ABX.HE Indexed Credit Default Swaps and the Valuation of Subprime MBS

Richard Stanton, and Nancy Wallace*

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Abstract

Current pricing of ABX.HE indexed credit default swaps (CDS) imply levels of forecasted losses for sup-prime residential mortgage backed securities (RMBS) that are substantially greater than realized credit events in these securities. Regression results, controlling for the correlational structure of the common underlying mortgage pools, indicate that the credit performance of the referenced sub-prime RMBS is uncorrelated with observed fluctuations in the ABX.HE indexed CDS returns. Although we find some evidence that volatility shocks, as measured by VIX, have also negatively impacted ABX.HE returns, these effects are not consistently associated with devaluations on higher credit rated ABX.HE indexed CDS. Instead, the returns on ABX.HE indexes of all credit qualities are consistently and statistically significantly related to short-sale demand imbalances in the option and equity markets of the publicly-traded builders, the commercial banks, the investment banks and the government sponsored enterprises (GSEs). The combined effect of the unique settlement structure of the ABX.HE indexes, the lower short sales constraints in the indexed credit default swap market, and the important supply limitations in the cash market for BBB and BBB- tranches appear to have significantly amplified arbitrage imbalances between the cash market for tranches and the ABX.HE indexed derivatives. Our results indicate that dislocations associated with aggregate short-selling imbalances in the mortgage related capital markets rather than credit events in the outstanding stock of sub-prime RMBS, *per se* appear to be central to the substantial price devaluations of the ABX.HE indexed credit default swaps. Our finding that the short-selling strategies of arbitrageurs have exacerbated the effects of negative economic shocks in the sub-prime RMBS market leads us to conclude that the ABX.HE indexed CDS are imperfect benchmarks for marking-to-market mortgage portfolios because the indexed market does not efficiently aggregate information concerning the credit performance of referenced sub-prime mortgage obligations.

*Please address correspondence to (Wallace): Haas School of Business, University of California, Berkeley, Berkeley, CA, 94720. Phone: (510) 642-4732. Fax: 510-643-7357. E-mail: wallace@haas.berkeley.edu. (Stanton): Haas School of Business, University of California at Berkeley, Berkeley, CA 94720. Phone: (510) 642-7382. E-Mail: stanton@haas.berkeley.edu.

1 Introduction

Credit default swap (CDS) indexes that track the prices of CDS on standardized baskets of reference obligations are a recent and important capital market innovation. These indexes allow market participants to trade the credit risk of referenced entities without having to enter into multiple swap positions on specific named credits and without having to own, or to have borrowed, the referenced obligations. In addition, trading in CDS indexes is supported by consortia of market makers so that the liquidity of CDS index markets is usually higher than the market for named CDS or the over-the-counter cash markets for the referenced obligations.

The ABX.HE indexes, tracking CDS prices on referenced baskets of sub-prime residential mortgage backed securities, RMBS, began trading in January of 2006. The market makers for the ABX.HE indexes were the investment banks with the largest market share in structuring and sales of sub-prime mortgage backed securities in the United States.[1] Although information on the size of the ABX.HE index markets has only been available since December of 2008,[2] the ABX.HE indexes are known to have been widely used by banks and investment banks to hedge their sub-prime residential mortgage pipeline risk and by investment banks, hedge funds and other investors to make directional bets on the future performance of sub-prime mortgage backed securities.[3]

With the global collapse of sub-prime RMBS trading, the more liquid market for the ABX.HE indexed CDS has become an important benchmark for "market" pricing of sub-prime mortgage related securities. As a result, many portfolio investors in sub-prime mortgage securities have used, and are continuing to use, the ABX.HE prices as a benchmark for mark-to-market valuations of their portfolio holdings of these securities.[4] In March 2008, the Division of Corporation Finance of the Security and Exchange Commission sent public companies an illustrative letter with preparation guidelines for the Management's Discus-

[1]The sixteen investment banks in the consortium, CDS IndexCo LLC, included: Bank of America, BNP Paribas, Deutsche Bank, Lehman Brothers, Morgan Stanley, Barclays Capital, Citigroup, Goldman Sachs, RBS, Greenwich Capital, UBS, Bear Stearns, Credit Suisse, JP Morgan, Merrill Lynch, and Wachovia

[2]The Depository Trust & Clearing Corporation (DTCC) began voluntary reporting on the outstanding inventory of credit default swaps, including CDS written on the ABX.HE indexes, at the end of December 2008.

[3]Descriptions of the large bets that were taken by The Paulson Hedge Fund and Goldman Sachs on the ABX.HE-2006-2 indexes for BBB and BBB- rated referenced obligations can be found in Kelly (December 14, 2007); Mackintosh (January 15, 2008); Zuckerman (January 15, 2008) and Lewis (February 16, 2008) among many others.

[4]For example, the Swiss bank UBS AG wrote down its subprime-mortgage investments by $10 billion largely based on the ABX.HE indexes (See, UBS AG 6K financial statements). Both Morgan Stanley and Citigroup cited devalutions in the ABX.HE indexes to justify their significant write-downs of sub-prime securities (See, Ng, Mollenkamp, and Patterson (2007)).

sion and Analysis, MD&A, statements required for Form 10-K quarterly reports. The letter suggested that:

> "Regardless of how you have classified your assets and liabilities within the SFAS 157 hierarchy, if you have not already done so in your Form 10-K, consider providing the following additional information in your MD&A:
>
> - A general description of the valuation techniques or models you used with regard to your material assets or liabilities. Consider describing any material changes you made during the reporting period to those techniques or models, why you made them, and, to the extent possible, the quantitative effect of those changes.
> - To the extent material, a discussion of the extent to which, and how, you used or considered relevant market indices, for example ABX or CMBX, in applying the techniques or models you used to value your material assets or liabilities. Consider describing any material adjustments you made during the reporting period to the fair value of your assets or liabilities based on market indices and your reasons for making those adjustments. ..."[5]

Despite the importance of the ABX.HE index market and its links to the operation of the sub-prime securities market, there has been little research that focuses on the pricing dynamics of the ABX.HE indexes or appropriate sub-prime security valuation methodologies based upon the ABX.HE index prices. Early research on the operation of the ABX.HE market was produced by the research departments of investment banks (See Sinha and Chabba (2006), Choudhry (2006), Kazarian, Mingelgrin, Risa, Huang, Ciampini, and Brav (2005), Dubitsky, Mellia, Bhu, Fenske, Guo, Li, Dumitrascu, and Yang (2006)) and primarily focused on the mechanics of the market and hedging strategies.

Two recent papers by Fender and Scheicher (2008) and Fender and Hoerdahl (2008) at the Bank of International Settlements have analyzed possible macro drivers of the five sub-indexes of the ABX.HE-2006-1 vintage indexes. They found that market liquidity proxies such as price changes on the futures contract written on the Case-Shiller composite index and the Chicago Board Options Exchange Volatility Index, (VIX),[6] covaried with the returns on ABX.HE-2006-1 indexes. Changes in aggregate measures of loan delinquency and rating downgrades on the referenced basket of obligations affected returns on the lower rated ABX indexes. Fender and Scheicher (2008) also reported the results of a simplified CDS valuation

[5]See, Sample Letter Sent to Public Companies on MD&A Disclosure Regarding the Application of SFAS 157 (Fair Value Measurements), http://www.sec.gov/divisions/corpfin/guidance/fairvalueltr0308.htm.

[6]A measure of the implied volatility of S&P 500 index options.

exercise that found sub-prime mortgage securities to be under-valued by as much as 60% based on corresponding writedowns on the ABX.HE indexes. A Bank of England report also compared cash flow valuations of sub-prime mortgage-backed securities of different vintages to writedowns based on a simplified valuation model of CDS written on the ABX.HE indexes. The Bank of England Report also concluded that the index-based CDS valuations led to potential under-valuations of sub-prime obligations of about $64 billion (See, Bank of England (2008)).

In another recent paper, Longstaff (2008), analyzes the pricing of sub-prime collateralized debt obligations, CDOs, and their contagion effects on the market. Longstaff assumes that reported ABX.HE prices are proxies for sub-prime CDO market prices and finds strong contagion effects from lower rated sub-prime CDOs, to the higher rated sub-prime CDOs, and finally to the stock market. Gorton (2008a) concentrates on a possible correlational channel between the ABX.HE index market and the repo markets. He only analyzes the ABS.HE-2006-1 index and finds that the cash basis, the difference between the sub-prime CDS spread by credit rating and the spread on the underlying sub-prime tranches by credit rating, is highly correlated with dislocations in the repo market through July of 2007. He argues that the explosive growth in the ABX.HE cash basis reflected fear of counterparty default, especially in the repo market, where defaults would lead to the delivery of bonds that could not be sold (See, Gorton (2008a); Gorton (2008b)).

Accounting standards for valuing sub-prime securities have also been identified as an important source of feedback between the sub-prime crisis and the collapse of trading in the mortgage credit markets. Ryan (2008) notes, that as "firms have announced losses on sub-prime positions, debt markets have become more averse to holding these positions and increasingly illiquid, causing fair values of the positions to decline further and become more difficult to measure" (See Ryan (2008), p. 2). He argues that although FAS 157 definitions of fair value are clearer than prior GAAP measures, the FAS 157 notion of "orderly" market transactions in the current crisis have become increasing difficult to identify and apply. He explores a hypothetical case study concerning the predicament of a large commercial bank attempting to estimate, and justify under tier 3 FAS 157 accounting rules, fair values for sub-prime AAA securities based upon significant prior write-downs of comparable portfolios held by investment banks, significant price decreases of the ABX.HE indexes of similar ratings, and significant realized and forecast decreases in published house price indexes. He concludes that many holders of sub-prime securities "...have "capitulated" and are selling sub-prime security positions at virtually any price to remove the perceived taint from their balance sheets" (See Ryan (2008), p. 3).

In summary, recent research has focussed on only a subset of the ABX.HE indexes and has not yet undertaken a thorough analysis of the link between the credit performance of the underlying referenced mortgage obligations and the time series of ABX.HE prices and returns. There is also a tension in the literature between a view that the ABX.HE prices can serve as direct measures of returns in the referenced sub-prime securities markets and results indicating that the ABX.HE prices are potentially highly imperfect measures of sub-prime security values and credit performance. Finally, ambiguity concerning the relationship between the trading prices of ABX.HE indexes and the valuations of referenced sub-prime securities, have led to significant problems in the use of FAS 157 accounting standards that require the benchmarks from "orderly" market transactions to justify valuations of non-trading assets.

The purpose of this paper is to analyze whether the ABX.HE index prices efficiently aggregate information concerning the credit performance of referenced sub-prime mortgage obligations. Indexed derivatives markets that operate without liquid markets in the underlying asset may be subject to arbitrage imbalances arising from the difficulties associated with taking offsetting bets in the cash market when the index market over- or undershoots true asset values (See Gorton (2008b); Case, Shiller, and Weiss (1993); Lovell and Vogel (1973); and Powers (1976)). These types of imbalances may be especially true in the ABX.HE CDS market 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.

The paper is organized into five sections. In Section 2, we explain the specifics of the ABX.HE index credit default swap contract. In Sub-section 2.1, we discuss ABX.HE hedging strategies and the unique settlement structure of credit default swaps written on the ABX.HE indexes. Our discussion highlights the potential importance of short selling strategies on the price dynamics of the ABX.HE indexes. In Sub-section 2.2, we explain ABX.HE index pricing and returns calculations and define the returns measure that we use as the dependent variables in our subsequent analysis. We conclude our discussion of the ABX.HE market operations in Sub-section 2.3, where we develop the hypotheses that we will test in our empirical specifications. In Section 3, we explain how we link pools of sub-prime loans to the references bond structures that are the referenced basket of obligations for each of the traded ABX.HE indexes. We then discuss the observed composition and performance of these obligations. In Section 4, we discuss the additional data sources that are needed to test our null hypotheses and we introduce our econometric specifications. In Section 5, we present our empirical results and we conclude in Section 6.

2 The ABX.HE Indexes

The ABX.HE index tracks the prices of CDS contracts written on a fixed basket of twenty equally weighted U.S. subprime RMBS pools. Originally, each vintage of the ABX.HE index included five sub-indexes that corresponded to tranches of different ratings from each of the twenty equally weighted RMBS deals. The first subindex, the ABX.HE.AAA, references a specific AAA-rated class from each of the reference RMBS pools, the second subindex, the ABX.HE.AA, references a specific AA-rated class from each of the reference RMBS pools, the third subindex, the ABX.HE.A, references a specific A-rated from each of the reference pools, and so on to the fifth subindex, ABX,HE.BBB-. The tranches referenced by an ABX index of a given rating are selected based on their ratings at the time the indexes are issued. Since the reference pool of obligations is fixed, subsequent changes in the ratings of the underlying referenced tranches can lead to a lack of correspondence between the rating of the ABX.HE index and the credit ratings of the referenced obligations. The AAA tranches referenced by the ABX indexes are usually not at the top of the capital structure of the RMBS pools. Since the senior part of the capital structure of sub-prime RMBS deals usually includes a number of AAA-rated tranches, the ABX.HE AAA referenced obligations tend to be selected from the longer duration AAA positions. Although these bonds benefit from the subordination structure of the mezzanine bonds, they have more interest rate and default risk than the shorter AAA tranches.[7]

The ABX.HE indexes were originally designed to be issued every six months with each subsequent index referencing a new basket of twenty recently originated sub-prime RMBS pools. The first series, the ABX.HE-2006-1 series, reference sub-prime residential mortgage backed securities (RMBS) that were originated in the second half of 2005. Because of the severe disruptions in the sub-prime RMBS, only four indexes have been issued: the ABX.HE-2006-1 (issued in January, 2006); the ABX.HE-2006-2 (issued in July, 2006); the ABX.HE-2007-1 (issued in January, 2007); and the ABX.HE-2007-2 (issued in July, 2007). The ABX.HE-2008-1 series was to have been issued in January of 2008 but was canceled due to insufficient RMBS origination and trading, No subsequent ABX.HE indexes have been issued.

The sub-prime RMBS that are included in the ABX.HE indexes are required to meet fixed criteria concerning the composition of the basket of referenced obligations and the quality of

[7] In October, 2007 a new Penultimate AAA (PENAAA) was introduced. This is a relatively new ABX.HE security that references a specifc AAA-rated bond in each of the reference RMBS pools that is higher in the cash flow priority structure than the ABX.HE-AAA so it has a shorter duration and theoretically less risk, (i.e., it is the penultimate payout AAA bond), than the longer duration bonds tracked by the ABX.HE.AAA indexes.

the underlying sub-prime loans. Markit Group Ltd. and the consortium of member dealers constrain the basket to include only four deals from the same originator and no more than six deals can have the same servicer. The minimum deal size must be $500 million, the pools must consist of at least 90% first liens, and the average FICO score of the borrowers must be 660. The referenced AAA tranche is the longest cash flow position within each RMBS deal and it must have an average life that is greater than 5 years. The average life for the referenced subordinated tranches must be 4 years. Although the composition of each of the ABX.HE indexes is made-up of the same twenty referenced obligations, over time the notional balances of the underlying CDS amortize following the principal paydown structure of the respective referenced classes.

2.1 Protection Buyer and Seller Payouts

The protection buyer of an ABX.HE index of a given credit rating pays the protection seller an one-time up-front fee of par minus the observed market price of the ABX.HE index plus a monthly premium, called the fixed leg. The premium rate for an ABX.HE index of a given vintage and credit rating is fixed until the vintage expiry date when the notional balances of the referenced obligations have fully amortized, defaulted, and/or have been pre-paid. The ABX.HE indexes that reference obligations with lower credit ratings have higher fixed premia, reflecting higher expected default likelihoods, than the premia for the referenced obligations with higher credit ratings. The ABX.HE indexes follow the International Swaps and Derivatives Association pay-as-you-go (PAUG) structure, in which the ABX.HE protection seller pays the protection buyer amounts equal to the writedowns and principal shortfalls of the referenced obligations, called the floating leg.[8] If credit events are subsequently reversed, the protection buyer reimburses the protection seller for previously paid principal and interest shortfalls.

The PAUG structure is different from the cash settlement structure of CDS on corporate names where realizations of credit events require the protection seller to pay the full notional amount of the reference obligation to the protection buyer in exchange for the protection buyer's delivery of the reference obligation. The lack of physical settlement in the CDS index market means that there may be important disparities in the size of the cash and derivative markets, since protection buyers are never required to deliver the referenced entity to the protection seller. It also means that there is no risk of short squeezes in the ABX.HE CDS market.

[8] Markit Group, LTC defines "writedowns" as a reduction in the outstanding principal amount of the reference obligation or the forgiveness of any amount of principal by the holders of the obligation. "Principal shortfalls" are defined as a failure to pay principal on the part the reference obligation.

Protection sellers on the ABX.HE index markets have a position that is analogous to a long position in the underlying referenced credit. In addition, these long positions can be obtained quickly and in large amounts despite supply and demand mismatches in the underlying sub-prime security cash market. Similarly, protection buyers are short the credit risk of the underlying referenced obligations. The motivation for these positions may be negative views on the sub-prime mortgage market, hedging objectives in the management of pipeline risk, or the exploitation of arbitrage opportunities arising from pricing inefficiencies between the cash and derivatives markets. Since the underlying reference obligation need not be owned, the cost of short positions in the ABX.HE market may be less than the costs of similarly targeted short selling in the equities markets.[9] In addition, until recently there was no centralized clearinghouse that reported the open interest and trading volumes of ABX.HE indexes so supply and demand fundamentals related to these contracts were difficult to know.

2.2 ABX.HE Prices

CDS written on the ABX.HE indexes trades on a price basis. ABX.HE market price is reported as a discount, or premium, to par. The difference between par and the reported price determines the amount of the single up-front fee that the protection buyer must pay to the protection seller for the right to make the monthly premium payments.[10] Because the coupon payments, or premia, on ABX.HE sub-index are fixed at the issuance date of the sub-index, the market prices of the indexes must adjust to reflect changes in assessments of the default risk of the underlying reference obligation, the liquidity of these obligations, and the counterparty risk of the protection sellers. Since short positions through the ABX.HE market are often heavily levered, prices may also reflect counterparty risk in the lending, or repo, markets (See, Gorton (2008a)). When the ABX index trades below par, the market cost of default risk protection on sub-prime mortgages has increased since the issuance date of the index. For example, if the price of the ABX index was quoted as 80% of par, the protection buyer would pay the protection seller an upfront fee of 20% of the notional amount to be insured in addition to the monthly fixed premium on the index.

In Figure 1 through Figure 3 we plot the market prices for the four vintages of the ABX.HE sub-indexes by credit rating. As shown, the indexes are issued at par and prices

[9] As noted by Jones and Lamont (2002) in order for an arbitrageur to sell short in the equities market, the stock must be borrowed for a fee from the current owner. These fees are determined by supply and demand in the stock loan market. In addition to these direct costs, other costs include recalls of the stock loan and legal and institutional constraints such as the short selling blackout period on bank and investment bank stocks that was imposed on the capital market by the Security and Exchange Commission from September 19, 2008 through October 2, 2008.

[10] If the market price of the ABX.HE contract is at a premium, the protection seller makes a one-time payment to the protection buyer

are reported as a percentage of par for each individual index of a given vintage. These market values are computed as the average CDS trading prices for the twenty referenced obligatgions in the OTC operations of the market makers. The market makers have some discretion in reporting trades. Since several dealers no longer exist, the depth of the OTC trades have fallen over time. Markit drops the highest and lowest reported CDS price and computes the average which is considered the market valuation.

The average valuations reported in top panel of Figure 1 are for the AAA bond indexes and the AA bond indexes are reported in the bottom panel. There is very little variation in these ABX.HE subindex prices until July, 2007 when the initial revelations concerning the poor performance of two Bear Stearns' sub-prime CDOs became public. After July, the ABX.HE subindex values continued to fall until our last measurement period on November 7, 2008. The final value observed market prices for the ABX.HE-2006-1 and ABX.HE-2006-2 AAA bonds were about $40 per $100 of notional, the ABX.HE-2007-1 bond fell to about $60 per $100 of notional, and the ABX.HE-2007-2 vintage fell to about $83 per $100 of notional for AAA bonds. These prices imply that the up-front fee for CDS on the ABX.HE-2006-1 and ABX.HE-2006-2 was $60 per $100 of notional and was $40 and $27 per $100 of notional for the ABX.HE-2007-1 and 2007-2, respectively. The devaluations for the AA bonds were even more dramatic, ending at about $15 per $100 of notional for the ABX.HE-2006-1 and ABX.HE-2006-2 AA bonds, about $20 per $100 of notional for the ABX.HE AA bonds, and about $43 per $100 of notional for the ABX.HE-2007-2 AA bonds.

Figure 2 reports the daily market devaluations for the A bonds and the BBB bonds that currently trade at about $8 per $100 and $4 per $100 of notional respectively (the vintage ABX.HE-2007-2 trades at about $17 per $100 of notional). Figure 3 reports significant ABX.HE index devaluations for the BBB- sub-indexes that traded at less that $3 per $100 on November 7, 2008. Based upon these trading prices, CDS are trading on a interest only valuations apparently assuming 100% principal losses on notional principal levels. The loss levels implied by these prices and those of the more senior bonds in the prior Figures suggest that the loss rates on the underlying mortgages are in excess of 70% of the overall initial bond principal securitized in the subprime pools from 2006 through 2007. These market prices also imply very large increases in the cost of insurance on sub-prime mortgage securities.

Following Schoenbucher (2003) and Duffie (1999), the market spread of a cash settled credit default swap equates the fixed and floating legs of the CDS at issuance. Thus, the spread is simply a weighted sum, over the life of the CDS, of the implied hazard rates of default for the referenced credit given assumed recovery rates. The standard CDS valution methodology, therefore, involves solving for the spread between the default risky and riskless bond and then backing out the implied hazard rates. CDS written on the ABX.HE indexes, however, can not be obtained as simply. This is because the ABX.HE CDS involves: 1) a one-time payment up-front by either the protection buyer or seller; 2) amortization of the bond principal; and 3) a contract maturity that is the lessor of the amortization period or the default timing of the last bond.

For the CDS contract to be fairly priced at issuance, the present value of the fixed leg plus the single up-front payment paid by the protection buyer must equal the hazard adjusted present value of the floating leg that is paid by the protection seller.[11] The issuance value of the ABX.HE indexed CDS, $V_{ABX.HE}$, at $(t = 0)$ can be written as:

$$E^Q[\bar{s}\sum_{t=1}^{T}\delta_t\bar{B}(0,T_{k_t})+(Par-P_{ABX_t})/100)\times N_t] = E^Q[\gamma\sum_{k=1}^{kn}\delta_{k-1}H(0,T_{k-1},Tk)\bar{B}(0,T_{k_t})]. \quad (1)$$

The righthand side of equation (1) is the value of the fixed leg payment paid by the Protection Buyer. The fixed premium payment, $\delta_{t-1}\bar{s}$, occurs at T_{k_n} if there is no default at T_{k_n}, δ_k is defined as the distance between two tenor dates $T_{k+1} - T_k$ for all periods $0 \leq k \leq K$ and $\bar{s}$ is the ABX.HE spread, or fixed premium. $\bar{B}(0, T_{k_t})$ is the current notional of the referenced bonds on the CDS. The protection buyer's up-front fee payment is the difference between par and the market price of the ABX.HE, P_{ABX}, times N_0, the notional amount of the insurance. The floating leg of the ABX.HE CDS that is paid by the Protection Seller, includes a payment γ at T_k if default occurs in the time interval $]T_{k-1}, T_k]$. The functions $H(.)$ are the default hazards on the reference obligations and they are a function of the aggregate hazards of the underlying loan collateral.

On the issuance date of the new ABX.HE index, when $t = 0$, the market price of the ABX.HE is par, so the second term in the protection buyer's payment is zero. The spread, or fix premium, is thus a function of the default hazards as in the standard formulation for cash settled CDS. At all subsequent periods, after $t = 0$, the up-front payment component of the ABX.HE market price, the P_{ABX_t} term in equation (1), is time varying. These market prices, the P_{ABX_t} , are the values that are reported in Figure 1 through Figure 3. As previously discussed these prices are currently substantially below par. Since the ABX.HE coupon payments are fixed over time, fluctuations in the market prices of the ABX.HE index, the P_{ABX_t}, are largely a function of updates to the default hazards, $H(.)$, shocks to liquidity or counterparty risk that affect the market price, the discounting, of the current notional value of the bonds referenced by the index (the $\bar{B}(0, T_{k_t})$ in equation (1)).

If we compute the daily continuously compounded return for the ABX.HE index as

[11] These valuation arguments have been developed under the "risk-neutral" probability measure, where all probabilities and expectations are taken under the spot martingale measure Q. It is well known that the risk-neutral probabilities and the historical (statistical) probabilities can be very different in real world evaluations of credit risk.

$log(V_{ABX.HE_{t+1}}/V_{ABX.HE_t})$, the daily changes in the discounted fixed premium structure should be very small relative to the changes in the ABX.HE market prices, P_{ABX}. A precise valuation of the fixed premium component of the ABX.HE index return would involve estimating daily updates to a term structure model. It is likely that the modelling errors from such a term structure fitting exercise would swamp the true valuation changes in this component of the credit default swap contract. To avoid these errors, we instead follow prior authors (See, Longstaff (2008) and Fender and Hoerdahl (2008)) and compute the daily continuously compounded returns, *ex dividend*, as the $log(P_{ABX.HE_{t+1}}/P_{ABX.HE_t})$. Although there could be discrete jumps in term structure that are driven by abrupt changes in the liquidity and counterparty risk of these markets and these could potentially lead to valuation effects even though the coupons are fixed, we treat the market pricing component as the dominant returns component in our empirical analyses.[12] From equation (1), the changes in the pricing component could arise from changes in the termination hazards for default on the referenced sub-prime loans and/or from adjustments in liquidity or counterpart risk such that the CDS pricing is fair. Our first empirically testable hypothesis from equation (1) is whether ABX.HE index returns are importantly related to the credit performance (the default hazard rates) of the referenced basket of sub-prime obligations as opposed to channels related to liquidity and counterparty risk.

2.3 The Short-Selling and the ABX.HE Indexes

As previously discussed, the ABX.HE index markets were designed to decouple supply constraints in the cash market for sub-prime RMBS securities from the supply and demand objectives of market participants seeking to rapidly structure hedges or to take large positions in the sub-prime CDS market. The primary mechanism that allows for this decoupling is the PAUG settlement structure for the indexed CDS. Under PAUG, short positions are not required to deliver the referenced security at settlement, so short positions in indexed CDS do not face short-selling constraints associated with the requirements of either buying, or borrowing, the referenced security for settlement. The removal of this constraint also reduces the costs of short-selling in the CDS indexed market relative to short-selling in the equities or options markets because short sellers cannot be exposed to short squeezes.

The ABX.HE indexed CDS allows short-sellers to either take large directional bets on the mortgage sector or individual banks in the sector, a bet on the portfolio performance, and/or bets on baskets of named securities since the referenced obligations of each index are known. Although the exact size of the short-selling bets on the ABX.HE indexes is unknown,

[12] The next version of this paper will formally test this assumption by fitting the daily term structure valuations for the floating leg of the CDS.

it is known that these positions delivered two of the largest single successful payouts in the history of financial markets: the Paulson & Co. series of funds that secured $12 billion in profits from sub-prime bets based on the ABX indexes in 2007 (Mackintosh (January 15, 2008)) and the Goldman Sachs bet on the ABX.HE index that generated nearly $4 billion of profits and erased $1.5 to $2.0 billion of losses on Goldman's $10 billion sub-prime portfolio holdings in 2007 (Kelly (December 14, 2007)).

An important recent literature in finance has considered whether arbitrageurs amplify fundamental shocks in the context of short-arbitrage in equities markets (See, Dechow, Hutton, Muelbroek, and Sloan (2001); Jones and Lamont (2002); Fishman, Hong, and Kubik (2007); Lamont and Stein (2003) and Lamont and Stein (2004), among others). The consensus in this literature is that the prices of shorted stock are very sensitive to economic shocks. These results indicate the importance of limited arbitrage in affecting asset price dynamics and the potentially destablizing role of speculators in the overall stock market. Short-interest flows into the ABX.HE index markets constitute an, as yet untested, channel affecting ABX.HE index price dynamics. Here we are interested in whether proxies for imbalances between the derivative and cash markets in subprime RMBS may be affected by the demand for short-selling the stocks of financial institutions. Since there was no functioning clearinghouse for CDS contracts until recently, we follow prior authors (See, Lamont and Stein (2004), Fishman et al. (2007) and Jones and Lamont (2002)) in the use of two indirect measures for the demand for short-selling. The first indirect measure of short-selling demand is the value weighted short-interest ratio (the market value of shares sold short, divided by the value of shares outstanding) for banks, investment banks, the government sponsored enterprises, GSEs, Fannie Mae and Freddie Mac, and the public home builders. The short-interest ratio is a measure of how long it would take short sellers, in days, to cover their entire positions if the price of a stock begins to rise. The short interest ratio can also be applied to entire exchanges to determine the sentiment of the market as a whole. If an exchange has a high short interest ratio of around five or greater, this can be taken as a bearish signal, and vice versa. Our second indirect measure for the demand for short-selling mortgage related exposure is the Chicago Board Options Exchange's (CBOE) daily put-call ratio. This ratio is constructed as the CBOE open interest in put options to the open interest in call options on stocks and indexes for publicly traded banks, investment banks, GSEs, and home builders. The ratio is a rather noisy measure of the magnitude of shorting done, however, it has performed well in other recent applications Lamont and Stein (2004).

In Table 1, we report recently released information on the current gross and net notional outstanding interest in the ABX.HE indexed CDS. We compare these notionals to the current outstanding principal balances of the baskets of referenced sub-prime RMBS. As shown, as of December 28, 2008, the net notional amount of ABX.HE indexed CDS was $33.7 billion dollars and these swap position were written on a referenced sub-prime RMBS notional value of about $25 billion. The large hedges in 2007 were written on the 2006 vintage ABX.HE indexed CDS and, as shown, even now the outstanding net notional amount of CDS on these tranches is about 6 to 1. In Figure 5 and Figure 6 we plot the short-interest ratios and the put-call ratios for the publicly traded home builders, the GSEs, the investment banks, and the banks. As shown, the short-interest ratios for the public builders and GSEs hover around five or more which is typically considered by the market as a strongly bearish signal. Although the banks and the investment banks have short-interest ratios of less than three over the period, spikes are apparent in July, 2007 around the time the Bear Stearns CDO failures became known. Overall, the put-call ratios average around 2 to 1.5 to 1 in all four of the graphs. Although there are spikes in these ratios again around July, 2007, they are significantly less pronounced that those for the short-interest ratio. The short-interest ratio appears somewhat more volatile than the put-call ratio, although sharp movements in the ratios appear related. In particular, there are important increases in the short interest-ratio around October, 2006 just prior to the large sub-prime bets in the ABX.HE market which are unobservable.

It is also possible that in the aftermath of the short-selling episode that began in the second quarter of 2006 that involved large short positions on the ABX.HE-2006-2 index and was associated with unprecedented payouts on the Paulson and Goldman Sachs "hedges", among those of others arbitrageurs, that the arbitrage foundations between the ABX.HE index CDS market and the less liquid cash market for the referenced sub-prime RMBS simply broke down. In addition, these bets were very focussed on the lowest credit-rated RMBS tranches which are also the tranches with the smallest principal allocations in all RMBS deals. The combined effect of the unique settlement structure, the lower short sales constraints in the ABX.HE credit default swap market, and the important supply limitations in the cash market for BBB and BBB- tranches, may have significantly amplified credit related dislocations in mortgage capital markets. The extraordinary demand pressure for short positions on sub-prime credit, itself may have affected the prices that protection sellers were willing to accept on the trades. This second channel for pricing pressure is the focus of our second hypothesis. Our test is whether the aggregate demand pressure for short positions on public companies with exposure to mortgage risk such as the banks, investment banks, builders, and the GSEs is an alternative factor in the significant devaluations in the ABX.HE CDS indexes. This channel is less related to the performance of the mortgage contracts themselves and more related to short selling constraints in the options and equities markets over this period including the short selling moratoria that the SEC placed on these markets in September and October of 2008.

3 ABX.HE Referenced Securities: Sub-prime Loans and RMBS

To distinguish between these alternative explanations for the price dynamics of the ABX.HE indexes, we assemble loan-by-loan performance information for each for the sub-prime RMBS pools that are referenced by the four trading ABX.HE indexes. Our detailed month-by-month performance data was obtained from Bloomberg and the two major securitization trustees, Wells Fargo Bank and LaSalle Trustee. Because the tranched allocation of the referenced pools makes subprime MBS payoffs nonlinear in the mortgage cash flow distributions, we also assembled detailed information concerning the subordination structure of the pools from the deal prospectuses including the performance triggers, the over-collateralization and excess spread characteristics of the waterfalls. This information allowed us to track the payout performance of the referenced bonds conditional on the credit the performance of the underlying loans from the date of the ABX.HE index issuance until the end of November, 2008. We then interact the loan-level performance data with the evolution of the subordination structure of the deal to obtain an accurate measure of the loan credit performance channel on ABX.prices.

Table 2 presents the shelf contributors to the Markit ABX.HE 2006-2007 indexes. As shown, there is considerable concentration in the contributions of troubled originators such as Countrywide, Bear Stearns, First Franklin, and New Century. Less obvious is that some of the shelves of the larger investment banks, such as Merrill Lynch and Goldman Sachs, are conduit securitization deals for the same troubled lenders: First Franklyn in the case of Merrill Lynch, and New Century in the case of Goldman Sachs. Thus the originator concentration both within and across deals is heavily concentrated on a relatively few lenders, making it possible to use the index to make targeted bets on specific financial institutions though the CDS market.

As shown, the ABX.HE contributed deals are slightly smaller than the average deal sizes of the shelves, while the coupons and the maturities of the underlying mortgage appear to be quite representative of the shelves. Although not shown, the contributed principal balances of the ABX.HE deals represents less than 10% of the overall principal balances of these shelves. Also not shown in the table, the average number of bonds in the waterfall structures of the contributed deals is about fifteen, whereas only five bonds are contributed. This is particularly important for the AAA bonds that are contributed, since the AAA bonds usually account for about 80% of the outstanding balance at issuance, however, the AAA bonds referenced in the ABX.HE is the long duration AAA bond which is usually not the most senior and largest AAA bond in the deals. These limitations of the ABX.HE deal coverage may imply that the ABX.HE indexes are not suitable for statistical inference to the population performance of subprime mortgages. If there is any hope for the indexes reflecting the credit performance of subprime mortgages, however, they should at least reflect the credit performance of the loans within each of the deals which are the focus of our paper.

Table 3 presents the loan characteristics of the pools at the pool issuance date. As shown in the table there is considerable variability in the number of loans in the contributed pools. The pools from First Franklin are on average about 8500 loans, whereas the contributed pools from Residential Asset Mortgage Products are on average only about 1723 loans. We also report on the state-level geographic concentrations of the pools. As shown, California and Florida are the largest contributor states and within these states there is considerable concentration by MSA. Thus, the geographic allocations in the pool principal is quite skewed to a relatively few MSAs. The next largest contributor state is New York with Georgia, Illinois, and Texas following. As shown, more than two thirds of the contributed pool principal is comprised of ARM loans and many of these as 2/28 loans. There does not appear to be much heterogeneity in the average loan-to-value ratios of the loans at origination.

In Table 4, we summarize the subordination structure of the subprime RMBS pools that are referenced by the 2006 and 2007 vintages of the ABX.HE indexes. The top panel of the table presents the average subordination levels at issuance for each vintage of the ABX.HE. The average subordination levels are very similar across the two vintages of the ABX.HE indexes and both have very thin levels of principal cushion for the lowest credit rating BBB- and BBB tranches. Even the AAA tranches have average subordination levels of only about 23%. The relative thinnes of these subordination structures was predicated on assumptions that the subprime RMBS pools would experience high levels of prepayments associated with refinancing to capture home equity growth. The second panel of the Table 4 shows that subordination levels for all the tranches of the 2007 vintage ABX.HE indexes have increased on average and this was the expected progression of the sub-prime RMBS subordination structure. The referenced pools for the 2006 ABX.HE index have not experienced the same improvement in the subordination structure of the tranches probably because the slow prepayment speeds of the underlying sub-prime mortgages have both increased the duration of all the tranches and left the subordination structure relatively thin. The contrast between the evolution of the 2006 and 2007 pools is symptomatic of the poor performance of the early vintage pools.

The third panel of Table 4, presents the average tranche sizes by credit rating for the two vintages of ABX.HE indexes. The structure of the two vintages are quite similar and the AAA tranche has the largest principal allocation and the BBB- rated tranches have the smallest allocation of principal at issuance. The lowest panel of Table 4 presents the average percentage of the original principal allocation that remains for each tranche across the vintages. As shown, the lowest credit-rated BBB and BBB- tranches have experienced credit losses and currently have about 88% and 73% of their original principal allocation remaining respectively. Some of the referenced pools have lost all of the principal in the BBB and BBB- rated tranches. At the A credit-rating, the 2006 tranches have also experienced losses of principal with one pool experiencing a 55% loss of original principal. The 2007 vintage ABX.HE indexes have experience no principal losses on the senior bonds and the 2006 tranches have experienced reductions in outstanding principal held by the senior AAA bonds due to prepayment. Overall, these summary statstics suggest that the current performance of the referenced sub-prime RMBS do not correspond very closely with the precipitous devaluations in the ABX.HE indexes.

Table 5 presents the over-collateralization and excess spread structure for the sub-prime RMBS pools that are referenced by the four ABX.HE indexes. The degree of over collateralization is a form of credit enhancement for the tranches in sub-prime RMBS deals. Higher levels of over-collateralization means that more the sub-prime mortgage collateral exceeds the notional on the tranches in the deal, this implies that the principal and interest payments on the bond principal that was sold should be less affected by shortfalls. Excess spread is another form of credit enhancement in the pools and it is associated with the difference between the weighted average coupon on the underlying mortgages and the weighted average coupons on the tranches. The over-collateralization and the excess spreads that are structured into these deals are intended to build-up credit enhancements over the performance life of the transaction. The build-up in credit enhancement from the principal and interest payment on the total loan collateral should generate surpluses or reserves to protect the RMBS bond principal. Over time these reserves should afford higher levels of credit enhancement than is reported for these deals as of November 11, 2008.

Although there are twenty individual bonds contributed to the ABX.HE basket, in most cases the performance of these bonds is highly correlated across credit ratings because the underlying pool of mortgages determines bond performance. Since in most cases a given deal contributes a bond to each of the five credit indexes for an ABX.HE index of a given vintage, there are important sources of correlation across the performance of the ABX.HE indexes by credit rating within a vintage. The cross sectional correlation in the time series of performance must inform any econometric analysis of the performance of these indexes. Since the underlying credit performance of the loans is shared by the bonds of all credit-ratings, what differentiates the performance of the bonds is the subordination of the bonds and the performance triggers that determine the distributions of reserves and over collateralization to the bonds. Thus, the performance of each bond, or cusip, in the ABX.HE index is determined by the interaction of the credit performance of the pool of loans that collateralizes the deal and the bond's unique subordination structure. Both the subordination structures of the individual bonds and the performances of the mortgage loans in the pools are time varying.

Table 6 presents the time series averages of the percent of overall principal value in the pool that is 30 day delinquent rate, 60 day delinquent, 90 day delinquent, real estate owned after foreclosure, REO, in foreclosure, or in bankruptcy. The last column of the table reports the total exposure of pool principal over the holding period for any of these credit events. All calculations have been done controlling for prepaid principal and the mortgage measurements are given monthly following standard industry practice. As shown in Table 6, the overall percentage of principal at risk is about 24% of current outstanding balance. If the loss rates were 100% on all of these credit events, then the principal balances of the BBB-, BBB, and A bonds would be wiped out.[13] The average 30 day delinquency rates are about 4% over the holding period, the average 60 day delinquencies are also about 2% and the 90 day delinquencies are about 3%. Of course, at the end of the period we see the maximum values in these pools and these levels are at alarming levels, although never more than 20%. The average foreclosure levels are about 8% across the indexes, REO is about 4%, and bankruptcy is around 1%. The typical progression is for the loans to be first 30 day delinquent, then 60 days delinquent, the 90 day delinquent, until the loan ends up in foreclosure, bankruptcy, or REO. Surprisingly, from the loan-level-data the cure rate on all the 30 and 60 delinquency rates is about 30%.

4 Empirical Analysis of ABX.HE Valuations

As previously discussed, the ABX.HE indexes serve several functions. They track the price of credit default insurance on a standardized basket of subprime pools and they function as a benchmark for the mark-to-market of the subprime mortgage securities. We have two goals in our empirical analysis. First, we will test whether ABX.HE index returns are importantly related to the credit performance (the default hazard rates) of the referenced basket of sub-prime obligations as opposed to channels related to liquidity and counterparty risk. Second, we will test whether short-selling strategies that focused on the performance of banks, investment banks, builders, and the GSEs are an alternative factor in the significant devaluations in the ABX.HE CDS indexes. This channel is less related to the performance

[13] There are currently numerous BBB- and BBB bonds that have experienced total losses

of the mortgage contracts themselves and more related to short selling constraints in the options and equities markets over this period.

To carry out our analysis, we will exploit both the bond and loan-level performance of the referenced sub-prime RMBS pools for each of the four ABX.HE indexes that are currently trading. To fully understand the structure of our data, we follow the actual trading information in the market. The Markit Group Ltd. reports daily trading prices as an average of a given "depth" of bond trades, which they report. The market participants also have information about the performance metrics for the mortgage pools and these are reported at a monthly trading frequency at the end of the month. We also consider an additional set of macro controls such as the changes the VIX, changes in the slope of the term structure of interest rates, measured as the difference between the one year constant maturity treasury yield and the 10 year constant maturity treasury, and changes in the one year constant maturity treasury yield. These interest rate data were obtained from the Federal Reserve web site for the H15 series and the Treasury data frequency is daily. Following Longstaff (2008), market participants also have information on the evolution of the overall stock market performance, so we introduce controls for these effects measured using S & P 500 returns using data from Yahoo.finance.com.

We also control for the mortgage performance effects that are associated with house price dynamics. House price dynamics are reported in Figure 4, for the states with the highest average proportion of loans in the ABX.HE constituent pools. Unfortunately, market participants have access to only a quarterly house price indexes by state and these are available from the Office of Housing Enterprise Oversight (OFHEO). As shown, in Figure 4, over our sample period the indexes appear remarkably smooth. In addition, all states, but Texas, have experienced significant downturns in the index over the analysis period.[14] To construct our analysis series, we interact the monthly time series of the state percentages of the principal outstanding for each pool in the basket for each ABX.HE vintage index. This highly smoothed series is obviously not an accurate measure of the likely dynamics of the housing factor on mortgage and ABX.HE performance, however, it is the relevant information that is available to traders on the ABX.HE indexes.

As discussed, to control for the hedging and CDS derivatives role of the ABX.HE index valuations we obtain the short interest ratio, measured as the ratio of the shorted stock to the average daily trading volume and the ratio of put option open interest to call option open interest. To reiterate, the short open interest ratio indicates how long it will take short sellers,

[14]One other possible source of forward measures of house price dynamics would, in principle, be available from the Case-Shiller Indexed futures contract. Given the lack of trading on these contracts, however, we decided the informational content of these series would not be high

in days, to cover their entire positions if the price of a stock begins to rise. Larger values indicate more short open interest positions that could potentially have to be unwound. We obtain monthly data on these positions from Bloomberg and Shortsqueeze.com. We track the short-interest ratio and the put-call option ratio for thirty three publicly traded companies and group them into four categories: banks, investment banks, public builders, and GSEs.[15].

Finally, we have a measure of the number of constituent bonds that underly the valuation averages reported by Markit Group Ltd. Our measure of depth of the trading market has been falling over time and now averages about eight trading bonds. We also have a measure of the percentage of ARMs represented in remaining balance of the pool. This measure is also an indicator variable.

The frequency of our analysis is daily. The left hand side variable is measured as the daily time series of the log difference in ABX.HE valuations. The S&P right hand side variable are also measure daily and we introduce several lags of each variable. Our interest rate data is also measure daily and we use the change in the rates and the change in the slope as regressors. All the other regressors are measured as first differences, other than the percentage of ARMs and the number of bonds traded. The house price data is interpolated to monthly and then interacted with the time series of states. The monthly series is brought to a daily series that is constant within months. Similarly, the monthly short interest ratio series is brought to a daily series of monthly first differences that are constant within months. The data structure is stacked for the time series of each cross-section of deals within the ABX.HE basket and the intercepts for these are fixed across cusips. The system is estimated with a seemingly unrelated regression controlling for the contemporaneous correlation of the bonds within a basket. The specification appears as:

$$ABX_{it}^{AAA} = \beta_0^{AAA} + \beta_1^{AAA} ABX_{i,t-k} + \sum_{k=0}^{2} \beta_{2k}^{AAA} SP_{j,t-k} + \sum_{l=3}^{37} \beta_l^{AAA} (X - X_{t-1}) + \varepsilon_{it}^{AAA} \quad (2)$$

$$ABX_{it}^{AA} = \beta_0^{AA} + \beta_1^{AA} ABX_{i,t-k} + \sum_{k=0}^{2} \beta_{2k}^{AA} SP_{j,t-k} + \sum_{l=3}^{37} \beta_l^{AA} (X - X_{t-1}) + \varepsilon_{it}^{AA} \quad (3)$$

$$ABX_{it}^{A} = \beta_0^{A} + \beta_1^{A} ABX_{i,t-k} + \sum_{k=0}^{2} \beta_{2k}^{A} SP_{j,t-k} + \sum_{l=3}^{37} \beta_l^{A} (X - X_{t-1}) + \varepsilon_{it}^{A} \quad (4)$$

[15]In the public companies that we track include: Ambac Financial Group Inc.; Bank of America Corp.; Bank of New York Company; Barclays PLC; Capital One Financial Corp.; Centex Corp.; Citigroup Inc.; Countrywide Financial Corp.; Credit Suisse Group; Deutsche Bank Aktiengesellschaft; Fannie Mae; Flagstar Bancorp Inc.; Freddie Mac; Goldman Sachs Group Inc.; HSBC Holdings PLC; JPMorgan Chase & Co.; Kaufman and Broad; KeyCorp; Lennar Corp.; Merrill Lynch & Co. Inc.; Morgan Stanley; Pulte Homes Inc.; Sovereign Bancorp Inc.; SunTrust Banks Inc.; The PNC Financial Services Group Inc.; The Ryland Group Inc.; Toll Brothers Inc.; U.S. Bancorp; UBS AG; Wachovia Corp.; Webster Financial Corp.; and Wells Fargo & Company

$$ABX_{it}^{BBB} = \beta_0^{BBB} + \beta_1^{BBB} ABX_{i,t-k} + \sum_{k=0}^{2} \beta_{2k}^{BBB} SP_{j,t-k} + \sum_{l=3}^{37} \beta_l^{BBB} (X - X_{t-1}) + \varepsilon_{it}^{BBB} \quad (5)$$

$$ABX_{it}^{BBB-} = \beta_0^{BBB-} + \beta_1^{BBB-} ABX_{i,t-k} + \sum_{k=0}^{2} \beta_{2k}^{BBB-} SP_{j,t-k} + \sum_{l=3}^{37} \beta_l^{BBB-} (X - X_{t-1}) + \varepsilon_{it}^{BBB-} \quad (6)$$

The estimation results are reported in Table 6 for the pooled sample over the four vintages of indexes. We find that the daily ABX.HE index returns by credit-rating are strongly positively correlated with lagged index returns, contemporaneous and lagged S&P returns. The change in the slope of the yield curve is shown to have positive and statistically significant effect on the AA, A, BBB, and BBB- index returns as it should since the coupon structure of all the bonds is floating at LIBOR plus a spread. Changes in the one-year constant maturity Treasury rates have a similar anticipated effect on the returns of the indexes of all credit ratings. The we find that the change in the one year constant maturity index and the change in the slope of the term structure all have statistically significant and positive affects on the change in ABX.HE returns for all five of the bond credit ratings. The VIX, or "fear index" increases with more volatility which in turn increases the cost of the option positions that are needed to hedge risk. As anticipated, the VIX index is strongly negatively associated with the ABX.HE returns for the AAA, AA, A, and BBB credit rated ABX.HE since protection sellers should require a higher up-front payment for the ABX.HE CDS protection. Surprisingly, however, the VIX is strong positively associated with the returns on the BBB- indexes suggesting possible mis-pricings for these contracts.

Our measure for the demand for short-selling demand has different effects across the five ABX.HE sub-indexes by credit-rating. Other than the GSE short interest effect, the changes in the short interest coefficients are largely negatively associated with changes in the ABX.HE returns. Thus, larger increases in the short interest ratios reduced the index returns and as the cost of the protection on principal and interest of sub-prime RMBS rose. For the banks and public builders, in particular, the short interest ratio is statistically significant and negatively related to change in the ABX.HE returns for all credit-ratings. Dubitsky et al. (2006) report that large macro hedge funds expressed their bearish views on the housing market by shorting mortgage credit and buying protection on BBB and BBB- ABX credit default swaps. This protection buying increased BBB and BBB- spreads over the same period. Changes in the GSE and the investment bank short interest ratio have statistically significant and positive effects on the changes in ABX.HE. This suggests that demand imbalances in short-selling move in tandum between the equities and the ABX.HE market. Surprisingly, however, we would expect increased demand pressure to negatively effect the ABX.HE returns as protection sellers demand require more for the increased demand for the CDS insurance. This effect again provides some evidence for mispricing in the ABX.HE CDS markets. Positive changes in the put-call ratios lead to statistically significant negative changes in returns in the ABX.HE markets for the investment banks suggesting that demand imbalances flowed into the ABX.HE markets from the options markets, but surprisingly we find positive and statistically significant changes in the returns for the AA, A, the BBB- bonds again suggesting that short selling demand imbalances were less coordinated between the ABX and options markets the investment banks or they were mispriced.

Very surprisingly, the change in the credit performance of the underlying mortgages interacted with the percentage of bond subordination for the each of the referenced obligations on the credit default swaps appears to have no statistically significant effects on the change in the ABX.HE returns except for two anomalous effects. The subordination interacted changes in the foreclose percent and the change in the 30 day delinquency rate are both positively and statistically significantly associated with changes in ABX.HE. This suggests that greater the incidence of these credit events the lower the up-front payment that was required from the CDS buyer. This again suggest likely mispricing of the credit risks in these indexes. As anticipated, we find that the initial levels of overcollateralization and excess spread at origination are statistically and negatively associated with smaller changes inthe ABX.HE index. Since these credit enhancements should mitigate the credit risk exposure for all the referenced bonds the CDS should be less sensitive to all exogenous shocks.

From our prior discussion, the lack of geographic diversification found in the sub-prime mortgage pools appears to make them very vulnerable to shocks in the California and Florida housing markets. We find statistically and significantly positive associations with changes in the OFHEO house price indexes in these states and changes in the ABX.HE indexes, so large negative shocks are associated with larger negative shocks to the ABX returns and a higher cost of protection against losses on the principal and interest cash flows of the bonds. The housing index channel is negatively related to the ABX returns for many of the states with smaller geographic representation in the pools, suggesting that the ABXHE pricing may not be sufficiently sensitive to shocks in the housing channel generally.

Overall, these results suggest that the short-interest demand channel is a more important correlate with ABX.HE returns than are the credit events on the mortgages. Fear, as measured by the VIX or volatility, is also an important factor in the movements of bond returns and this effect could be driven by shocks to liquidity or counterparty risk. On average, we account for about 20% of the observed variance in the ABX.HE returns.

As a further robustness check on the effects of the short interest ratio and the put-call ratio, Table 8 reports regression results for the same system as above but with only the short interest ratio and the put-call ratio. Our proxies for the short-interest demand explains about

4% to 5% of the overall variance in ABX.HE. The ABX.HE returns are mostly negatively correlated with the demand for short interest for all the subindexes. The results for the BBB and BBB- strongly indicate that the demand flows move from the option and short-selling market into the ABX.HE markets and these flow have the anticipated effects on ABX.HE returns and the up-front payments on the CDS. We find some anomalous effects of on the ABX returns for the AAA and AA bonds. Overall, these results reinforce our conclusion that the demand for short-selling was an important channel in the pricing dynamics of the ABX.HE indexes.

In Table 9 through Table 12, we re-estimate our specification for the individual ABX.HE indexes. These specifications allow us to partially control for the mixture of the times series and cross sectional effects of our estimator. What we see in all four tables, is that our results that are reassuringly similar to those reported in Table 6 for the pooled sample. Overall, we see very modest or no association between the credit performance of the pools and the returns on the ABX.HE. The California and Florida affects are apparent in most of the specifications. Although we find some evidence that perceptions of volatility through the VIX are also associated with ABX.HE returns, this result is not found consistently either across credit ratings or vintages of the ABX.HE. The factors that lead to the greatest apparent effects on the ABX.HE returns remains the demand for short selling positions for all bond credit ratings. These results are especially strong and consistent for the lower rated ABX.HE indexed CDS starting in the Fall of 2006 when the large hedges were placed. The results consistently show demand flows for short selling that appear to move from options and stock short selling positions to demand for protection through the ABX.HE CDS. The effects of this demand pressure is to decrease the returns on the ABX.HE and increase the cost of insuring principal and interest on sub-prime RMBS. The credit performance channel is again found to be nearly non-existent in these results and this result again suggest that external supply and demand effects of hedging flows may have a larger role in determining ABX.HE returns than mortgage default performance *per se*. This finding suggests some caution in using the ABX.HE indexes as a pure indicators of underlying mortgage fundamentals. It also appears to support the claim that the ABX.HE indexes are an imperfect benchmark for mark-to-market portfolio valuations for subprime mortgages.

5 Conclusions

Current pricing of ABX.HE indexed credit default swaps (CDS) imply levels of forecasted losses for sup-prime residential mortgage backed securities (RMBS) that are substantially greater than realized credit events in these securities. Regression results, controlling for the correlational structure of the common underlying mortgage pools, indicate that the credit performance of the referenced sub-prime RMBS is uncorrelated with observed fluctuations in the ABX.HE indexed CDS returns. Although we find some evidence that volatility shocks, as measured by VIX, have also negatively impacted ABX.HE returns, these effects are not consistently associated with devaluations on higher credit rated ABX.HE indexed CDS. Instead, the returns on ABX.HE indexes of all credit qualities are consistently and statistically significantly related to short-sale demand imbalances in the option and equity markets of the publicly-traded builders, the commercial banks, the investment banks and the government sponsored enterprises (GSEs). The combined effect of the unique settlement structure of the ABX.HE indexes, the lower short sales constraints in the indexed credit default swap market, and the important supply limitations in the cash market for BBB and BBB- tranches appear to have significantly amplified arbitrage imbalances between the cash market for tranches and the ABX.HE indexed derivatives. Our results indicate that dislocations associated with aggregate short-selling imbalances in the mortgage related capital markets rather than credit events in the outstanding stock of sub-prime RMBS, *per se* appear to be central to the substantial price devaluations of the ABX.HE indexed credit default swaps. Our finding that the short-selling strategies of arbitrageurs have exacerbated the effects of negative economic shocks in the sub-prime RMBS market leads us to conclude that the ABX.HE indexed CDS are imperfect benchmarks for marking-to-market mortgage portfolios because the indexed market does not efficiently aggregate information concerning the credit performance of referenced sub-prime mortgage obligations.

Table 1: Outstanding ABX.HE Indexed CDS Positions and the Outstanding Principal on the Referenced Basket of Sub-prime Residential Mortgage Backed Securities Sorted by ABX.HE Subindexes and Credit Rating

The table presents the total outstanding U.S. dollar amount of ABX.HE indexed Credit Default Swaps (CDS) for gross and net notionals and the number of outstanding contracts by class. We also report the aggregate current outstanding balances for the basket of twenty bonds that comprise each of the ABX.HE subindexes and compute the percentage of CDS coverage per dollar of outstanding bond principal for the 20 component tranches. These data were obtained from the Depository Trust & Clearing Corporation (DTCC) website, $http://www.dtcc.com/products/derivserv/suite/tradeinfo_warehouse.php$

	Gross Notional ($000,000)	Net Notational ($000,000)	Contracts	Current Tranche Notional ($000,000)	Ratio Net ABX.CDS to Bond Notional
ABX.HE.AAA 2006	29,159	6,999	1859	2,978	2.35
ABX.HE.AA 2006	13,821	3,451	773	2,195	1.57
ABX.HE.A 2006	15,281	2,184	570	1,115	1.95
ABX.HE.BBB 2006	13,560	3,570	590	630	5.66
ABX.HE.BBB- 2006	23,545	3,237	1244	478	6.78
ABX.HE-PENAAA 2006	10,220	2,550	609	4,604	5.54
ABX.HE.AAA 2007	14,951	4,623	1045	2,867	1.61
ABX.HE.AA 2007	6,656	2,179	409	2,034	1.07
ABX.HE.A 2007	4,300	1,650	248	955	1.73
ABX.HE.BBB 2007	2,796	947	201	471	2.01
ABX.HE.BBB- 2007	4,481	947	368	472	2.00
ABX.HE-PENAAA 2007	7,639	1,389	401	6,206	.22
Totals	146,409	33,724	8,317	25,005	1.35
Total CDS	14,328,232	1,276,228	224,706		
ABX.HE % of Total	1.02%	2.64%	3.70%		

Table 2: The ABX.HE Shelf Contributors to the Markit ABX.HE 2006-2007 Indexes

The table presents the total origination shelf for mortgage backed originators who placed at least one bond in the ABX index from 2006 through 2007. The data for this table were obtained from Markit, Bloomberg, Wells Fargo Trust, and LaSalle Trustee.

			Shelf Means				ABX Deal Means		
Shelf Name	Shelf Abbreviation	Deals	Weighted Average Coupon WAC	Weighted Average Maturity WAM	Original Balance (000)	Deals	Weighted Average Coupon WAC	Weighted Average Maturity WAM	Original Balance (000)
Asset Backed Funded Certificates	ABFC	11	8.12	316	961,432	1	8.77	338.00	675,393
ACE Securities Corporation	ACE	54	8.75	288	670,907	4	8.21	328.33	688,292
Ameriquest Mortgage Securities Inc.	AMRSI	12	8.23	310	1,514,963	1	7.85	316.00	802,916
AMRESCO Securities Inc.	ARSI	10	8.20	352	902,916	2	8.36	323.00	1,046,348
Bear Stearns Asset Backed Securities Trust	BSABS	82	7.55	309	502,028	4	8.13	350.25	469,066
Carrington Mortgage Loan Trust	CARR	17	8.21	324	1,060,439	2	8.04	331.50	960,125
Credit Based Asset Services	CBASS	36	8.45	290	491,498	1	8.31	334.50	460,153
Citigroup Mortgage Loan Trust Inc.	CMLTI	76	7.07	322	741,912	7	7.91	339.71	1,653,558
Countrywide Asset Backed Trust	CWL	106	8.27	310	973,097	4	8.24	341.86	1,089,040
First Franklin–Merrill Lynch	FFMER	7	9.18	321	1,057,885	6	8.21	449.00	1,663,430
First Franklin Mortgage Loans	FFML	41	8.37	302	1,044,185	4	8.07	343.00	827,887
Fremont Home Loan Trust	FHLT	15	8.20	323	1,300,721	1	8.03	330.00	1,027,570
Goldman Sachs GSAMP Trust	GSAMP	48	8.49	301	586,051	4	8.38	331.89	791,727
Home Equity Asset Trust	HEAT	17	8.47	317	978,412	3	8.36	381.35	767,223
J.P. Morgan Mortgage Acquisition Trust	JPMAC	25	7.97	318	970,400	4	7.81	324.80	801,370
Long Beach Mortgage Loan Trust	LBMLT	19	8.21	357	1,907,743	3	8.14	361.50	913,593
Master Asset Backed Securities Trust	MABS	28	8.16	319	782,548	3	8.24	328.27	504,965
Merrill Lynch Mortgage Investment Trust	MLMI	56	7.90	302	674,256	3	8.19	337.00	774,442
Morgan Stanley Capital Inc.	MSAC	40	8.26	318	1,342,828	3	8.87	333.00	1,190,837
New Century Home Equity Trust	NHET	10	7.94	316	1,781,766	2	7.76	316.26	745,077
Novastar Home Equity Loans	NHEL	11	8.85	315	1,527,146	1	8.19	342.24	674,657
Option One Mortgage Loan Trust	OOMLT	17	8.20	328	1,278,233	1	8.16	342.00	1,214,732
Residential Asset Mortgage Products Inc.	RAMP	38	7.98	313	644,034	2	8.12	322.47	313,055
Residential Asset Securities Corp.	RASC	39	8.67	316	655,766	3	8.62	339.99	659,494
Security Asset Backed Receivables Inc.	SABR	27	8.48	322	898,713	4	8.23	327.54	522,528
Structured Asset Investment Loan Trust	SAIL	19	8.28	314	1,896,950	2	8.35	326.13	997,958
Structure Asset Security Corp.	SASC	21	8.15	353	952,142	4	8.00	333.26	826,901
Soundview Home Equity Loan Trust	SVHET	30	8.48	314	901,195	4	8.31	333.59	1,242,287
WAMU Asset Backed Certificates	WMHE	3	8.01	342	1,075,185	1	7.74	392.75	1,283,495

Table 3: Composition of Loan Pools Underlying the Markit ABX.HE 2006-2007 Indexes

The table presents summary statistics for the loan pools that were contributed to the 2006 and 2007 ABX Indexes by Shelf. The data for this table were obtained from Markit, Bloomberg, Wells Fargo Trust, and LaSalle Trustee.

Shelf Name	Shelf Abbreviation	Mean Loans in Pool	CA (%)	FL (%)	IL (%)	MD (%)	MI (%)	NJ (%)	NV (%)	NY (%)
Asset Backed Funded Certificates	ABFC	3019.0	27.3	14.2	1.1	1.8	1.7	3.9	2.1	11.2
ACE Securities Corporation	ACE	3243.0	42.1	12.4	2.4	1.6	1.3	2.5	3.4	5.2
Ameriquest Mortgage Securities Inc.	AMSI	4514.0	16.2	12.1	2.6	2.2	4.5	4.0	1.6	9.6
AMRESCO Securities Inc.	ARSI	4925.0	33.4	15.0	5.3	2.6	3.1	3.2	2.3	6.5
Bear Stearns Asset Backed Securities Trust	BSABS	2452.8	30.3	11.4	5.2	3.1	2.6	3.3	2.2	5.9
Carrington Mortgage Loan Trust	CARR	4532.0	32.2	9.6	3.7	2.3	2.1	4.0	2.4	7.9
Credit Based Asset Services	CBASS	2452.0	25.4	22.6	2.4	2.6	1.6	1.2	2.9	3.4
Citigroup Mortgage Loan Trust Inc.	CMLTI	7962.1	27.1	16.1	7.2	4.5	1.3	4.2	2.1	5.0
Countrywide Asset Backed Trust	CWL	5617.0	23.4	14.2	3.2	2.9	2.4	2.4	2.8	4.9
First Franklin–Merrill Lynch	FFMER	8449.0	16.1	11.5	6.4	2.6	2.7	3.4	1.9	8.6
First Franklin Mortgage Loans	FFML	4329.0	29.4	10.0	4.1	2.2	3.4	2.4	2.5	5.2
Fremont Home Loan Trust	FHLT	2687.1	20.2	7.0	2.4	1.9	2.8	1.8	2.8	3.5
Goldman Sachs GSAMP Trust	GSAMP	4717.0	21.2	12.8	4.8	3.2	2.5	3.8	2.0	5.6
Home Equity Asset Trust	HEAT	4229.7	26.7	14.9	4.4	3.0	1.3	2.5	2.6	3.9
J.P. Morgan Mortgage Acquisition Trust	JPMAC	4166.0	15.1	17.8	4.3	3.9	2.6	5.8	1.1	10.3
Long Beach Mortgage Loan Trust	LBMLT	4772.0	33.7	9.8	6.5	2.5	2.1	2.7	1.1	4.6
Master Asset Backed Securities Trust	MABS	2474.0	41.5	9.4	2.1	2.1	1.4	3.0	3.5	5.2
Merrill Lynch Mortgage Investment Trust	MLMI	3575.3	22.6	12.4	5.1	4.1	2.0	5.3	1.9	11.0
Morgan Stanley Capital Inc.	MSAC	5999.0	37.1	12.4	3.8	3.9	1.0	3.7	1.8	6.5
New Century Home Equity Trust	NCHET	3726.0	38.4	9.4	3.0	1.5	1.6	2.5	2.5	6.8
Novastar Home Equity Loans	NHEL	3668.0	29.9	15.0	3.0	1.4	2.2	1.4	2.2	1.3
Option One Mortgage Loan Trust	OOMLT	5307.0	24.2	11.0	2.3	2.5	2.1	5.8	1.5	10.2
Residential Asset Mortgage Products Inc.	RAMP	1723.0	22.8	11.1	4.1	3.8	1.9	2.1	3.0	5.4
Residential Asset Securities Corp.	RASC	4009.8	17.5	12.8	4.0	2.5	3.8	2.5	2.1	3.4
Security Asset Backed Receivables Inc.	SABR	2739.3	29.2	11.3	2.9	2.5	2.2	4.1	2.5	7.6
Structured Asset Investment Loan Trust	SAIL	5193.0	33.7	9.3	5.6	1.9	3.0	2.8	2.3	7.5
Structure Asset Security Corp.	SASC	4689.0	26.4	11.2	4.7	5.1	2.8	3.0	1.9	3.7
Soundview Home Equity Loan Trust	SVHE	6411.3	23.2	10.7	4.0	3.0	2.5	3.6	1.7	6.9
WAMU Asset Backed Certificates	WMHE	5229.0	38.6	8.1	2.6	5.9	1.3	3.5	0.6	6.2

Shelf Name	Shelf Abbreviation	PA (%)	TX (%)	VA (%)	WA (%)	AZ (%)	GA (%)	OH (%)	ARM (%)	WALTV (%)
Asset Backed Funded Certificates	ABFC	1.9	8.6	1.7	1.4	1.7	1.4	0.9	81.8	79.3
ACE Securities Corporation	ACE	1.3	2.9	1.3	2.5	4.9	1.1	0.9	79.2	82.0
Ameriquest Mortgage Securities Inc.	AMSI	4.2	5.2	.	2.5	4.0	2.1	3.8	68.9	79.5
AMRESCO Securities Inc.	ARSI	1.5	4.2	.	0.8	6.6	0.2	.	81.4	81.7
Bear Stearns Asset Backed Securities Trust	BSABS	2.5	4.4	3.1	1.5	3.2	3.2	1.6	71.7	81.8
Carrington Mortgage Loan Trust	CARR	1.8	4.9	1.4	1.7	3.3	2.1	1.6	82.0	81.3
Credit Based Asset Services	CBASS	3.3	3.3	2.0	2.3	5.8	0.5	1.0	67.2	79.6
Citigroup Mortgage Loan Trust Inc.	CMLTI	2.1	3.4	3.4	1.9	5.5	0.8	0.9	67.8	81.4
Countrywide Asset Backed Trust	CWL	2.4	4.4	3.1	2.7	4.1	3.0	1.8	64.6	80.1
First Franklin–Merrill Lynch	FFMER	1.5	4.6	1.3	4.5	2.0	3.4	2.8	80.7	83.4
First Franklin Mortgage Loans	FFML	1.6	4.3	1.7	2.3	2.5	3.1	3.0	80.0	81.8
Fremont Home Loan Trust	FHLT	1.2	2.9	1.3	2.0	2.1	3.5	2.5	81.5	82.5
Goldman Sachs GSAMP Trust	GSAMP	1.8	6.5	2.0	1.6	2.5	4.8	2.4	76.8	80.6
Home Equity Asset Trust	HEAT	1.8	4.4	2.4	2.4	5.3	2.2	1.6	78.4	81.8
J.P. Morgan Mortgage Acquisition Trust	JPMAC	2.6	3.0	2.8	1.0	2.4	2.2	2.5	70.2	78.4
Long Beach Mortgage Loan Trust	LBMLT	1.7	8.1	1.7	3.0	1.3	2.8	0.9	84.8	80.2
Master Asset Backed Securities Trust	MABS	1.8	3.8	1.2	1.7	3.9	1.6	1.2	81.8	85.8
Merrill Lynch Mortgage Investment Trust	MLMI	2.3	1.9	3.2	1.3	4.0	2.2	1.2	73.9	84.0
Morgan Stanley Capital Inc.	MSAC	1.5	4.4	2.2	3.0	3.3	1.3	0.7	81.6	77.1
New Century Home Equity Trust	NCHET	1.5	4.5	1.6	1.6	2.2	1.3	1.8	70.8	80.8
Novastar Home Equity Loans	NHEL	1.9	1.7	2.1	5.2	4.0	2.2	2.7	74.9	82.6
Option One Mortgage Loan Trust	OOMLT	2.1	6.0	2.4	2.8	2.8	1.8	0.9	88.7	82.3
Residential Asset Mortgage Products Inc.	RAMP	3.3	3.1	3.6	1.6	4.8	2.5	2.5	73.5	82.2
Residential Asset Securities Corp.	RASC	2.4	4.7	3.0	2.7	4.8	3.7	2.4	73.6	81.8
Security Asset Backed Receivables Inc.	SABR	2.1	5.5	2.5	1.7	2.6	2.2	1.6	77.9	81.4
Structured Asset Investment Loan Trust	SAIL	1.6	2.9	1.1	1.6	3.5	1.0	3.8	74.3	84.0
Structure Asset Security Corp.	SASC	2.6	2.9	3.5	2.0	4.4	1.7	2.0	65.7	81.8
Soundview Home Equity Loan Trust	SVHE	2.7	4.8	3.1	2.0	3.4	2.4	3.1	73.8	82.6
WAMU Asset Backed Certificates	WMHE	1.6	5.1	1.7	4.7	1.7	1.3	0.5	74.5	78.4

Table 4: Subordination Percentages for the Eighty Sub-Prime RMBS Pools Referenced by the ABX.HE Indexes

The table presents the average subordination level by credit rating for all the bonds in each vintage of ABX.HE. The leverage ratio is computed as the inverse of the loss rate that would be required for a complete loss of principal for each bond in the deal's waterfall structure.

ABX.HE Year	Bond Rating	Mean	Standard Deviation	Minimum	Maximum
		Subordination at Issuance (%)			
2006	AAA	23.17	7.38	16.43	60.28
	AA	14.12	2.04	10.65	19.75
	A	8.24	1.66	5.57	12.50
	BBB	3.84	1.68	0.00	6.80
	BBB-	3.05	1.42	0.01	5.80
2007	AAA	23.12	7.70	6.00	53.72
	AA	13.29	3.19	3.31	19.75
	A	7.68	2.33	1.73	12.55
	BBB	3.78	1.98	1.02	7.40
	BBB-	2.62	1.86	0.00	5.85
		Subordination as of 11/28/08 (%)			
2007	AAA	48.89	14.64	19.79	82.12
	AA	29.94	10.26	7.96	51.39
	A	15.32	7.07	0.00	28.01
	BBB	6.05	4.27	0.43	15.06
	BBB-	3.56	3.92	0.00	12.77
2007	AAA	28.30	6.29	18.95	54.92
	AA	16.14	3.33	9.57	22.39
	A	8.45	3.12	0.08	14.70
	BBB	3.48	2.74	0.00	8.62
	BBB-	2.91	2.04	0.00	6.96
		Tranche Size at Issuance ($000,000)			
2006	AAA	76.11	55.30	15.00	242.83
	AA	55.87	25.52	23.18	157.79
	A	28.33	13.28	12.83	75.25
	BBB	17.47	72.57	62.51	387.50
	BBB-	15.69	62.27	50.79	341.00
2007	AAA	71.76	39.03	18.45	188.32
	AA	52.71	15.98	29.47	105.64
	A	23.99	6.21	12.10	38.31
	BBB	14.19	3.69	6.64	25.35
	BBB-	16.36	6.18	8.25	44.11
		Percentage of Balance Remaining as of 11/28/08 (%)			
2006	AAA	94.95	16.53	24.56	100.00
	AA	100.00	0.00	100.00	100.00
	A	98.45	8.35	55.03	100.00
	BBB	89.29	30.93	0.00	100.00
	BBB-	74.24	36.28	0.00	100.00
2007	AAA	100.00	0.00	100.00	100.00
	AA	100.00	0.00	100.00	100.00
	A	100.00	0.00	100.00	100.00
	BBB	87.68	25.90	0.00	100.00
	BBB-	72.38	44.22	0.00	100.00

Table 5: Over Collateralization and Excess Spread Sorted by the Vintage and Series of the ABX.HE Indexes

The table presents the summary statistics for the amount of over collateralization and the excess spread for the securitization deals that were included in the ABX.HE indexes by vintage.

ABX.HE Year and Series	Mean	Standard Deviation	Minimum	Maximum
	Over Collateralization at Issuance			
ABX.HE-2006-1	1.00	4.99	0.45	5.30
ABX.HE-2006-2	1.17	2.64	0.00	9.03
ABX.HE-2007-1	0.65	1.01	0.00	3.87
ABX.HE-2007-2	1.90	1.73	0.00	5.26
	Over Collateralization as of 11/28/08			
ABX.HE-2006-1	2.94	1.09	0.50	4.60
ABX.HE-2006-2	2.77	0.94	0.50	4.80
ABX.HE-2007-1	2.08	0.93	0.00	4.20
ABX.HE-2007-2	3.31	1.66	0.00	5.85
	Excess Spread at Issuance			
ABX.HE-2006-1	1.03	0.30	0.43	1.56
ABX.HE-2006-2	1.40	0.55	0.66	2.78
ABX.HE-2007-1	1.69	0.55	0.74	2.75
ABX.HE-2007-2	1.27	0.48	0.53	2.18

Table 6: Loan Credit Performance for Markit ABX.HE Indexes to 11/28/08

The table presents the average percentage of outstanding pool principal balance that was 30 days delinquent, 60 days delinquent, 90 days delinquent, held as Real Estate Owned, in Foreclosure, or in Bankruptcy. These performance measures are measured monthly at the pool level for all deals the Markit ABX.HE Indexes. The reported averages in the table are computed over the holding period for each pool in the ABX.HE Index. We also report the sample average of the total principal balance that is affected by all of the above credit events,*ALL Credit Events*.

		30 Day Delinquent %	60 Day Delinquent %	90 Day Delinquent %	Foreclosure %	REO %	Bankrupt %	All Credit Events
ABX.HE-2006-1	Mean	4.28	2.24	3.31	8.33	4.78	1.33	24.27
	Std. Dev.	1.72	1.32	3.31	6.09	4.62	1.39	15.89
	Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Maximum	8.56	6.37	23.50	28.09	19.70	6.10	65.20
ABX.HE-2006-2	Mean	4.29	2.45	1.69	9.06	4.93	1.13	24.75
	Std. Dev.	1.58	4.24	0.00	6.64	4.68	1.20	15.79
	Minimum	0.00	0.00	14.20	0.00	0.00	0.00	14.20
	Maximum	8.45	0.00	14.13	27.90	21.50	4.05	67.61
ABX.HE-2007-1	Mean	4.92	2.68	3.53	8.43	4.09	1.08	24.66
	Std. Dev.	1.85	1.28	3.20	5.64	4.30	1.12	14.53
	Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Maximum	23.33	6.40	18.45	25.00	14.53	5.85	57.20
ABX.HE-2007-2	Mean	5.09	2.85	3.84	8.18	3.18	0.88	24.03
	Std. Dev.	1.72	1.27	3.30	5.34	3.38	0.83	13.54
	Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Maximum	11.03	5.69	16.29	19.72	13.32	5.52	48.62

Table 7: Stacked Seemingly Unrelated Regressions for Pooled 2006 and 2007 Vintage Market Indexes ABX.HE

The table presents results across the five bond ratings. The ABX.HE is measured as the log difference as is the measure of the S&P return all other regressors except the indicator variables are measured as first differences.

	AAA Bonds		AA Bonds		A Bonds		BBB Bonds		BBB- Bonds	
	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.
Intercept	0.00443	0.00137 ***	0.01118	0.00262 ***	0.01079	0.00310 ***	0.01529	0.00303 ***	0.00933	0.00307 ***
Lag1 ABX Return	0.19351	0.00495 ***	0.22918	0.00460 ***	0.12057	0.00494 ***	-0.01259	0.00484 ***	-0.03612	0.00501 ***
S & P 500 Return	0.86050	0.03220 ***	1.29932	0.06160 ***	1.36634	0.07280 ***	1.06608	0.07130 ***	1.03321	0.07230 ***
Lag1 S & P 500 Return	0.68428	0.02960 ***	1.17334	0.05630 ***	1.08766	0.06670 ***	0.63127	0.06500 ***	0.53784	0.06590 ***
Yield Curve Slope	0.00119	0.00134	0.01783	0.00256 ***	0.02476	0.00302 ***	0.02300	0.00296 ***	0.02098	0.00299 ***
One Year CMT	0.01760	0.00131 ***	0.03780	0.00251 ***	0.06091	0.00297 ***	0.04762	0.00290 ***	0.04679	0.00294 ***
VIX	-0.00033	0.00010 ***	-0.00183	0.00020 ***	-0.00010	0.00023	-0.00023	0.00023	0.00039	0.00023 ***
Short Interest Ratio - GSEs	0.01144	0.00233 ***	0.01684	0.00446 ***	0.00524	0.00527	0.01913	0.00516 ***	0.00752	0.00523
Short Interest Ratio - Investment Banks	0.00069	0.00009 ***	0.00000	0.00016	-0.00117	0.00019 ***	-0.00205	0.00019 ***	-0.00229	0.00019 ***
Short Interest Ratio - Builders	-0.01932	0.00477 ***	-0.05891	0.00911 ***	-0.03630	0.01080 ***	-0.06072	0.01050 ***	-0.02930	0.01070 ***
Short Interest Ratio - Banks	-0.00016	0.00003 ***	-0.00093	0.00005 ***	-0.00144	0.00006 ***	-0.00150	0.00006 ***	-0.00141	0.00006 ***
Ratio Open Interest Put Options to Call Options - GSEs	0.00509	0.00844	0.03988	0.01610 **	-0.00622	0.01910	-0.06127	0.01870 ***	-0.06602	0.01890 ***
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.02347	0.00329 ***	0.01638	0.00628 ***	0.02149	0.00742 ***	0.00597	0.00725	0.02049	0.00733 ***
Ratio Open Interest Put Options to Call Options - Builders	0.00325	0.00465	-0.00145	0.00888	-0.01362	0.01050	-0.00608	0.01030	-0.00075	0.01040
Ratio Open Interest Put Options to Call Options - Banks	-0.00083	0.00612	0.00893	0.01170	-0.02263	0.01380	-0.08377	0.01350 ***	-0.10228	0.01370 ***
% Bond Subordination × 30 Delinquency %	0.00008	0.00039	0.00156	0.00130	-0.00009	0.00263	0.01081	0.00524	0.01471	0.00698 **
% Bond Subordination × 60 Delinquency Rate	-0.00055	0.00050	0.00197	0.00157	0.00262	0.00316	0.00381	0.00614	0.00812	0.00809
% Bond Subordination × 90 Delinquency Rate	-0.00022	0.00031	0.00068	0.00100	0.00315	0.00212	0.00034	0.00424	-0.00079	0.00562
% Bond Subordination × REO %	0.00002	0.00011	0.00045	0.00031	0.00068	0.00058	0.00192	0.00099 *	0.00076	0.00113
% Bond Subordination × Foreclosure %	-0.00020	0.00026	0.00041	0.00080	0.00484	0.00165 **	0.00644	0.00321	0.00606	0.00416
% Bond Subordination × Bankruptcy %	-0.00037	0.00092	-0.00174	0.00276	0.00390	0.00531	-0.00904	0.00946	-0.01205	0.01190
Percentage of Overcollateralization at Pool Origination	-0.00710	0.00569	-0.01467	0.01090	-0.00523	0.01290	0.00734	0.00017 ***	0.01892	0.01280
Percentage of Excess Spread at Pool Origination	-0.00032	0.00014 **	-0.00047	0.00026 *	-0.00040	0.00031	-0.00070	0.01350 ***	-0.00092	0.00031 **
Percentage of ARMs at Origination	0.00000	0.00001	0.00001	0.00002	0.00002	0.00002	0.00003	0.00002	0.00003	0.00002 *
% of Pool in CA × CA House Prices Index	0.00001	0.00000 ***	0.00001	0.00000 ***	0.00001	0.00000 ***	0.00001	0.00000 ***	0.00000	0.00000 **
% of Pool in FL × FL House Prices Index	0.00003	0.00000 ***	0.00007	0.00001 ***	0.00007	0.00001 ***	0.00004	0.00001 ***	0.00004	0.00001 ***
% of Pool in IL × IL House Prices Index	-0.00007	0.00003 ***	-0.00007	0.00005	-0.00001	0.00006	-0.00009	0.00006	-0.00005	0.00006
% of Pool in MD × MD House Prices Index	0.00006	0.00002 ***	0.00002	0.00004	-0.00006	0.00005	0.00000	0.00005	-0.00011	0.00005 **
% of Pool in MI × MI House Prices Index	0.00004	0.00003	-0.00006	0.00005	-0.00015	0.00006 **	0.00008	0.00006	-0.00003	0.00006
% of Pool in NJ × NJ House Prices Index	-0.00001	0.00003	-0.00014	0.00005 ***	-0.00015	0.00006 ***	-0.00006	0.00006	-0.00002	0.00006
% of Pool in NV × NV House Prices Index	-0.00002	0.00002	-0.00008	0.00004 **	0.00006	0.00005	0.00008	0.00005 *	0.00001	0.00005
% of Pool in NY × NY House Prices Index	0.00000	0.00000	-0.00003	0.00001 ***	-0.00006	0.00001 ***	-0.00006	0.00001 ***	-0.00006	0.00001 ***
% of Pool in PA × PA House Prices Index	-0.00012	0.00005 **	-0.00008	0.00010	0.00010	0.00012	0.00035	0.00011 ***	0.00053	0.00012 ***
% of Pool in TX × TX House Prices Index	0.00000	0.00002	-0.00012	0.00004 ***	-0.00026	0.00005 ***	-0.00020	0.00005 ***	-0.00025	0.00005 ***
% of Pool in VA × VA House Prices Index	-0.00008	0.00002 ***	-0.00028	0.00004 ***	-0.00020	0.00005 ***	0.00001	0.00005	-0.00007	0.00005
% of Pool in WA × WA House Prices Index	-0.00004	0.00002 ***	0.00001	0.00003	-0.00004	0.00004	-0.00014	0.00004 ***	-0.00012	0.00004 ***
% of Pool in AZ × AZ House Prices Index	0.00001	0.00003	-0.00001	0.00006	-0.00007	0.00007	-0.00001	0.00007	-0.00001	0.00007
% of Pool in GA × GA House Prices Index	-0.00013	0.00005 ***	0.00014	0.00009	0.00021	0.00010 **	-0.00025	0.00010 **	-0.00016	0.00010
% of Pool in OH × OH House Prices Index	0.00008	0.00039	0.00156	0.00130	-0.00009	0.00263	0.01081	0.00524 **	0.01471	0.00698 **
ABX Depth (Traded Tranches)	-0.00001	0.00008	0.00016	0.00015	-0.00031	0.00018 *	-0.00106	0.00017 ***	-0.00106	0.00018 ***
R Squared	0.14880		0.25940		0.26030		0.15120		0.14450	

Table 8: Stacked Seemingly Unrelated Regressions by Vintage of the ABX.HE indexes using only the short interest ratio and the ratio of open interest for put options to call options for banks, investment banks, the government sponsored enterprises, and the public builders.

The table presents results across the five bond ratings. All the regressors except the indicator variables are measured as first differences.

	AAA Bonds		AA Bonds		A Bonds		BBB Bonds		BBB- Bonds	
	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.
	ABX.HE 2007-01									
Short Interest Ratio - GSEs	0.0805	0.0074 ***	0.1184	0.0129 ***	0.0889	0.0131 ***	-0.0098	0.0123	-0.0093	0.0135 ***
Short Interest Ratio - Investment Banks	-0.0001	0.0002	-0.0023	0.0004 ***	-0.0045	0.0004 ***	-0.0027	0.0004 ***	-0.0025	0.0004 ***
Short Interest Ratio - Builders	-0.0311	0.0025 ***	-0.0445	0.0043 ***	-0.0479	0.0044 ***	-0.0347	0.0041 ***	-0.0428	0.0045 ***
Short Interest Ratio - Banks	-0.0008	0.0001 ***	-0.0020	0.0001 ***	-0.0020	0.0001 ***	-0.0009	0.0001 ***	-0.0008	0.0001 ***
Ratio Open Interest Put Options to Call Options - GSEs	-0.0313	0.0158 **	-0.0042	0.0276	-0.0463	0.0280	-0.0191	0.0264	-0.0469	0.0289
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.0370	0.0068 ***	0.0155	0.0119	0.0053	0.0120	-0.0009	0.0113	-0.0172	0.0124
Ratio Open Interest Put Options to Call Options - Builders	-0.0820	0.0087 ***	-0.1697	0.0153 ***	-0.1248	0.0155 ***	0.0484	0.0160 ***	0.0484	0.0160 ***
Ratio Open Interest Put Options to Call Options - Banks	0.1007	0.0131 ***	-0.0042	0.0276	0.0777	0.0232 ***	-0.1696	0.0218 ***	-0.1551	0.0240 ***
R Squared	0.0625		0.0625		0.0660		0.0691		0.0466	
	ABX.HE 2007-02									
Short Interest Ratio - GSEs	-0.1050	0.0571 *	-0.7172	0.0959 ***	-0.4539	0.1008 ***	-0.4134	0.0896 ***	-0.6669	0.0917 ***
Short Interest Ratio - Investment Banks	0.0044	0.0017 ***	0.0217	0.0028 ***	0.0089	0.0030	0.0113	0.0026 ***	0.0194	0.0027 ***
Short Interest Ratio - Builders	-0.0168	0.0045 ***	-0.0537	0.0076 ***	0.0076	0.0080 ***	-0.0613	0.0071 ***	-0.0846	0.0073 ***
Short Interest Ratio - Banks	0.0007	0.0005	0.0056	0.0009 ***	0.0021	0.0010 ***	0.0028	0.0009 ***	0.0056	0.0009 ***
Ratio Open Interest Put Options to Call Options - GSEs	0.1787	0.0977 *	1.2736	0.1644 ***	0.6910	0.1727 ***	0.8525	0.1536 ***	1.3756	0.1571 ***
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.1488	0.0296 ***	-0.4720	0.0498 ***	-0.2461	0.0524 ***	-0.2595	0.0466 ***	-0.3868	0.0476 ***
Ratio Open Interest Put Options to Call Options - Builders	0.1254	0.0523 **	0.6262	0.0879 ***	0.4200	0.0924 ***	0.5102	0.0840 ***	0.5102	0.0840 ***
Ratio Open Interest Put Options to Call Options - Banks	0.4024	0.0963 ***	1.2736	0.1644 ***	0.5011	0.1702 ***	-0.6247	0.1513 ***	-1.3127	0.1547 ***
R Squared	0.0646		0.0887		0.0922		0.0784		0.0886	
	ABX.HE 2006-01									
Short Interest Ratio - GSEs	0.0069	0.0012 ***	0.0201	0.0028 ***	0.0308	0.0055 ***	0.0441	0.0060 ***	0.0224	0.0054 ***
Short Interest Ratio - Investment Banks	0.0004	0.0001 ***	0.0006	0.0001 ***	0.0003	0.0002	-0.0002	0.0003	-0.0002	0.0002
Short Interest Ratio - Builders	-0.0038	0.0004 ***	-0.0090	0.0011 ***	-0.0124	0.0021 ***	-0.0286	0.0023 ***	-0.0207	0.0021 ***
Short Interest Ratio - Banks	-0.0001	0.0000 **	-0.0003	0.0000 **	-0.0010	0.0001 ***	-0.0011	0.0001 ***	-0.0011	0.0001 ***
Ratio Open Interest Put Options to Call Options - GSEs	0.0014	0.0037	0.0304	0.0091 ***	0.1246	0.0177 ***	0.0225	0.0192	-0.0191	0.0173
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.0048	0.0017 ***	0.0101	0.0041 **	0.0512	0.0080 ***	0.0124	0.0087	0.0103	0.0078
Ratio Open Interest Put Options to Call Options - Builders	-0.0065	0.0017 ***	-0.0216	0.0043 ***	-0.0833	0.0083 ***	-0.0334	0.0081 ***	-0.0334	0.0081 ***
Ratio Open Interest Put Options to Call Options - Banks	0.0062	0.0026 ***	0.0304	0.0091 ***	0.0159	0.0122 ***	0.0091	0.0133	-0.0366	0.0119 ***
R Squared	0.0268		0.0438		0.0456		0.0326		0.0339	
	ABX.HE 2007-02									
Short Interest Ratio - GSEs	0.0253	0.0029 ***	0.0472	0.0063 ***	0.0783	0.0072 ***	0.0490	0.0062 ***	0.0198	0.0065 ***
Short Interest Ratio - Investment Banks	0.0006	0.0001 ***	0.0000	0.0003	-0.0012	0.0003	-0.0030	0.0003 ***	-0.0041	0.0003
Short Interest Ratio - Builders	-0.0117	0.0011 ***	-0.0188	0.0024 ***	-0.0372	0.0028 ***	-0.0335	0.0024 ***	-0.0227	0.0025 ***
Short Interest Ratio - Banks	-0.0003	0.0000 ***	-0.0012	0.0001 **	-0.0021	0.0001 ***	-0.0020	0.0001 ***	-0.0014	0.0001 ***
Ratio Open Interest Put Options to Call Options - GSEs	0.0339	0.0084	0.0880	0.0186 ***	0.0690	0.0211 ***	-0.0046	0.0181	-0.0117	0.0190
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.0029	0.0038	0.0518	0.0084 **	0.0379	0.0095 ***	0.0168	0.0081	0.0260	0.0085 ***
Ratio Open Interest Put Options to Call Options - Builders	-0.0370	0.0042 ***	-0.0966	0.0094 ***	-0.1494	0.0106 ***	-0.0086	0.0096	-0.0086	0.0096
Ratio Open Interest Put Options to Call Options - Banks	0.0214	0.0059 ***	0.0880	0.0186 ***	0.0468	0.0147 ***	-0.0657	0.0126 ***	-0.1038	0.0132 ***
R Squared	0.0428		0.0505		0.0835		0.1054		0.0879	

Table 9: Stacked Seemingly Unrelated Regressions for ABX.HE–06–01

The table presents results from ABX–06–01 across the five bond ratings. The ABX.HE is measured as the log difference as is the measure of the S&P return all other regressors except the indicator variables are measured as first differences.

	AAA Bonds		AA Bonds		A Bonds		BBB Bonds		BBB- Bonds	
	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.
Intercept	0.00073	0.00084	-0.00056	0.00191 ***	0.01450	0.00371 ***	0.02120	0.00435 ***	0.00701	0.00387 *
Lag1 ABX Return	0.07908	0.00829 ***	0.18799	0.00804 ***	0.23710	0.00727 ***	0.06514	0.00812 ***	0.07271	0.00827 ***
S & P 500 Return	0.26654	0.02380 ***	0.83183	0.05400 ***	1.86875	0.10510 ***	1.42567	0.12290 ***	1.23369	0.10960 ***
Lag1 S & P 500 Return	0.35232	0.02210 ***	0.92781	0.05010 ***	1.17383	0.09760 ***	1.11120	0.11390 ***	0.98893	0.10150 ***
Yield Curve Slope	0.00133	0.00098	0.01288	0.00223 ***	0.02367	0.00434 ***	0.02440	0.00506 ***	0.03367	0.00452 ***
One Year CMT	0.01149	0.00095 ***	0.03647	0.00215 ***	0.05472	0.00420 ***	0.06875	0.00489 ***	0.06309	0.00436 ***
VIX	0.00017	0.00007 ***	0.00034	0.00016 **	-0.00044	0.00031	-0.00137	0.00037 ***	-0.00077	0.00033 **
Short Interest Ratio - GSEs	0.00303	0.00131 **	0.00604	0.00297 **	0.00790	0.00577	0.02088	0.00678 ***	0.00261	0.00603
Short Interest Ratio - Investment Banks	0.00052	0.00006 ***	0.00072	0.00013 ***	0.00014	0.00026	-0.00005	0.00030	-0.00007	0.00027
Short Interest Ratio - Builders	-0.00205	0.00295	-0.00304	0.00669	-0.06156	0.01300 ***	-0.09784	0.01520 ***	-0.03068	0.01350 **
Short Interest Ratio - Banks	0.00000	0.00002	-0.00013	0.00004 ***	-0.00085	0.00009 ***	-0.00086	0.00010 ***	-0.00097	0.00009 ***
Ratio Open Interest Put Options to Call Options - GSEs	-0.00810	0.00542	0.00981	0.01230	0.04851	0.02390 **	-0.00985	0.02810	-0.01339	0.02500
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.01048	0.00233 ***	-0.00422	0.00528	0.05392	0.01030 ***	-0.00899	0.01200	0.00124	0.01060
Ratio Open Interest Put Options to Call Options - Builders	-0.00034	0.00278	-0.00036	0.00631	-0.02178	0.01230 *	-0.02739	0.01440 *	-0.01079	0.01280
Ratio Open Interest Put Options to Call Options - Banks	-0.00647	0.00384 *	-0.01440	0.00872	-0.00041	0.01690	-0.02819	0.01990	-0.03886	0.01770 **
% Bond Subordination × 30 Delinquency %	0.00006	0.00021	0.00000	0.00087	0.00053	0.00279	0.00633	0.00770	0.00979	0.00906
% Bond Subordination × 60 Delinquency Rate	-0.00019	0.00032	-0.00016	0.00129	0.00390	0.00419	0.00436	0.01100	0.01918	0.01250
% Bond Subordination × 90 Delinquency Rate	0.00001	0.00018	-0.00001	0.00072	-0.00020	0.00240	-0.00667	0.00606	0.00012	0.00704
% Bond Subordination × REO %	0.00001	0.00005	0.00000	0.00015	-0.00012	0.00045	0.00035	0.00092	-0.00012	0.00093
% Bond Subordination × Foreclosure %	0.00009	0.00017	0.00031	0.00068	0.00062	0.00222	-0.00524	0.00541	0.00113	0.00619
% Bond Subordination × Bankruptcy %	0.00012	0.00062	0.00122	0.00226	0.00167	0.00728	-0.01733	0.01810	-0.01339	0.02030
Percentage of Overcollateralization at Pool Origination	0.00092	0.00440	0.00300	0.00996	0.00992	0.01940	0.01428	0.00026 ***	0.01362	0.02040
Percentage of Excess Spread at Pool Origination	0.00002	0.00019	0.00024	0.00044	0.00146	0.00086 *	0.00168	0.01990	0.00182	0.00090 **
Percentage of ARMs at Origination	0.00000	0.00001	0.00000	0.00001	-0.00001	0.00003	-0.00002	0.00003	-0.00002	0.00003
% of Pool in CA × CA House Prices Index	0.00000	0.00000	0.00000	0.00000 **	0.00001	0.00000 *	0.00001	0.00000 ***	0.00001	0.00000 **
% of Pool in FL × FL House Prices Index	0.00001	0.00000 ***	0.00002	0.00001 ***	0.00004	0.00002 **	0.00010	0.00002 ***	0.00005	0.00002 ***
% of Pool in IL × IL House Prices Index	-0.00001	0.00002	-0.00004	0.00004	-0.00008	0.00008	-0.00007	0.00009	-0.00006	0.00008
% of Pool in MD × MD House Prices Index	0.00002	0.00001	0.00001	0.00003	-0.00004	0.00006	0.00011	0.00007	-0.00001	0.00006
% of Pool in MI × MI House Prices Index	0.00001	0.00002	0.00002	0.00004	0.00006	0.00007	0.00023	0.00008 ***	0.00009	0.00007
% of Pool in NJ × NJ House Prices Index	-0.00006	0.00002 ***	-0.00009	0.00005 *	-0.00012	0.00010	-0.00026	0.00012 *	-0.00002	0.00011
% of Pool in NV × NV House Prices Index	0.00001	0.00001	0.00002	0.00003	0.00001	0.00005	-0.00004	0.00006	-0.00001	0.00006
% of Pool in NY × NY House Prices Index	0.00000	0.00000	-0.00001	0.00001	-0.00005	0.00001 **	-0.00007	0.00002 ***	-0.00006	0.00002 ***
% of Pool in PA × PA House Prices Index	-0.00003	0.00003	-0.00008	0.00006	0.00002	0.00012	0.00002	0.00015	0.00017	0.00013
% of Pool in TX × TX House Prices Index	0.00001	0.00002	-0.00002	0.00003	-0.00016	0.00007 **	-0.00006	0.00008	-0.00016	0.00007 **
% of Pool in VA × VA House Prices Index	0.00001	0.00002	-0.00004	0.00004	-0.00010	0.00009	0.00015	0.00010	-0.00001	0.00009
% of Pool in WA × WA House Prices Index	-0.00001	0.00001	-0.00003	0.00003	-0.00007	0.00005	-0.00013	0.00006 *	-0.00008	0.00006
% of Pool in AZ × AZ House Prices Index	0.00001	0.00002	-0.00001	0.00005	-0.00007	0.00009	0.00000	0.00010	-0.00005	0.00009
% of Pool in GA × GA House Prices Index	0.00000	0.00002	-0.00001	0.00005	-0.00005	0.00010	-0.00012	0.00012	-0.00005	0.00011
% of Pool in OH × OH House Prices Index	0.00006	0.00021	0.00000	0.00087	0.00053	0.00279	0.00633	0.00770	0.00979	0.00906
ABX Depth (Traded Tranches)	-0.00008	0.00005	0.00019	0.00011	-0.00028	0.00022	-0.00082	0.00026 ***	-0.00036	0.00023
R Squared	0.14880		0.25940		0.26030		0.15120		0.14450	

Table 10: Stacked Seemingly Unrelated Regressions for ABX.HE–06–02

The table presents results from ABX–06–02 across the five bond ratings. The ABX.HE is measured as the log difference as is the measure of the S&P return all other regressors except the indicator variables are measured as first differences.

	AAA Bonds		AA Bonds		A Bonds		BBB Bonds		BBB- Bonds	
	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.
Intercept	0.00832	0.00233 ***	0.01644	0.00523 ***	0.01845	0.00628 ***	0.00643	0.00551	-0.00078	0.00585
Lag1 ABX Return	0.15940	0.00854 ***	0.23480	0.00788 ***	0.07218	0.00898 ***	-0.00197	0.00902	-0.06964	0.00962 ***
S & P 500 Return	0.74972	0.05240 ***	1.75938	0.11750 ***	1.34536	0.14120 ***	0.92002	0.12390 ***	0.85816	0.13160 ***
Lag1 S & P 500 Return	0.85852	0.04830 ***	1.23367	0.10810 ***	0.38131	0.13010 ***	0.80121	0.11340 ***	0.82565	0.12060 ***
Yield Curve Slope	-0.00384	0.00214 *	0.00716	0.00479	0.02050	0.00575 ***	0.00531	0.00505	-0.00050	0.00536
One Year CMT	0.01302	0.00208 ***	0.02862	0.00466 ***	0.05733	0.00559 ***	0.03200	0.00491 ***	0.05018	0.00522 ***
VIX	-0.00025	0.00017	-0.00198	0.00038 ***	0.00014	0.00045	0.00048	0.00040	0.00264	0.00042 **
Short Interest Ratio - GSEs	0.00765	0.00395 *	0.01561	0.00883 *	0.00792	0.01060	0.02298	0.00932 **	0.02956	0.00990 ***
Short Interest Ratio - Investment Banks	0.00080	0.00014 ***	-0.00004	0.00031	0.00051	0.00037	-0.00248	0.00033 ***	-0.00484	0.00035 ***
Short Interest Ratio - Builders	-0.02403	0.00772 ***	-0.06755	0.01730 ***	-0.05079	0.02080 **	-0.01897	0.01820	0.04489	0.01930 **
Short Interest Ratio - Banks	-0.00014	0.00004 ***	-0.00100	0.00010 ***	-0.00171	0.00012 ***	-0.00193	0.00011 ***	-0.00177	0.00011 ***
Ratio Open Interest Put Options to Call Options - GSEs	-0.00416	0.01220	0.05409	0.02740 **	-0.05816	0.03290 *	-0.06116	0.02890 **	-0.05291	0.03060 *
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.01267	0.00565 **	0.05095	0.01270 ***	-0.04052	0.01520 ***	-0.01335	0.01340	0.05861	0.01420 ***
Ratio Open Interest Put Options to Call Options - Builders	0.00938	0.00883	-0.00803	0.01980	-0.00437	0.02380	-0.02846	0.02100	-0.09093	0.02230 ***
Ratio Open Interest Put Options to Call Options - Banks	-0.01200	0.00910	0.02463	0.02040	-0.03299	0.02460	-0.06450	0.02160 ***	-0.07717	0.02300 ***
% Bond Subordination × 30 Delinquency %	0.00013	0.00075	0.00211	0.00271	0.00956	0.00564 *	0.02522	0.00987 **	0.03205	0.01360 **
% Bond Subordination × 60 Delinquency Rate	0.00037	0.00076	0.00228	0.00261	0.00280	0.00534	0.01181	0.00944	0.01828	0.01300
% Bond Subordination × 90 Delinquency Rate	0.00062	0.00085	0.00126	0.00294	0.00730	0.00613	0.00649	0.01070	0.00154	0.01450
% Bond Subordination × REO %	0.00005	0.00121	-0.00218	0.00431	-0.00434	0.00882	-0.02410	0.01470	-0.03103	0.01920
% Bond Subordination × Foreclosure %	0.00035	0.00047	0.00090	0.00166	0.00526	0.00346	0.00653	0.00636	0.00383	0.00879
% Bond Subordination × Bankruptcy %	0.00050	0.00190	0.00324	0.00633	0.00601	0.01270	0.01331	0.02180	0.02381	0.02930
Percentage of Overcollateralization at Pool Origination	-0.00231	0.01120	-0.00099	0.02510	-0.00854	0.03010	0.00035	0.02670	0.01711	0.02850
Percentage of Excess Spread at Pool Origination	0.00004	0.00022	-0.00009	0.00050	0.00021	0.00060	0.00027	0.00053	-0.00005	0.00057
Percentage of ARMs at Origination	-0.00001	0.00002	-0.00001	0.00004	-0.00004	0.00004	0.00002	0.00004	0.00004	0.00004
% of Pool in CA × CA House Prices Index	0.00000	0.00000	0.00001	0.00000 ***	0.00001	0.00000 *	0.00000	0.00000	0.00000	0.00000
% of Pool in FL × FL House Prices Index	0.00002	0.00001 **	0.00004	0.00002 *	0.00004	0.00003 *	0.00001	0.00002	-0.00005	0.00002 *
% of Pool in IL × IL House Prices Index	-0.00012	0.00006	-0.00017	0.00014	-0.00021	0.00017	0.00010	0.00015	0.00035	0.00016
% of Pool in MD × MD House Prices Index	0.00003	0.00003	-0.00002	0.00008	0.00011	0.00009	-0.00001	0.00008	-0.00015	0.00008 *
% of Pool in MI × MI House Prices Index	0.00004	0.00006	0.00003	0.00013	-0.00031	0.00015 **	-0.00014	0.00013 ***	-0.00007	0.00014
% of Pool in NJ × NJ House Prices Index	-0.00008	0.00004	-0.00010	0.00010	-0.00025	0.00012 **	-0.00014	0.00010 *	-0.00002	0.00011
% of Pool in NV × NV House Prices Index	0.00013	0.00005	0.00014	0.00011	0.00086	0.00013 ***	0.00042	0.00011 ***	0.00009	0.00012
% of Pool in NY × NY House Prices Index	-0.00001	0.00001	-0.00003	0.00002	-0.00007	0.00002 ***	-0.00007	0.00002 ***	-0.00006	0.00002 ***
% of Pool in PA × PA House Prices Index	-0.00017	0.00010	-0.00013	0.00023	0.00022	0.00027	0.00082	0.00024 ***	0.00107	0.00026 ***
% of Pool in TX × TX House Prices Index	-0.00002	0.00005	-0.00025	0.00010 **	-0.00042	0.00012 ***	-0.00042	0.00011 ***	-0.00049	0.00012 ***
% of Pool in VA × VA House Prices Index	-0.00004	0.00004	-0.00012	0.00010	-0.00006	0.00012	0.00004	0.00010	0.00004	0.00011
% of Pool in WA × WA House Prices Index	-0.00007	0.00003 **	-0.00011	0.00007	-0.00029	0.00008	-0.00023	0.00007 ***	-0.00018	0.00008 **
% of Pool in AZ × AZ House Prices Index	0.00000	0.00005	-0.00008	0.00011	0.00006	0.00013	-0.00002	0.00011	-0.00012	0.00012
% of Pool in GA × GA House Prices Index	-0.00002	0.00011	0.00012	0.00024	0.00021	0.00029	0.00013	0.00025	0.00015	0.00027
% of Pool in OH × OH House Prices Index	0.00013	0.00075	0.00211	0.00271	0.00956	0.00564 *	0.02522	0.00987 **	0.03205	0.01360 **
ABX Depth (Traded Tranches)	-0.00032	0.00012 ***	-0.00004	0.00027	-0.00043	0.00032	-0.00087	0.00028 ***	-0.00183	0.00030 ***
R Squared	0.24110		0.24960		0.19970		0.16680		0.14520	

Table 11: Stacked Seemingly Unrelated Regressions for ABX.HE–07–01

The table presents results from ABX–07–01 across the five bond ratings. The ABX.HE is measured as the log difference as is the measure of the S&P return all other regressors except the indicator variables are measured as first differences.

	AAA Bonds		AA Bonds		A Bonds		BBB Bonds		BBB- Bonds	
	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.
Intercept	0.00118	0.00645	0.04291	0.01190 ***	0.04098	0.01240 ***	0.06943	0.01160 ***	0.06519	0.01280 ***
Lag1 ABX Return	0.21950	0.01050 ***	0.19727	0.01010 ***	-0.01976	0.01080 *	-0.12074	0.00968 ***	-0.10010	0.01000 ***
S & P 500 Return	1.17701	0.08280 ***	1.07521	0.15240 ***	1.11048	0.15960 ***	1.11367	0.14950 ***	1.06907	0.16440 ***
Lag1 S & P 500 Return	0.82108	0.07590 ***	1.39363	0.13810 ***	1.55507	0.14500 ***	0.97870	0.13540 ***	0.43621	0.14860 ***
Yield Curve Slope	0.00269	0.00344	0.04404	0.00633 ***	0.01693	0.00664 **	0.01435	0.00619 **	0.01615	0.00679 **
One Year CMT	0.02639	0.00344 ***	0.06691	0.00631 ***	0.06699	0.00663 ***	0.04690	0.00618 ***	0.05033	0.00678 ***
VIX	-0.00015	0.00032	-0.00135	0.00058 **	0.00135	0.00061 **	0.00409	0.00057 ***	0.00516	0.00063 ***
Short Interest Ratio - GSEs	0.04458	0.01650 ***]	0.01555	0.03070	-0.03945	0.03220	-0.13102	0.03000 ***	-0.14646	0.03300 ***
Short Interest Ratio - Investment Banks	0.00011	0.00043	-0.00090	0.00080	-0.00223	0.00084 ***	-0.00076	0.00078	0.00021	0.00086
Short Interest Ratio - Builders	-0.03499	0.02540	-0.27633	0.04690 ***	-0.25642	0.04910 ***	-0.40551	0.04590 ***	-0.41597	0.05040 ***
Short Interest Ratio - Banks	-0.00054	0.00013 ***	-0.00154	0.00025 ***	-0.00151	0.00026 ***	-0.00089	0.00025 ***	-0.00064	0.00027 **
Ratio Open Interest Put Options to Call Options - GSEs	-0.02481	0.03120	-0.18945	0.05750 ***	-0.28921	0.06020 ***	-0.52976	0.05640 ***	-0.61200	0.06190 ***
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.02368	0.01070 **	0.05952	0.01970 ***	0.02484	0.02070	0.08945	0.01930 ***	0.07203	0.02120 ***
Ratio Open Interest Put Options to Call Options - Builders	-0.03375	0.03080	0.08512	0.05690	0.14422	0.05950 **	0.36382	0.05550 ***	0.40751	0.06100 ***
Ratio Open Interest Put Options to Call Options - Banks	0.05470	0.03310 *	-0.00379	0.06110	-0.15838	0.06400 **	-0.48949	0.05980 ***	-0.51608	0.06570 ***
% Bond Subordination × 30 Delinquency %	0.00025	0.00128	0.00165	0.00420	0.00220	0.00720	0.00308	0.01190	0.00509	0.01690
% Bond Subordination × 60 Delinquency Rate	0.00014	0.00171	-0.00065	0.00550	-0.00023	0.00956	-0.00443	0.01640	-0.00693	0.02330
% Bond Subordination × 90 Delinquency Rate	-0.00010	0.00109	0.00290	0.00392	0.00645	0.00694	0.01544	0.01210	0.01961	0.01720
% Bond Subordination × REO %	0.00035	0.00190	0.00492	0.00717	0.00847	0.01290	0.02699	0.02200	0.03787	0.03090
% Bond Subordination × Foreclosure %	0.00009	0.00074	0.00168	0.00223	0.00348	0.00386	0.00879	0.00682	0.01164	0.00928
% Bond Subordination × Bankruptcy %	-0.00014	0.00352	-0.00064	0.01070	-0.00658	0.01880	-0.01367	0.03350	-0.01945	0.04770
Percentage of Overcollateralization at Pool Origination	-0.00315	0.02120	0.00025	0.03890	0.00049	0.04070	0.03480	0.03830	0.04041	0.04220
Percentage of Excess Spread at Pool Origination	-0.00018	0.00045	-0.00030	0.00083	0.00005	0.00088	0.00045	0.00084	0.00042	0.00092
Percentage of ARMs at Origination	0.00004	0.00004	0.00020	0.00007 ***	0.00018	0.00008 **	0.00025	0.00007 ***	0.00028	0.00008 ***
% of Pool in CA × CA House Prices Index	0.00000	0.00000	0.00002	0.00001 ***	0.00001	0.00001 **	0.00001	0.00001	0.00001	0.00001
% of Pool in FL × FL House Prices Index	0.00001	0.00001	0.00003	0.00002	0.00003	0.00002	0.00000	0.00002	0.00000	0.00002
% of Pool in IL × IL House Prices Index	-0.00006	0.00008	-0.00031	0.00015 **	-0.00028	0.00016 *	-0.00033	0.00015 **	-0.00037	0.00016 **
% of Pool in MD × MD House Prices Index	-0.00003	0.00010	-0.00002	0.00018	0.00010	0.00018	0.00001	0.00017	-0.00003	0.00019
% of Pool in MI × MI House Prices Index	0.00004	0.00013	-0.00029	0.00023	-0.00048	0.00024	-0.00080	0.00023 ***	-0.00082	0.00025 ***
% of Pool in NJ × NJ House Prices Index	0.00000	0.00007	-0.00008	0.00013	-0.00007	0.00014	-0.00023	0.00013 *	-0.00026	0.00014 *
% of Pool in NV × NV House Prices Index	-0.00001	0.00008	0.00008	0.00015	0.00019	0.00015	0.00009	0.00014	0.00007	0.00016
% of Pool in NY × NY House Prices Index	-0.00001	0.00002	-0.00010	0.00003 ***	-0.00009	0.00003 ***	-0.00014	0.00003 ***	-0.00016	0.00003 ***
% of Pool in PA × PA House Prices Index	-0.00006	0.00022	-0.00016	0.00040	-0.00004	0.00042	-0.00020	0.00040	-0.00026	0.00044
% of Pool in TX × TX House Prices Index	-0.00010	0.00007	-0.00051	0.00014 ***	-0.00047	0.00014 ***	-0.00055	0.00013 ***	-0.00063	0.00015 ***
% of Pool in VA × VA House Prices Index	-0.00006	0.00007	-0.00032	0.00013 **	-0.00025	0.00014 *	-0.00044	0.00013 ***	-0.00051	0.00014 ***
% of Pool in WA × WA House Prices Index	-0.00002	0.00005	-0.00009	0.00010	-0.00005	0.00010	-0.00018	0.00010 *	-0.00020	0.00011 *
% of Pool in AZ × AZ House Prices Index	-0.00005	0.00012	-0.00023	0.00022	-0.00022	0.00023	-0.00022	0.00021	-0.00023	0.00023
% of Pool in GA × GA House Prices Index	0.00005	0.00022	0.00038	0.00040	0.00034	0.00042	0.00069	0.00039 *	0.00076	0.00043 *
% of Pool in OH × OH House Prices Index	0.00025	0.00128	0.00165	0.00420	0.00220	0.00720	0.00308	0.01190	0.00509	0.01690
ABX Depth (Traded Tranches)	0.00015	0.00023	-0.00102	0.00042 **	-0.00117	0.00044 ***	-0.00272	0.00041 ***	-0.00223	0.00045 ***
R Squared	0.00000		0.00000		0.00000		0.00000		0.00000	

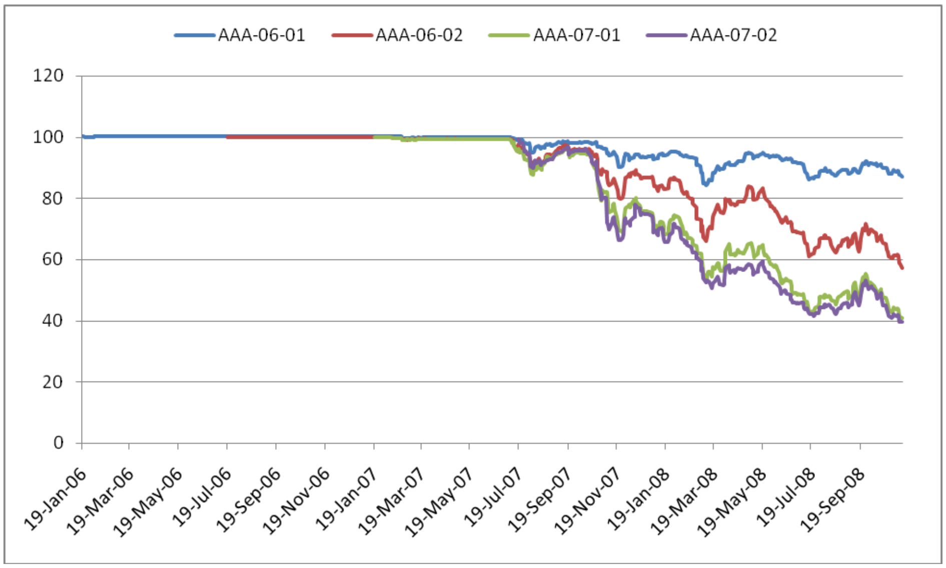
Table 12: Stacked Seemingly Unrelated Regressions

The table presents results from ABX–07–02 across the five bond ratings. The ABX.HE is measured as the log difference as is the measure of the S&P return all other regressors except the indicator variables are measured as first differences.

	AAA Bonds		AA Bonds		A Bonds		BBB Bonds		BBB- Bonds	
	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.	Coeff. Est.	Std. Err.
Intercept	-0.00601	0.00882	0.01709	0.01550	0.01024	0.01630	0.04165	0.01510 ***	0.06627	0.01530
Lag1 ABX Return	0.09822	0.01230 ***	0.15479	0.01160 ***	0.06684	0.01300 ***	-0.11889	0.01240 ***	-0.13501	0.01260 ***
S & P 500 Return	1.33435	0.10520 ***	1.51800	0.18420 ***	0.91994	0.19420 ***	0.45439	0.17990 **	0.49959	0.18310 ***
Lag1 S & P 500 Return	0.90438	0.09520 ***	1.31921	0.16490 ***	1.36309	0.17400 ***	-0.38576	0.16050 **	-0.16096	0.16270 ***
Yield Curve Slope	0.00219	0.00451	0.00198	0.00789	0.03898	0.00831 ***	0.05343	0.00769 ***	0.03541	0.00780
One Year CMT	0.01345	0.00456 ***	0.01865	0.00794 **	0.07426	0.00837 ***	0.05900	0.00776 ***	0.04140	0.00787 ***
VIX	-0.00058	0.00067	-0.00261	0.00115 **	-0.00070	0.00122	0.00023	0.00113	-0.00089	0.00115 **
Short Interest Ratio - Investment Banks	0.00059	0.00035 *	0.00015	0.00061	-0.00239	0.00064 ***	0.00030	0.00058	0.00044	0.00059
Short Interest Ratio - Builders	-0.02376	0.02910	-0.18366	0.05090 ***	-0.02558	0.05360	-0.20883	0.04950 ***	-0.33851	0.05000 **
Short Interest Ratio - Banks	-0.00042	0.00014 ***	-0.00142	0.00024 ***	-0.00188	0.00026 ***	-0.00127	0.00024 ***	-0.00120	0.00024 ***
Ratio Open Interest Put Options to Call Options - Investment Banks	-0.10930	0.01890 ***	-0.07778	0.03300 **	0.06042	0.03500 *	0.05288	0.03210	0.08050	0.03230 **
Ratio Open Interest Put Options to Call Options - Builders	0.02954	0.01680 *	0.05441	0.02940 *	0.00814	0.03100	0.03996	0.02870	0.06493	0.02910 **
Ratio Open Interest Put Options to Call Options - Banks	0.73096	0.22940 ***	0.40744	0.39720	-0.46535	0.41950	-1.44497	0.38650 ***	-1.88048	0.38950 ***
% Bond Subordination × 30 Delinquency %	0.00067	0.00190	0.00094	0.00594	0.00119	0.01120	0.00270	0.01940	0.00302	0.02670 **
% Bond Subordination × 60 Delinquency Rate	0.00034	0.00217	0.00238	0.00637	0.00555	0.01170	0.01157	0.02050	0.01798	0.02730
% Bond Subordination × 90 Delinquency Rate	0.00017	0.00112	0.00057	0.00353	0.00145	0.00691	0.00277	0.01230	0.00388	0.01650
% Bond Subordination × REO %	0.00023	0.00270	0.00202	0.00735	0.00467	0.01290	0.00814	0.02050	0.01126	0.02550
% Bond Subordination × Foreclosure %	0.00022	0.00105	0.00080	0.00293	0.00183	0.00567	0.00391	0.01000	0.00565	0.01320
% Bond Subordination × Bankruptcy %	0.00014	0.00268	-0.00021	0.00744	-0.00058	0.01190	-0.00142	0.01800	-0.00227	0.02230
Percentage of Overcollateralization at Pool Origination	-0.00051	0.01810	-0.00026	0.03200	-0.00078	0.03390	-0.00168	0.03170	-0.00112	0.03220
Percentage of Excess Spread at Pool Origination	-0.00005	0.00065	-0.00008	0.00116	-0.00006	0.00122	-0.00002	0.00111	0.00005	0.00112
Percentage of ARMs at Origination	0.00000	0.00006	0.00000	0.00010	0.00000	0.00011	0.00000	0.00010	0.00000	0.00010
% of Pool in CA × CA House Prices Index	0.00000	0.00001	0.00001	0.00001 ***	0.00001	0.00001 *	0.00001	0.00001	0.00002	0.00001
% of Pool in FL × FL House Prices Index	-0.00001	0.00003	0.00003	0.00004 *	0.00005	0.00005 *	0.00005	0.00004	0.00007	0.00004
% of Pool in IL × IL House Prices Index	0.00002	0.00012	-0.00017	0.00021	-0.00026	0.00022	-0.00029	0.00021	-0.00036	0.00021 *
% of Pool in MD × MD House Prices Index	-0.00002	0.00013	0.00006	0.00023	0.00010	0.00024	0.00011	0.00022	0.00014	0.00023
% of Pool in MI × MI House Prices Index	0.00003	0.00028	-0.00025	0.00050	-0.00039	0.00053	-0.00044	0.00048	-0.00054	0.00048
% of Pool in NJ × NJ House Prices Index	0.00000	0.00014	-0.00005	0.00025	-0.00007	0.00026	-0.00009	0.00024	-0.00011	0.00025
% of Pool in NV × NV House Prices Index	-0.00002	0.00014	0.00009	0.00025	0.00013	0.00027	0.00014	0.00025	0.00018	0.00025
% of Pool in NY × NY House Prices Index	0.00000	0.00002	-0.00003	0.00003	-0.00005	0.00003	-0.00006	0.00003 *	-0.00007	0.00003 **
% of Pool in PA × PA House Prices Index	0.00013	0.00050	-0.00074	0.00087	-0.00118	0.00092	-0.00133	0.00085	-0.00169	0.00086 *
% of Pool in TX × TX House Prices Index	0.00002	0.00012	-0.00012	0.00022	-0.00019	0.00023 ***	-0.00022	0.00021	-0.00028	0.00021
% of Pool in VA × VA House Prices Index	0.00003	0.00011	-0.00022	0.00019	-0.00034	0.00020 *	-0.00039	0.00018 **	-0.00049	0.00019 ***
% of Pool in WA × WA House Prices Index	0.00001	0.00008	-0.00006	0.00014	-0.00008	0.00015	-0.00010	0.00013	-0.00012	0.00014
% of Pool in AZ × AZ House Prices Index	0.00003	0.00022	-0.00011	0.00038	-0.00018	0.00040	-0.00019	0.00037	-0.00024	0.00037
% of Pool in GA × GA House Prices Index	-0.00005	0.00028	0.00034	0.00049	0.00053	0.00052	0.00060	0.00048	0.00074	0.00048
% of Pool in OH × OH House Prices Index	0.00067	0.00190	0.00094	0.00594	0.00119	0.01120	0.00270	0.01940	0.00302	0.02670
ABX Depth (Traded Tranches)	0.00094	0.00037 ***	0.00138	0.00064 **	-0.00015	0.00068	-0.00154	0.00063 **	-0.00206	0.00063 ***
R Squared	0.18390		0.18100		0.17020		0.09600		0.08850	

Figure 1: Prices for the Bonds with AAA and AA Credit Ratings for the 2006 and 2007 Markit ABX.HE Indexes

This Figure plots the Markit ABX.HE indexes for the ABX.HE–2006–1, ABX.HE–2006–1, ABX.HE–2007–1, and ABX.HE–2007–1 Series.



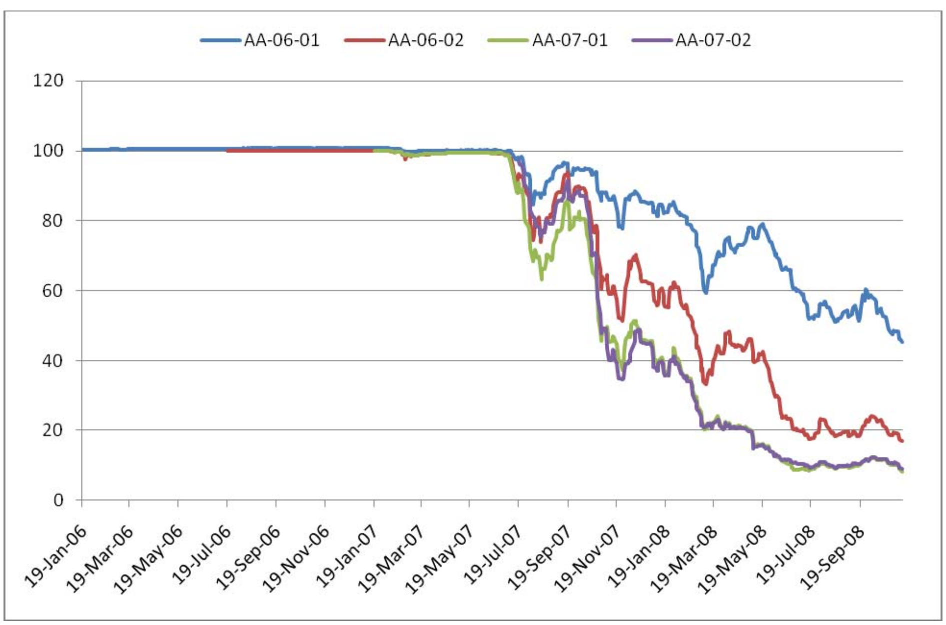
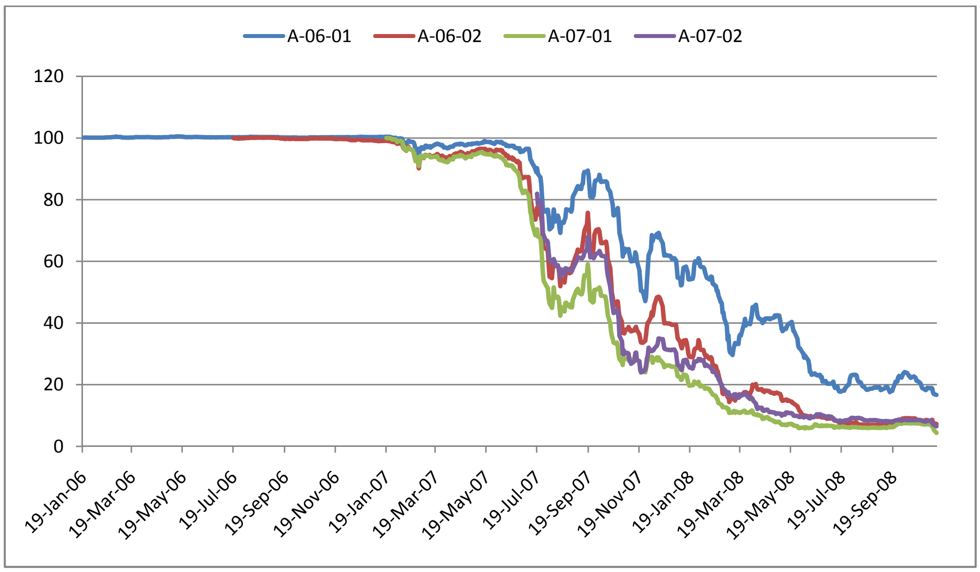


Figure 2: Prices for the Bonds with AA and BBB Credit Ratings for the 2006 and 2007 Markit ABX.HE Indexes

This Figure plots Markit ABX.HE indexes for the ABX.HE–2006–1, ABX.HE–2006–1, ABX.HE–2007–1, and ABX.HE–2007–1 Series.



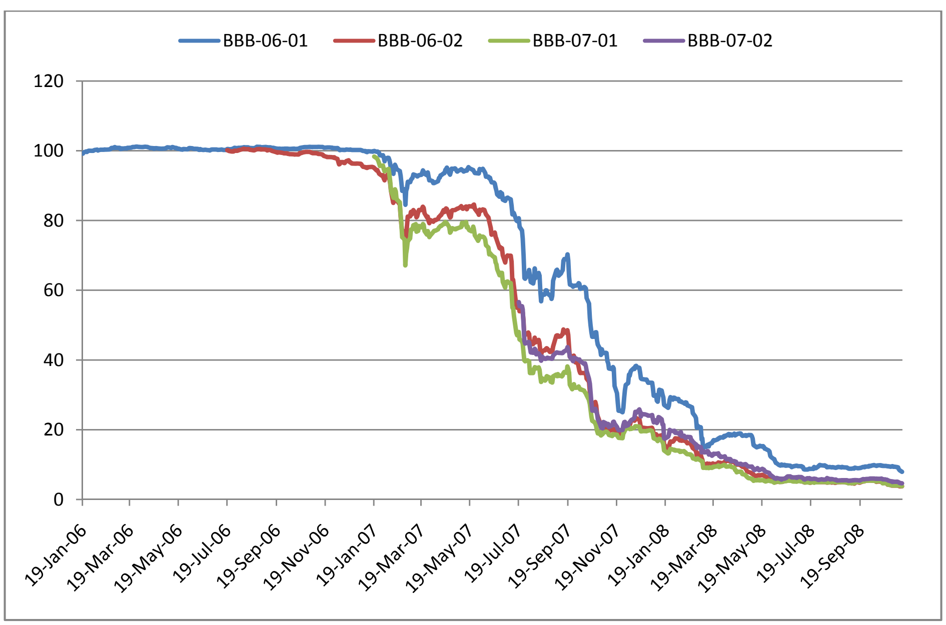


Figure 3: Prices for the Bonds with BBB- Credit Ratings for the 2006 and 2007 Markit ABX.HE Indexes

This Figure plots Markit ABX.HE indexes for the ABX.HE–2006–1, ABX.HE–2006–1, ABX.HE–2007–1, and ABX.HE–2007–1 Series.

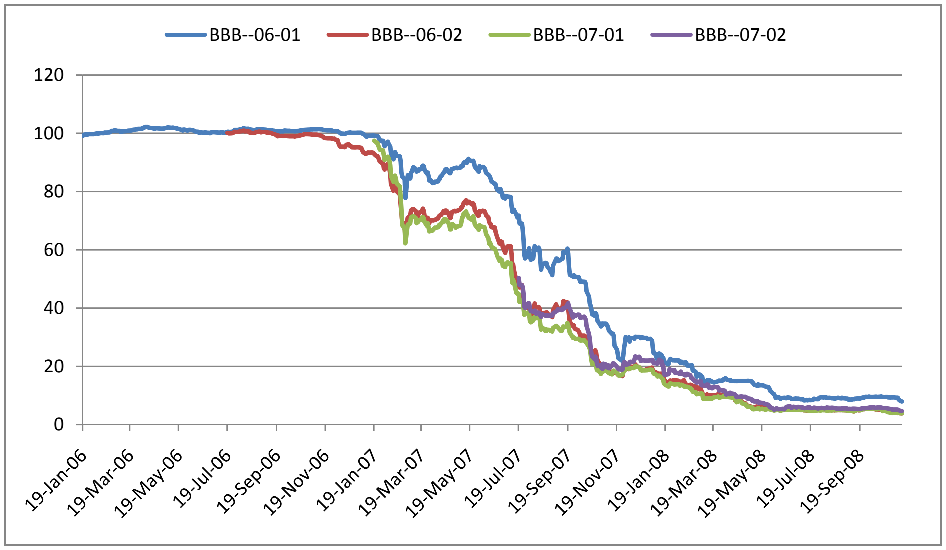


Figure 4: OFHEO Price Indexes for the State with the Highest ABX.HE Concentrations

This Figure plots the OFHEO price indexes over the sample period for the states with the highest concentration of mortgages in the constituent residential mortgage backed security pools for the Markit ABX.HE indexes from 2006 through 2007.

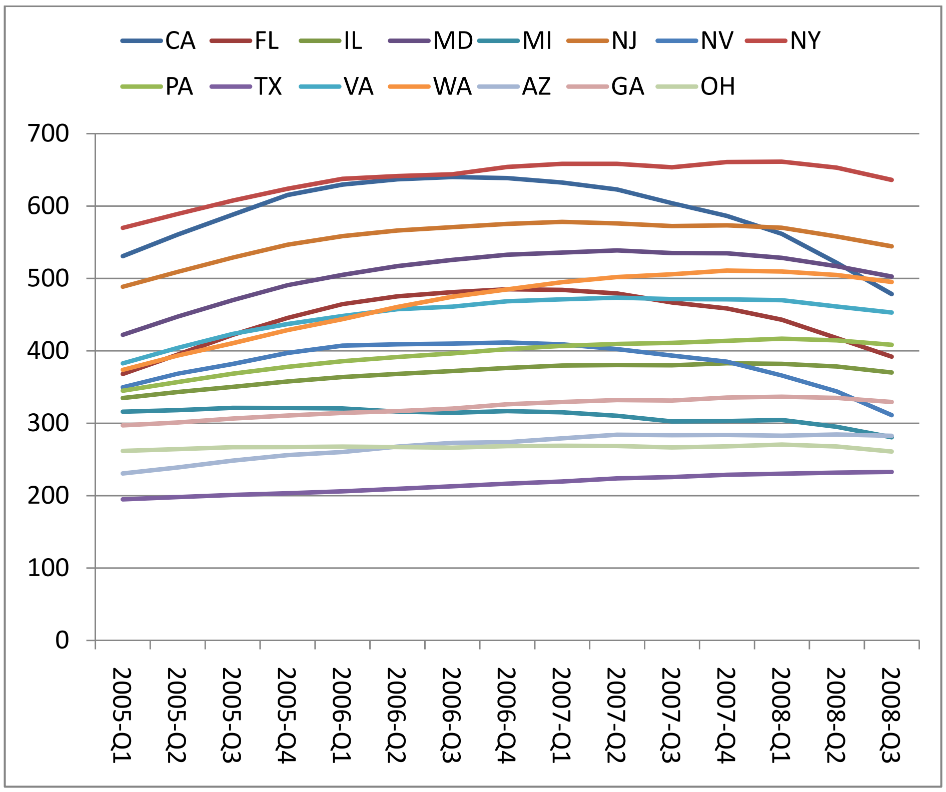
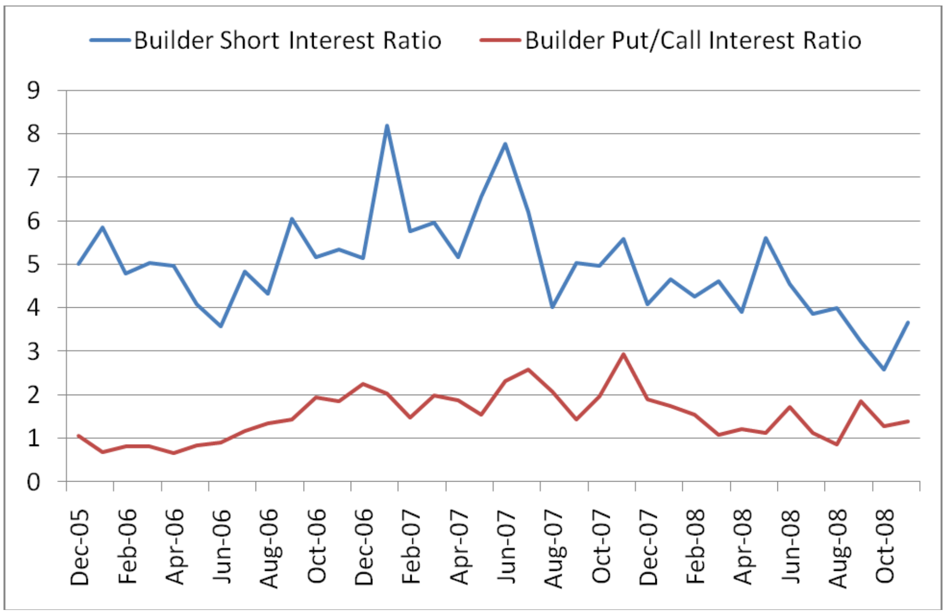


Figure 5: Short Interest Ratio and Ratio of Put Volume to Call Volume for Builders (Upper Figure) and GSEs (Lower Figure)

This Figure plots the Short Interest ratios and the Ratio of Put Volume to Call Volume for Buildings and GSEs. The Short Interest Ratios were obtained from Bloomberg and ShortSqueeze.com and the Volume of Puts and Calls were obtained from CRSP and DeltaNeutral.com.



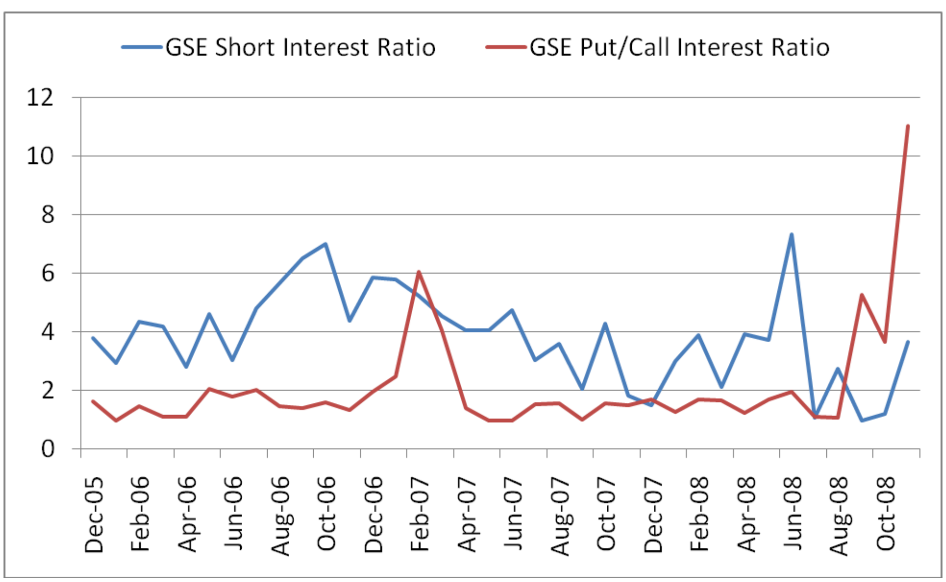
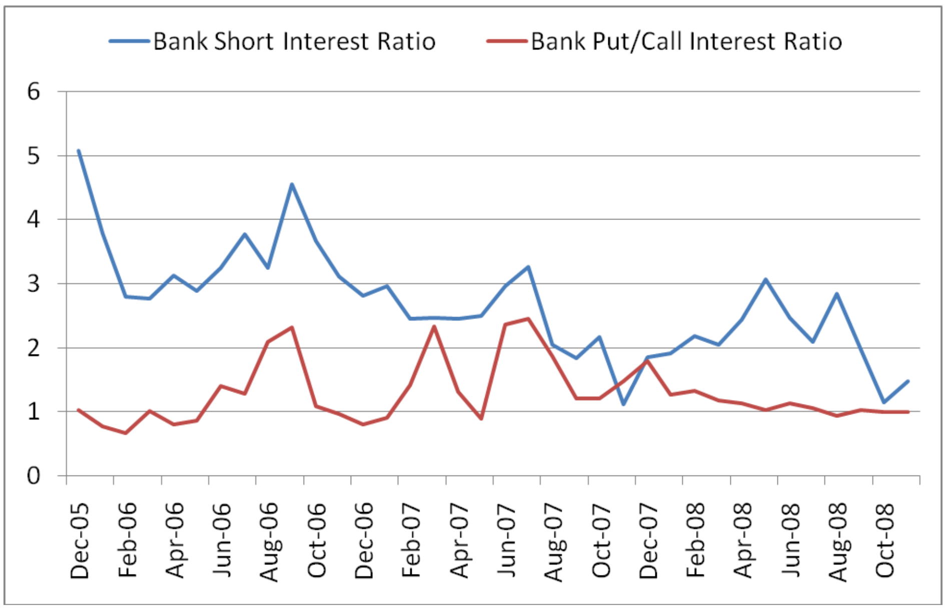
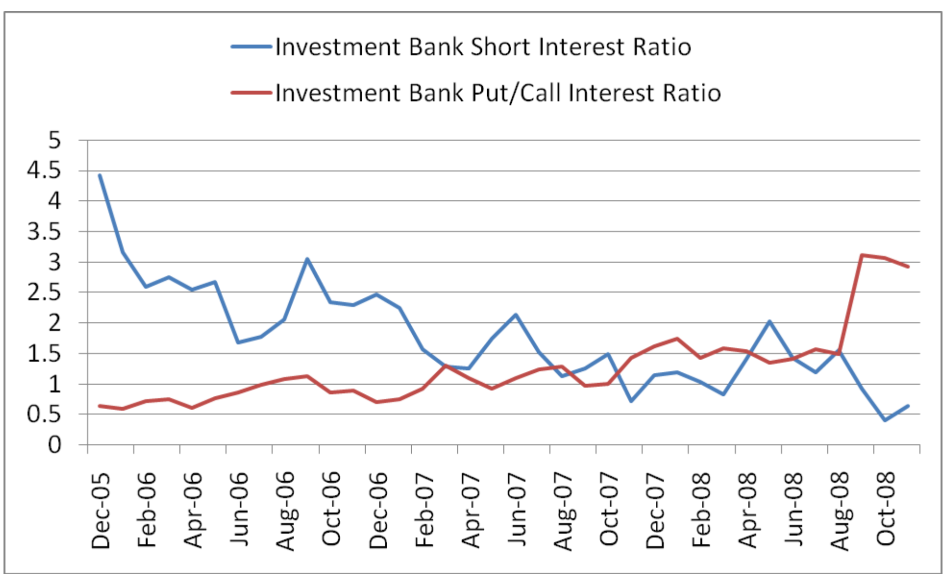


Figure 6: Short Interest Ratio, Ratio of Put Volume to Call Volume for Banks (Upper Figure) and Investment Banks (Lower Figure), and the average trading volume for Financial SPDRS (ticker=xlf).

This Figure plots the Short Interest ratios and the Ratio of Put Volume to Call Volume for Buildings and GSEs. The Short Interest Ratios were obtained from Bloomberg and ShortSqueeze.com and the Volume of Puts and Calls were obtained from CRSP and DeltaNeutral.com.





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