www.hhs.se/df/seminarworkshops/documents/riddiough.pdf>; Richard Stanton & Nancy Wallace, *CMBS Subordination, Ratings Inflation, and Regulatory-Capital Arbitrage* (July 11, 2011) (unpublished paper), <http://faculty.haas.berkeley.edu/stanton/papers/pdf/cmbx.pdf>.

²⁰⁶ See FIN. CRISIS INQUIRY COMM'N FINAL REPORT, *supra* note 4, at 417–18 (Keith Hennessey, Douglas Holtz-Eakin & Bill Thomas, dissenting) (arguing the bubble began in the late 1990s); Bernanke, *International Capital Flows*, *supra* note 6, at 1, 22; see also YVES SMITH, *ECONNED: HOW UNENLIGHTENED SELF INTEREST UNDERMINED DEMOCRACY AND CORRUPTED CAPITALISM* 209–10 (2010) (arguing that any global savings glut cannot fully explain the bubble).

PLS, and the problems with the ratings agencies explain why dubious investments received the AAA seal of approval. Neither, however, explains the demand for the noninvestment-grade, junior tranches of PLS, which are indispensable for making the economics of structured finance work.

Structured finance can generate AAA-rated securities out of lower quality assets via tranching and other credit-enhancement devices, and the vast majority of PLS received an AAA-rating, at origination.²⁰⁷ When turning a pool of subprime mortgages into AAA-rated securities, there is always a by-product of noninvestment-grade junior tranches. These tranches have higher yields because of their low rating, but they are not always easy to sell. Yet selling them is essential to making the economics of securitization work.

If the riskiest 5–10% of a deal could not be sold, the deal economics would not work for the securitization sponsor. Unless a buyer can be found for the junior tranches at a reasonable yield, PLS are not a viable asset. Put differently, without investors in the junior tranches of PLS, there would not be any AAA-rated PLS to meet the global savings glut's demand for safe investments. Understanding the demand for the *junior* tranches of PLS is thus critical to understanding why there was an oversupply of underpriced mortgage finance.²⁰⁸

The traditional market for these noninvestment-grade tranches of structured-finance products was a much more limited pool of subordinated-debt investors.²⁰⁹ These investors tended to be more circumspect about credit risk precisely because they are the most exposed to it by virtue of their subordination. Even with higher yields, it was not always easy for underwriters to place the junior tranches with investors.²¹⁰ Economist Manuel Adelino has found that buyers of subordinated PLS often demanded a premium for investing in riskier deals based on ultimate performance.²¹¹ Subordinated-debt investors' risk tolerance should have thus provided a limit on the expansion of PLS; as the junior tranches of PLS became riskier, investors would have demanded a higher yield (or simply would not have bought them). In order to support the higher yields, PLS issuances would have had to contain higher yielding mortgages, meaning mortgages with higher interest rates.²¹² Higher interest rates on the mortgages would have reduced consumer demand for mortgage finance and thus their ability to purchase real estate. The end result would have been for real-estate prices to return to an equilibrium. Subordinated-debt buyers should thus have provided a natural limitation on risk and restored correct asset prices according to the Fundamental Theorem of Asset Pricing.

a. Collateralized-Debt Obligations (CDOs). The expansion of the collateralized-debt obligation (CDO) market largely, or at least temporarily, bypassed the risk limitation on PLS otherwise provided by subordinated-debt investors.²¹³ CDO is a generic term for securitizations, but deals

²⁰⁷ See Bernanke, *International Capital Flows*, *supra* note 6, at 3, 14–15.

²⁰⁸ By *junior*, we refer not just to the junior-most tranches but also to the mezzanine tranches.

²⁰⁹ See SMITH, *supra* note 206, at 247 (“[T]here was little appetite for the AA through BBB layers of a subprime mortgage bond, which accounted for nearly 20% of the total value. There was a cohort of sophisticated investors that were interested. But the small size of this group limited the amount of subprime that could be securitized, and consequently made these investors fairly powerful.”).

²¹⁰ Larry Cordell, Yilin Huang, & Meredith Williams, *Collateral Damage: Sizing and Assessing the Subprime CDO Crisis*, Fed. Reserve Bank of Phila. Working Paper No. 11-30, August 2011, at <http://www.philadelphiafed.org/research-and-data/publications/working-papers/2011/wp11-30.pdf> at 10.

²¹¹ See Adelino, *supra* note 43, at 27.

²¹² Conceivably, overcollateralization of the PLS could also be used to produce higher yields without increasing the yields on individual mortgages, but this would make securitization less profitable.

²¹³ See Mark H. Adelson & David P. Jacob, *The Subprime Problem: Causes and Lessons*, J. STRUCTURED FIN., Spring 2008, at 12, 12–17.

referred to as CDOs typically involve a securitization of existing PLS—that is, a resecuritization. Resecuritization, with further tranching, transformed some of the junior—frequently called mezzanine—tranches of PLS into senior, investment-grade CDO securities, albeit with a higher degree of implicit leverage.²¹⁴ As financial commentator Yves Smith (Susan Webber’s *nom de blog*) has memorably explained, “CDOs were originally devised as a way to dress up these junior layers and make them palatable to a wider range of investors, just as unwanted piggy bits get ground up with a little bit of the better cuts and a lot of spices and turned into sausage.”²¹⁵ Resecuritization turned high-yield dross into investment-grade gold²¹⁶ (see Figures 24 and 25).

Figure 24. PLS Securitization

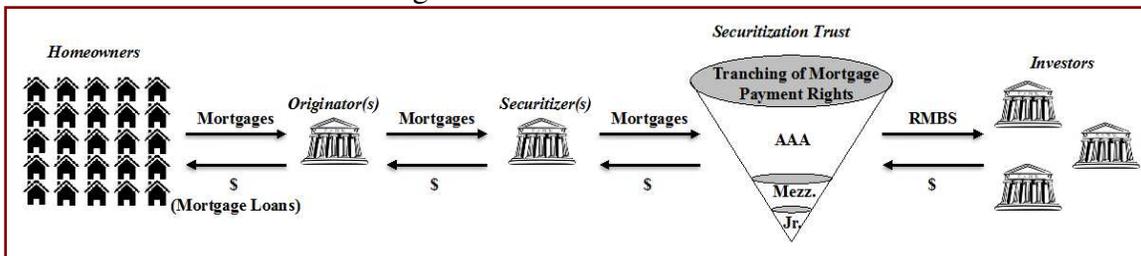


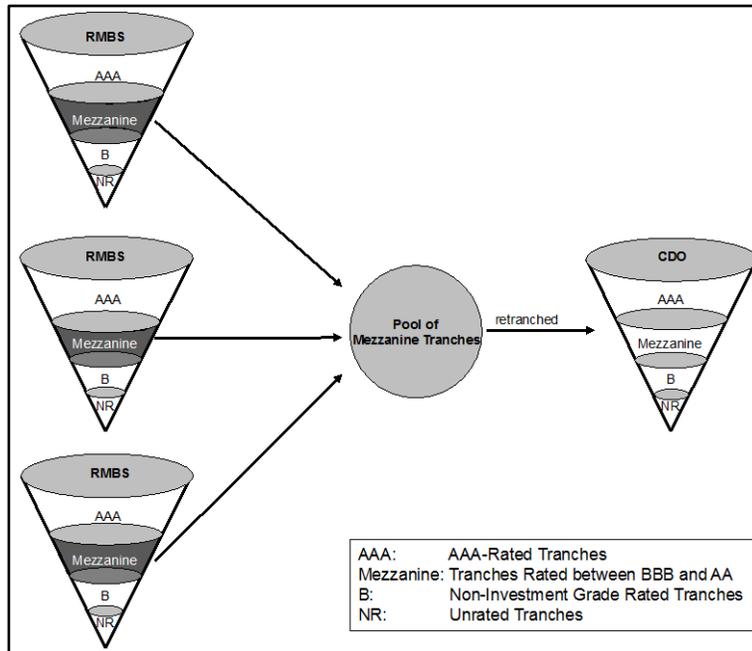
Figure 25. Resecuritization of PLS into a CDO

²¹⁴ There are two flavors of CDO, the “high grade” and the “mezzanine” CDO. Larry Cordell, Yilin Huang, and Meredith Williams have explained, “Generally, bonds with a credit rating of A or above were placed into so-called “high-grade” CDOs; BBB-rated bonds were placed into mezzanine [] CDOs”. Cordell, Yilin, & Williams, *supra* note 210, at 4. See also *id.* at 9 for further details of high grade and mezzanine classification. Functionally, the difference between high grade and mezzanine appears to be the very slight difference between A and BBB ratings, where an A is merely one ratings step above BBB.

Cordell, Yilin and Williams calculate that there were \$342 billion of high-grade CDOs were issued, and \$299 billion of mezzanine CDOs. *Id.* There was relatively little resecuritization of non-investment-grade pieces of PLS. Cordell, Yilin and Williams speculate that an investment grade rating on the underlying securities was critical for getting CDOs rated. *Id.* at 10 n.28. Given that the non-investment grade pieces were quite small, however, the amount that needed to be resecuritized was limited.

²¹⁵ SMITH, *supra* note 206, at 247.

²¹⁶ To extend Smith’s porcine metaphor, a CDO is a swine that is fed pork products.



By 2005, most subprime PLS were being resecuritized into CDOs,²¹⁷ and structured-finance products accounted for over half of global CDO assets between 2004 and 2007.²¹⁸ Between 1999 and 2007, over \$641 billion in structured finance products were put into CDOs (cash, hybrid and synthetic), with over 80% by dollar amount resecuritized between 2005 and 2007.²¹⁹ Resecuritization enabled investors to take on additional leverage, which meant that these investors were much more exposed to mortgage defaults than investors in MBS.²²⁰

The rapid expansion of the CDO market occurred in 2006 and 2007, during the middle and end of the bubble, as the drop in underwriting standards became apparent (see Figure 26). While an accounting rule change in 2006 made some types of CDOs more attractive to US investors,²²¹

²¹⁷ See Anna Katherine Barnett-Hart, *The Story of the CDO Market Meltdown: An Empirical Analysis* 10–11 (Mar. 19, 2009) (unpublished B.A. thesis, Harvard College), available at <http://www.hks.harvard.edu/m-rcbg/students/dunlop/2009-CDOmeltdown.pdf>.

²¹⁸ See *Global CDO Issuance*, SEC. INDUSTRY & FIN. MARKETS ASS'N, http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CBsQFjAA&url=http%3A%2F%2Fwww.sifma.org%2Fuploadedfiles%2Fresearch%2Fstatistics%2Fstatisticsfiles%2Fsf-global-cdo-issuance-sifma.xls&ei=xNCqTqfHNoLg0QHOPNikDw&usg=AFQjCNE8O6pNS8OsquCdxJ0LzWPxQtT9YA&sig2=vGcCiG7U8Hu_EZwa2CYQzw (last visited Jan. 13, 2012) (select the “Collateral” tab in the Excel spreadsheet).

²¹⁹ Cordell, Huang, & Williams, *supra* note at 31, tbl. 2. (listing \$343 billion in cash CDOs, \$177 billion hybrid cash-synthetic CDOs, and \$91 billion in synthetic CDOs, with 69% of cash deals, 99% of hybrid deals, and 89% of synthetic deals by dollar amount occurring in 2005-2007).

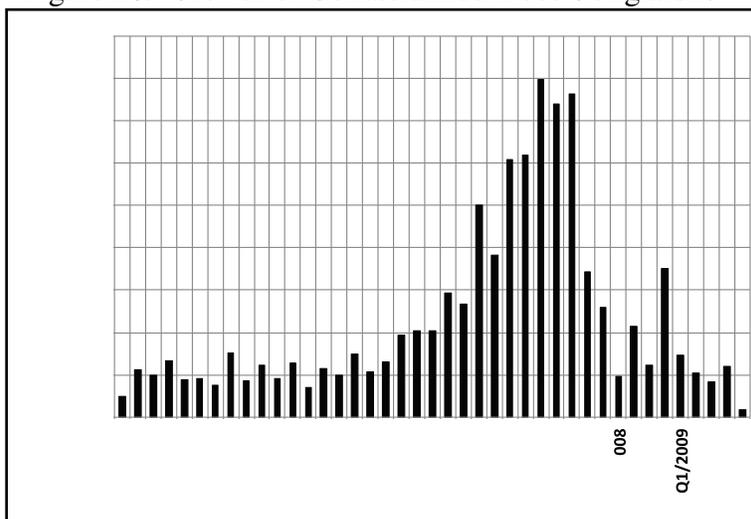
²²⁰ See GRANT, *supra* note 180, at 171, 182.

²²¹ Prior to February 2006, synthetic CDOs were not particularly appealing to US investors because of their GAAP accounting treatment. (See *infra* section IV.B.2.c regarding synthetic CDOs.) Statement of Financial Accounting Standards (SFAS) 133 requires that “All derivative instruments shall be measured at fair value,” meaning mark-to-market accounting applies. SFAS 133 ¶17. SFAS 133 also requires the derivative component (the “embedded derivative”) of a hybrid contract like an insurance contract, to be bifurcated and carried at fair value. The credit risk derivative component of a synthetic CDO thus had to bifurcated from non-derivative components (e.g., counterparty-specific factors) and carried at fair value, rather than at book value.

In February 2006, however, SFAS 155 was promulgated. SFAS 155 amended SFAS 133. Among the changes was the insertion of a new paragraph, ¶14B into SFAS 133. This paragraph exempted the credit risk component of securitized assets and liabilities from treatment as “embedded derivatives” under SFAS 133. The

the expansion of the CDO market may well have been driven by the “sell” side, rather than the “buy” side, as a vehicle for disposing of securitization byproduct. The expansion of the CDO market occurred when subordinated-debt investors would have demanded larger risk premiums and market appetite for direct investment in junior PLS tranches would have reached its limit. But, as noted in Figures 10, 11, and 12, between 2003 and 2005 spreads were falling on PLS, and PLS issuance was expanding.²²² This was possible only because CDOs enabled the PLS market to bypass the constraint of subordinated-debt investors’ limited risk appetite.²²³ CDOs simply outbid traditional subordinated investors for lower rated MBS tranches because they were willing to accept lower risk-adjusted yields. CDOs likely lengthened the housing bubble by at least a third, making the decline all the more painful.

Figure 26. Growth of Collateralized-Debt Obligations²²⁴



CDOs themselves, however, needed buyers. Again, the investment-grade senior positions in the CDOs were relatively easy to sell, but the junior positions posed a challenge, and unless the junior tranches could be sold, the economics of resecuritization would not work. Some junior

result is that no part of a synthetic CDO need be carried at fair value. It can instead be carried at face value absent impairment.

It is important to note that this change only affected synthetic CDOs because cash CDOs were never subject to derivate accounting treatment under SFAS 133, despite being derivatives in the sense that their value derives from the performance of a set of underlying assets. Derivate treatment under SFAS 133 requires, *inter alia*, that an instrument must require “no initial net investment or an initial net investment that is smaller than would be required for other types of contracts that would be expected to have a similar response to changes in market factors.” SFAS 133, ¶6(b). Funded cash CDOs require an initial net investment to purchase the CDO’s assets. Synthetic CDOs, particularly if there is an unfunded super-senior piece, would meet this definition. Thus, the change in accounting treatment likely expanded the synthetic CDO market in the United States. This occurred at precisely the time when the housing market boom was peaking and securitizers were having difficulty finding enough mortgages to meet the demand for MBS.

²²² See Yongheng Deng et al., CDO Market Implosion and the Pricing of CMBS and Sub-Prime ABS, at 4, 28 fig.3 (Apr. 2008) (unpublished article), available at http://www.teri.org/research/article_pdf/wp150.pdf.

²²³ See generally LEWIS, *supra* note 81, at 140 (“All by himself, [CDO manager Wing] Chau generated vast demand for the riskiest slices of subprime mortgage bonds, for which there had previously been essentially no demand.”).

²²⁴ See Asset-Backed Alert, ABS Database. Between 2001 and 2007, 75% of global CDO issuance was U.S.-dollar denominated. See *Global CDO Issuance*, *supra* note 218 (select the “Denomination” tab in the Excel spreadsheet).

tranches of the CDOs were resecuritized again as CDOs, and so on. But there was a limit to resecuritization: real purchasers were required for CDOs to be issued in volume. As it turned out, the demand for the bottom tranches of the CDOs came from an unlikely source: short investors. These short investors were the investors who were convinced in 2004 and 2005 that mortgage lending was becoming too risky.²²⁵ As it turned out, their short demand actually exacerbated the risk in the mortgage market by increasing the supply of mortgage finance.

b. Credit-Default Swaps (CDS). To understand how short investors actually drove the supply of mortgage credit, it is necessary to understand the difficulties involved with shorting real estate and the particular solution that short investors devised. To short an asset involves selling the asset without owning it and then purchasing it in time to meet the delivery obligation. The short seller's hope is that the asset price will decline between the time it enters into the sales contract and the time of the delivery obligation.

It is difficult to sell real estate itself short.²²⁶ Every parcel of real estate is unique, so the short seller cannot meet its delivery obligation.²²⁷ Thus, to short New York real estate, one would have to sell the Empire State Building, the Chrysler Building, and Rockefeller Center, without actually owning them, and then manage to buy them at a lower price before the closing of the first sale! The difficulty in shorting real estate is one reason it has historically been so prone to price bubbles.

PLS can, in theory, be shorted directly²²⁸ but, because they are relatively illiquid, shorting is a risky endeavor; the short seller might not be able to find PLS to purchase that meet its delivery obligation. Markets with short-sale constraints are particularly susceptible to asset bubbles.²²⁹

It is possible, however, to short mortgages indirectly, through credit-default swaps (CDS). A CDS is a form of credit insurance²³⁰ in which one party (the protection buyer) agrees to pay

²²⁵ See generally LEWIS, *supra* note 81 (noting that investors' demand for PLS outstripped the supply of mortgages).

²²⁶ See Richard Herring & Susan Wachter, *Bubbles in Real Estate Markets 4* (Zell/Lurie Real Estate Ctr., Working Paper No. 402, 2002), available at <http://realestate.wharton.upenn.edu/newsletter/bubbles.pdf>. Shorting real estate should not be confused with a short sale, in which a mortgage lender agrees to let a borrower sell property for less than the full amount due on the mortgage and forgives the deficiency.

²²⁷ Similarly, the uniqueness of real estate is a reason that specific performance is generally available as a remedy for breach of real-estate sales contracts. See RESTATEMENT (THIRD) OF PROP. (SERVITUDES) § 8.3 cmt. b (2000).

²²⁸ It is also possible to short housing-related stocks, such as those of major homebuilders or banks with large real-estate portfolios, but this applies only indirect market pressure and is an expensive and risky strategy because of the indirect connection with real-estate prices.

²²⁹ See, e.g., J. Michael Harrison & David M. Kreps, *Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations*, 92 Q.J. ECON. 323, 324–25 (1978) (arguing that differences in investor opinions combined with short-sale constraints can create a “speculative premium”); Charles M. Jones & Owen A. Lamont, *Short-Sale Constraints and Stock Returns*, 66 J. FIN. ECON. 207, 209 (2002) (finding “that stocks that are expensive to short . . . [have higher valuations] and low subsequent returns”); Edward M. Miller, *Risk, Uncertainty, and Divergence of Opinion*, 32 J. FIN. 1151, 1154 (1977) (arguing that in a market where short selling is limited and investors hold a divergence of opinions, asset prices may rise above fundamental levels because the price only reflects the views of optimistic investors); José A. Scheinkman & Wei Xiong, *Overconfidence and Speculative Bubbles*, 111 J. POL. ECON. 1183, 1208 (2003) (arguing that, if short sales were prohibited and some investors were overconfident regarding asset appreciation, then asset prices would rise above their fundamental values).

²³⁰ Insurance conceivably would have provided market discipline. If private mortgage insurance were required on all high LTV loans, as is the case in Canada, see MIN, *supra* note 155, at 9, then insurance premiums could have maintained discipline on underwriting standards. See Susan Wachter, *Procyclicality and Lending Standards Through-the-Cycle* (Aug. 2010) (unpublished paper) (on file with authors). The collapse of the GSEs itself was arguably an insurance failure because the GSEs failed to reserve countercyclically for losses on their guarantee business and found themselves in a rate war (for risk-adjusted rates) with PLS credit enhancements, including monoline bond insurers.

regular premia to its counterparty (the protection seller) until and unless a defined credit event occurs on a reference asset.²³¹ Upon the occurrence of a credit event, the payment flow reverses, and the protection seller pays the protection buyer the agreed-upon level of insurance coverage. Thus, the protection buyer is short and the protection seller is long on the reference asset, without either having to own the reference asset.

A CDS is generally written on a particular bond, meaning that a single CDS is written on a single PLS tranche, not on an entire MBS deal.²³² CDS, however, are not an effective means of shorting an individual PLS tranche because it is difficult to find a counterparty that will take the long position as CDS protection seller. If the counterparty merely wants to be long on the PLS tranche, it is possible to buy the PLS tranche directly.²³³ Moreover, the counterparty will likely be suspicious that an informational asymmetry exists between it and the short CDS protection buyer: What does the protection buyer know that makes it want to be short on this particular bond?

One reason that a CDS protection seller would not be as concerned about an informational asymmetry favoring the protection buyer was if there was an informationally neutral explanation for the short positions. Frequently, CDS protection was being purchased as part of a “negative-basis” trade, meaning that CDS protection was used to create a matched hedge on long positions for which the cost basis for CDS protection was less than the yield from the long position.²³⁴ The investor would thus be hedged to a neutral position in terms of credit risk but would still be collecting net yield. In many instances, accounting rules permitted investors to immediately book as revenue the net present value of the excess yield on the PLS tranche over the protection payment on the CDS in negative-basis trades.²³⁵ Thus, if an investor purchased a \$10 million PLS tranche that yielded 1,000 basis points and had an average term of five years, and CDS protection on that tranche cost 200 basis points, the investor could book the discounted present value of 800 basis points for five years on \$10 million. Negative-basis trades thus let future profits be recognized on an accelerated timeline, thereby increasing current bonus pools.²³⁶

The use of CDS for shorting helped mask the extent of short pressure because the CDS market is primarily a dealer market, which made the level of short demand opaque. Because CDS are a dealer market, most are technically done as two sets of swaps: a CDS between the ultimate short and the dealer as long, and then a second CDS between the dealer as short and the ultimate long. The dealer will ideally make perfectly matched swaps (and thus have no exposure on the swaps other than the counterparty risk) and take a spread between the deals as well as fees.²³⁷ The result is that the ultimate protection seller (the long) never knows who the ultimate

²³¹ See, e.g., VINOD KOTHARI, *SECURITIZATION: THE FINANCIAL INSTRUMENT OF THE FUTURE* 524–25 (2006); David Mengle, *Credit Derivatives: An Overview*, *ECON. REV.*, Fourth Quarter 2007, at 1, 1–2.

²³² CDS can, in theory, be written on a collection, or bucket, of assets, but more often this takes the form of a CDS on a CDO, rather than a CDS on a bucket of individually selected assets.

²³³ There are reasons for a protection seller to choose to enter into a CDS rather than buy the reference asset. The counterparty might want to receive the protection-premium cash flow without having to invest in an asset.

²³⁴ See SMITH, *supra* note 206, at 194.

²³⁵ See GORTON, *supra* note 49, at 100; SMITH, *supra* note 206, at 194–95 (noting that immediate booking of profits for negative-basis trades was a particular problem under the Basel II capital rules that applied to European banks).

²³⁶ SMITH, *supra* note 206, at 255.

²³⁷ In Goldman Sachs’ Abacus 2007-AC1 CDO, John Paulson technically was never in contractual privity with Abacus 2007-AC1; instead, Paulson entered into a set of swaps with Goldman Sachs, which, as a dealer, in turn entered into a set of swaps with Abacus 2007-AC1. The Abacus 2007-AC1 deal shows that, in practice, not all swaps were perfectly matched. Thus, Goldman Sachs was unable to find a perfectly matched swap in the Abacus 2007-AC1 CDO and was left holding some of the long exposure on the deal.

protection buyer (the short) is or the real price the short is paying (or vice versa); the price transparency for CDS was not readily apparent for much of the bubble. This meant that the longs could not gauge the level of short demand or changes in that level. By virtue of being a dealer market, CDS limited the information available to long investors about short pressures.

c. Synthetic CDOs. As it turned out, most of the long counterparties on CDS on PLS were not the ultimate economic parties in interest, but themselves CDOs. Because of the difficulty in using CDS to short individual MBS, short investors (or, more technically, CDS dealers) generally utilized CDOs as their long counterparties, rather than direct investors.²³⁸ The use of CDOs as the long parties in CDS on PLS played a critical role in expanding the mortgage bubble.

²³⁸ In theory, the CDO managers should have been just as worried as any other counterparty underwriting bespoke CDS. CDO managers, however, might have reduced their diligence because they are compensated through two separate management fees, a senior and a subordinated fee, both based on assets under management. See KOTHARI, *supra* note 231, at 433. The senior fee is paid at the top of the cash-flow waterfall before any of the investors in the CDO receive payment. See Douglas J. Lucas, Laurie S. Goodman & Frank J. Fabozzi, *Collateralized Debt Obligations and Credit Risk Transfer* 7 fig.3 (Yale Int'l Ctr. for Fin., Working Paper No. 07-06, 2007), available at <http://ssrn.com/abstract=997276>. The subordinated fee is distributed after all of the other expenses—other than the equity tranche—are paid; it is the junior-most “debt” tranche in the CDO. See *id.* The subordinated-fee portion is typically twice the size of the senior-fee portion. See Manuel Arrive & Pablo Mazzini, *Outlook on the CLO Manager Landscape: The Features of the Survivors*, HEDGE FUND J., Oct. 2008, <http://www.thehedgefundjournal.com/magazine/200810/research/outlook-on-the-clo-manager-landscape-.php>. Although the fees are based on assets under management, see LEWIS, *supra* note 81, at 142, because of their structuring, the subordinated fee is determined by both assets under management and the CDO’s performance; if the CDO performs poorly, the subordinated fee will be too far down in the cash-flow waterfall to receive a recovery. The belief was that keeping the majority of CDO-manager compensation in a subordinated fee would align the CDO managers’ incentives with those of the CDO investors. See Kate Birchall, *Cash Flow CDOs*, in ASSET SECURITISATION AND SYNTHETIC STRUCTURES: INNOVATIONS IN THE EUROPEAN CREDIT MARKETS 179, 189 (Rick Watson & Jeremy Carter eds., 2006).

In fact, this fee structure encourages CDO managers (1) to maximize assets under management and (2) to maximize the short-term return on those assets even at the expense of long-term performance. Although the senior–subordinate structure of CDO managers’ fees has some resemblance to that of B-piece investor special servicers for commercial mortgage-backed securities, it does not fully align the CDO managers’ interests with those of investors in the way that a horizontal tranche takes a pro rata recovery from all assets in the CDO. If the CDO managers’ fee levels are high enough, the CDO managers may be content leaving money on the table in the form of the subordinated tranches; the CDO managers may make enough money from the senior fees that income from the subordinated tranches is irrelevant. This appears to have been the case with the infamous CDO manager Wing Chao, memorably described in Michael Lewis’s *The Big Short*. See LEWIS, *supra* note 81, at 140.

Second, this structure does not compensate the CDO managers based on the ultimate performance of the CDO at maturity. Instead, like hedge-fund managers, the CDO managers are compensated based on short-term performance. The result is a replication of the bonus-pool reward system and its fake-alpha problem, with compensation based on short-term excess returns rather than long-term performance. The CDO managers’ fees are paid from both interest and principal payments received by the CDO. Many assets held by CDOs have balloon-payment structures so that, in the initial years of the CDO, the assets will be making only interest payments, not principal payments. The CDO managers’ fees, however, have senior and subordinate status in both interest and principal-payment waterfalls. This structure incentivizes CDO managers to load up on high-risk, high-return assets. Although many of these assets will eventually default, the defaults will not all happen at the beginning of the CDO’s life. That means that, for at least a while, the interest payments received by the CDO will be quite high, so there will be cashflows to cover the subordinated fees. As defaults rise, the subordinated fees may become out of the money, but it may not matter. Unlike investors, CDO managers do not necessarily have any principal invested in the CDO; any income is, in essence, gravy. The CDO managers may have their reputations connected with the CDOs, but reputational constraints may be irrelevant if the CDO managers can make enough money in a short time. Put differently, the structure of CDO-manager compensation enables one to get rich quick and then retire, leaving the CDO investors holding the bag.

Despite the oversupply of mortgage credit, the housing-finance market could not produce a sufficient volume of mortgage notes for PLS and thus for cash CDOs—CDOs whose assets were PLS and other securities. As Gillian Tett noted, during 2005 and 2006, “The big, dirty secret of the securitization world was that there was such a frenetic appetite for more and more subprime loans to repackage into CDOs that the supply of loans had started lagging behind demand.”²³⁹

The solution to this shortage of PLS for cash CDOs was to produce synthetic CDOs (or, more typically, hybrid, cash-synthetic CDOs) whose assets consisted of credit-default swaps. The synthetic CDOs sold credit-default protection, meaning that they were long on the reference assets (PLS or CDOs). Synthetic CDOs were able to produce lots of AAA-rated tranches to satisfy the insatiable demand for AAA-rated assets due, in part, to the global supply glut. But unlike creating a cash CDO, a synthetic CDO requires both long *and* short demand. In order to create the CDS that will go into the CDO, there have to be parties that want to go short on the reference assets (PLS).

This meant that rather than divorcing the CDO market from actual mortgage-credit supply, synthetic CDOs themselves contributed to the oversupply of underpriced mortgage credit. Synthetic CDOs contributed to the oversupply of mortgage credit in three ways. First, synthetic CDOs greatly increased the supply of CDS protection available and therefore reduced CDS spreads (the price of CDS protection). Lower CDS spreads made the credit arbitrage between CDS and CDOs more attractive. Whereas there was a limited number of institutions that would sell CDS protection on PLS directly—primarily AIG and the monoline bond insurers—synthetic CDOs effectively made a much broader range of institutional investors—all CDO investors—sellers of CDS protection, thereby pushing down CDS spreads.²⁴⁰

Second, synthetic CDOs compressed PLS credit spreads themselves, which thereby lowered mortgage interest rates. CDS spreads (the price of CDS protection) are linked to PLS spreads (the yield on PLS) via arbitrage. When CDS spreads tighten, it is cheaper to insure against PLS, which increases demand for PLS, thereby pushing down the yield on the PLS, which lowers the cost of borrowing.²⁴¹ Conversely, if CDS spreads widen, it is more attractive for long investors to go into synthetic CDOs than into PLS (or cash CDOs). The result is that, to compete, PLS and cash CDOs have to increase their yields, which translates into an increase in mortgage interest rates. Widening spreads would have made it costlier for the short to take out its CDS position and would have also constrained the supply of mortgage credit, thereby squelching the housing bubble that the shorts wanted to see build up and collapse. Using synthetic CDOs as the vehicle for shorting the housing market hid short investors’ negative view of the market, allowing them to do more deals with low premiums.

Some short investors, such as John Paulson in Goldman Sachs’ infamous Abacus 2007-AC1 CDO deal, simply shorted the market by taking out naked CDS positions on PLS via a synthetic CDO.²⁴² But other shorts, such as the Magnetar hedge fund, devised a more sophisticated long-short strategy.²⁴³ These investors purchased long positions in the equity tranches of CDOs and

²³⁹ GILLIAN TETT, *FOOL’S GOLD: HOW THE BOLD DREAM OF A SMALL TRIBE AT J.P. MORGAN WAS CORRUPTED BY WALL STREET GREED AND UNLEASHED A CATASTROPHE* 124–25 (2009).

²⁴⁰ A change in the accounting treatment of synthetic CDOs in February 2006 made them more attractive for US investors. *See supra* note 221.

²⁴¹ *See SMITH, supra* note 206, at 262.

²⁴² *See id.* at 259.

²⁴³ *See* Jesse Eisinger & Jake Bernstein, *The Magnetar Trade: How One Hedge Fund Helped Keep the Bubble Going*, PROPUBLICA (Apr. 9, 2010, 12:59 PM), <http://www.propublica.org/article/all-the-magnetar-trade-how-one-hedge-fund-helped-keep-the-housing-bubble>.

then used the high coupons on these equity tranches to fund much larger short positions on the mezzanine tranches of the CDOs using CDS.²⁴⁴

To illustrate, consider a hedge fund that wants to go short on the mortgage market. The hedge fund invests in a \$200 million CDO. The hedge fund purchases the junior-most “equity” tranche, which represents 5% of the deal, for \$10 million. The equity tranche yields 20%, or \$2 million per year, as long as it is in the money. This \$2 million would cover the CDS premium of 125 basis points on \$160 million worth of *mezzanine* pieces in the CDO. The hedge fund would be betting that the loss severity for the CDO would not only wipe out the equity tranche, but also the mezzanine. If so, the hedge fund would be paid \$160 million for a \$10 million investment. If, on the other hand, the CDO performed perfectly, the short would be cashflow neutral. Only if the CDO performed such that the equity tranche, but not the mezzanine, was wiped out would the hedge fund lose. Given that even a marginal increase in losses on the underlying mortgages would wipe out both the CDO equity tranche and the CDO mezzanine tranches, this was a reasonable bet to make.

To make this long–short strategy work, the hedge fund would need there to be \$190 million in outside investment in the CDOs’ cash bonds. By putting up the money for the equity tranche, the short made possible the AAA-rated tranches that were easy to place. In other words, the \$10 million of investment from the short hedge fund was effectively leveraged into \$200 million of CDO finance. If the CDO held the bottom 5% of a PLS deal, it would then be leveraged again into \$4 billion in mortgage funding. Thus, a small investment in a CDO equity tranche as part of a self-funding long–short position could be the catalyst of a significantly greater amount of mortgage funding, which in turn meant lower underwriting standards and a greater chance of the short part of the long–short position paying off.

The CDO market meant that every dollar of investment in the equity tranche of a CDO was effectively leveraged into a much greater supply of mortgage finance.²⁴⁵ As Yves Smith has explained, “[E]very dollar in mezz ABS CDO equity that funded cash bonds created \$533 dollars of subprime demand.”²⁴⁶ Thus, it is estimated that Magnetar alone was responsible for between 35% and 60% of the subprime PLS issued in 2006, all based on perhaps \$30 billion in equity positions in CDOs.²⁴⁷ By purchasing the “equity” layer of CDOs, it made all the senior positions—which Magnetar shorted—possible.²⁴⁸

Moreover, by controlling the equity position in a CDO, the short hedge fund would have had a veto over what PLS the CDO purchased. And because of its net short position on the CDO, the hedge fund would have wanted the CDO to purchase the riskiest assets possible because these would have had a higher chance of defaulting and triggering a payment to the hedge fund on the

²⁴⁴ See SMITH, *supra* note 206, at 257–61.

²⁴⁵ This is a distinct type of leverage than that which is usually considered in the case of CDOs, namely the leverage of the protection seller who does not have to commit full funding of its position upfront, enabling it to deploy those funds elsewhere. See Erik F. Gerding, *Credit Derivatives, Leverage, and Financial Regulation’s Missing Macroeconomic Dimension*, 8 BERKELEY BUS. L.J. 102, 113-114 (2011). It is also distinct from a third type of leverage in the CDO space, namely the leveraging of a limited number of PLS tranches into a much greater systemic financial exposure through synthetic securitization. Synthetic CDOs also greatly amplified the financial risk on a set group of mortgages. Thus, Larry Cordell, Yilin Huang, and Meredith Williams have found that between 1999 and 2007, 5,496 BBB-rated PLS were references some 36,901 times in 727 publicly traded CDOs, which had the effect of “transforming \$64 billion of BBB subprime bonds into \$140 billion of CDO assets.” Cordell, Huang, & Williams, *supra* note 210, at 2, 10, 34 (table 6).

²⁴⁶ See SMITH, *supra* note 206, at 261 (emphasis removed).

²⁴⁷ *Id.* at 260; see also Eisinger & Bernstein, *supra* note 243 (discussing Magnetar business practices).

²⁴⁸ See SMITH, *supra* note 206, at 259.

CDS and, in the meantime, would have yielded a higher coupon, thereby enabling the hedge fund to purchase even more CDS protection.²⁴⁹

The result was that this short demand increased the risk in the mortgage market by increasing the supply of mortgage finance. This finance was priced not of the risk on the mortgages but on the existence of an arbitrage in credit pricing between credit-default-swap protection on assets and the assets themselves. As long as CDS spreads remained low, shorts were able to stake out CDS positions without causing a contraction in mortgage credit. Put differently, the shorts' strategy for shorting the mortgage market was to go *long* on the *junior* tranches of CDOs (but not the senior tranches) in order to ensuring funding for an ever more unstable mortgage market.

The greater the short demand for junior tranches of CDOs (again, the *long* position on the underlying assets), the greater the overall need and effort to place the senior tranches of the CDOs (likewise, long positions on the underlying assets), but there was a ready and steady demand for all sorts of AAA-rated assets.²⁵⁰ Greater supply of CDOs lowered the yield that CDOs had to offer to sell, which in turn meant less pressure for yield on the CDOs' underlying PLS assets, which in turn kept down the cost of mortgages. This phenomenon might explain why AAA-rated PLS were trading through AAA-rated corporates during the bubble, as shown in Figure 12. The relatively small (if vociferous) demand for junior CDO tranches to fund short positions had made huge PLS issuance possible and thus fueled the underpriced supply of mortgage credit.

It was possible, at least starting in mid-2006, for investors simply to go short on the mortgages by taking a position on the ABX (a series of indices that track CDS pricing on PLS).²⁵¹ The ABX, however, had the serious disadvantage of making demand and pricing for CDS on particular PLS transparent. With transparency of demand, the spreads on the ABX grew as demand for CDS protection grew. Not so with synthetic CDOs. Using bespoke CDS with synthetic CDOs, rather than a standardized bucket of CDS like the ABX index, had the effect of hiding demand. Because the demand was diffused throughout the market rather than

²⁴⁹ *Id.* at 256.

²⁵⁰ Bernanke, *International Capital Flows*, *supra* note 6, at 7–8. See also Gorton, Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007 (May 11-13, 2009) (unpublished manuscript), available at <http://www.frbatlanta.org/news/Conferen/09fmc/gorton.pdf> (discussing investor demand for “informationally insensitive” financial assets).

²⁵¹ See Ingo Fender & Martin Scheicher, *The ABX: How Do the Markets Price Subprime Mortgage Risk?*, BIS Q. REV., Sept. 2008, at 67, 68. The ABX was launched on January 19, 2006. See *CDS IndexCo and Markit Announce Roll of the ABX.HE Indices*, BUS. WIRE (Jan. 19, 2007, 8:00 AM), <http://www.businesswire.com/news/home/20070119005133/en/CDS-IndexCo-Markit-Announce-Roll-ABX.HE-Indices>. For details on the ABX index methodology, see Press Release, MarkIt, Index Methodology for the ABX.HE Index for the Sub-Prime Home Equity Sector (“ABX.HE Index Rules”) (Sept. 5, 2008), <http://www.markit.com/assets/en/docs/products/data/indices/structured-finance/ABX%20rules%20revised%209-9-08.pdf>.

A similar index, the CMBX, exists for CMBS. See *The CMBX: The Future Is Here*, NOMURA FIXED INCOME RES. (Nomura, New York, N.Y.), Mar. 23, 2006, at 1, http://www.securitization.net/pdf/Nomura/CMBX_23Mar06.pdf; Alan Todd & Yuriko Iwai, *An Introduction to the CMBX.NA Index and Single-Name CMBS CDS*, CMBS WORLD (CRE Fin. Council, New York, N.Y.), Spring 2006, at 29, 29, <http://www.crefc.org/assetlibrary/F1F85F3A-D0A5-4EF6-AAACD-D73C7ADEF496/994a8967a1614f9cb3da761b5d8818602.pdf>; see also *CMBX Draws Fire for Lack of Transparency*, COM. MORTGAGE ALERT (Mar. 14, 2008), <http://www.cmalert.com/headlines-search.php?s=CMBX+Index+Draws+Fire+for+Lack+of+Transparency> (arguing that there is a lack of trading-volume information on CMBX); *Trade Group Urges More CMBX Disclosure*, COM. MORTGAGE ALERT, (Mar. 28, 2008), <http://www.cmalert.com/headlines-search.php?s=Trade+Group+Urges+More+CMBX+Disclosure>.

concentrated on an index, and because it was in an OTC-dealer market, the demand for CDS protection was never fully apparent.

Synthetic CDOs made it cheaper for short investors to gain CDS protection on PLS (and CDOs) and enabled a long–short strategy of purchasing the junior tranches in order to get the cashflow to fund the CDS protection on the mezzanine tranches (and, in the case of CDOs, to have control over what assets went into the CDO). Synthetic CDOs thus increased short investors’ demand for subordinated pieces of PLS and CDOs, which, in the short term, increased the supply of capital in the mortgage market.

By 2005 and 2006, the oversupply of underpriced mortgage credit was being driven heavily by short investors in CDOs. Put differently, the supply of mortgage credit was being based not on the risk on mortgages themselves but on the price arbitrage between two different forms of complex mortgage-derivative products, CDS and CDOs. When the price of CDS protection rose in 2007, in part because of widening spreads on the ABX indices,²⁵² the arbitrage opportunity ended, and the system collapsed as the funding evaporated.

d. The ABX Indices. Although the ABX would seem to provide a story of effective market discipline on the mortgage market, there is reason to question whether it could be relied upon to perform such a function. First, the ABX is an index. Indices are only useful in tracking overall market movements but cannot impose meaningful market discipline on individual assets. Thus, the performance of the S&P 500 index does not indicate anything about the performance of any one of the 500 individual underlying stocks it tracks. The ABX does not reflect the risk in most deals, or even in all tranches of the deals it tracks. This means riskier tranches and riskier deals can free ride off less risky ones included in the ABX. Given the heterogeneity of MBS deals, the pricing of CDS on one deal does not necessarily reflect on other deals. Moreover, given its public methodology, it can easily be gamed by financial institutions that wish to make the market appear less risky.

Second, the ABX issues new indices on CDS semiannually. This means that there can be a significant time lag between changes in mortgage-origination risk and such reflection in the ABX. There is a time lag between origination and securitization and a time lag between securitization and CDS on the PLS being reflected in the ABX. Moreover, rising housing markets can reduce default levels because of the ability to refinance or sell properties. At best, then, the ABX can deflate housing bubbles but not prevent them.

Third, and most important, the ABX might be driven by factors other than default risk on the mortgages underlying the RBMS referenced by the CDS tracked by the index. As former Moody’s managing director Jerome Fons has observed, the ABX diverges significantly from the values of the actual PLS its CDS reference.²⁵³ Instead, the ABX could be reflecting arbitrage and hedging strategies or counterparty risk. If so, the ABX would be inherently of limited use as a market-discipline mechanism on mortgage and PLS underwriting.

Prices in indexed derivatives markets that reference an illiquid underlying-asset market can be driven by arbitrage imbalances. When the index strays from the fundamental value of the underlying assets, it is difficult for investors to take advantage of arbitrage opportunities in the underlying-asset market.²⁵⁴ Economists Richard Stanton and Nancy Wallace note that arbitrage

²⁵² See John Geanakoplos, *Solving the Present Crisis and Managing the Leverage Cycle*, FRBNY ECON. POL’Y REV., August 2010, at 101, 110–11, available at <http://www.ny.frb.org/research/epr/10v16n1/1008gean.pdf>.

²⁵³ See Jerome S. Fons, *Shedding Light on Subprime RMBS*, J. STRUCTURED FIN., Spring 2009, at 81, 89.

²⁵⁴ Cf. Karl E. Case, Jr. et al., *Index-Based Futures and Options Markets in Real Estate*, J. PORTFOLIO MGMT., Winter 1993, at 83, 84 (arguing that “[t]he establishment of real estate futures and options contracts could

imbalances may be a particular problem for the ABX “because it was specifically designed to allow for large positions that would otherwise be impossible due to the relative scarcity of trading sub-prime mortgage backed securities.”²⁵⁵ Thus, Stanton and Wallace have found “that the credit performance of the [ABX’s referenced subprime PLS] is uncorrelated with observed fluctuations in the ABX[.]”²⁵⁶ Instead, they found that the ABX correlated with short-sale demand imbalances in the option and equity markets of publicly traded builders, commercial banks, investment banks, and GSEs.²⁵⁷

The ABX might also reflect excessive demand for hedging due to the illiquid nature of PLS, rather than credit risk on the PLS. Financial economist Gary Gorton has argued that, in 2007, the ABX might not have reflected actual risk because it was heavily used by banks to hedge their illiquid positions, which led to demand for CDS protection overwhelming the market and causing index prices to stray from the risk implied by real-estate fundamentals.²⁵⁸

The ABX also reflects counterparty risk on the CDS it tracks. CDS protection substitutes the credit risk on the protection seller for the protection risk on the reference asset. Even if the CDS is collateralized and underwritten by a sound counterparty, credit risk will still exist. Thus, all ABX sub-indices registered a noticeable drop and then rebounded in February and March of 2008, both before and after Bear Stearns’s collapse. The credit risk on the PLS did not suddenly change; Bear Stearns’s collapse had no effect on the soundness of the mortgages backing the PLS. Likewise, the spreads for the ABX—the difference in cost between purchasing CDS protection and purchasing a risk-free investment—spiked during the height of the financial crisis, between September and October 2008, and then fell dramatically on October 28, when the Treasury announced its capital injection into the nation’s largest financial institutions.

Gary Gorton argues that there is a high correlation between the ABX and the sale-and-repurchase (repo) market used for short-term secured funding by many financing institutions. Therefore, the ABX may have been reflecting counterparty risk rather than PLS risk.²⁵⁹ In a repo transaction, one financial institution sells another a security and simultaneously agrees to repurchase it within a short timeframe, at a higher price.²⁶⁰ Economically, this is equivalent to a secured loan, with the security as the collateral and the difference in sale-and-repurchase price as the interest. If the repo obligor defaults, its counterparty keeps the collateral security. PLS were frequently used as repo collateral, and repo collateral was frequently rehypothecated, which meant that the repo seller would use the collateral that was originally posted to it as collateral for its own repo borrowing.²⁶¹

spectacularly lower transaction costs for trading in real estate”); Michael C. Lovell & Robert C. Vogel, *A CPI-Futures Market*, 81 J. POL. ECON. 1009, 1009 (1973) (arguing to “extend the concept of a futures market to provide a means of hedging against fluctuations in . . . the consumer price index”); Mark J. Powers, *Does Futures Trading Reduce Price Fluctuations in the Cash Markets?*, 60 AM. ECON. REV. 460, 464 (1970) (arguing that futures markets should “result . . . [in] more informed decision making and prices that are more closely representative of basic supply and demand conditions”).

²⁵⁵ See Richard Stanton & Nancy Wallace, *ABX.HE Indexed Credit Default Swaps and the Valuation of Subprime MBS 5* (Feb. 15, 2008) (unpublished paper), available at <http://escholarship.org/uc/item/5s75x0ns#page-1>.

²⁵⁶ See *id.* at 23.

²⁵⁷ See *id.*

²⁵⁸ See Gary Gorton, *Information, Liquidity, and the (Ongoing) Panic of 2007*, 99 AM. ECON. REV. 567, 572 (2009).

²⁵⁹ See *id.* at 569–72.

²⁶⁰ See Gary Gorton & Andrew Metrick, *The Run on Repo and the Panic of 2007–2008*, at 8 (Mar. 9, 2009) (unpublished paper), available at <http://econ-www.mit.edu/files/3918>.

²⁶¹ See *id.* (explaining rehypothecation).

Accordingly, the increase in ABX prices might have reflected increased counterparty risk, particularly in the repo market, where defaults would lead to financial institutions getting stuck with illiquid PLS. And because of rehypothecation—the pledging of collateral from one’s own extension of credit against one’s borrowings—the number of financial institutions seeking CDS protection would have exceeded the actual exposure to PLS that existed in the system, thereby further spurring demand for CDS protection and pushing up CDS prices.²⁶² The inability to sort out MBS credit risk and CDS counterparty risk limited the usefulness of the ABX as a market-discipline device.

PLS proved impervious to normal market-discipline methods. Credit ratings were compromised in terms of incentives and were ill suited for analyzing and rating heterogeneous, complex PLS products that lacked a performance history. The expansion of resecuritization via CDOs removed the natural risk-appetite limitation on mortgages. Smart short investors understood the decline in mortgage-underwriting standards, but their investment instrument of choice was incapable of imposing much market discipline on housing-finance markets. Regulation was nonexistent in the PLS market, and largely absent in the mortgage-origination market. The result, of course, was that other, more informationally limited investors failed to accurately price for risk and overinvested in MBS.

V. STANDARDIZATION AS AN INFORMATIONAL PROXY

In any market, as long as there is a return on heterogeneity and complexity, one can, in the absence of effective regulatory oversight, expect heterogeneity and complexity to prevail. If market participants can benefit from shrouded information, they will continually attempt to shroud the information. This also holds true for securitization markets and suggests regulation will serve a critical role as the housing-finance system is redesigned and rebuilt. Regulation must concentrate on correcting the informational failures in the housing-finance market and should begin with standardization of MBS.

Proper standardization implies the prohibition of nonstandardized products. Although there has been standardization in some segments of the U.S. housing-finance market, we propose market-wide standards, meaning that nonstandard products would be eliminated from the market rather than simply shifted to a different part of the market.

Historically in the United States and Europe, securitization as a vehicle for housing finance has succeeded when credit risk has been borne, implicitly or explicitly, by the government and regulated accordingly.²⁶³ Government assumption of credit risk is a form of product standardization that alleviates the need for investors to analyze credit risk. GSE securitization standardized credit risk by having the GSEs guarantee all of their MBS and by having the implicit backing of the United States government behind the GSEs’ guarantee. Proposals that seek to establish some form of government guarantee in the housing-finance market are thus proposals requiring at least some measure of standardization.

A government-backed mortgage-finance market poses its own problems, particularly the socialization of risk and the politicization of underwriting standards. Lesser forms of standardization—of mortgage and MBS credit-risk structures, rather than of credit risk—might

²⁶² See Gary Gorton & Andrew Metrick, *Securitized Banking and the Run on Repo* 10 n.12 (Yale Int’l Ctr. for Fin., Working Paper No. 09-14, 2010), <http://ssrn.com/abstract=1440752> (discussing rehypothecation as a multiplier).

²⁶³ See generally Snowden, *supra* note 25, at 270–95 (providing a history of effective securitization in the United States and Western Europe).

be sufficient to facilitate adequate risk pricing without forcing a trade-off between market stability and risk socialization.²⁶⁴

Irrespective of the outcome of housing-finance reform, market discipline—be it by regulators or by investors—requires real-time information that can be easily analyzed, an outcome that requires standardization. As Lewis Ranieri, the godfather of mortgage securitization (and reputed creator of the term securitization),²⁶⁵ has noted, unless PLS investors rely on ratings, they will need to reverse engineer deals as part of their investment analysis.²⁶⁶ Reverse engineering a PLS is an incredibly expensive process.²⁶⁷ Because deals are not standardized, each deal must be independently reverse engineered to properly identify the best investment, which adds to the expense of the analysis. As a result, most investors rely on ratings.²⁶⁸

Standardization allows for more investors to be able to reverse engineer deals in a cost-effective manner and thereby have more effective market discipline. Standardization also adds to market stability. Standardization helps confine the parameters of market experience, and, as economists Reshmaan Hussam, David Porter, and Vernon Smith have shown, bubbles are less likely to occur in “experienced” markets with bounded parameters.²⁶⁹

Standardization also enables more effective discipline by regulators and the market. The housing bubble evaded regulatory and market discipline partly because only one of the two components of the cost of housing—interest rates—was observable in real time. The other component—the credit-risk premium—was only observable after the fact and, even then, perhaps not fully. The inability to observe the real-time change in underwriting standards prevented the systemic scope of the housing bubble from being manifested until it was too late.²⁷⁰ Only when regulators or the market have information about lending practices and their

²⁶⁴ In this Article, we take no position as to the form of the future secondary housing-finance market—whether it should be completely privatized, run through cooperatives, run as a public utility, run through GSEs, or even completely nationalized. See Adam J. Levitin & Susan M. Wachter, *Rebuilding Housing Finance* (2010) (unpublished paper) (on file with authors), for our views on potential models for the U.S. housing-finance market.

²⁶⁵ See Mike McNamee, *Lewis S. Ranieri: Your Mortgage Was His Bond*, BLOOMBERG BUSINESSWEEK (Nov. 29, 2004), http://www.businessweek.com/magazine/content/04_48/b3910023_mz072.htm.

²⁶⁶ See Lewis Ranieri, Comments at the Department of Treasury and Department of Housing and Urban Development’s Conference on the Future of Housing Finance (Aug. 17, 2010) (on file with authors).

²⁶⁷ See Mason & Rosner, *supra* note 19, at 18 (“[T]he lack of liquidity, transparency, history and available data coupled with unprecedented complexity has made it difficult for all but the most well funded, well staffed and most sophisticated to analyze the markets or assets.”).

²⁶⁸ See *id.*

²⁶⁹ See Reshmaan N. Hussam et al., *Thar She Blows: Can Bubbles Be Rekindled with Experienced Subjects?*, 98 AM. ECON. REV. 924, 924 (2008) (“[I]n order for price bubbles to be extinguished, the environment in which the participants engage in exchange must be stationary and bounded by a range of parameters. Experience, including possible ‘error’ elimination, is not robust to major new environment changes in determining the characteristics of a price bubble.”).

²⁷⁰ PLS investors could access loan-level, presale data if they were willing to pay for it, and they could also request that particular mortgages be eliminated from the securitization pool, much like B-piece buyers in commercial mortgage securitization. See Interview with William A. Frey, CEO, Greenwich Fin. Servs. Most PLS investors were unaware of the option of reviewing loan-level data presale. *Id.* See also Cordell, Huang & Williams, *supra* note 210, at 25 (“One of the enduring myths of the crisis is that loan-level data on the mortgage securities in these CDOs were not available to properly value these CDOs. Loan level data were available on most securities directly through Intex, with data on most others available from third-party vendors. Disclosures on securities recommended in the reforms by the IOSCO Technical Committee (2008, p. 3-4) were already mostly available for the SF ABS CDOs. For investors, it was all available upon request.”). It is uncertain whether investors could have successfully analyzed this data had they accessed it. See also *id.* at 25 (discussing problems with data quality).

pervasiveness can they make a proper judgment about their sustainability and thereby determine whether a bubble is forming.

To monitor against housing bubbles, then, it is necessary to have data not only on interest rates but also on the character of credit. It is insufficient, however, to simply require greater data disclosure about the collateral and borrowers supporting MBS, as the SEC's amendments to Regulation AB do.²⁷¹ Instead, investors need to have access to meaningful data that can be effectively analyzed in real time. Disclosure alone does not make data meaningful.

Disclosure of hundreds of loan-level data elements is useless unless the relationships among those elements are known. While it may be possible to design effective multivariate-risk models, excess information and variables reduce the predictability of such models, especially when new terms, for which there is no track record, are introduced.²⁷² It is possible, however, to facilitate mortgage risk modeling and real-time analysis of changes in underwriting standards by reducing the number of potential variables affecting a loan's risk profile through product standardization. Product standardization facilitates underwriting discipline by both regulators and the market.

The problems heterogeneity poses for investors have been recognized by property-law scholars. In a seminal paper, Professors Thomas Merrill and Henry Smith noted that idiosyncratic forms of property impose information costs on potential purchasers. The mere potentiality of idiosyncratic property forms, in itself, imposes diligence costs on purchasers, who are then forced to ascertain that what they are purchasing is not in fact idiosyncratic.²⁷³ Thus, idiosyncratic property forms create "an externality involving measurement costs: Parties who create new property rights will not take into account the full magnitude of the measurement costs they impose on strangers to the title."²⁷⁴ "[F]ree customization of property forms would create an information-cost externality; mandatory standardization is the legal system's way of reducing these external costs to an acceptable level."²⁷⁵ Similarly, applying Merrill and Smith's insights to contract law, Joshua Fairfield has argued that standardization reduces information costs in

Corell, Huang, & Williams also note that the speed at which subprime mortgage debt was being resecuritized was probably not fully appreciated, thereby disguising aggregate market risk. *Id.* at 26.

²⁷¹ See Asset-Backed Securities, 75 Fed. Reg. 23,328 (proposed May 3, 2010) (to be codified at 17 C.F.R. pts. 200, 229–30, 232, 239–40, 243, 249). In recognition of informational failures in structured finance, the SEC has proposed a major revision to Regulation AB, which governs asset-backed securities. The SEC proposal is entirely disclosure focused. It would require loan-level data disclosures to be made in XML (eXtensible Markup Language) format as part of the issuance process as well as ongoing reporting. For residential mortgages, 137 data points would be collected for each mortgage on origination (although many points would be nonapplicable for many mortgages) and 151 data points for ongoing reporting. See 75 Fed. Reg. at 23,361, 23,368.

²⁷² The Regulation AB revisions could also have the unintended consequence of making housing-finance markets locally based, rather than nationally based, because detailed geographic data on borrowers will become available. Although this could impose some discipline on localities' policy choices, it could also increase the price volatility of local housing markets, undermining the stability necessary for social gains.

²⁷³ See Thomas W. Merrill & Henry E. Smith, *The Property/Contract Interface*, 101 COLUM. L. REV. 773, 777 (2001) ("[T]he adoption of novel forms of property has implications not only for the immediate parties to the transaction but also for third parties, who must incur additional costs of gathering information in order to . . . decide whether to seek to acquire these rights.").

²⁷⁴ Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1, 26–27 (2000).

²⁷⁵ Merrill & Smith, *supra* note 273; see also Merrill & Smith, *supra* note 274, at 33 ("One way to control the external costs of measurement to third parties is through compulsory standardization of property rights.").

contracting.²⁷⁶ Standardization reduces informational costs for investors by simplifying both information acquisition and analysis.

PLS are quintessentially idiosyncratic property forms. The underlying assets are themselves heterogeneous between deals, even within an asset class such as RMBS (residential mortgage-backed securities) or CMBS (commercial mortgage-backed securities). Factors such as geographic dispersion, occupancy status, underwriting and appraisal methods, and property types all affect the risks assumed. Even if the underlying assets of the trust were all identical, credit and interest-rate tranching and credit enhancements prevent the ownership interest of any particular PLS certificate from being equivalent to another. Thus, one could create two synthetic PLS based on one real PLS and have different capital structures—really ownership interests—in each one. This is not simply a matter of credit subordination; shifting the allocation of principal and interest payments based on deal performance triggers are common in PLS.²⁷⁷ There is no standard PLS, which means that investors must analyze each deal on its own by scrutinizing numerous unique characteristics, making PLS analysis an extremely costly endeavor.

To standardize MBS, it is necessary not only to standardize deal features, such as tranching structures and other credit enhancements, but also to standardize the underlying mortgages and origination procedures, including documentation requirements. Borrower risk is stochastic, but the risk from particular mortgage products is not.

The GSEs have already brought significant standardization to the mortgage market by implementing standard notes and security instruments, automated underwriting, MBS forms, and servicing procedures. Although there are some differences in practice between the GSEs, they have moved the market from multiple standards to their two standards. The emergence of the PLS market resulted in a destandardization.²⁷⁸

Standardizing MBS does not mean eliminating consumer choice for mortgages. There have always been niche mortgage products, and there are borrowers for whom these products are appropriate. But niche products should not be securitized. These products involve distinct risks, require more careful underwriting, and should remain on banks' balance sheets. If a bank wants to incur the risk of underwriting an exotic mortgage product, it should be allowed the opportunity so long as it puts its own risk capital at stake.

We propose restricting securitization to proven, sustainable mortgage products for which there is well-established consumer demand and performance history.²⁷⁹ If securitization were

²⁷⁶ See Joshua Fairfield, *The Cost of Consent: Optimal Standardization in the Law of Contract*, 58 EMORY L.J. 1401, 1404 (2009) (arguing that standardization of contracts reduces the information costs of contracting); Joshua A.T. Fairfield, *The Search Interest in Contract*, 92 IOWA L. REV. 1237, 1256–57 (2007) (same).

²⁷⁷ See GORTON, *supra* note 49, at 87–90 (explaining the many nuances of PLS).

²⁷⁸ The principle of standardization in the mortgage market is not itself a novel or radical one. The idea has worked well in the past, creating a deep, liquid market, and enabling mortgages to be sold on the To-Be-Announced (TBA) market, meaning that the mortgages are sold to the GSEs before they are actually closed. The existence of the TBA market allows borrowers to lock in their mortgage rates months before their closing. See JAMES VICKERY & JOSHUA WRIGHT, FED. RESERVE BANK OF N.Y., TBA TRADING AND LIQUIDITY IN THE AGENCY MBS MARKET 12 (2010), available at http://www.ny.frb.org/research/staff_reports/sr468.pdf.

²⁷⁹ We note that the Dodd–Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, 124 Stat. 1376 (2010) (codified in scattered sections of the U.S.C.), opens the door to moving the mortgage-securitization market substantially in this direction by imposing risk-retention requirements for securitizations beyond qualifying residential mortgages. The statute stipulates that “qualified residential mortgage” is to be defined jointly by various financial regulators, “taking into consideration underwriting and product features that historical loan performance data indicate result in a lower risk of default”—including loan documentation, underwriting (front-end and back-end debt ratios), “the potential for payment shock on adjustable rate mortgages through product features and

restricted to a limited menu of mortgage forms—for example, the “plain vanilla” thirty-year fixed, the “plain chocolate” fifteen-year fixed, and perhaps the “strawberry” 5/1 or 7/1 adjustable-rate mortgages—investors would not be taking on mortgage-product risk. We term this menu of mortgage products the “Neapolitan” mortgages, a term we find especially fitting given that Neapolitan means of the new city.

There is little reason to doubt that Neapolitan mortgage products’ long history of satisfying the vast majority of consumer borrowers will continue in the future. Combined with the availability of niche products from balance-sheet lenders, consumers will still be able to choose from a wide array of mortgage products to find the product that best fits their needs and financial abilities.

By limiting securitization to Neapolitan mortgages, certain underwriting standards would be hard-wired into securitization. Because the highest payment burden is at the beginning of the mortgage’s term, there is a limit to how weak borrower credit can be with a fully amortized product. Speculative future income and expenses are less of a concern. Interest-only, pay-option, hybrid-ARM, and 30/40 balloon mortgages and other short-term affordability products present markets with a “Rocky Road” option that allows weaker or aspirational borrowers to receive financing that has a high likelihood of failure. Enabling aspirational borrowing encourages cyclical expansions of credit and housing-price volatility, which destabilizes communities and the economy.

Although standardization would also restrict investor choices, we do not believe this is a critical cost. Investors have far more investment options than homeowners have mortgage-product options, and the resulting marginal loss in investor choice would be minimal. Although structured finance has long prided itself on offering securities for a particular investor’s needs, most PLS deals (unlike CDOs), were not actually designed for individual investors. Furthermore, we do not see standardization as precluding collateralized-mortgage-obligation (CMO) structures that allow for individualized tailoring of maturities to match a particular investor’s interest-rate risk preferences. Thus, standardization of PLS offerings is unlikely to restrict choice for investors in a detrimental way. Indeed, it is hard to believe that investors want prime jumbos to be heavily standardized but do not support standardization for nonprime PLS. Ultimately, standardization benefits investors by increasing liquidity, which increases the value of securities.

The major alternative approach to addressing the investor–securitizer, principal–agent problem is the approach taken by the Dodd–Frank Wall Street Reform and Consumer Protection Act, which requires that securitizers retain a portion of the risk on their securitizations.²⁸⁰ This approach, known as skin in the game, intends to create a securitizer–investor partnership and thereby align principals’ and agents’ interests. A full discussion of the skin-in-the-game

underwriting standards,” and the existence of private mortgage insurance—and “prohibiting or restricting the use of balloon payments, negative amortization, prepayment penalties, interest-only payments, and other features that have been demonstrated to exhibit a higher risk of borrower default.” See 15 U.S.C. § 78o-11(e)(4)(B) (Supp. IV 2011). The result of Dodd–Frank is that it will be more expensive to securitize nonqualified residential mortgages. This might result in these products being retained on balance sheets or simply not being originated in the first place. The definition of qualified residential mortgage will result in some measure of standardization, but, at this point, it is not clear what products will be treated as qualified residential mortgages.

²⁸⁰ See *id.* § 78o-11.

approach is beyond the scope of this Article; we take up this issue in detail elsewhere and here merely note that it does not address the core informational problems in securitization.²⁸¹

Requiring the standardization of securitization for well-tested, seasoned products is the only sure method of addressing the investor–securitizer, principal–agent problem. Standardized securitization ensures that securitization is a means of enhancing consumer and investor welfare and systemic stability, rather than becoming a source of systemic risk and instability.

²⁸¹ See Adam J. Levitin, Andrey D. Pavlov & Susan M. Wachter, *Dodd–Frank Act and Housing Finance: Can It Restore the Private Risk Capital to the Securitization Market?*, 29 YALE J. ON REG. (forthcoming 2012).