

Examining Issuance and Pricing of Commercial Mortgage Backed  
Securities during the Financial Crisis of 2007 - 2009

By

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Submitted to the Program in Real Estate Development  
in Conjunction with the Center for Real Estate  
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Master of Science in Real Estate Development

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ABSTRACT

Changes in the issuance of Commercial Mortgage Backed Securities are examined and contrasted with market events and policy action during the financial crisis of 2007 - 2009. Additionally, a sample of investment-grade Commercial Mortgage Backed Securities are separated by original rating and observed in a time series chart against the market events and policy actions from June 2007 through May 2010.

Thesis Supervisor: Andrew Lo

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## Acknowledgements

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## Chapter 1 - Introduction

In this paper we will attempt to better understand the timing of new issuance and pricing changes of commercial mortgage backed securities and the events of the recent financial crisis. Using the New York Federal Reserve crisis timeline we will compare the major news and policy events of the crisis with data from the same period.

The paper will be organized as follows: first, a discussion of the structure and history of CMBS followed a brief overview of proposed changes to the securities in the wake of the financial crisis. The paper will then analyze issuance data with the Federal Reserve timeline followed by similar comparisons on individual CMBS bonds. The paper will conclude with a summary of the comparisons.



## Chapter 2 - History and Structure of CMBS

Throughout the past two decades, Commercial Mortgage Backed Securities (CMBS) have played an increasingly important role in the financing of commercial real estate across the globe. Their existence helps provide additional sources of capital to the real estate finance by transforming a group of mortgages into a series of securitized bonds that appeal to a larger pool of investors. In this section we will briefly explore the mechanism by which the transformation occurs, how it was created and the effects it has had on the commercial real estate industry.

A commercial mortgage backed security is a specific type of asset-backed security (ABS). Asset-backed securities are financial instruments whose value is collateralized by a pool of underlying assets. The securities derive their value from an interest in and the rights to certain cash flows received from the pool of assets. ABS is a broad term for instruments that can pool together assets from a broad range of originations. Some common asset-backed securities include: residential mortgages, auto loans, home equity loans, credit card receivables and commercial mortgages. Although this is a very basic term that encompasses many varied instruments, the different classes are often lumped together in discussion and even regulation.<sup>1</sup> As the topic of this thesis is CMBS, the remainder of this section will be focused on describing only these securities.

CMBS were first introduced in the mid-1980s but their growth began to gain momentum in the early 1990s, partially out of necessity. The bonds were used to help offload a glut of mortgages that were absorbed by the Resolution Trust Corporation in the wake of the commercial real estate crash of the early 1990s. This security was particularly important because it helped to provide new sources of capital to the commercial real estate financing market at a time when traditional funding

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<sup>1</sup> The generalization of ABS is particularly evident in recent financial regulatory reform proposals.

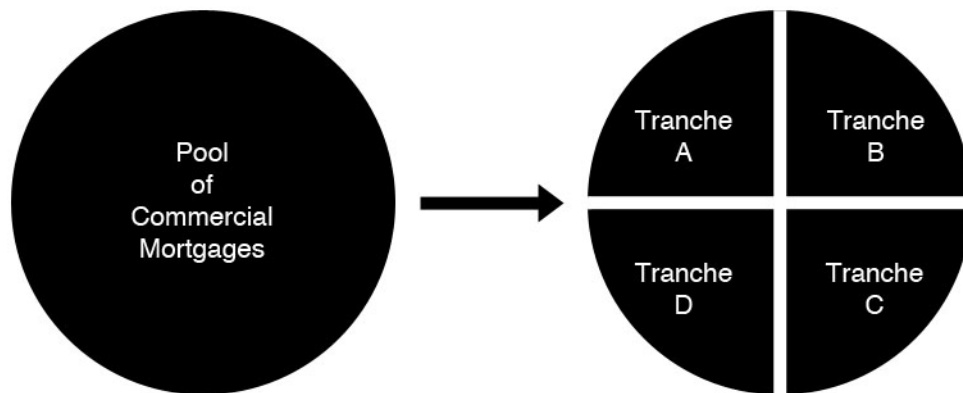
sources were depleted. The ability of CMBS to attract capital that is not used to managing the risks associated with commercial real estate is centered on the structure of the bonds themselves that we will explore in the next section.

## Design and Function of CMBS

The basic concept of a CMBS issuance is simple at face. A group of mortgages are pooled together and the rights to the cash flows are shared among the issuance's investors. Along with the cash flows, the investors assume prepayment and default risk as well. Although complications arise in the customization of this concept for investors' preferences, the sharing of cash flows and risk is achieved through a concept known as tranching.

Tranches are created through the partitioning of the rights to the cash flows from the underlying assets and the assumption of the risks mentioned earlier. The appeal of tranching is that the varying tranches have characteristics that satisfy different investors. This expands the investor base by allowing for customization in each issuance. To better understand tranching, we will walk through a basic example.

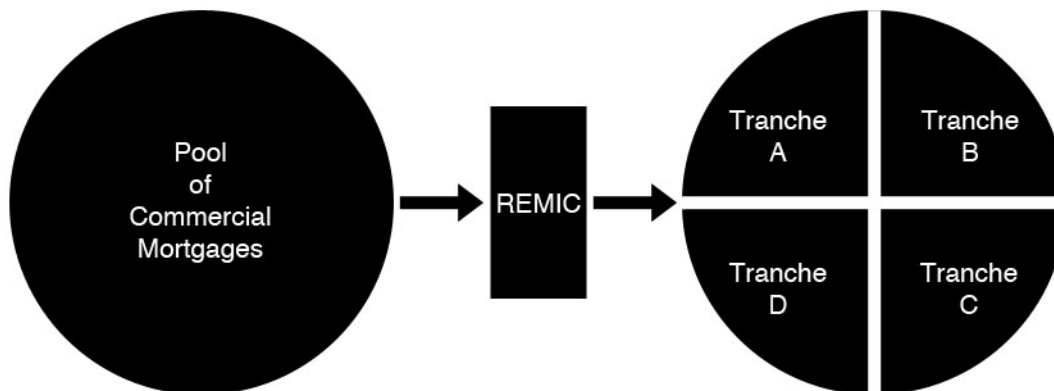
The concept of tranching is depicted below. The pool of assets is divided up so that the tranches represent a portion of that pool. One important characteristic of tranching is that the tranches do not represent a claim on any specific mortgage in the pool; rather they share in the risks and cash flows as defined in the offering. Shown below is the basic example we will build from to cover the concepts of a CMBS issuance.



The face value of the mortgages in the pool is subdivided into the four tranches shown. The characteristics of each tranche depend on the offering but for now it's only important to understand that the tranches represent a portion of the total pool without holding a claim on any one individual mortgage. Each tranche has bonds that are issued and governed by the tranche's risk and reward characteristics. In practice, this requires some administrative components that we will discuss briefly.

A crucial component of the CMBS is the function of the Real Estate Mortgage Investment Conduit (REMIC). The REMIC is a special entity that owns the pool of mortgages and issues bonds to investors. It is granted special status by the IRS so that no taxes are paid on the income generated by the pool of assets. This ruling avoids a situation where investors would encounter double taxation on both the REMIC's income and the distributions of the bonds. To remain qualified as a REMIC, the entity must meet many strict guidelines that limit the actions available upon foreclosure

or default.<sup>2</sup> The IRS also imposes restrictions on active management of the pool of mortgages so the beginning assets must remain largely static. Depicted below, the REMIC acts as a sort of middleman between the whole mortgages and the investors in each tranche.



Other administrative features of a CMBS offering include various means of oversight to assist in the day-to-day management. The issuance will include a Master Servicer in charge of the cash flow collection from the mortgages through the REMIC and the subsequent distribution to the bondholders. In addition to the Master Servicer, the deal will often also include a sub-servicer that maintains contact with the individual borrowers in the mortgage pool. A third servicer, the Special Servicer, deals with loan defaults, foreclosures and workouts. The Special Servicer role has gained increased attention as more loans are requiring workouts and the Special Servicer is often unable to align decisions with the best interests of each investor in the offering because of subordination and loss recognition characteristics.

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<sup>2</sup> Revisions to the rules on Modifications of Commercial Loans Held by a REMC are posted in the IRS Bulletin 2007-12 dated March 19, 2007.

Another crucial component of a CMBS deal is the involvement of a ratings agency to determine the bonds' creditworthiness. The credit rating acts as a measure of the quality of the bond for investors. In some ways it also determines the size of the market for the issuance as many large institutional investors have guidelines or minimum ratings requirements for investments. Each agency has their own model for assigning credit ratings and their effectiveness has come under increased scrutiny in the post-crisis era. The rating takes into account, among other things, the quality of the underlying asset pool and the subordination of the bond's tranche.<sup>3</sup>

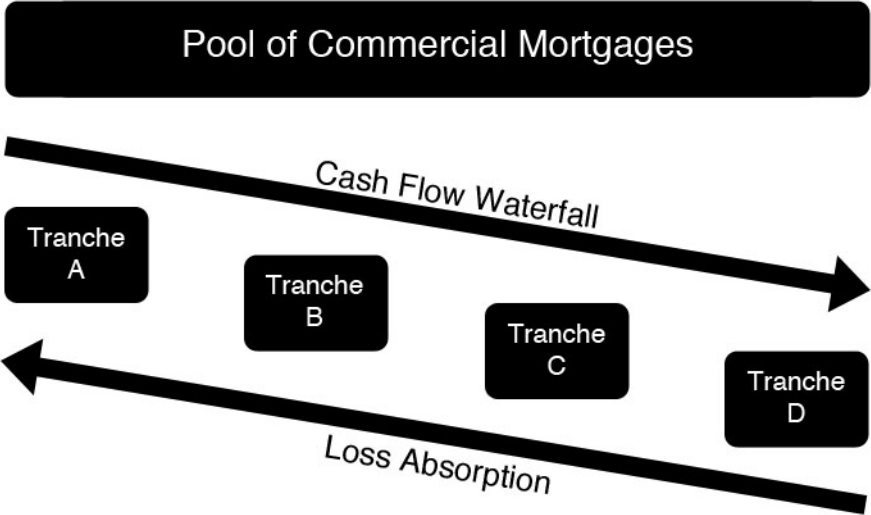
The subordination of a tranche refers to its place in the cash flow waterfall, its priority in receiving distributions. As the underlying assets provide cash flow the bondholders receive a payment equal to the return on the bond that they purchased provided that adequate income is generated. The cash flow waterfall provides payments first to the bonds from the tranche with the highest credit enhancement, or least subordination – those at the top of the waterfall. Once their required return is met, the next tranche receives their payment and so on until all of the income is distributed. In many cases there is a residual amount left after all of the tranches have been paid. This residual component is sold as a separate tranche that is often referred to as the “equity” portion of the deal. Because this cash flow is difficult to predict, it is typically below investment grade and is often unrated by an agency. The purchaser of the equity portion is therefore unable to rely on the opinion of a ratings agency and requires the ability to perform their own unique due diligence on the offering. The equity purchaser plays a unique role in a CMBS offering because they are provided more in-depth information than other investors. They also have the ability to remove loans from the pool prior to the offering. The logic is that they must absorb the first losses so their

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<sup>3</sup> The original rating at issuance is one of our characteristics for dividing the pool of bonds we will observe in the pricing section of this thesis.

evaluations will be the most conservative with regards to default and loss absorption. In addition to having the ability to remove loans from the pool prior to the final issuance, the equity holder typically also has the unilateral ability to replace the special servicer. Often times the equity investor and the special servicer are the same entity, which creates the possibility of misaligned interests among senior bondholders and the equity holder.

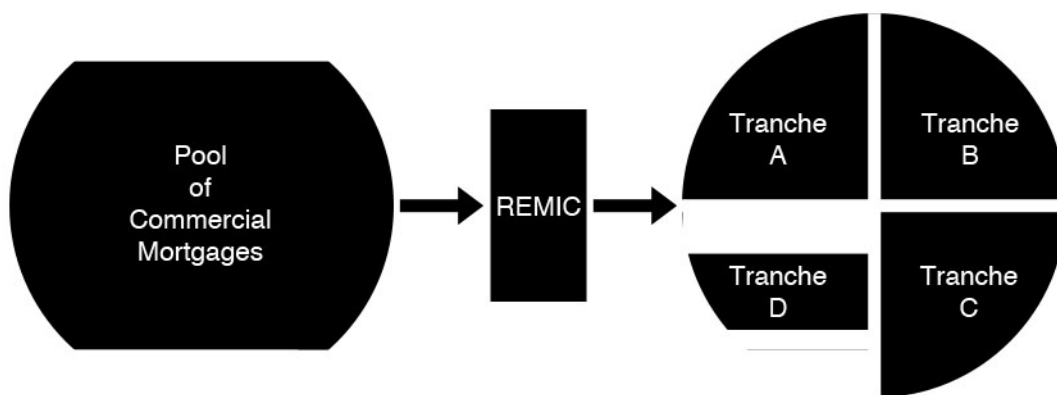
Losses to the underlying pool of mortgages are allocated in an opposite fashion to the cash flow waterfall. As the assets in the experience a loss in principal, that decrease is deducted from the principal of the tranche lowest on the waterfall. This sensitivity to potential losses causes the tranches with the least amount of subordination to bear the most risk of default in the underlying asset pool. In turn, these tranches require the highest rate of return on their investment.



Literature will often refer to the credit enhancement of a particular tranche. A tranche's credit enhancement is a measure of the level of subordination. The credit enhancement is the amount of loss that a pool of mortgages can incur without reducing the principal amount of that particular

bond. The credit enhancement of the most highly rated tranche of a CMBS offering is of particular interest because that is an indication of the amount of risk that the most conservative investor is willing to take. Work by Stanton and Wallace (2010) has shown that subordination levels on AAA-rated tranches decreased to historically low levels before the collapse in issuance.

To illustrate the concept of loss absorption and credit enhancement the previous example is shown with a portion of the commercial mortgage pool defaulted. Regardless of which mortgages in the pool have defaulted, the lowest tranche absorbs the aggregate loss until defaults equal to the face value of the tranche have occurred. At that point the tranche would be effectively wiped out and the next subordinate tranche would begin to absorb any subsequent defaults. A typical deal would have many more tranches but the concept works the same.



Now that the basics of a CMBS offering have been covered, it's worth contemplating exactly what was accomplished by creating these securities. We mentioned earlier that the growth in CBMS was crucial in providing a new source of funds to the real estate financing market but how does simply grouping mortgages and then redistributing their cash flows appeal to new investors? It may seem



like financial alchemy but the answer lies in what's known as transformation. With CMBS, we have two types of transformation occurring: Credit Transformation and Liquidity Transformation.

Credit Transformation occurs when an asset's credit is enhanced with priority or guarantees. In this case, the credit enhancement mentioned previously in the tranching creates the credit transformation. By using the cash flow waterfall and loss absorption rules we create bonds of varying credit worthiness. It has been demonstrated that the most value creation in securitization occurs when AAA-rated securities are maximized so this is an important concept in understanding the success of commercial mortgage backed securities.<sup>4</sup> Credit Enhancement also helps protect the most senior investors by creating bonds that are less sensitive to private information.

The second type of transformation that occurs is Liquidity Transformation. The basis for liquidity transformation is the fact that it's easier to trade standardized bonds than the individual underlying assets in the issuance's pool. This enhanced liquidity adds value for investors by making it easier to buy and sell the securities.

Another related concept that has helped CMBS gain popularity is the concept of maturity mismatch, funding long-term assets with short-term liabilities. The issuers of commercial mortgages, typically banks, are most often affected by maturity mismatch because they fund long-term mortgages with short-term deposits. CMBS is a vehicle by which banks can bundle these mortgages and reduce the maturity mismatch by selling the mortgage pool. As CMBS has gained a more prominent role in the real estate finance market, mortgage origination has become more specialized with the emergence of conduit lenders, lenders who place mortgages with the intent to securitize the loans as soon as

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<sup>4</sup> An, Xudong, Deng, Yongheng and Gabriel, Stuart A, 2008

possible. The motivations of conduit lenders have come under recent scrutiny, as investors are now beginning to question the completeness and consistency of conduit lenders' due diligence.

If the concept of CMBS seemed like financial alchemy, then the issuance of Collateralized Debt Obligations (CDOs) may be difficult to fathom. CDOs are similar to CMBS except that the pool of underlying assets is not restricted to commercial mortgages. CDOs can hold a variety of assets, including tranches from CMBS issuances. If a CDO holds CMBS bonds, they will typically be of a lower rating as these are more difficult for an issuer to sell given the restrictions of institutional investors mentioned earlier. The CDO uses these assets to issue bonds that are rated by the agencies and sold to investors. During the financial crisis, CDOs of CDOs were created and dubbed CDO-Squareds. The creation of these securities is the topic of much investigation today as researchers are beginning to understand the complications associated with increasingly interconnected financial instruments.

The issuance of CDOs is often cited as an example of the overindulgence of the financial crisis. Indeed, in a July 2010 Federal Reserve Bank of New York Staff Report on Shadow Banking, CDOs and their role in the financial crisis are covered in great detail and included in their conclusions is the statement that:

“recent changes in rating criteria by the rating agencies suggest that AAA credit enhancement levels for new transactions would be very high without diversification across vintage, country, and sector. Consequently, it seems unlikely that ABS CDOs will rise from the dead at any point in the near future.”

Less than a year after this report was authored, the first CDO containing CMBS bonds is being offered and others are currently being rated<sup>5</sup>. This is not pointed out to cherry pick a statement from the report that can be refuted, rather to reinforce the resiliency of these instruments and the financial institutions that produce these offerings.<sup>6</sup>

With a better understanding of the history and structure of commercial mortgage backed securities, we can now move forth and explore some of the changes that are being proposed in the wake of the financial crisis.

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<sup>5</sup> <http://www.reuters.com/article/2011/07/15/cdo-launch-idUSN1E76E0JS20110715>

<sup>6</sup> It should be noted that a CMBS CDO can also be used to securitize debt that does not conform to the restrictive IRS REMIC qualifications that were mentioned previously.

## CMBS 2.0 and Proposed Changes in the Securities

### CREFC Proposed Changes

After the drop off in issuance that occurred during the financial crisis, the Commercial Real Estate Finance Council (CREFC) aimed to restore confidence in the marketplace by amending industry standards to quell concerns on performance and transparency. Recent issuances of commercial mortgage backed securities are now referred to as “CMBS 2.0”; a rebranding that implies a significant upgrade over previous standards. Before examining recent issuance data it is important to understand what changes have been made and the motivation behind the changes.<sup>7</sup>

The CREFC releases guidelines and industry standards for lenders and investors in the commercial real estate market. Their stated goal is to use CMBS 2.0 as a vehicle to improve: “Loan Underwriting; Additional Disclosure; and Representations and Warranties”<sup>8</sup>. Here we will cover the changes that have been proposed to meet the improved standards as well as some of the issues that spawned the changes.

The CREFC has created a standardized list of Representations and Warranties that lenders are asked to include in an offering. The list addresses the depth and quality of the due diligence that the lender performed on the borrower. It also documents common characteristics of the loans that investors expect. Their goal moving forward is to include this list with each issuance and provide the investor with a black-lined version of the Representations and Warranties in the event that any

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<sup>7</sup> Certainly the Dodd-Frank Act’s affirmation has caused some urgency as regulators are now crafting rules that will aim to quell the same concerns that the CREFC members are addressing. The logic being that if the CREFC is acting independently to address the issues, the regulators will be more likely to adopt similar policies.

<sup>8</sup>

[http://www.crefc.org/About\\_CMSA/Press\\_Releases/2011/CREFC\\_Releases\\_Market\\_Standards\\_for\\_CMBS\\_2\\_0](http://www.crefc.org/About_CMSA/Press_Releases/2011/CREFC_Releases_Market_Standards_for_CMBS_2_0)

changes are made. This also helps provide a basis for any disputes, as the expectations of the originator are uniform and consistent.

To help expedite any disputes that do arise, the CREFC is proposing a requirement that third-party mediation occur before the commencement of legal action. The goal is to expedite claims of breach in the Representations and Warranties through a standardized process that investors can count on with each offering.

The CREFC is also aiming to tighten up underwriting standards with the use of a “Principles-Based Underwriting Framework”. The guide provides a basis for defining common issues and metrics in commercial real estate as well as a framework for identifying potential risks so that investors have adequate information about the underlying loans. This guide follows the CREFC’s common theme of consistency and transparency in the new issuances.

The final proposed change from the CREFC is the inclusion of an updated “Annex A”, a datasheet containing characteristics of each property in the loan pool. This is an updated version that will include more information on the property’s expenses, income, reserves and loan details.

The CREFC is helping to provide investors with more confidence about the offering by providing more in-depth information that is provide uniformly across all deals. Whether or not this represents an overhaul of the bonds worthy of a rebranding is ultimately up to the investor. Even with these updated market standards, it’s likely that we will see many more changes in the coming months as the implications of the Dodd-Frank Act are beginning to take shape in the form of proposed regulations.

## Chapter 3 - Events of the Financial Crisis

The New York Federal Reserve Bank has identified a series of Policy Actions and Market Events that can be used as milestones in the timeline of the crisis. The timeline is useful in understanding what events may have triggered fluctuations in the marketplace.

Some of the key events that appear to have the most influence on CMBS issuance are summarized briefly below:

### 06/26/07 - SEC Begins Investigation of 12 CDO Issuers

After Bear Stearns announced that two of its hedge funds suffered extensive losses, it was revealed that the source of the trouble was CDO investments with significant subprime exposure. In a Financial Times article on the SEC investigation, a quote appears from the head of interest rate strategy at Credit Suisse that states: "If there is contagion, the problem certainly has sufficient scale to become a financial event."<sup>9</sup> As previously mentioned, CDOs were common holders of CMBS bonds so it would be expected that this news could have a significant effect on issuance and pricing alike.

### 01/11/08 - BOA Announces Purchase of Countrywide Financial

Bank of America announced the purchase of Countrywide Financial for \$4 billion, double its previous investment of \$2 billion in the company which occurred just a few months earlier.

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<sup>9</sup> Mackenzie, Michael. "SEC Probes Troubled Subprime Market." *Financial Times*.

06/06/08 – S&P Downgrades Two Largest Monoline Bond Insurers

S&P cut MBIA and AMBAC down from AAA rated to AA – and AA respectively. The downgrades are a sign of concern for the ability of the companies to make good on policies covering ABS and, particularly CDOs containing residential mortgage backed securities.

09/19/08 – Treasury Secretary Paulson calls for Troubled Asset Relief Program and specifically mentions the need to provide additional funds to mortgage market.

11/25/08 – TALF Established to Provide Loans Collateralized by ABS

The Federal Reserve Board announced the creating of the Term Asset-Backed Loan Facility (TALF). TALF is originally aimed at providing liquidity for ABS collateralized by student loans, auto loans, credit card loans, and small business loans.<sup>10</sup>

02/10/09 – Fed States Willingness to Expand TALF

The Federal Reserve Board announces that it is prepared to expand TALF to as much as \$1 trillion and could allow for AAA CMBS and other ABS.<sup>11</sup>

03/19/09 – TALF Eligible Securities Expanded

The Federal Reserve Board announces that TALF would now accept ABS backed by a wider set of loans, however CMBS was not included in the list of acceptable collateral.<sup>12</sup>

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<sup>10</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20081125a.htm>

<sup>11</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20090210b.htm>

<sup>12</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20090319a.htm>

08/17/09 – TALF Extended

The TALF program is extended and lending on newly issued CMBS is extended through June 30, 2010.<sup>13</sup>

10/05/09 – Changes to Process for Evaluating ABS Pledged to TALF

TALF eligible ABS will now be subject to stricter evaluations, although CMBS has already been subject to a formal risk assessment.<sup>14</sup>

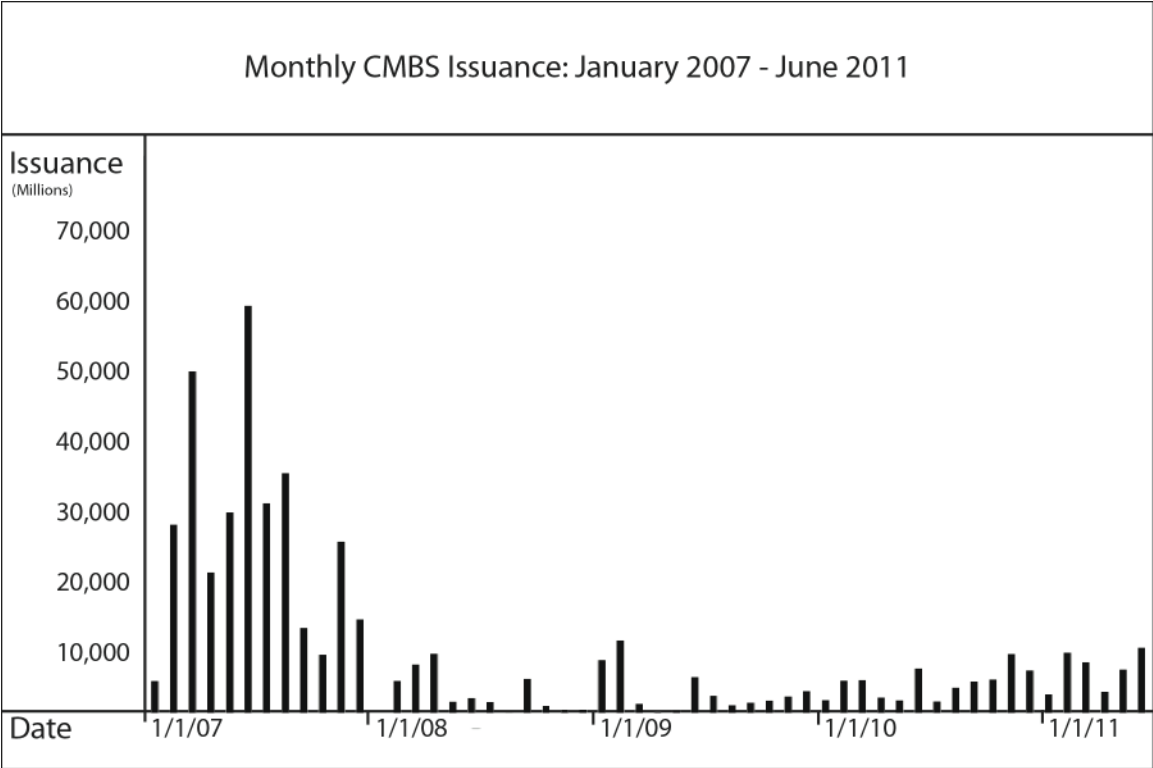
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<sup>13</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20090817a.htm>

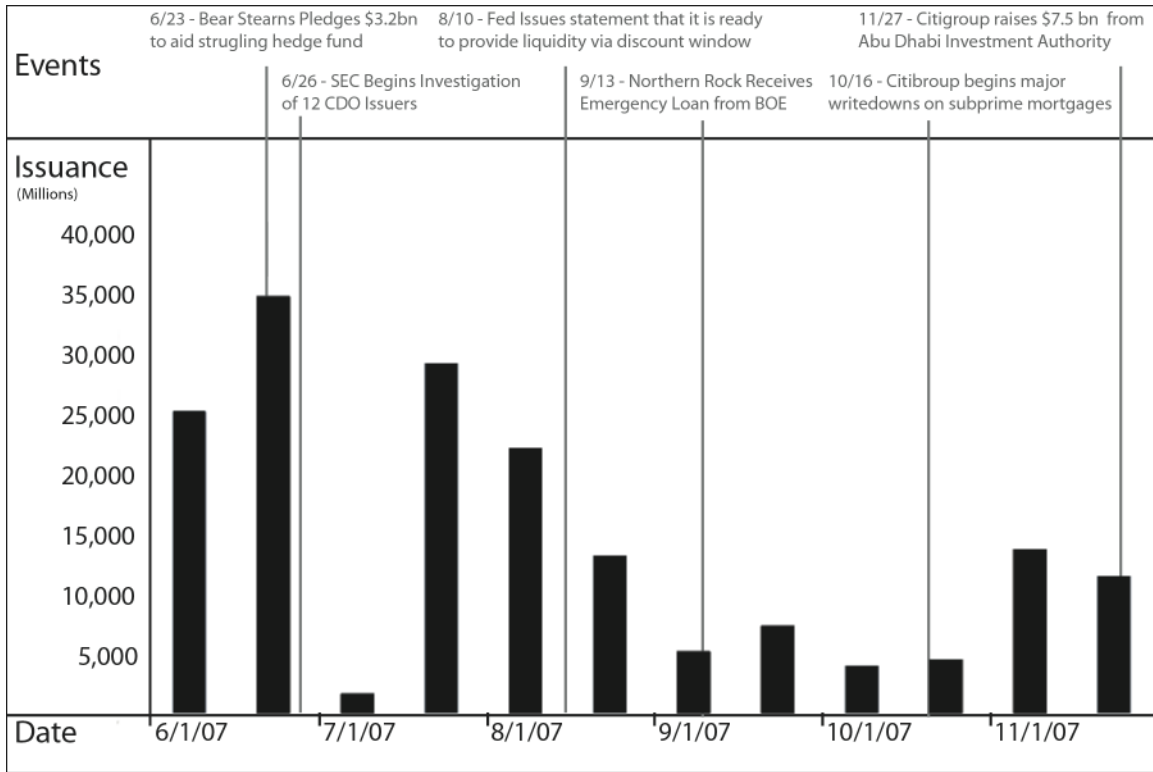
<sup>14</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20091005b.htm>



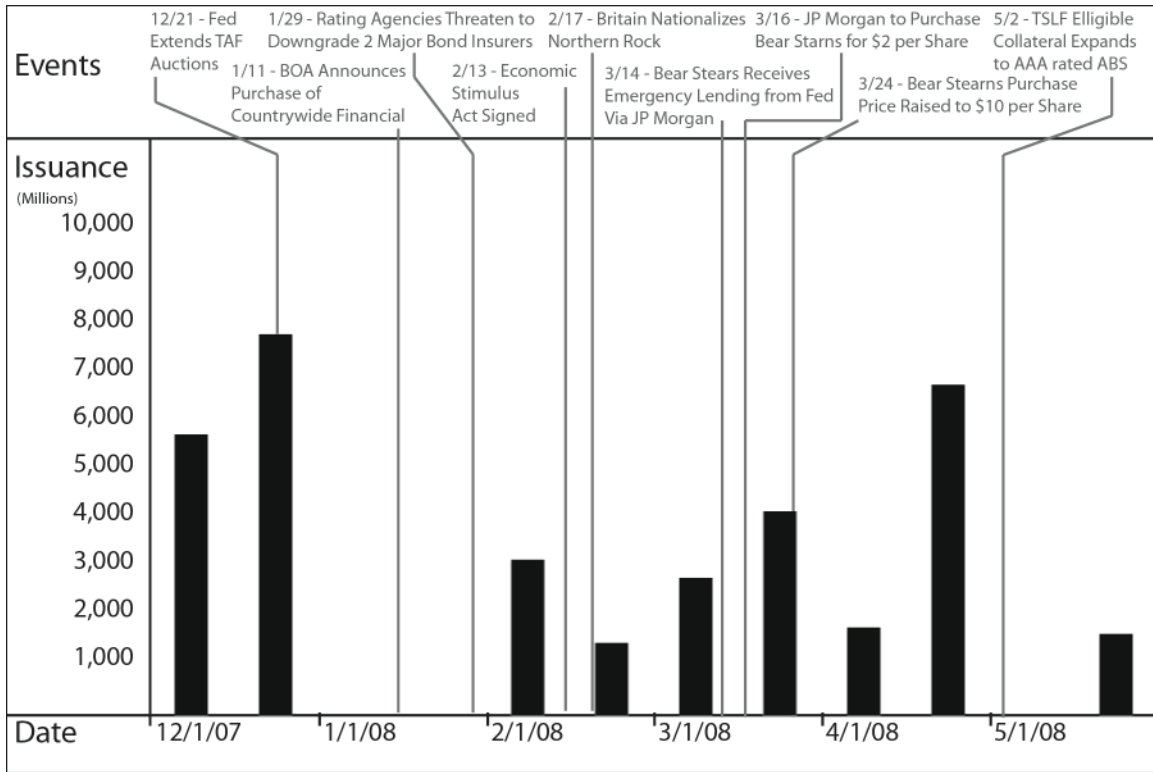
# Chapter 4 - CMBS Issuance



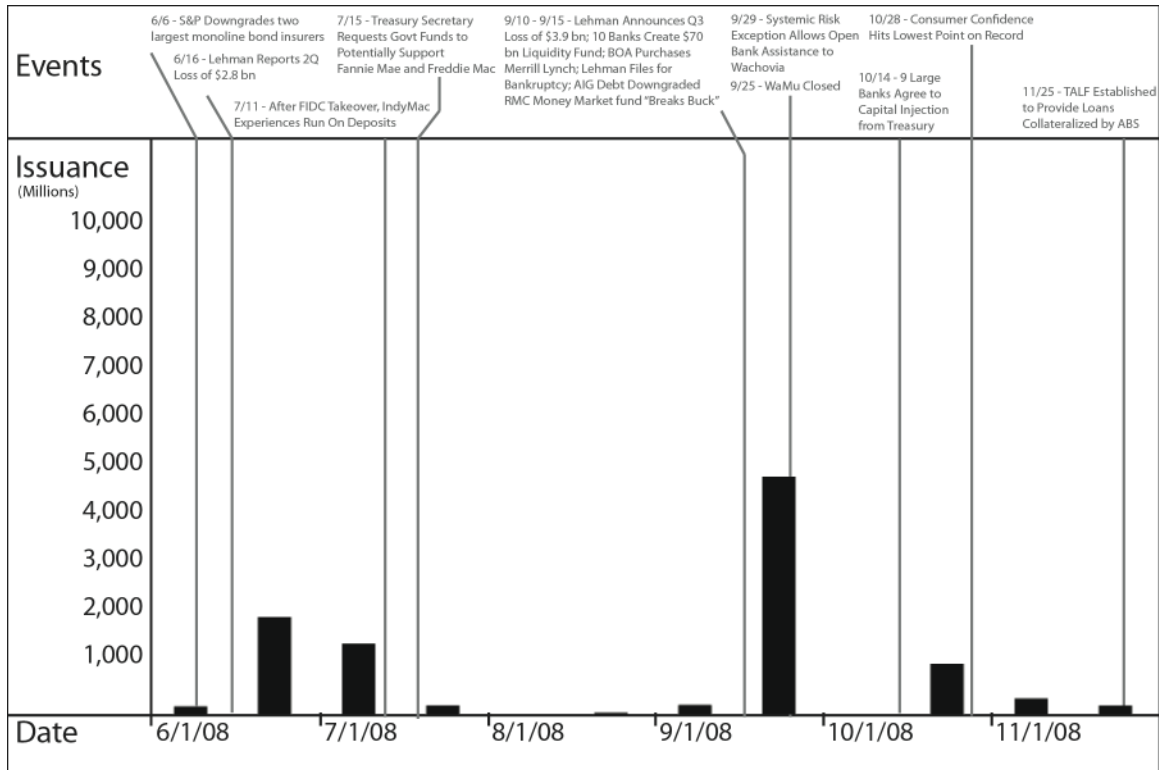
The monthly issuance shown above offers a visual perspective for the size and length of the collapse in the marketplace. The data was gathered from CMAAlert and sorted here by the date of the issuance’s pricing. Some noticeable trends here are the steep downward trend after June of 2007, the relative flatness in 2008 and early 2009 and then the slight upward trend from the middle of 2009 until June 2011. We will use six-month increments combined with financial crisis events to help relate key dates in the financial crisis to fluctuations in issuance.



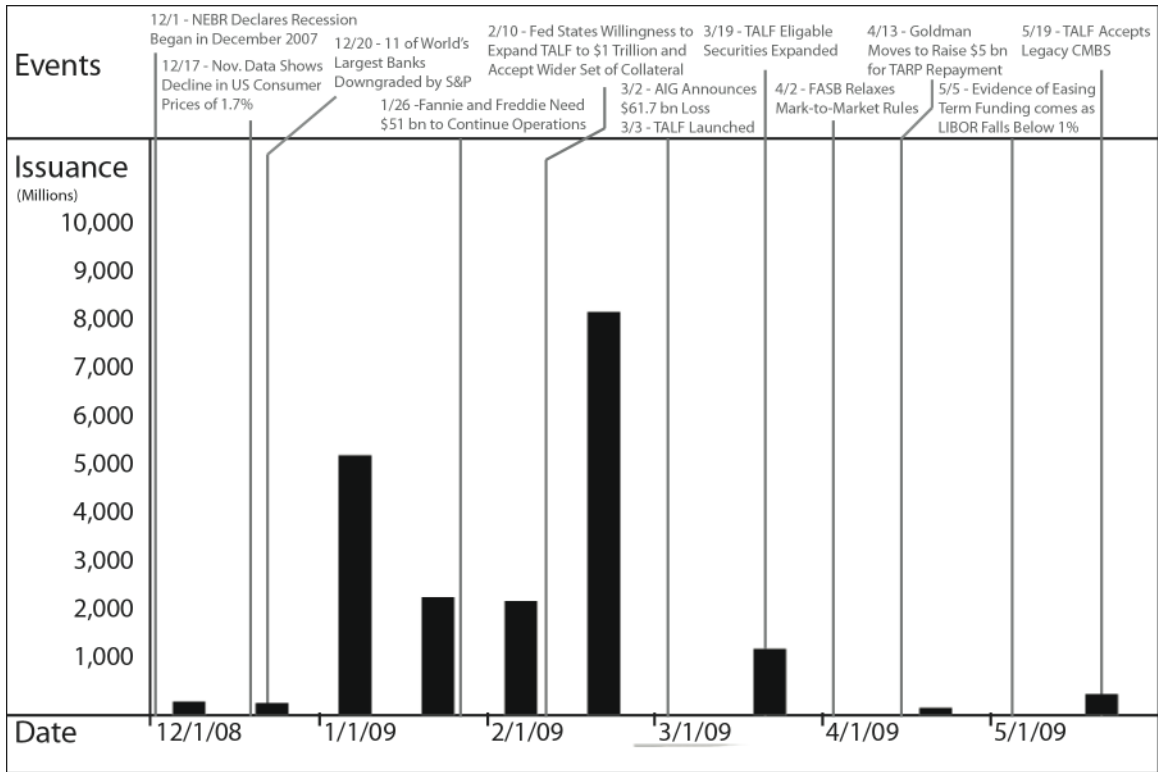
Shown above we have the initial six month of our financial crisis timeline. The dollar amount issued is shown in half-month increments. The largest issuance in our data set comes in the second half of June with \$34,801 mm occurring as Bear Stearns announces the losses to two of its major hedge funds. Shortly after that announcement, the SEC begins their investigation of the CDO issuers. In the two weeks following the SEC’s announcement, issuance is just \$8,488 mm and just \$1,714 mm in the first two weeks of July. As additional negative news comes from Northern Rock and Citigroup, issuance continues a downward trend, averaging a 19.56% drop in bi-weekly issuance from August through October. In November issuance increases to a total monthly issuance of \$25,237 mm but, as we will observe, the increase in issuance is temporary. During this six-month period the average monthly issuance is \$28,802 mm.



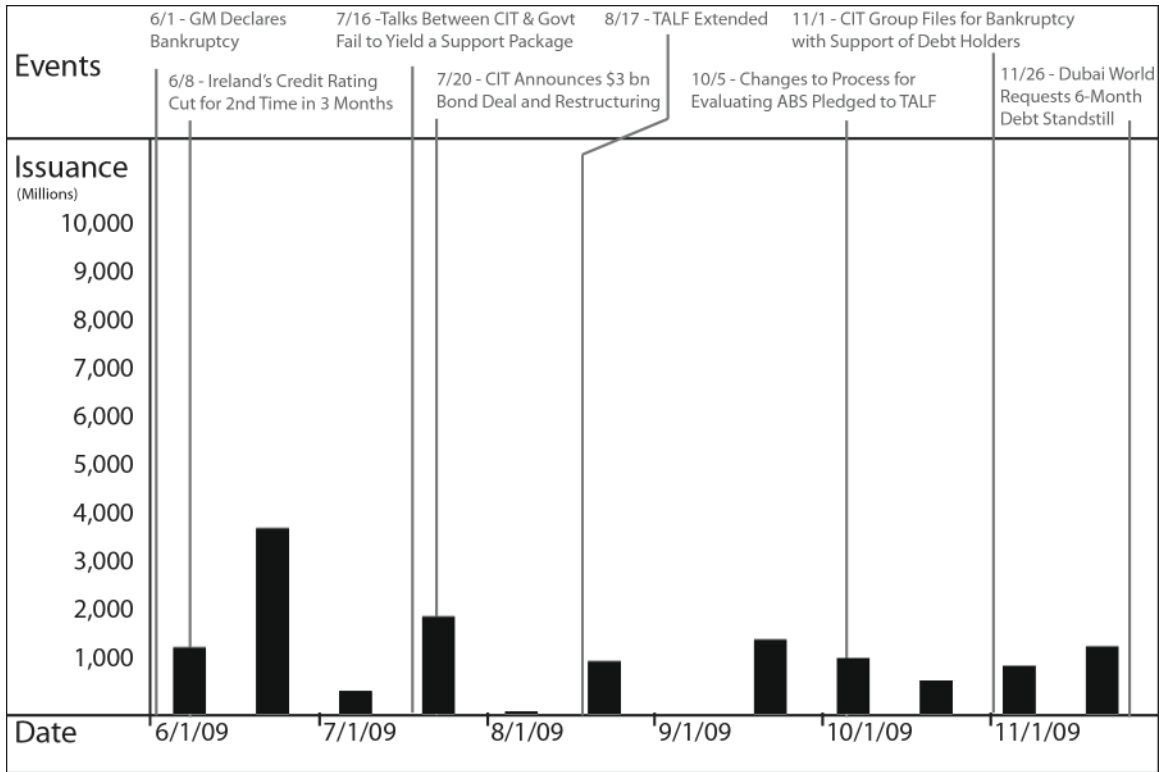
From this point forward, our scale y-axis scale shifts from a previous maximum of \$40,000 mm to a maximum of \$10,000 mm so that we can better observe the relative changes with regards to the news or events of the crisis. In January of 2008 we observe the only complete month in our data set with no new issuance. During that time, Bank of America announces their purchase of Countrywide Financial and the ratings agencies threaten to downgrade two large bond insurers. As JP Morgan completes its purchase of Bear Stearns, issuance reaches \$6,902 mm in the second half of April before flat lining in the first half of May. From February through the end of May, average monthly issuance is \$5,603 mm, less than one-fifth of the average issuance in our previous six-month set.



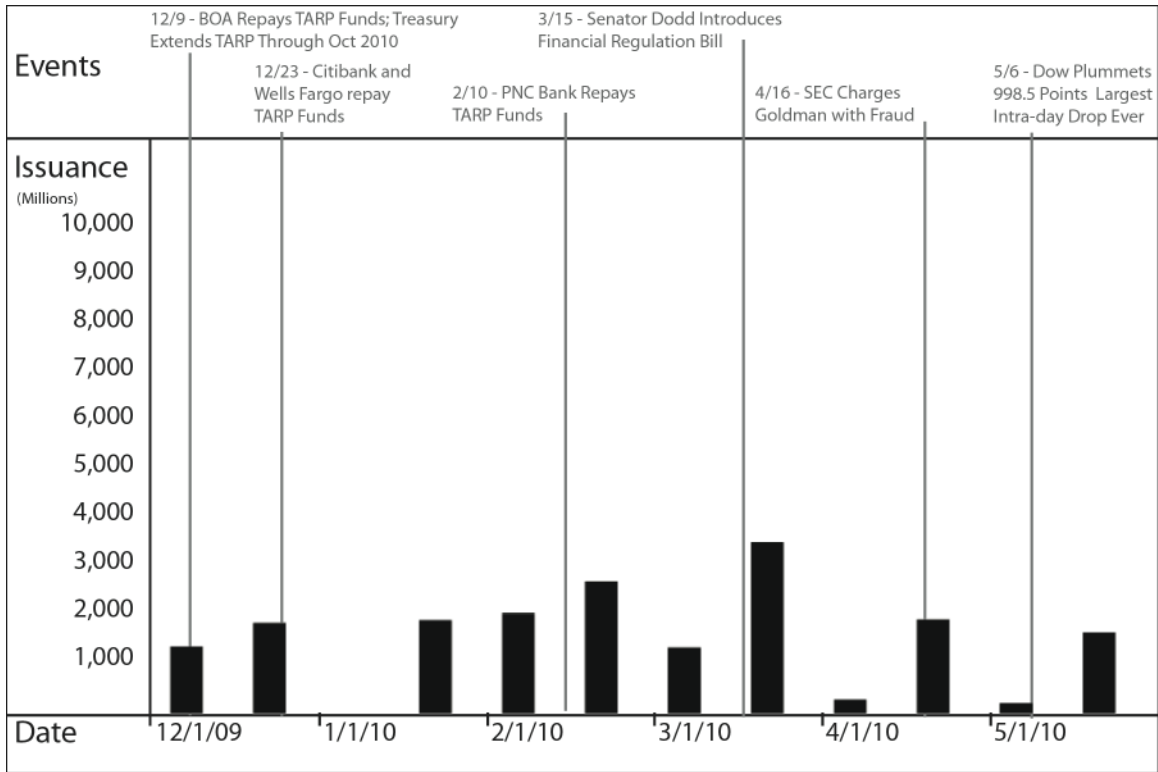
In the beginning of June, S&P officially downgrades the two largest monoline bond insurers followed by the enormous second quarter loss posted by Lehman Brothers. Issuance remains low as Treasury Secretary Paulson requests government funding to support Fannie Mae and Freddie Mac. In the six weeks following Secretary Paulson’s statement, issuance is a combined \$251 mm with only \$50 mm coming in the month of August. The first two weeks of September are fraught with bad news led by the Bank of America purchase of Merrill Lynch, the Lehman Brothers bankruptcy, AIG’s ratings downgrade and the first money market fund to officially “break the buck”. At the end of November, the TALF is established to help reestablish liquidity in limited asset backed security markets. During this six-month period the average monthly issuance is \$1,769, continuing the downward trend observed in the original issuance graph.



At the end of 2008, more negative news is announced as the NEBR declares that a recession officially began one year previous, US Consumer Prices are declining and 11 of the world’s largest banks are all downgraded by S&P. Despite the news, 2009 starts out strong with \$7,856 mm and \$10,729 mm of new issuance in January and February respectively. During that time, it is announced that Fannie and Freddie need \$51 bn in additional funding to continue operations and the Federal Reserve states a willingness to expand TALF to accept a wider set of collateral, hinting at a possibility of including CMBS which is followed by a two-week issuance of \$8,359 mm, the largest since November of 2007. In the beginning of March, AIG announces a Q4 loss of \$61.8 bn, the largest loss in history. Throughout the remainder of the six-months, issuance remains low totaling just \$2,009 mm in March through May. In April Goldman Sachs provided some positive news by announcing their intention to repay \$10 bn TARP funds. Also, it was announced towards the end of May that the TALF program would now accept legacy CMBS as collateral.



During the six-month period beginning in June and ending in November 2009, we notice a more evenly distributed set of issuances averaging \$2,478 mm per month. The news is mostly unrelated to CMBS or real estate in general until mid-August when the TALF program is extended. In November the proposed changes in evaluating TALF assets are introduced but CMBS bonds are already subject to additional measures of creditworthiness and are unaffected by the additional requirements.



In the final six-month series of our analysis, we begin to see a series of positive news events with Bank of America, Citibank, Wells Fargo and PNC all announcing intention to repay TARP funds. The data appears to be heading in a positive trend with average monthly issuance at \$3,196 mm for this six-month period. Shown below, in the 13 months succeeding this chart, average monthly issuance has trended upward to \$5,796 mm per month with a minimum of \$1,744 mm and a maximum of \$9,679, indicating that the issuance is still fairly evenly distributed and trending upward.

## Chapter 5 - Pricing Timeline

To explore the changes in pricing during the financial crisis we will observe a set of data and compare the pricing changes in the same six-month increments that we used with the issuance data. The individual bonds we will analyze are AAA, AA, A and BBB rated tranches equally distributed from deals placed in 2001 – 2007.<sup>15</sup> The data was provided by Trepp and the deals were selected from Trepp’s annual portfolios of public conduit deals. Each deal was chosen at random with the qualification that delinquency is currently at or below 10%. In all, 34 deals were selected with 134 individual bonds included in the analysis. The average size of the offering is \$1,758,407,668 and the average current delinquency is 4.37%.<sup>16</sup>

Using the individual bond pricing we can observe the time series data as it unfolds during the crisis and also have a visual representation of how the individual bonds change in relation to one another.

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<sup>15</sup> The CUSIPs, Deal Name and Vintage are listed in Appendix A

<sup>16</sup> As of July 6<sup>th</sup>, 2011



## Daily Price Changes on Key Dates

In order to identify key dates during the financial crisis, the daily changes of the bonds were analyzed separately and as a group. The table below depicts the each tranche's movement on key dates. The individual dates represent the largest daily changes in pricing across all ratings and vintage:

Date	AAA	AA	A	BBB
9/19/2008	-0.07%	2.62%	3.40%	5.09%
10/24/2008	-1.89%	-2.69%	-3.26%	-3.84%
11/13/2008	-5.40%	-6.00%	-5.76%	-5.06%
11/18/2008	-5.78%	-9.51%	-10.23%	-9.64%
11/20/2008	-4.67%	-8.17%	-8.84%	-8.42%
11/24/2008	4.33%	3.13%	2.77%	2.27%
11/25/2008	3.36%	-3.00%	-6.21%	-5.72%
11/26/2008	-5.27%	-7.97%	-7.76%	-8.60%
11/28/2008	-6.56%	-9.28%	-9.63%	-11.53%
12/1/2008	1.52%	-1.32%	-2.12%	-2.45%
12/2/2008	3.43%	3.19%	2.93%	2.46%
12/4/2008	3.24%	2.12%	1.77%	1.32%
12/5/2008	3.53%	1.68%	1.11%	0.76%
3/25/2009	2.56%	3.56%	3.70%	3.23%
5/20/2009	2.43%	9.68%	9.16%	8.32%
5/21/2009	-2.49%	5.22%	6.09%	5.52%
7/31/2009	0.69%	2.17%	3.40%	5.04%

On the surface it's interesting to note that the bonds do not all move in sync on each of these days, although it is consistently the AAA tranche that is out of step with the AA, A and BBB. To get a better understanding of these movements, we will analyze the news that was released on each of these dates.

September 19, 2008 – Treasury Secretary Paulson held a news conference and spoke about the necessity of the U.S. Government's further involvement in providing funds for troubled assets and increasing liquidity. His speech repeatedly mentioned the need to purchase troubled mortgage assets.

October 23, 2008 – Former Federal Reserve Chairman Alan Greenspan released his prepared remarks for the House Committee of Government Oversight and Reform. His speech mentions that we are “in the midst of a once-in-a century credit tsunami” and that “governments are being required to take unprecedented measures”. The focus of his speech is subprime mortgage backed securities, ending with the claim that we need to “seek ways to reestablish a more sustainable subprime mortgage market”.

November 12, 2008 – Treasury Secretary Paulson announces that the government will begin to help non-bank financial institutions with bailout funds, stating “the important markets for securitizing credit outside the banking system also need support.” He also states that the government is no longer planning to purchase troubled mortgage assets as part of the plan.

November 18, 2008 – Less than one year after origination, two large commercial loans missed debt service payments and were transferred to special servicers. A \$209 mm loan backed by two Westin hotels and a \$125.2 mm loan backed by a California retail center are part of two JPMorgan Chase issuances. The rapid default of these large loans triggers several days of media coverage on underwriting standards, default predictions and rising spreads.

November 24, 2008 – Federal Reserve Board authorizes Term Asset-Backed Securities Loan Facility (TALF).

November 25, 2008 – Federal Reserve Board officially announces the creation of TALF which will lend up to \$200 bn on a non-recourse basis to holders of AAA-rated ABS backed by newly and recently originated consumer and small business loans. Although not including CMBS initially, the Terms and Conditions state that the set of permissible underlying credit exposures may be expanded to include CMBS. Also included is the restriction that originators of the loans must comply with executive compensation guidelines within the program. Specific details of the plan are not immediately released and the plan is subject to change in coming weeks.<sup>17</sup>

Also on November 25, Federal Reserve announces that it is beginning to purchase direct obligations of housing-related government-sponsored enterprises and the Federal Home Loan banks. The purchase includes mortgage backed securities backed by Fannie Mae, Freddie Mac and Ginnie Mae.

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<sup>17</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20081125a.htm>

December 1, 2008 – NBER declares that December 2007 officially marked the beginning of a recession.

December 2, 2008 – Federal Reserve announces the three month extension of three liquidity facilities including the Asset-Backed Commercial Paper Money Market Fund Liquidity Facility (AMLF) and the Term Securities Lending Facility (TSLF). The AMLF provides loans to depository institutions to purchase asset-backed commercial paper from money market mutual funds. Investment grade mortgage-backed securities are listed among the TSLF's eligible collateral.<sup>18</sup>

March 23, 2008 – Treasury announces details of Public-Private Investment Program (PPIP), part of President Obama's Financial Stability Plan. The plan includes two core programs, the Legacy Loans Program and the Legacy Securities Program. The Legacy Securities Program is specifically designed to add liquidity to mortgage backed securities markets. <sup>19</sup>

May 19, 2009 – The Federal Reserve Board announces that, beginning in July, certain high-quality CMBS issued before January 1, 2009 will become eligible collateral. The announcement is meant to build off of the March 23 inclusion of legacy CMBS and help spawn new issuance, which we observed previously in the months beginning June 2009.<sup>20</sup>

July 31, 2009 – FDIC launches a pilot Legacy Loans Program to purchase hard to value real estate securities.

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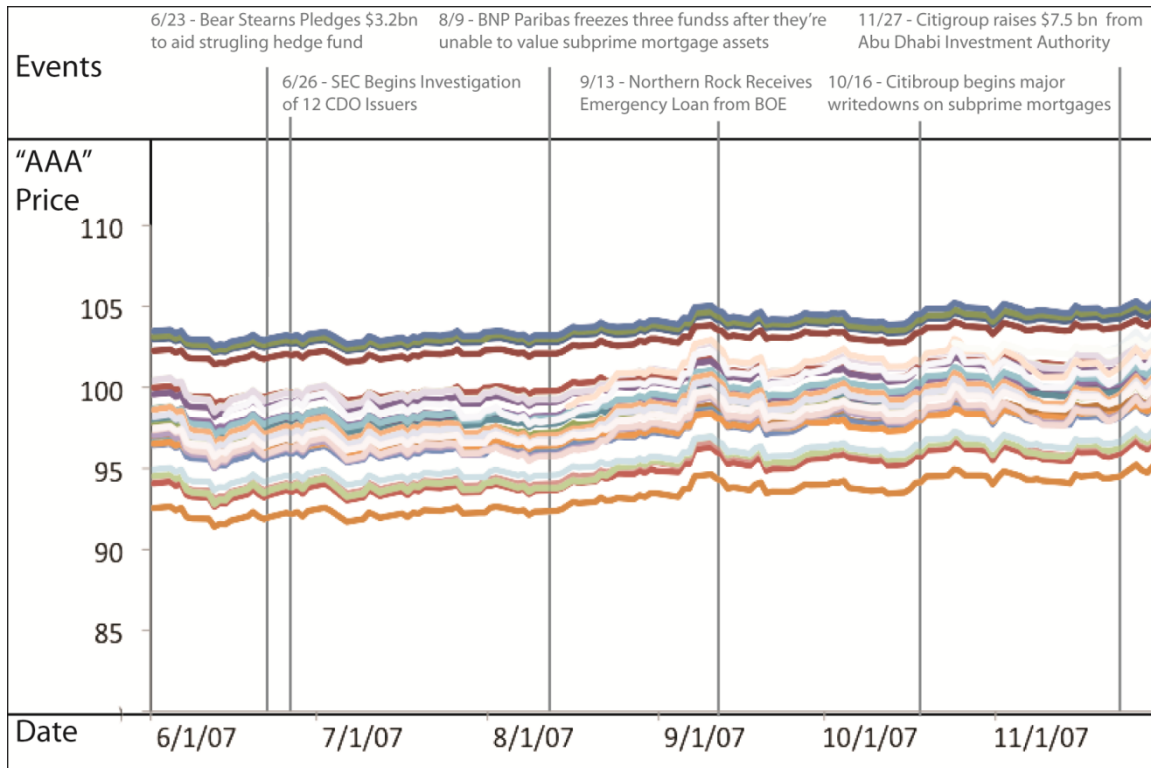
<sup>18</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20081202b.htm>

<sup>19</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20090323b.htm>

<sup>20</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20090319a.htm>

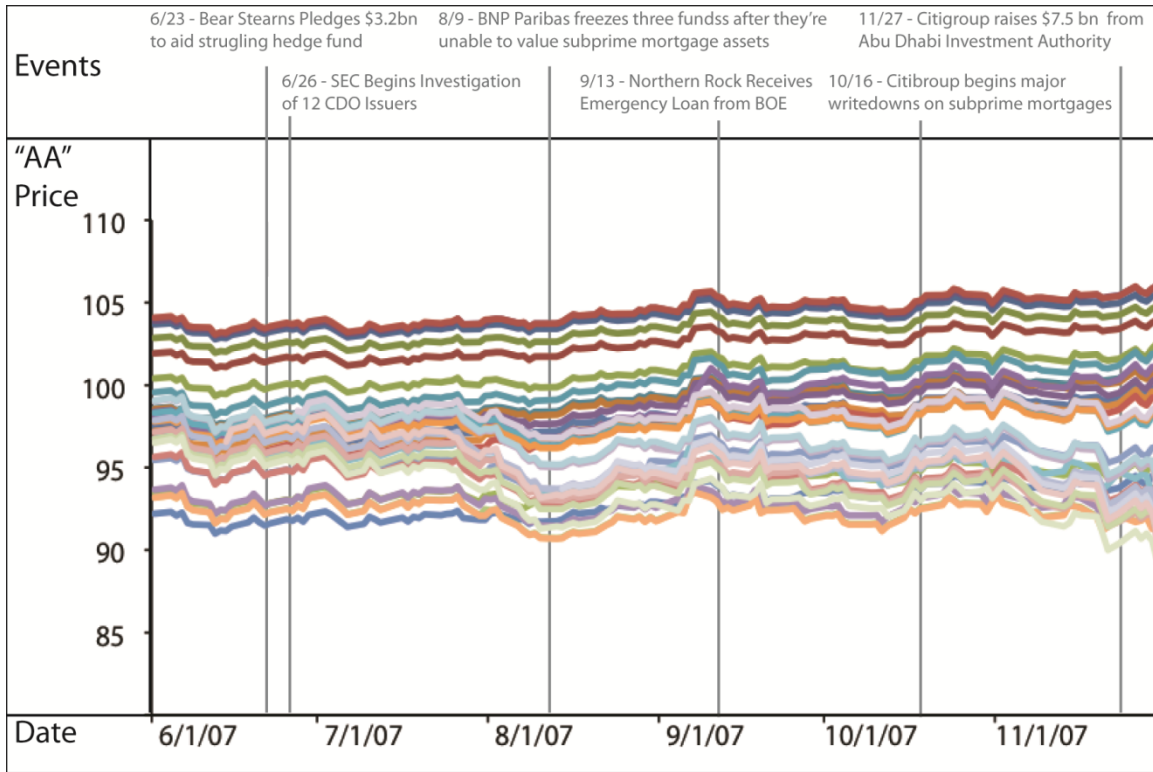
## Time Series Data

June 2007 – November 2007



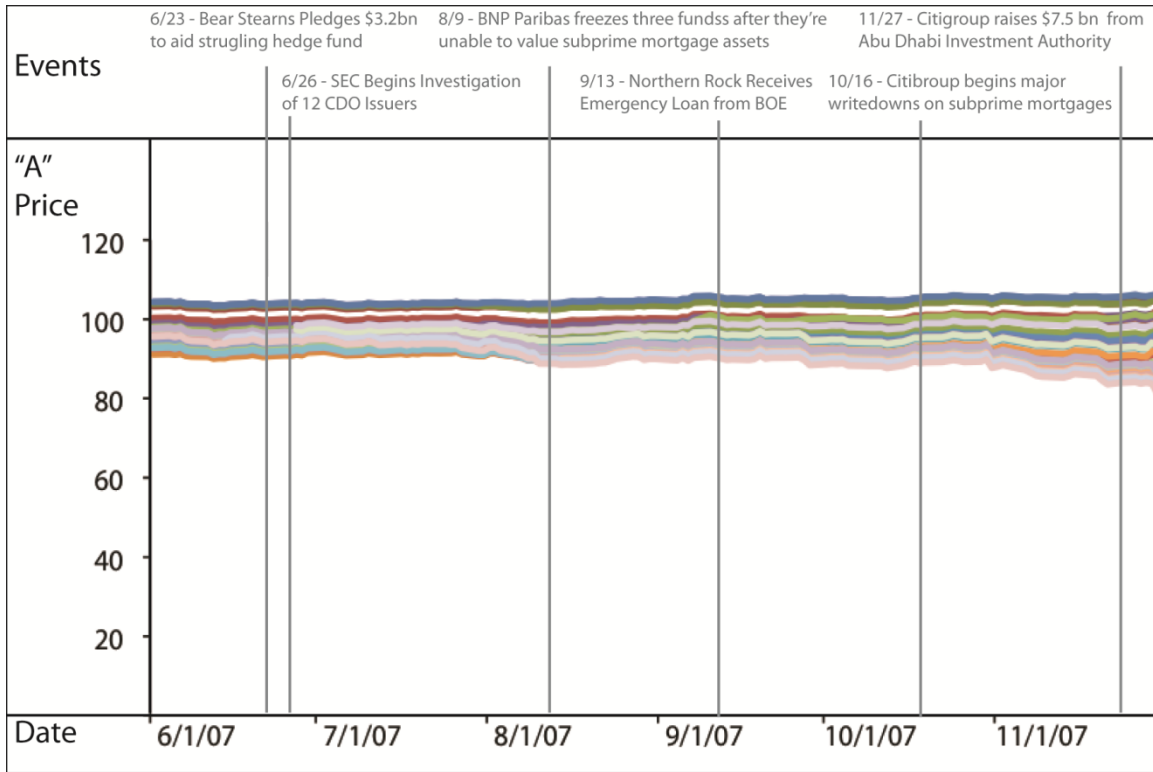
5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
0.81%	9/7/2007	-0.71%	9/20/2007
0.80%	11/26/2007	-0.58%	6/7/2007
0.54%	11/15/2007	-0.50%	10/31/2007
0.47%	9/5/2007	-0.49%	6/12/2007
0.45%	11/1/2007	-0.49%	7/5/2007

In our initial six month series, the pricing is stable in comparison with subsequent months. We do not observe any single day movements of more than 1% and the only large movement that occurs in conjunction with a news or policy event is the 10/31 drop of .5% as the FOMC lowers the federal funds rate 25 bp. We observe the sample of bonds trading in a tight band with 10.65 separating the highest and lowest priced bond of the sample. The bonds appear unaffected by the June 16<sup>th</sup> investigation of CDO issuers and the August 9<sup>th</sup> announcement from BNP Paribas.



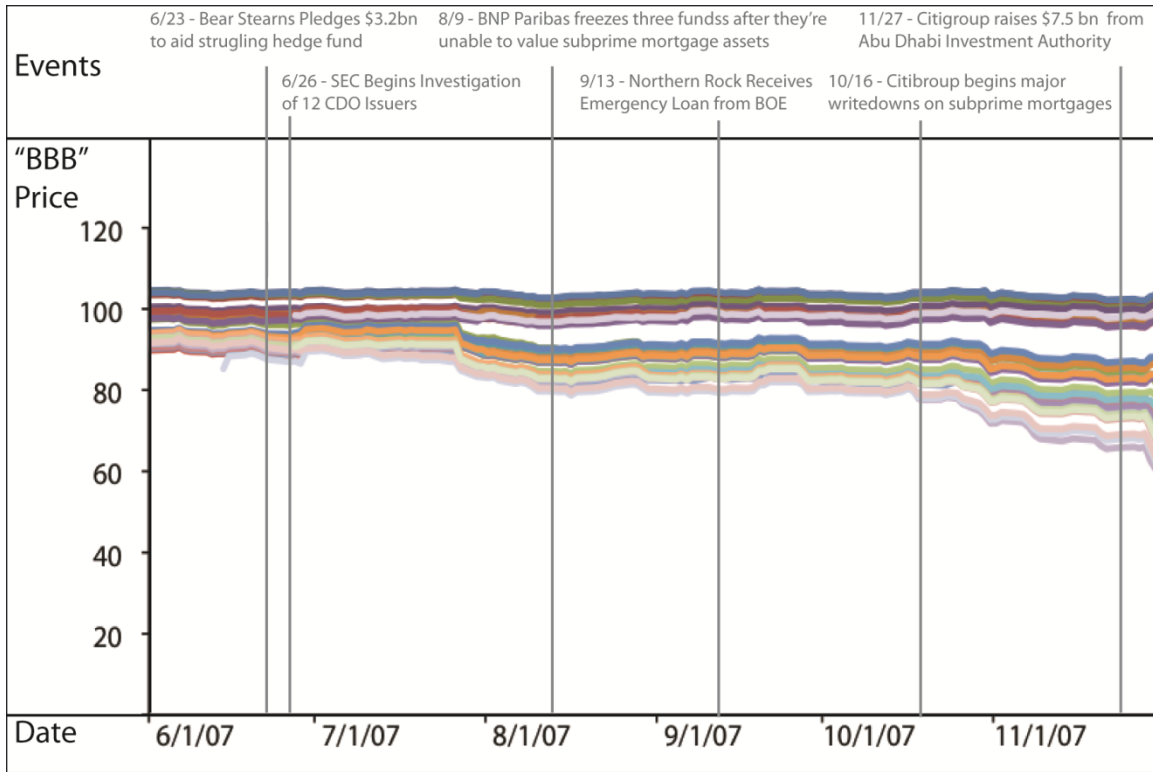
5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
0.81%	9/7/2007	-0.71%	9/20/2007
0.56%	11/26/2007	-0.66%	6/7/2007
0.49%	11/15/2007	-0.55%	7/5/2007
0.47%	6/29/2007	-0.53%	6/12/2007
0.46%	7/10/2007	-0.53%	11/20/2007

The AA bonds exhibit a similar pattern as the AAA bonds. The bonds all seem to trade in step with one another and do not show much of a reaction to any one piece of news aside from changes in the federal funds rate. The magnitude of the changes is also worth noting as we will observe much larger movements in the coming months.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
0.82%	9/7/2007	-1.42%	10/31/2007
0.61%	9/19/2007	-0.81%	9/28/2007
0.57%	11/15/2007	-0.72%	7/27/2007
0.57%	11/29/2007	-0.68%	9/20/2007
0.55%	6/29/2007	-0.68%	11/30/2007

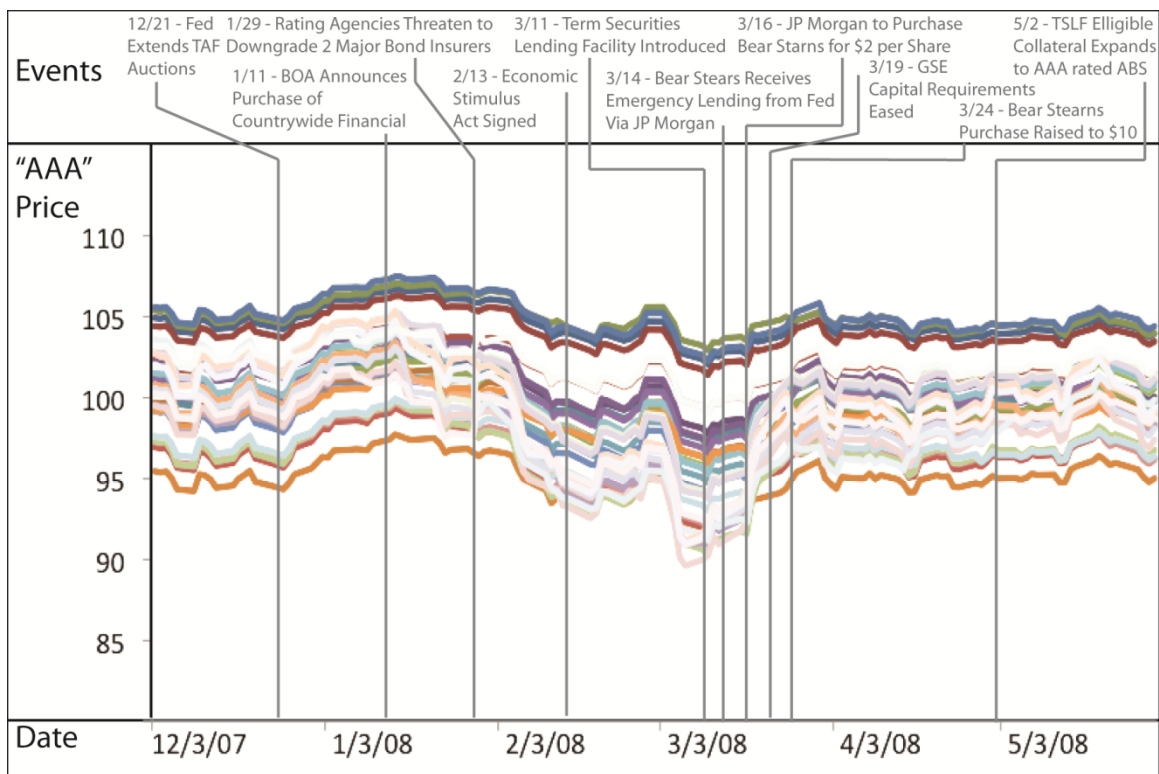
The A rated bonds follow the same trends as the AAA and AA tranches with the exception that all three of the federal funds rate adjustments occur in conjunction with a relatively large move in the average percentage change. The A bonds also do not appear to show any significant movement as BNP Paribas freezes three funds or Citigroup begins subprime related write downs.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
1.09%	9/19/2007	-2.61%	7/27/2007
1.06%	6/29/2007	-1.65%	10/31/2007
0.80%	9/7/2007	-1.42%	11/30/2007
0.70%	10/15/2007	-1.32%	7/30/2007
0.64%	10/16/2007	-1.24%	9/28/2007

The BBB bonds experience an interesting divergence on July 27<sup>th</sup> when the losses are heavier in issuances from 2004 – 2007, creating the fork in the graph shown above. The average loss for the later vintages is -3.87% while the 2001 – 2003 bonds post an average loss of -1.26%. Other large movements are observed around all three federal funds rate adjustments as well as the day Citigroup announces major write downs on subprime mortgages.

December 2007 – May 2008

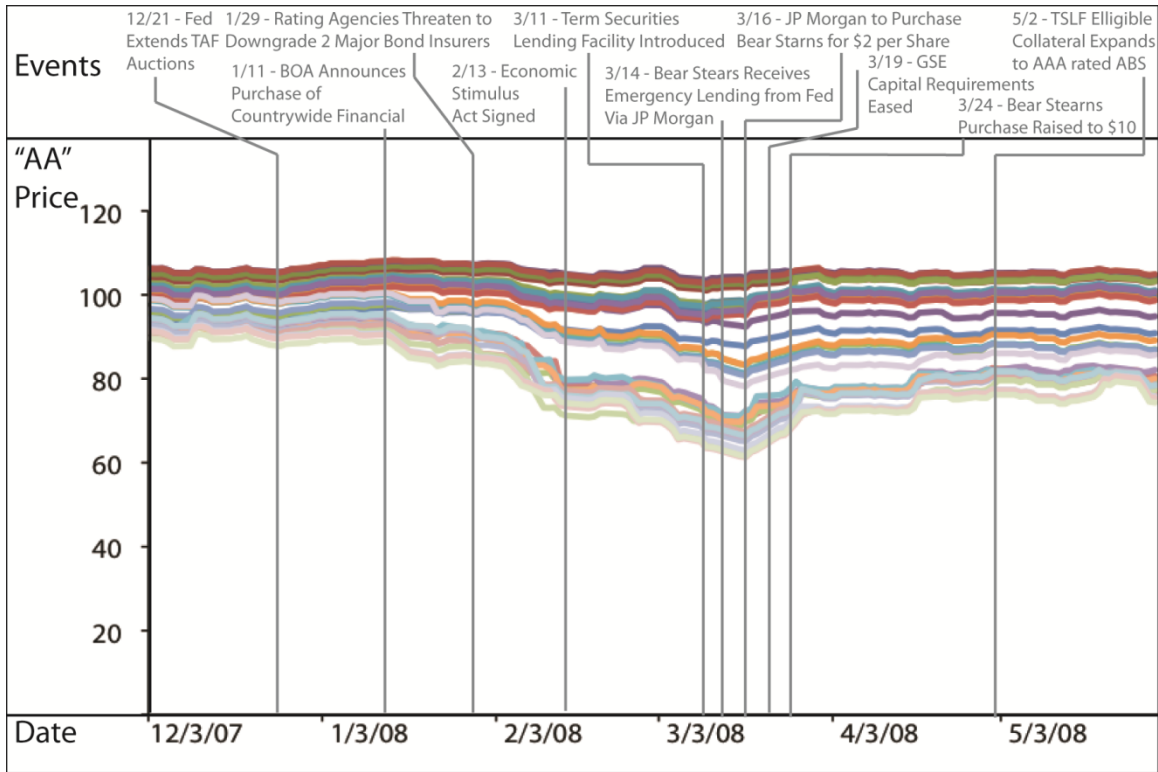


5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
1.61%	3/19/08	-1.54%	3/6/08
1.19%	12/11/07	-1.04%	4/1/08
1.01%	2/29/08	-0.95%	3/5/08
1.00%	2/21/08	-0.93%	2/6/08
0.89%	3/12/08	-0.80%	3/4/08

In this series we observe the AAA bonds experiencing large price movements when federal funds rates are adjusted on December 11<sup>th</sup>, January 22<sup>nd</sup>, March 18<sup>th</sup> and April 30<sup>th</sup>. The bonds also show a positive movement on March 12<sup>th</sup> as the Term Securities Lending Facility is introduced and includes residential mortgage backed securities as acceptable collateral.<sup>21</sup> In this series the average difference between the highest and lowest priced AAA bond is 10.25.

<sup>21</sup> <http://www.federalreserve.gov/newsevents/press/monetary/20070807a.htm>



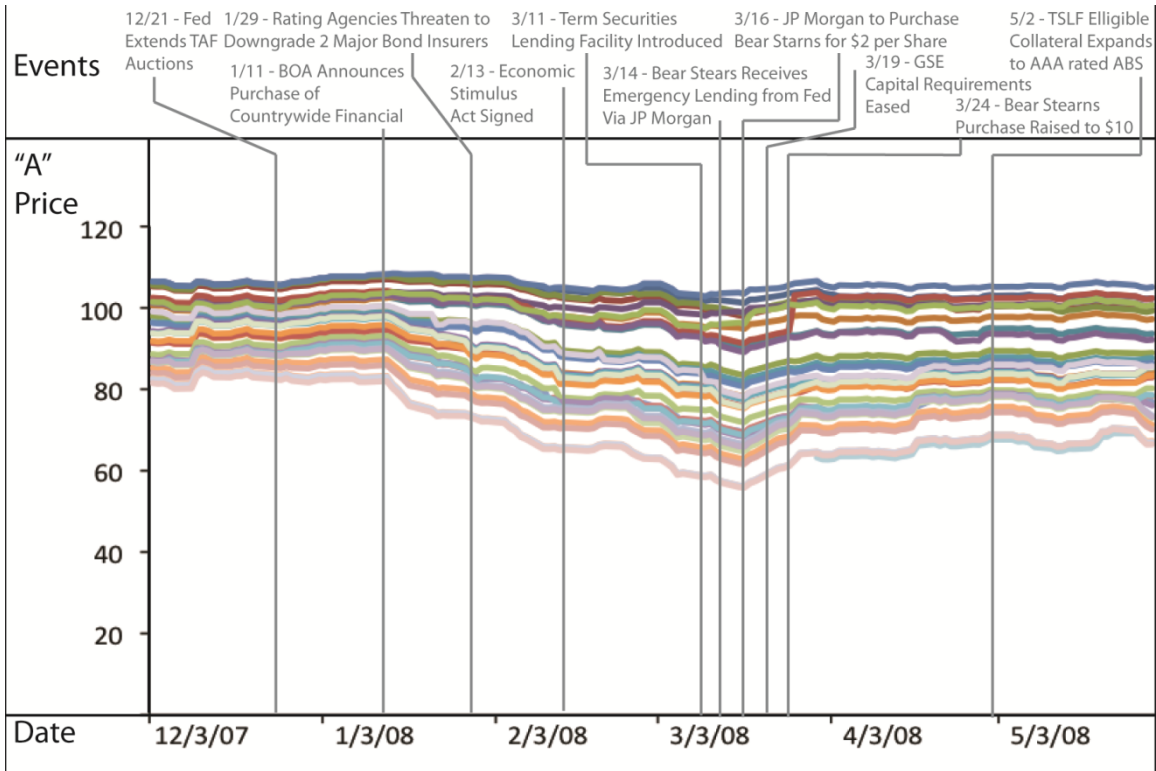


5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
1.91%	3/24/08	-2.29%	2/11/08
1.74%	4/18/08	-1.44%	3/6/08
1.62%	12/11/07	-1.27%	3/11/08
1.35%	3/19/08	-1.18%	3/5/08
1.13%	3/28/08	-1.13%	2/14/08

The AA bonds appear to show more sensitivity to the news and policy events than the AAA bonds. The largest average gain of this series comes as JPMorgan increased its purchase price of Bear Stearns to \$10 per share. On March 19<sup>th</sup>, Fannie Mae and Freddie Mac announced an initiative to increase liquidity in mortgage backed securities markets which coincided with a rise in valuations of 1.35%.<sup>22</sup> The decrease of -1.27% on March 11<sup>th</sup> coincides with the announcement of the Term Securities Lending Facility, a program which allows for AAA-rated private-label residential mortgage backed securities to be pledged as collateral.<sup>23</sup>

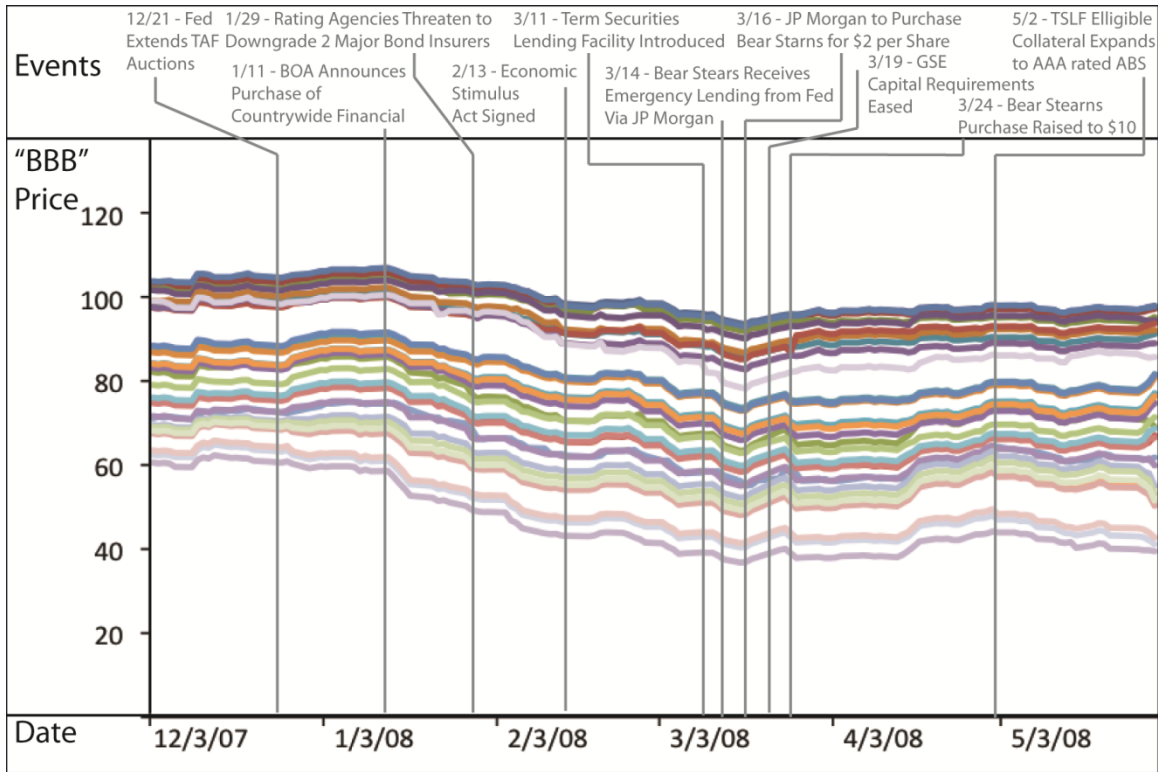
<sup>22</sup> Office of Federal Housing Enterprise Oversight News Release, March 19, 2008

<sup>23</sup> Federal Reserve Board of Governors March 11, 2008 Press Release



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
2.49%	3/24/08	-2.39%	2/11/08
2.48%	12/11/07	-1.69%	3/6/08
1.76%	4/18/08	-1.18%	3/5/08
1.35%	3/19/08	-1.17%	2/14/08
1.02%	3/28/08	-1.16%	3/17/08

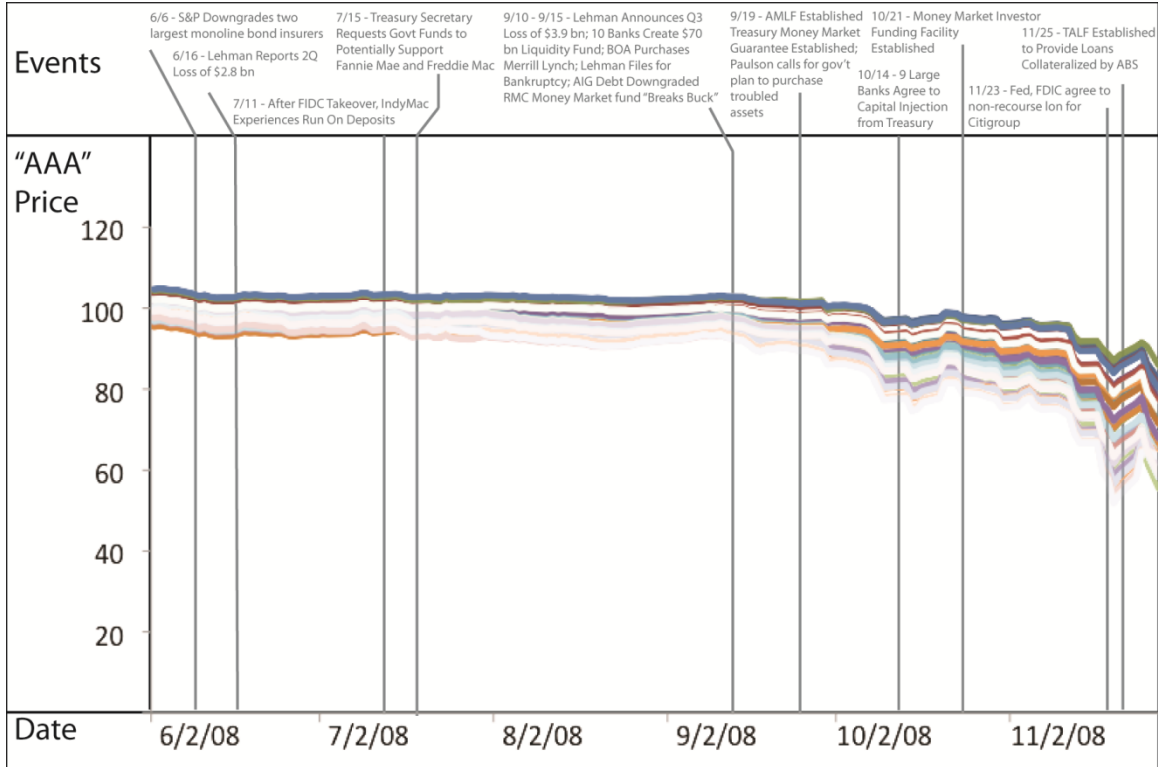
The A rated bonds have a similar pattern of response to news and policy as the AA bonds. They experience a larger decline after the announcement of JP Morgan's purchase of Bear Stearns for \$2 per share. That announcement acts as an inflection point that eventually levels out after the purchase price is raised to \$10 per share.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
2.58%	3/24/08	-1.79%	2/11/08
2.26%	12/11/07	-1.67%	3/14/08
1.70%	4/18/08	-1.57%	3/17/08
1.67%	4/28/08	-1.55%	3/6/08
1.41%	3/19/08	-1.54%	1/18/08

As we observed with the AA and A rated bonds, the largest single day gain was posted on the same day as JP Morgan’s increase in purchase price for Bear Stearns. It’s interesting to contrast the magnitude of the change with the AAA bonds which experienced a .83% average gain for the day, less than a third of the BBBs. The BBB bonds also post large losses on March 14<sup>th</sup>, the day that the FED approves JP Morgan’s purchase of Bear Stearns and on March 17<sup>th</sup>, the day after the \$2/share purchase price is announced.

June 2008 – November 2008

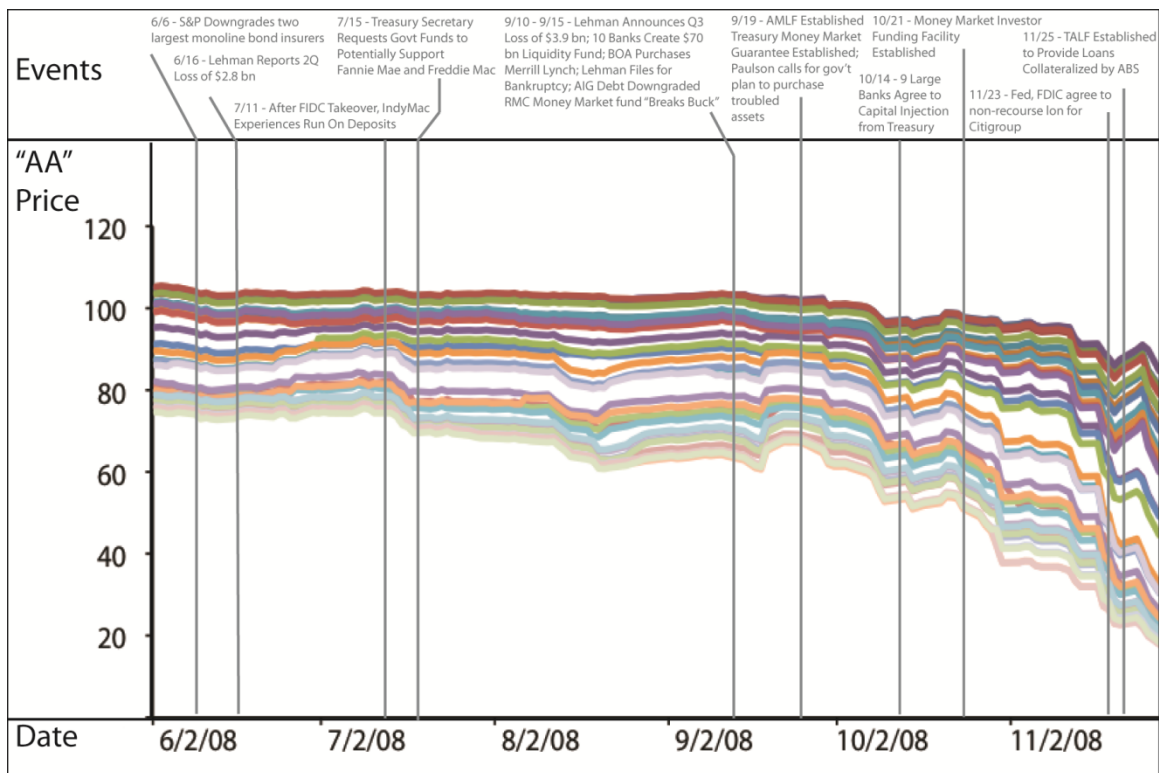


5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
4.33%	11/24/08	-6.56%	11/28/08
3.36%	11/25/08	-5.78%	11/18/08
2.62%	10/21/08	-5.40%	11/13/08
2.59%	11/21/08	-5.27%	11/26/08
0.93%	11/4/08	-4.67%	11/20/08

During this time we have a significant amount of negative news that was mentioned in previous sections. In the overview of significant daily pricing changes listed in a table at the beginning of this section, nine of the dates appear during this six-month interval. The difference between the highest valued AAA bond and the lowest widens to 14.06, suggesting that we might witness a divergence along vintage similar to the AA, A and BBB bonds in previous months.

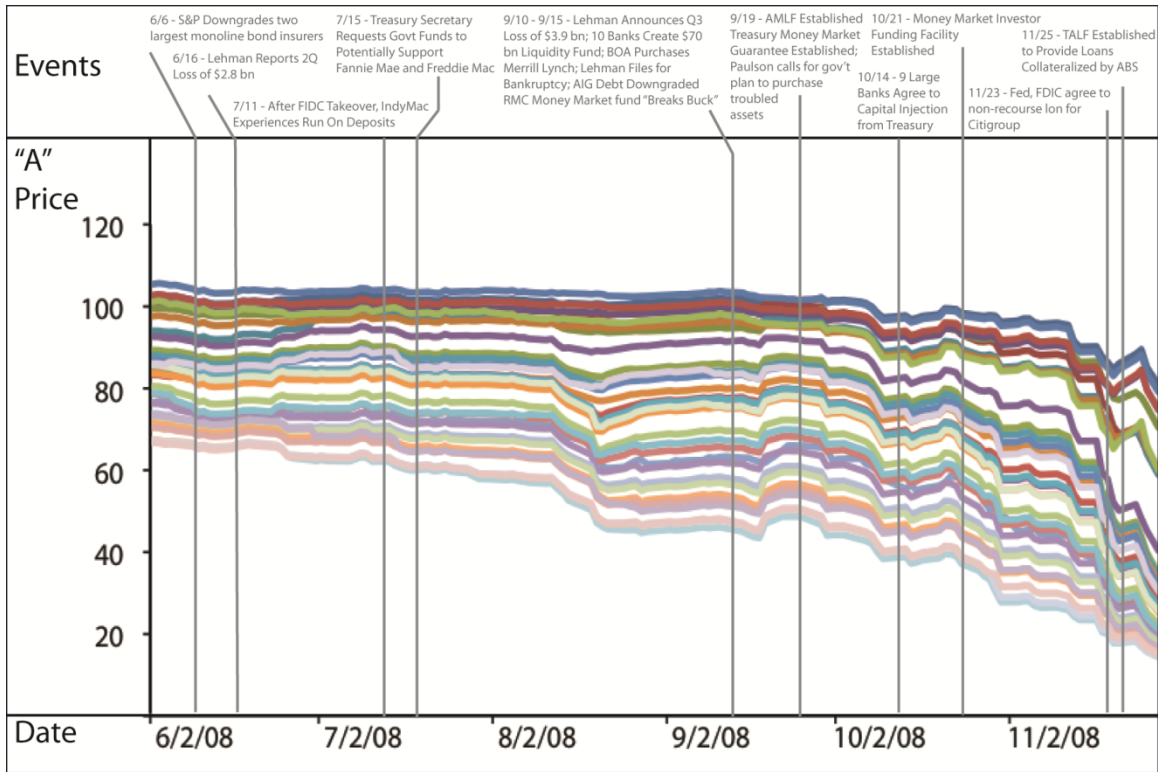
In this set, the period between November 24<sup>th</sup> and 28<sup>th</sup> is of particular interest. On the 23<sup>rd</sup>, the Treasury Department and Federal Reserve offer to guarantee a pool of Citigroup's assets that total \$306 billion comprised primarily of residential and commercial mortgage backed securities.<sup>24</sup> The bonds initially trade up for two days until TALF is officially introduced. At that point, the following two trading days witness steep declines.

The announcement of the Money Market Investor Funding Facility also appears to have a significant effect across all tranches. The October 21<sup>st</sup> announcement is accompanied by a boost of over 2% for each grouping.



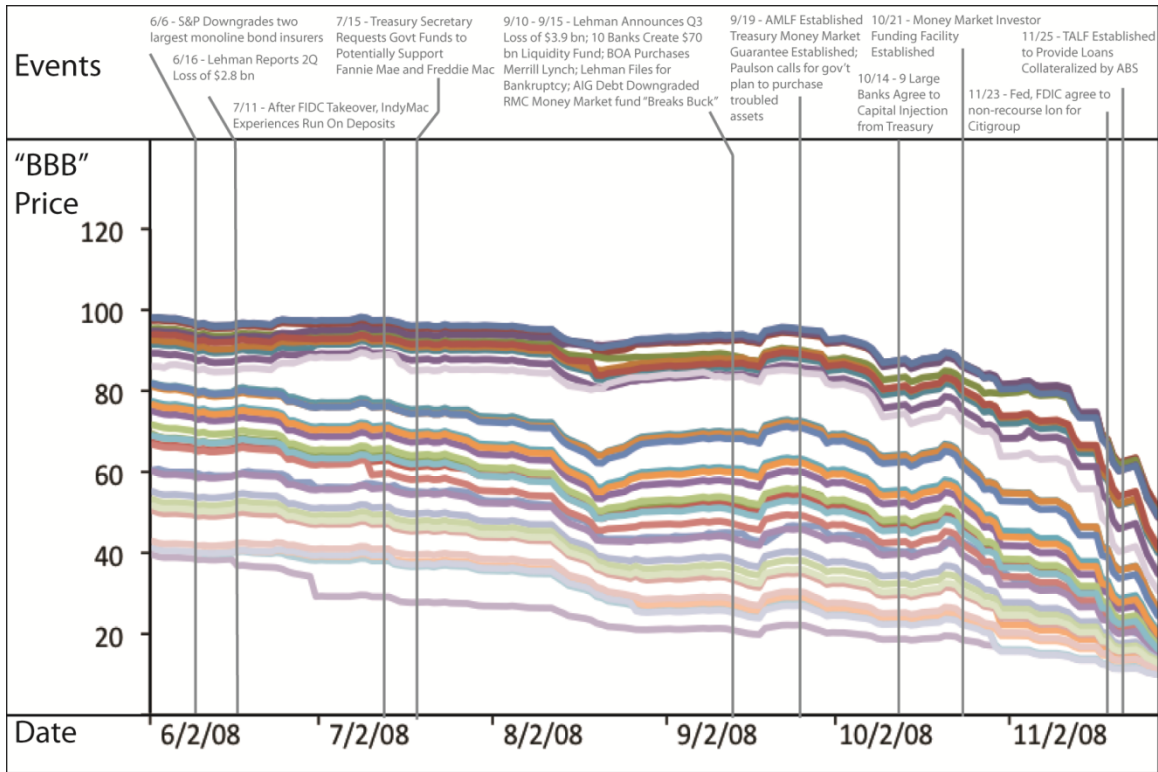
5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
3.13%	11/24/08	-9.51%	11/18/08
2.62%	9/19/08	-9.28%	11/28/08
2.24%	10/21/08	-8.17%	11/20/08
0.97%	9/22/08	-7.97%	11/26/08
0.91%	10/20/08	-6.00%	11/13/08

<sup>24</sup> Federal Reserve Board of Governors Press Release November 23, 2008



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
3.40%	9/19/08	-10.23%	11/18/08
2.77%	11/24/08	-9.63%	11/28/08
2.15%	10/21/08	-8.84%	11/20/08
1.61%	9/22/08	-7.76%	11/26/08
1.08%	10/20/08	-6.21%	11/25/08

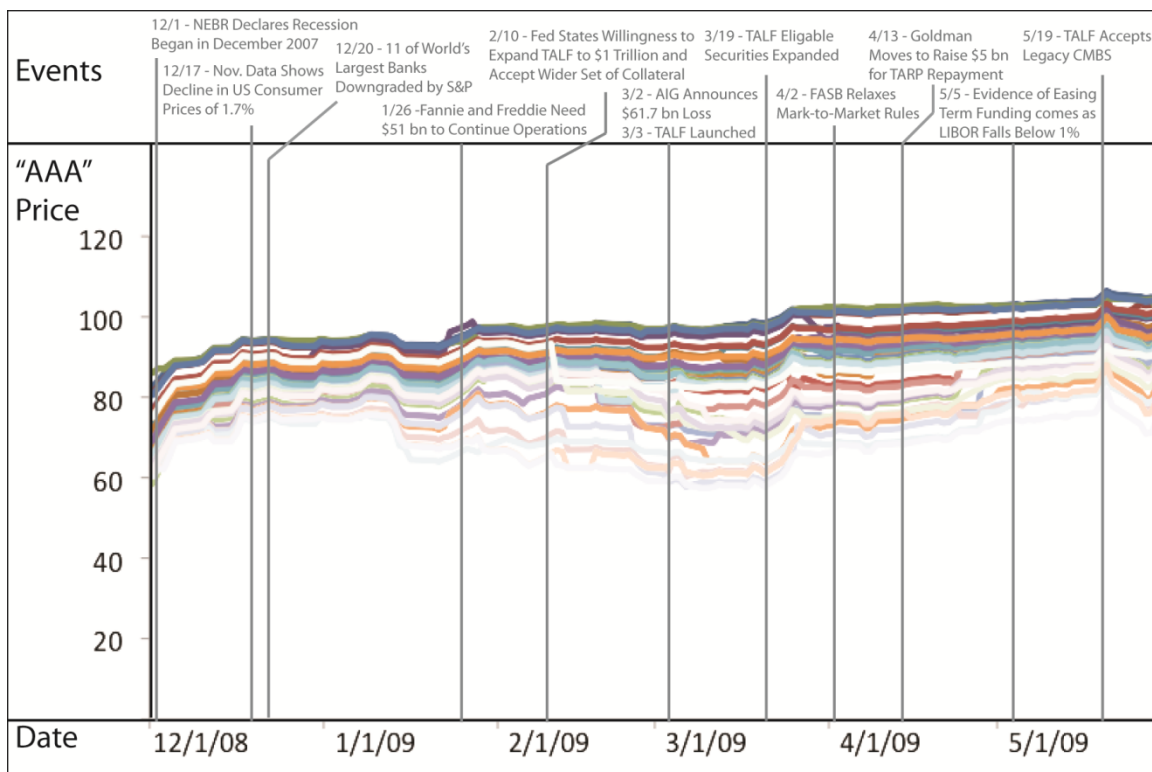
The September 19<sup>th</sup> speech by Treasury Secretary Paulson coincides with jump in valuation for AA, A and BBB rated bonds. The increase is magnified in the lower rated classes with an increased effect on more recent vintages.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
5.09%	9/19/08	-11.53%	11/28/08
2.81%	10/21/08	-9.64%	11/18/08
2.27%	11/24/08	-8.60%	11/26/08
2.21%	9/22/08	-8.42%	11/20/08
1.33%	10/17/08	-6.17%	10/31/08

Another interesting trend is the convergence of the BBB prices after details of the TALF program emerge. The difference between the highest and lowest priced bond reached a high of 73.99 on September 29<sup>th</sup>, gradually decreasing to 51.97 on November 24<sup>th</sup> before collapsing to 41.15 on November 28<sup>th</sup>.

December 2008 – May 2009

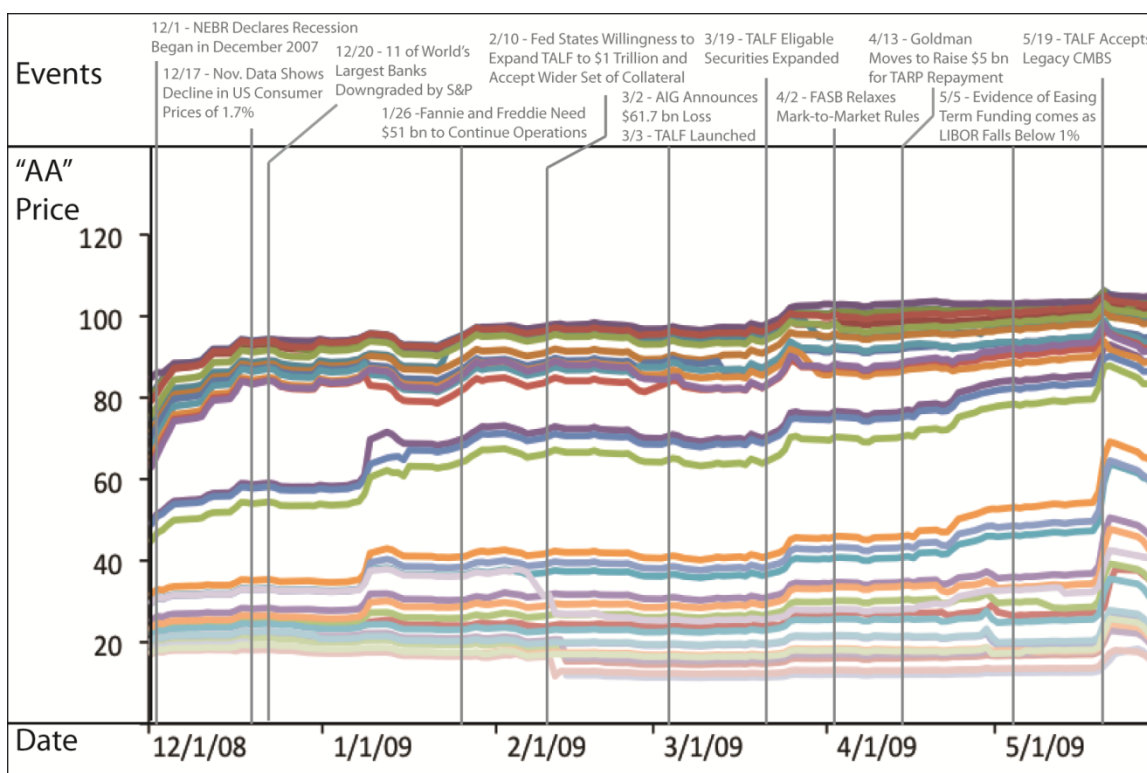


5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
3.53%	12/5/08	-2.55%	1/14/09
3.43%	12/2/08	-2.49%	5/21/09
3.24%	12/4/08	-1.88%	5/26/09
2.91%	3/23/09	-1.59%	2/19/09
2.82%	12/17/08	-1.57%	2/25/09

In December we begin to observe a price recovery in the CMBS bonds of all vintages as documented in the percentage change chart at the beginning of the section. The gains in early December are more clearly depicted in the AAA bonds as well as early-vintage AA and A bonds that were already trading at higher prices when compared to their newer counterparts. In addition, the May 19<sup>th</sup> announcement that TALF will accept Legacy CMBS as collateral does not coincide with as large a gain in the AAA bonds as it does with the other classes. This series of data shows the peak of the



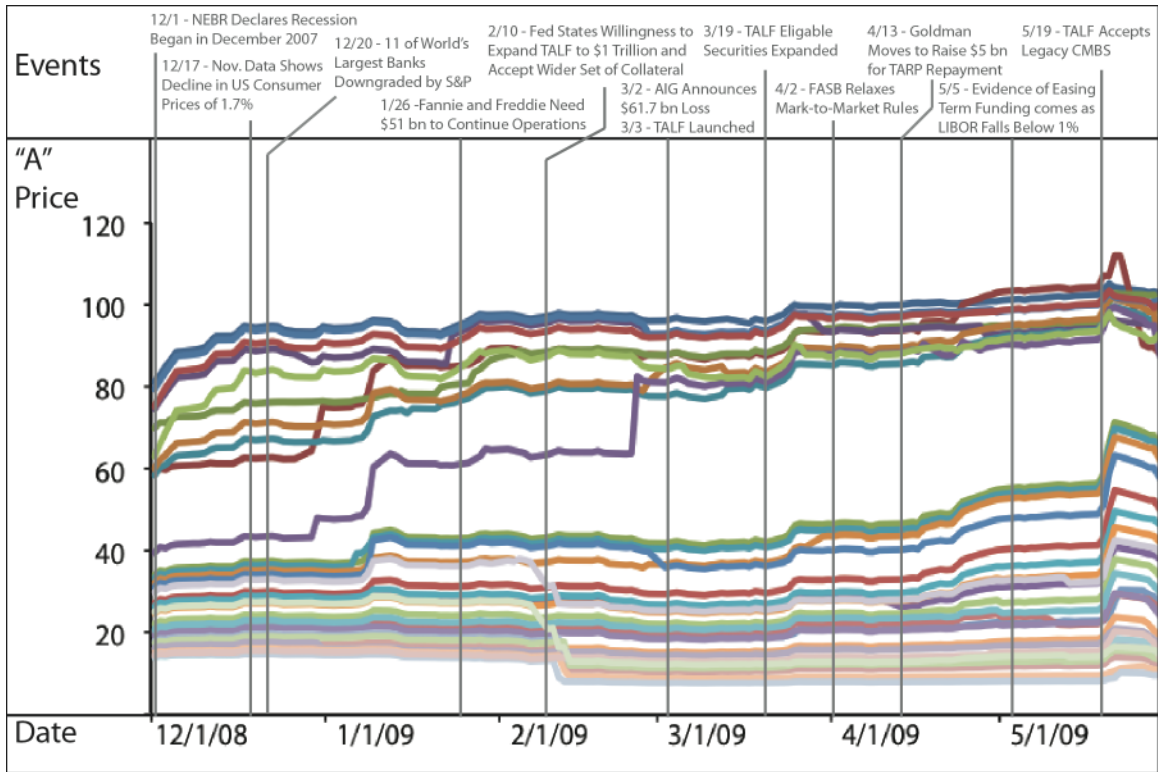
difference between highest and lowest priced value, with an average of 30.39, with a maximum of 40.457 observed on March 20<sup>th</sup>.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
9.68%	5/20/09	-2.36%	5/28/09
5.22%	5/21/09	-1.97%	5/27/09
3.56%	3/25/09	-1.85%	1/14/09
3.19%	12/2/08	-1.63%	5/26/09
2.96%	1/9/09	-1.60%	2/13/09

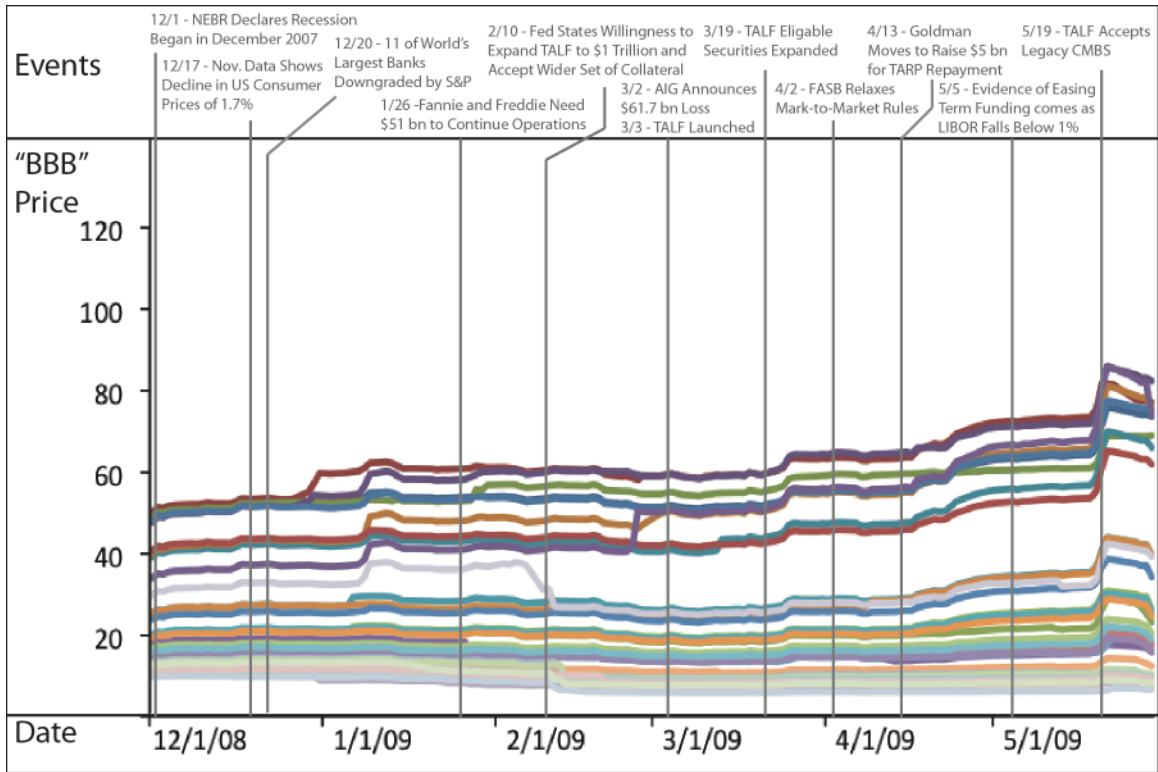
The AA bonds exhibit the large spike in valuation that accompanies the May 19<sup>th</sup> announcement that TALF will accept legacy CMBS as collateral, although the terms of the loan include a clause which states that the collateral must be of the highest investment-grade rating category.<sup>25</sup>

<sup>25</sup> [http://www.newyorkfed.org/markets/talf\\_cmbs\\_terms.html](http://www.newyorkfed.org/markets/talf_cmbs_terms.html)



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
9.16%	5/20/09	-3.95%	5/29/09
6.09%	5/21/09	-3.47%	2/13/09
3.70%	3/25/09	-2.38%	2/12/09
3.60%	1/9/09	-2.36%	5/26/09
2.97%	5/19/09	-2.18%	5/28/09

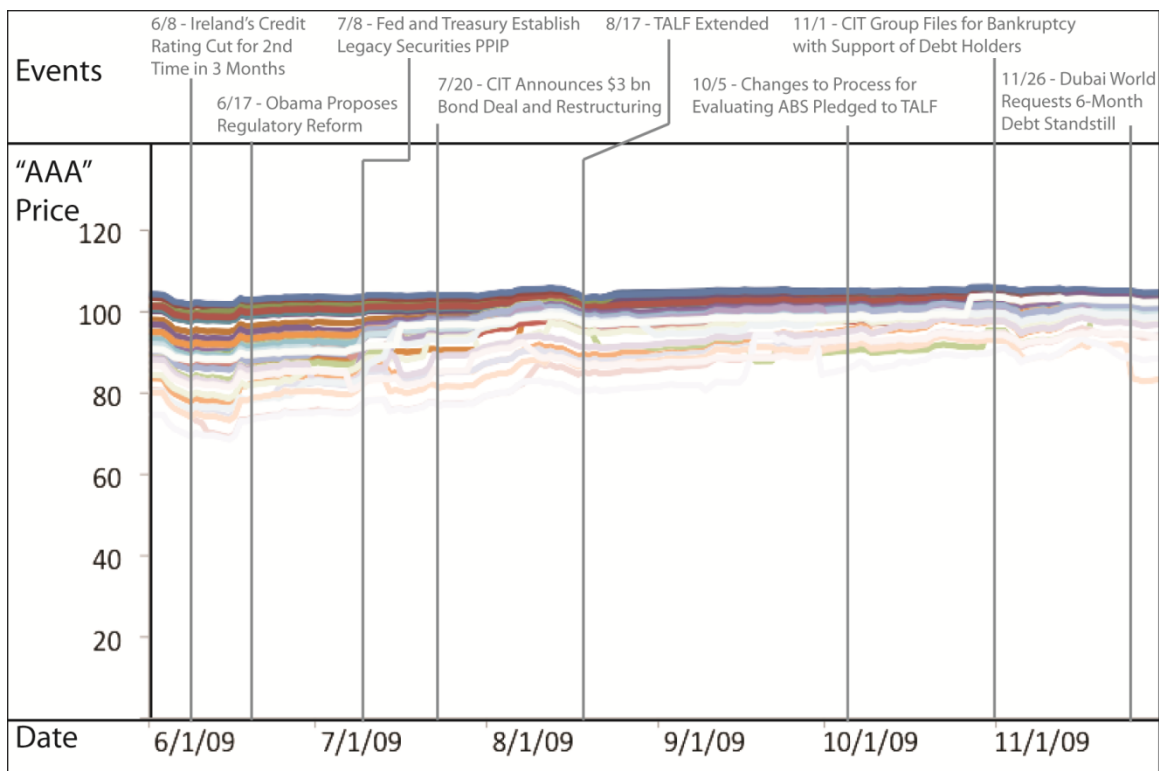
In the A rated bonds, the announcement of TALF's acceptance of legacy CMBS as collateral accompanies a much larger effect on the vintages of 2003 and beyond, as evidenced by the exaggerated spike in the lower half of the graph. On May 20<sup>th</sup> and 21<sup>st</sup>, the 2001 and 2002 vintages averaged a 1.24% daily increase while the 2003 – 2007 vintages averaged 9.59% per day, bringing up the average and reinforcing the differences in vintage across the sample.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
8.32%	5/20/09	-4.27%	5/29/09
5.52%	5/21/09	-2.60%	2/13/09
3.23%	3/25/09	-2.45%	12/1/08
2.46%	12/2/08	-2.24%	2/20/09
2.38%	5/19/09	-2.04%	5/27/09

The BBB rated bonds exhibit a similar percentage gain in valuation to the A bonds, however the trend across vintages is reversed. The 2006 and 2007 vintages average a 4.92% gain on May 20<sup>th</sup> while the other vintages average a 9.74% gain.

June 2009 – November 2009



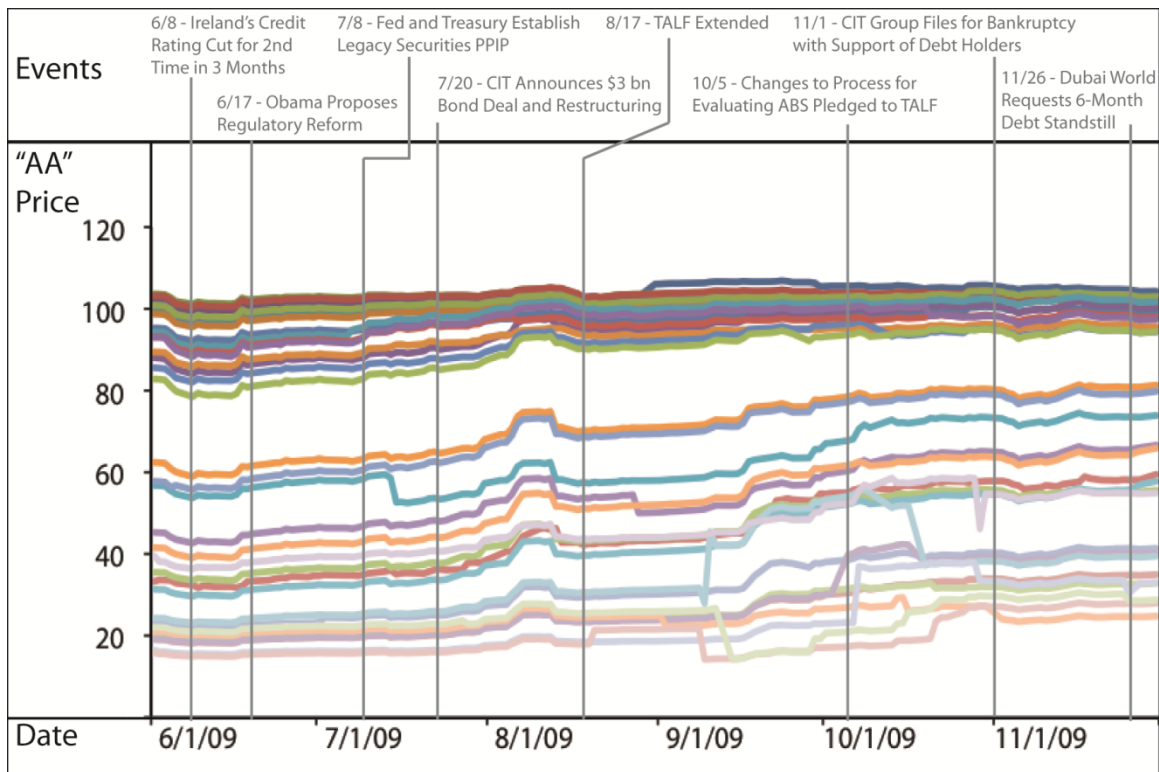
5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
2.65%	6/17/09	-1.59%	8/17/09
1.15%	7/10/09	-1.56%	6/4/09
1.11%	7/9/09	-1.51%	6/8/09
0.96%	8/6/09	-1.37%	6/5/09
0.88%	7/21/09	-0.94%	11/5/09

In the months following the inclusion of legacy CMBS in the TALF program, the news tends to be positive and less frequent than the previous year. The magnitude of the changes in valuation has also decreased in our sample as evidenced by the gains and losses listed above.

The AAA's largest gains came as President Obama laid out plans for regulatory reform.<sup>26</sup> The next two largest gains came as the Treasury Department released plans for the Public-Private Investment Program, which lays out details for the purchase of CMBS with the Legacy Securities

<sup>26</sup> [http://www.whitehouse.gov/the\\_press\\_office/Remarks-of-the-President-on-Regulatory-Reform/](http://www.whitehouse.gov/the_press_office/Remarks-of-the-President-on-Regulatory-Reform/)

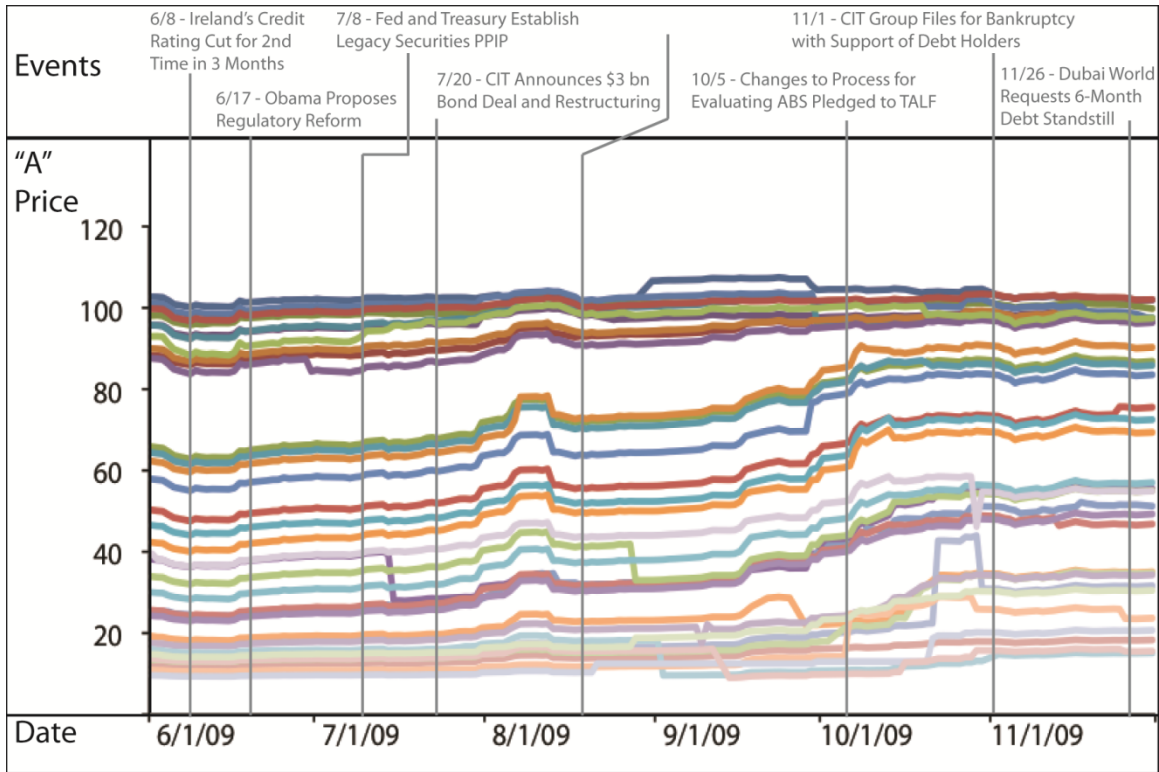
PPIP.<sup>27</sup> Some of the AAAs larger losses coincide with the downgrade of Ireland’s credit rating and the extension of TALF without any amendment to eligible collateral.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
2.62%	10/7/09	-3.41%	8/13/09
2.55%	8/6/09	-1.46%	9/14/09
2.42%	9/10/09	-1.43%	6/4/09
2.33%	6/17/09	-1.42%	6/8/09
2.23%	9/21/09	-1.34%	8/17/09

The AA bonds do not show the same gains after the PPIP is announced but they do experience a significant loss on the same day that Ireland’s credit rating is cut.

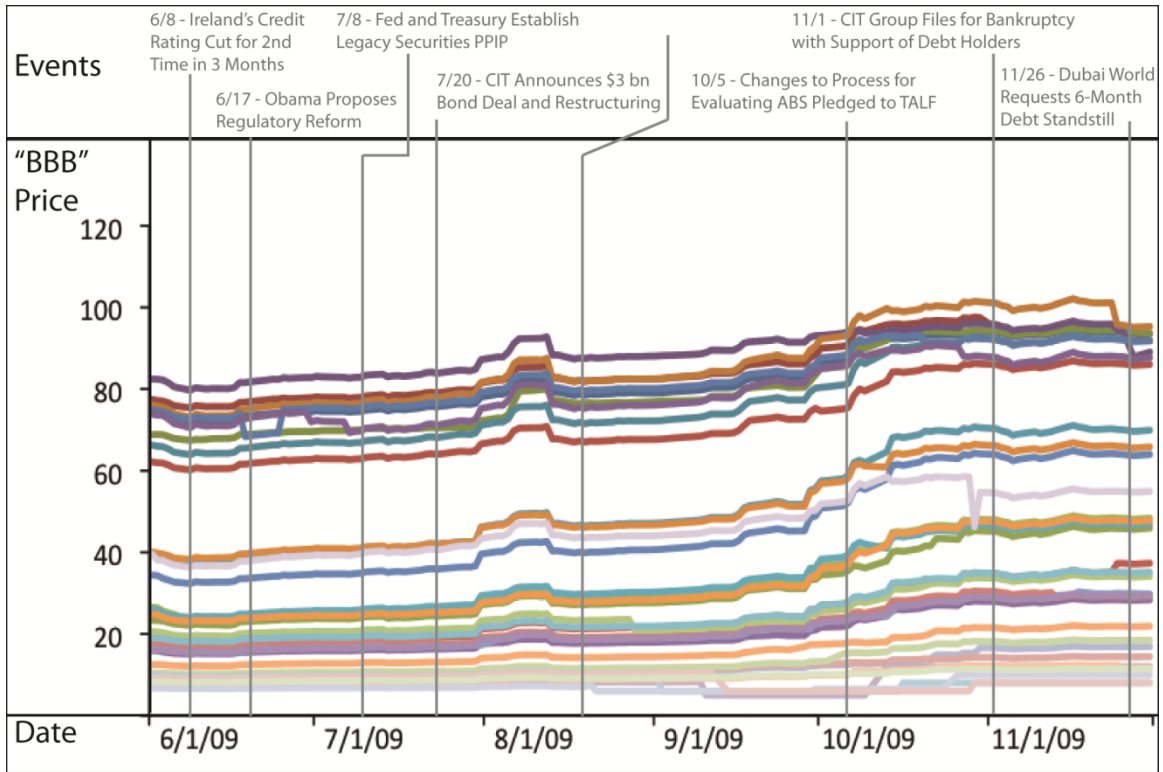
<sup>27</sup> <http://www.treasury.gov/press-center/press-releases/Pages/tg200.aspx>



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
3.40%	7/31/09	-4.00%	8/13/09
2.84%	10/6/09	-1.37%	9/14/09
2.78%	9/29/09	-1.29%	9/2/09
2.71%	8/6/09	-1.28%	8/17/09
2.62%	10/19/09	-1.27%	6/8/09

The A and BBB bonds both display strong gains on the same day that the FDIC launches a test of the funding mechanism for the Legacy Loans Program, part of the PPIP.<sup>28</sup> This initial test involves a portfolio of residential mortgage loans that fit the program's profile of troubled loans.

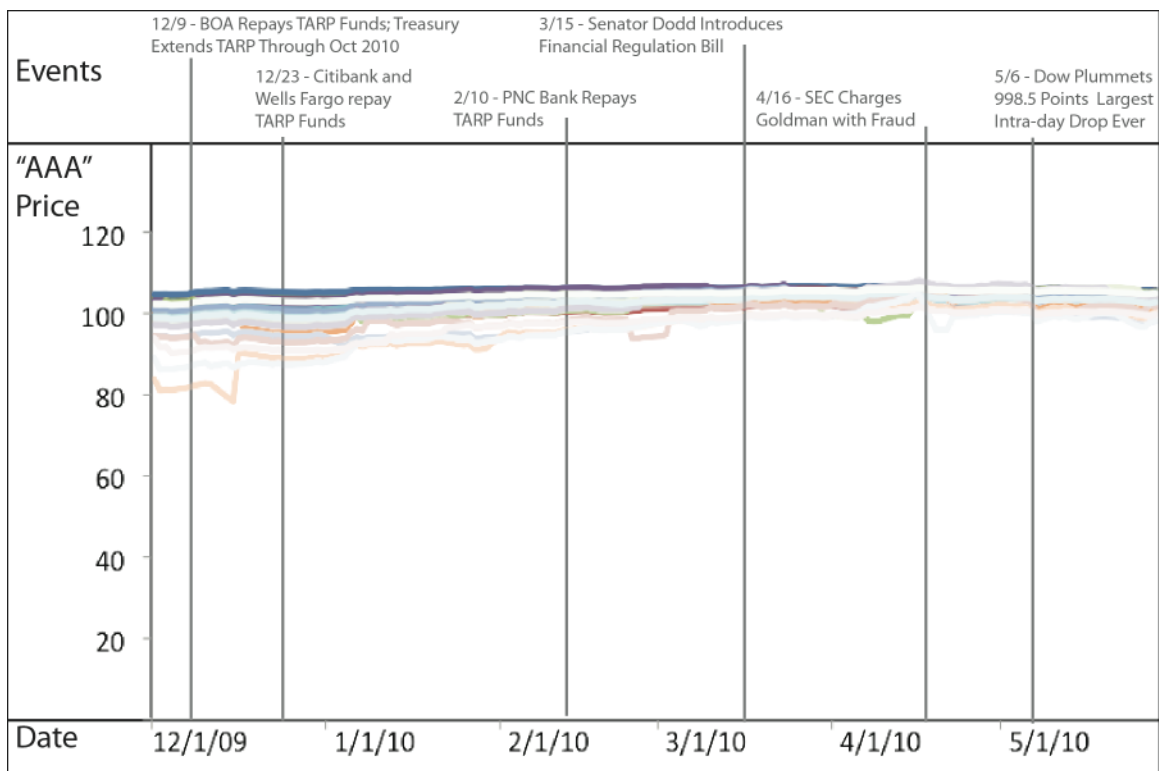
<sup>28</sup> <http://www.fdic.gov/news/news/press/2009/pr09131.html>



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
5.04%	7/31/09	-4.26%	8/13/09
3.72%	9/29/09	-1.26%	9/14/09
3.60%	10/14/09	-1.18%	6/8/09
3.03%	10/7/09	-1.13%	9/2/09
2.34%	8/6/09	-1.12%	7/14/09

Another jump in both the A and BBB bonds comes after the Federal Reserve releases changes in the procedures for evaluating TALF-eligible ABS. The release includes a more stringent risk assessment for collateral, a requirement that was already applicable to CMBS.

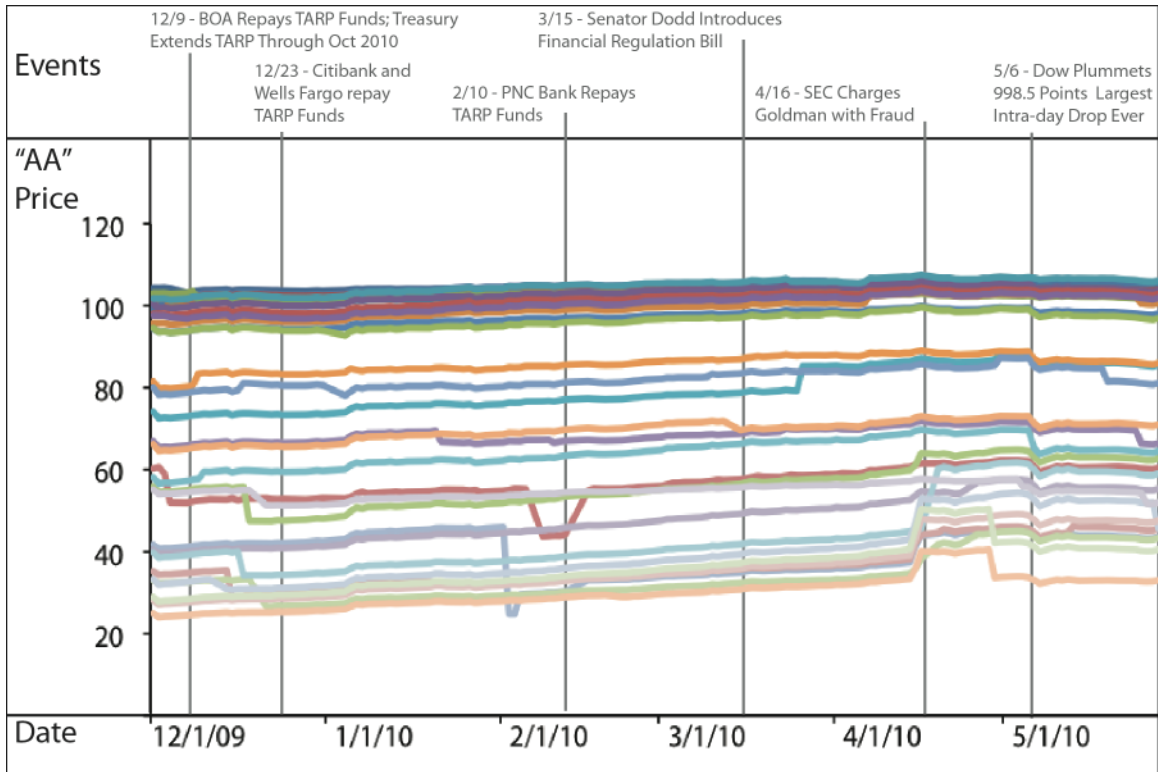
December 2009 – May 2010



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
0.92%	12/16/09	-0.96%	4/19/10
0.77%	1/5/10	-0.69%	12/15/09
0.49%	5/10/10	-0.58%	5/7/10
0.44%	12/8/09	-0.55%	1/27/10
0.42%	1/6/10	-0.40%	3/24/10

In our final set of data, the average difference between the highest and lowest priced AAA bond tightens to 11.59 over the six months, finishing at 7.55 at the end of May. We also observe a much less volatile set of data with no gains above 1% in a single day and no losses below 1% in any single day. The news at this time is more positive as we see banks beginning to repay TARP funds and the introduction of legislation that is designed to avoid the issues of the past two years.

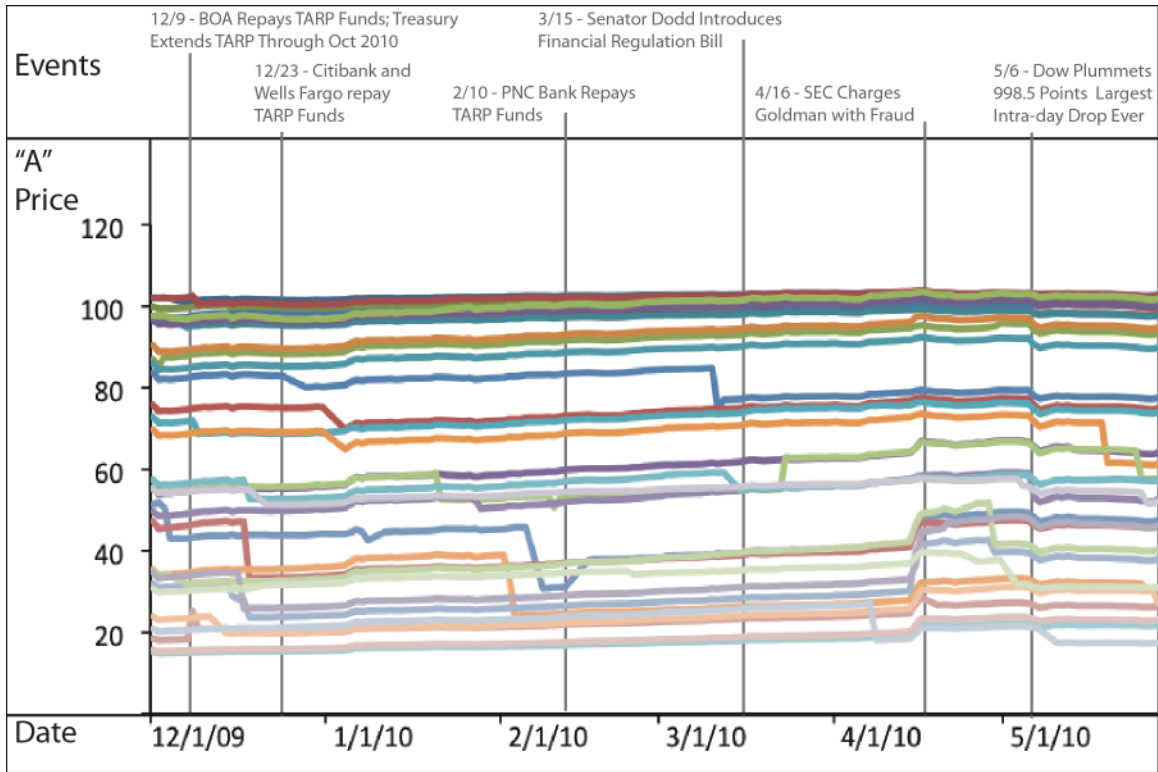




5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
2.34%	4/15/10	-1.43%	12/2/09
2.21%	4/16/10	-1.36%	5/6/10
1.48%	2/16/10	-1.31%	5/7/10
1.36%	5/10/10	-1.16%	12/15/09
1.19%	1/5/10	-0.96%	12/21/09

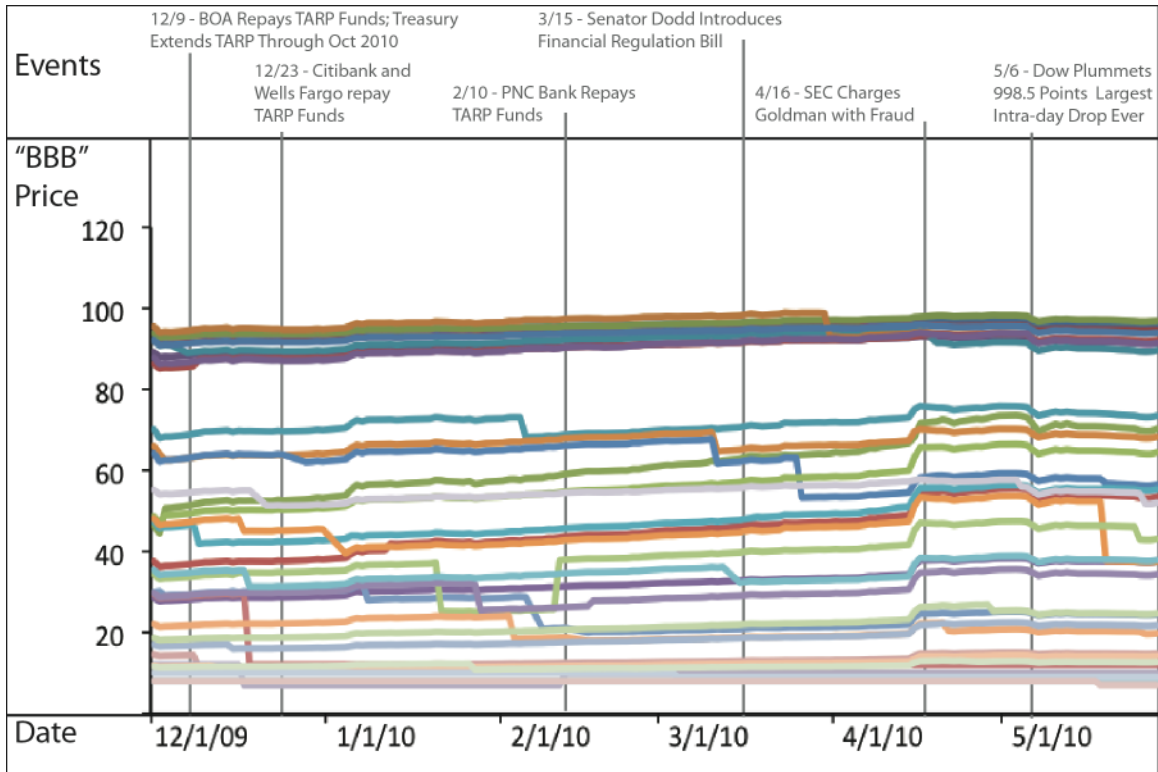
On May 6<sup>th</sup>, the Dow Jones Industrial Average posts a 998.50 point drop, its largest intraday point drop ever.<sup>29</sup> The AA, A and BBB bonds all experience significant losses on the 6<sup>th</sup> and the 7<sup>th</sup> but followed by gains after the weekend.

<sup>29</sup> Lauricella, Tom, and Peter McKay. 2010



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
4.09%	4/15/10	-1.91%	12/2/09
3.01%	4/16/10	-1.64%	5/6/10
1.60%	12/8/09	-1.58%	12/18/09
1.28%	1/5/10	-1.40%	5/7/10
1.16%	2/16/10	-1.05%	4/8/10

The gains observed on April 15<sup>th</sup> and 16<sup>th</sup> are skewed partially by two large jumps in 2006 vintage bonds.



5 Largest Gains		5 Largest Losses	
Amount	Date	Amount	Date
3.70%	4/15/10	-2.11%	12/2/09
2.11%	4/16/10	-1.99%	12/18/09
1.64%	2/11/10	-1.46%	12/17/09
1.53%	2/12/10	-1.23%	5/6/10
1.28%	5/10/10	-1.17%	5/7/10

Similar jumps in 2005, 2006 and 2007 vintages are observed on April 15<sup>th</sup> and 16<sup>th</sup>.

## Chapter 6 - Findings

The goal of this thesis is to observe changes in issuance and valuation of commercial mortgage backed securities in contrast to the news events and policy actions that shaped the financial crisis of 2007 – 2009. It would be naïve to assign causality or attempt to say for certain that any one action caused a change in a liquid market with so many influential factors. The hope is that this study will assist in the understanding of how the secondary market for CMBS bonds and new issuance CMBS unfolded during a time of financial chaos that was centered on real estate related mortgage backed securities.

The data on CMBS issuance showed that as the economic news grew more unpredictable, issuance fell and had difficulty sustaining any type of steady growth. It also suggests that issuance was beginning to return after a series of policy actions were put in place to promote liquidity and new issuance.

Our pricing data, while representing a small sample of the CMBS universe, demonstrated interesting fluctuations during the most uncertain times, including the wide spread between different vintages of AAA-rated bonds that eventually converged as the recession ended. It also provides some evidence as to how various policy actions affected pricing across the different bond classes, although it's difficult to say how much of the movement can be assigned to any one event or policy act.

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## Appendix A – Bonds Used in Sampling

CUSIP By Original Rating					
Year	Name	AAA	AA	A	BBB
2001	CSFB 2001-CK6	22540VNJ7	22540VLT7	22540VLV2	22540VMR0
2001	JPMCC 2001-C1	46625MFH7	46625MFD6	N/A	N/A
2001	LBUBS 2001-C7	52108HGZ1	52108HFT6	52108HFV1	52108HGA6
2001	MSDWC 2001-TOP5	61746WLT5	61746WLU2	61746WLV0	61746WMA5
2002	BACM 2002-2	05947UHM3	05947UHN1	05947UHR2	05947UHW1
2002	CSFB 2002-CKS4	22541NMR7	22541NMS5	22541NMU0	22541NMX4
2002	GMACC 2002-C	361849VV1	361849VW9	361849VY5	361849WD0
2002	LBUBS 2002-C1	52108HJJ4	52108HJK1	52108HJN5	52108HHE7
2002	MLMT 2002-MW1	59022HAU6	59022HAC6	59022HAD4	59022HAG7
2003	BSCMS 2003-PWR2	07383FXJ2	07383FWE4	07383FWF1	07383FWL8
2003	GMACC 2003-C2	361849YU0	361849YV8	361849YX4	361849ZC9
2003	LBUBS 2003-C7	52108HUM4	52108HUP7	52108HUT9	52108HUW2
2003	MSC 2003-IQ4	61745MQM8	61745MQN6	61745MQP1	61745MPZ0
2003	WBCMT 2003-C	929766MU4	929766MV2	929766MX8	929766NA7
2004	BACM 2004-2	05947URE0	05947URG5	05947URJ9	05947URN0
2004	CGCMT 2004-C1	173067AD1	173067AE9	173067AG4	173067AM1
2004	JPMCC 2004-CB9	46625M7C7	46625M6X2	46625M6Z7	46625M7E3
2004	LBUBS 2004-C4	52108HE42	52108HE67	52108HE91	52108HF82
2004	WBCMT 2004-C14	929766UL5	929766TQ6	929766TS2	929766TV5
2005	CD 2005-CD1	12513EAH7	12513EAM6	12513EAP9	12513EAW4
2005	CSFB 2005-C3	225458VR6	225458VV7	225458VX3	225458WA2
2005	GCCFC 2005-GG3	396789JU4	396789JX8	396789JZ3	396789KD0
2005	MLMT 2005-LC1	59022HNC2	59022HNF5	59022HNN1	59022HNL2
2005	WBCMT 2005-C19	929766Y31	929766X81	929766Y23	929766Y64
2006	BSCMS 2006-PW13	07388LAE0	07388LAL4	07388LAN0	07388LAR1
2006	JPMCC 2006-LDP6	46625YP64	46625YQ55	46625YQ63	46625YR21
2006	LBUBS 2006-C6	50179MAE1	50179MAK7	50179MAN1	50179MAS0
2006	CGCMT 2006-C4	17309DAE3	17309DAH6	17309DAK9	17309DAP8
2006	MSC 2006-IQ11	617453AQ8	617453AW5	617453AY1	617453AE5
2007	BACM 2007-4	059513AC5	059513AN1	059513AU5	059513BA8
2007	COMM 2007-C9	20047RAE3	20047RAK9	20047RAN3	20047RAT0
2007	JPMCC 2007-CB19	46630VAD4	46630VAP7	46630VAR3	46630VAU6
2007	MSC 2007-IQ13	61753JAB5	61753JAK5	61753JAM1	61753JAQ2
2007	SOVC 2007-C1	84604KAC3	84604KAF6	84604KAG4	84604KAJ8



## Appendix B – CUSIP Color Coded for Graphs

AAA	AA	A	BBB
22540VNI7	22540VLT7	22540VLV2	22540VMR0
52108HGZ1	46625MFD6	52108HFV1	52108HGA6
61746WLT5	52108HFT6	61746WLW0	61746WMA5
05947UHM3	61746WLU2	05947UHR2	05947UHW1
22541NMR7	05947UHN1	22541NMU0	22541NMX4
361849VV1	22541NMS5	361849VY5	361849WD0
52108HJJ4	361849VW9	52108HJN5	52108HHE7
59022HAU6	52108HJK1	59022HAD4	59022HAG7
07383FXJ2	59022HAC6	07383FWF1	07383FWL8
361849YU0	07383FWE4	361849YX4	361849ZC9
52108HUM4	361849YV8	52108HUT9	52108HUW2
61745MQM8	52108HUP7	61745MQP1	61745MPZ0
929766MU4	61745MQN6	929766MX8	929766NA7
05947URE0	929766MV2	05947URJ9	05947URN0
173067AD1	05947URG5	173067AE9	173067AM1
46625M7C7	173067AE9	46625M6Z7	46625M7E3
52108HE42	46625M6X2	52108HE91	52108HF82
929766UL5	52108HE67	929766TS2	929766TV5
12513EAH7	929766TQ6	12513EAP9	12513EAW4
225458VR6	12513EAM6	225458VX3	225458WA2
396789JU4	225458VV7	396789JZ3	396789KDO
59022HNC2	396789JX8	59022HNN1	59022HNL2
929766Y31	59022HNF5	929766Y23	929766Y64
07388LAE0	929766X81	07388LAN0	07388LAR1
46625YP64	07388LAL4	46625YQ63	46625YR21
50179MAE1	46625YQ55	50179MAN1	50179MAS0
17309DAE3	50179MAK7	17309DAK9	17309DAP8
617453AQ8	17309DAH6	617453AY1	617453AE5
059513AC5	617453AW5	059513AU5	059513BA8
20047RAE3	059513AN1	20047RAN3	20047RAT0
46630VAD4	20047RAK9	46630VAR3	46630VAU6
61753JAB5	46630VAP7	61753JAM1	61753JAQ2
84604KAC3	61753JAK5	84604KAG4	84604KAJ8
	84604KAF6		