SUPREME COURT OF THE STATE OF NEW YORK

COUNTY OF NEW YORK

CHINA DEVELOPMENT INDUSTRIAL BANK, Plaintiff, v. MORGAN STANLEY & CO. INCORPORATED, MORGAN STANLEY & CO. INTERNATIONAL PLC, (f/k/a MORGAN STANLEY & CO. INTERNATIONAL LIMITED), TCW ASSET MANAGEMENT COMPANY, JEFFREY GUNDLACH, LOUIS LUCIDO and DOES 1-50, Defendants.	Index No. 650957/2010 Hon. Justice Anil C. Singh

EXPERT REPORT OF ETHAN COHEN-COLE, PH.D.

JANUARY 13, 2017

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I. QUALIFICATIONS

1. I am a Managing Director and Financial Services Practice Lead at Econ One Research, a company that provides consulting services, including litigation support services on issues related to structured finance, financial economics, financial institutions, and risk management.

2. I was previously a professor in the Department of Finance at the University of Maryland, College Park's Robert H. Smith School of Business. In addition, I served as a faculty participant at the Center for Financial Policy and on the steering committee of the Center for Social Value Creation. I taught courses on various topics including risk management, financial institutions, and corporate finance.

3. Before teaching, I was a financial economist in the Supervision and Regulation function of the U.S. Federal Reserve System ("Federal Reserve"), where I provided technical and analytical direction to bank supervisors for many of the largest banks in the United States. At the Federal Reserve, I led quantitative reviews of large bank risk modeling efforts and was a designated system quantitative expert on risk management and Basel II.

4. At various stages of my career, I have worked in the banking sector in roles related to both mortgage securitization and risk management. In the mid-1990s, I worked as a technical risk management consultant. This job included helping clients build risk-based scoring systems for a range of loan types, including mortgages, and supporting clients in the construction of aggregate risk monitoring systems. At the Federal Reserve, I evaluated the market, operational, and mortgage credit risk models for many top-20 financial institutions. In addition to model evaluation, I worked extensively with mortgage databases to develop internal evaluations of bank risk and produced multiple papers relating to mortgage risk. I also evaluated bank-wide risk management systems from a technical, as well as a policy and governance, perspective. As an academic at the University of Maryland, I continued to research and work in the mortgage area. I wrote papers both on consumer credit as well as commercial paper.

5. I have experience evaluating structured financial products in a range of contexts. Recently, I have submitted expert reports on issues relating to numerous types of structured products. I have also served as an expert consultant on mortgage backed securities. Prior to working as an expert, I taught classes in risk management and financial institutions, during which I taught sections on structured products. At the Federal Reserve, I regularly reviewed industry risk management models that included a variety of structured financial products.

6. I have worked as a consultant to financial service companies, providing risk management and strategy advisory services to some of the world's largest and most complex financial service companies. Topics on which I have consulted include: Interest Rate Risk/Asset-Liability Management, Securities Lending, Operational Risk, Economic Capital, Custody Services, and Credit Risk.

7. I have published widely in economics and finance journals, including the *Review of Economics and Statistics*, the *Journal of Macroeconomics*, the *American Law and Economic Review*, the *Journal of Health Economics*, *Economic Inquiry*, *Economics Letters* and *Applied Economics*. I have also served as a referee for more than twenty academic journals, including the *Review of Financial Studies*, the *Quarterly Journal of Economics*, the *American Economic Review*, the *Journal of Monetary Economics*, the *Review of Economic Studies*, the *Review of Economics and Statistics,* the *American Economic Journal – Economic Policy,* the *Journal of Financial*

Intermediation, the *Journal of Money Credit and Banking,* the *Journal of Banking and Finance,* and the *Journal of Financial Services Research*.

8. I have delivered more than 75 lectures at universities and professional meetings. I have been a visiting scholar or professor at the University of California, Berkeley, the European Central Bank, the Bank of France and the Federal Deposit Insurance Corporation's Center for Financial Research. I have received scholarly research grants from the National Science Foundation, the National Institutes of Health, the National Institute of Justice, the Department of Education, the European Central Bank and the MacArthur Foundation.

9. I have included a recent CV as **Appendix A**: *Curriculum Vitae*. My CV includes all of my publications for the last ten years and all of my expert witness testimony for the last four years.

10. For a list of documents considered in my analysis, please reference **Appendix B**: *Documents Considered*.

11. For my work on this matter, I am being compensated at a rate of $875/hour. My compensation is not contingent upon my findings or the outcome of these matters. I reserve the right to modify, amend, or supplement my analysis or the opinions expressed herein.

II. CASE BACKGROUND AND ASSIGNMENT

12. China Development Industrial Bank ("CDIB" or "Plaintiff") is an institutional investor that entered into a $275 million credit default swap ("Supersenior Swap") with Morgan Stanley & Co. International on the supersenior tranche of the STACK 2006-1 Collateralized Debt Obligation ("CDO") ("STACK") on April 13, 2007 (the "Relevant Date").[1] Plaintiff brings claims against Morgan Stanley & Co. Incorporated and Morgan Stanley & Co. International plc (collectively, "Morgan Stanley" or "Defendant") for common law fraud, fraudulent inducement, and fraudulent concealment.[2]

13. Specifically, CDIB alleges that Morgan Stanley induced CDIB to enter into the Supersenior Swap by misrepresenting the risks and credit quality of the STACK CDO notes and the underlying securities, which included residential mortgage-backed securities ("RMBS"). The Complaint further alleges that by early 2007, Morgan Stanley had unique access to nonpublic information that led it to conclude that investments tied to the U.S. subprime residential real-estate mortgage bonds would lead to extensive losses, leading it to transfer the risk associated with its allegedly "bad investment" in U.S. subprime mortgage bonds to other investors, such as CDIB, through the Supersenior Swap.[3]

14. CDIB further alleges that STACK was "built upon fraudulent credit ratings"[4] and that Morgan Stanley created and structured STACK with knowledge that it was a "toxic and unsafe"

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[1] Complaint. *China Development Industrial Bank v. Morgan Stanley & Co. Incorporated, et al.* (N.Y. Sup. No. 650957/10) (July 15, 2010) ("Complaint") at intro, ¶¶ 3, 47, 67.

[2] Complaint at ¶¶ 3, 142 *et seq*., 148 *et seq*., and 155 *et seq*.

[3] Complaint at ¶¶ 2, 10, 14, 17.

[4] Complaint at ¶ 11.

investment.[5] CDIB claims that it has already "lost $228 million, net of reimbursements and premium payments," as a result of this trade.[6]

15. To support the allegations in the Complaint, Plaintiff has offered the expert reports of Amit Seru (the "Seru Report") and Kimberly Cornaggia (the "Cornaggia Report"),[7] among others. The Seru Report alleges that Morgan Stanley had access to proprietary information that was unavailable to other investors, which "allowed them to accurately forecast the significant decline in value of RMBS and CDOs like [STACK]."[8] Specifically, it argues that "Morgan Stanley understood that the majority of loans backing non-agency RMBS at the time did not meet underwriting guidelines and were misrepresented[.]"[9]Additionally, it argues that it was "[u]niquely known to Morgan Stanley" that slowing house prices would lead to losses in the collateral backing STACK.[10]

16. The Cornaggia Report alleges that Morgan Stanley knew that "the credit ratings of Stack's underlying RMBS were incorrect and overstated."[11] It concludes that, had Morgan Stanley's assessment of the RMBS collateral in STACK been entered into a credit rating model, STACK's certificates, including the certificate sold to Plaintiff, would have received lower credit ratings.[12] Because of this, the Cornaggia Report alleges that Morgan Stanley misrepresented the risk of the STACK Supersenior Swap.[13]

17. I have been retained by Morgan Stanley, through its counsel Davis Polk & Wardwell LLP, to respond to the reports submitted by Plaintiff's experts. More specifically, I have been asked to provide an opinion regarding: (1) the risk disclosed to CDIB in the offering documents and other disclosures, including the collateral list provided to CDIB prior to the Relevant Date; (2) whether the purported difference in loan-level characteristics alleged by Plaintiff's expert for the loans underlying the RMBS in STACK, and Morgan Stanley's alleged peculiar knowledge regarding the future performance of RMBS-related securities, would have materially affected the risk of CDIB's Supersenior Swap investment; (3) the house price appreciation and income overstatement analyses put forth in the Seru Report; and (4) the rating analysis performed in the Cornaggia Report.

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[5] Complaint at ¶ 12.

[6] Complaint at ¶ 127.

[7] Seru, Amit. Expert Report of Amit Seru. *China Development Industrial Bank v. Morgan Stanley & Co. Incorporated, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016); and Cornaggia, Kimberly. Expert Report of Kimberly J. Cornaggia. *China Development Industrial Bank v. Morgan Stanley & Co. Incorporated, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016).

[8] Seru Report at Summary.

[9] Seru Report at Summary.

[10] Seru Report at Summary.

[11] Cornaggia Report at 3.

[12] Cornaggia Report at 3.

[13] Cornaggia Report at 3.

III. SUMMARY

18. To test the materiality of the loan-level allegations in the Seru Report, I used a model similar to models used by RMBS investors prior to the Relevant Date to measure the impact of Dr. Seru's loan-level allegations on a reasonable investor's expectation of risk prior to the Relevant Date. The model considered the risk of default of the loans collateralizing the assets within STACK.[14]

19. To begin, Dr. Seru's allegations are completely inapposite. STACK not only had no restrictions on the loan characteristics that could underlie the RMBS within its portfolio, but in a managed CDO, a collateral manager was further permitted to make changes to the collateral, which meant that the loan characteristics of the underlying RMBS collateral could change at any time.

20. Nonetheless, to highlight how Dr. Seru's conclusions would have been immaterial to an investor – even making the counterfactual assumption that the characteristics of the underlying RMBS collateral would not change – I performed an analysis that considers the risk of default of the loans collateralizing the RMBS within STACK. My model evaluated the materiality of Dr. Seru's allegations with respect to the risk disclosed to CDIB. The model did this by (i) calculating the amount of risk a reasonable investor would have expected based on the disclosed information; (ii) calculating the amount of risk that would have been associated with the loans underlying the RMBS in STACK if Dr. Seru's loan-level allegations are assumed to be true; and (iii) comparing the risk calculated in (i) and (ii), that is, the amount of risk an investor would have expected to the amount of risk resulting from Dr. Seru's loan-level claims. In other words, I assessed whether Dr. Seru's loan-level allegations, if assumed to be true, would have resulted in risk levels that an investor would not have reasonably expected based on available information prior to the Relevant Date.

21. I determined that, even if one accepts the allegations in the Seru Report as true, the expected risk of the loans collateralizing the RMBS assets in STACK in March 2007 falls below the maximum risk an investor would have expected.

22. In addition, I assessed Dr. Seru's conclusions regarding house price appreciation ("HPA"). There are several flaws that significantly undermine his conclusions. I found that the Seru Report made erroneous, unsupported assumptions regarding Morgan Stanley's use of an HPA forecast and incorrectly used extrapolated data regarding the relationship between default losses and HPA. Specifically, the Seru Report failed to use a reliable method of extrapolation based on the actual historical relationship between HPA and collateral loss and bond loss; instead, he simply drew a line. Furthermore, the Seru Report incorrectly inferred default risk based on one factor, HPA, in isolation from all other relevant factors.

23. I also evaluated Dr. Seru's conclusions regarding income overstatement. I found that the Seru Report incorrectly concludes that Morgan Stanley had unique knowledge of income overstatement. The analysis in the Seru Report did not provide any evidence of such knowledge, let alone any evidence of income overstatement at all. Dr. Seru also did not consider how fundamental differences between the income data sources he used may have affected his results. Furthermore, the Seru Report failed to demonstrate that the differences in income growth rates between data sources were caused by income overstatement.

[14] For a technical description of my analyses, *see* **Appendix C**: *Technical Appendix.*

24. The Cornaggia Report also contained a number of flaws, rendering the purported conclusions unreliable. The Cornaggia Report was based upon faulty premises, including that Morgan Stanley had proprietary information regarding the risk of STACK and that Morgan Stanley somehow had control over the ratings issued for STACK by the rating agencies.

25. Additionally, the Cornaggia Report analyses were contrary to industry practice. The Cornaggia Report incorrectly utilized one macroeconomic factor, namely HPA, to suggest that the ratings for STACK collateral were inappropriately high, despite the fact that neither Standard & Poor's ("S&P") nor Moody's CDO rating models incorporated HPA as a separate, distinct input. Furthermore, the Cornaggia Report utilized an inappropriate "notching" procedure to purportedly re-rate the Supersenior Swap.

26. In response, I analyzed the ratings assigned to STACK utilizing the S&P CDO rating agency model used in the Cornaggia Report.[15] I found that, even after adjusting the ratings—as Cornaggia did—based on a rating agency stress test or information that was unavailable as of the Relevant Date (*i.e.*, using a notching schedule and a "negative watch" list set out by the rating agencies months *after* the Relevant Date), the ratings of STACK's Supersenior Swap were unaffected. Therefore, it is my opinion that there were no grounds for the assertion that Morgan Stanley misrepresented the ratings of the Supersenior Swap of STACK.

IV. RELEVANT BACKGROUND ON CDOS

A. Mortgage-Related Products

27. In 2007, the market offered many different types of mortgage-related products for purchase, including (i) RMBS, (ii) credit default swaps ("CDS") that referenced the performance of individual RMBS, and (iii) CDOs. I describe each of these products briefly below.

RMBS

28. RMBS are structured finance products backed by residential mortgage loans.[16] Rather than owning individual loans, investors in RMBS own a right to a proportionate share of the cash flows from the principal and interest payments made on the group of mortgage loans that served as collateral for a given RMBS.[17] These securities are divided into slices, or "tranches," each of which bears a different level of risk and offers a different level of return.[18] A common structure works as follows: the holders of the most senior tranche have the first right to receive principal and interest payments; each successive tranche will be paid after the tranche or tranches above

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[15] I use this model because it was used in forming the opinions contained in the Cornaggia Report. I understand from counsel that S&P has made no representation regarding whether this was the model used by S&P either as of the Relevant Date or to rate the Supersenior Swap.

[16] Fabozzi, Frank J., Michael G. Ferri, and Steven V. Mann. "Overview of the Types and Features of Fixed Income Securities." *The Handbook of Fixed Income Securities*. 8th ed. Ed. Frank J. Fabozzi. New York: McGraw Hill (2012): 3-19 at 16.

[17] Fabozzi, Frank J., Anand K. Bhattacharya, and William S. Berliner. *Mortgage-Backed Securities: Products, Structuring, and Analytical Techniques*. 2nd ed. Hoboken, NJ: Wiley (2011) at 25.

[18] Hu, Dapeng, and Robert Goldstein. "Nonagency Residential Mortgage-Backed Securities." *The Handbook of Fixed Income Securities*. 8th ed. Ed. Frank J. Fabozzi. New York: McGraw Hill (2012): 645-80 at 645.

it.[19] Consequently, return-oriented investors can buy subordinate tranches, which are riskier, but have higher expected yields.[20] Alternatively, investors can choose to purchase more senior tranches with lower expected returns and comparatively lower risk.[21] *See* **Exhibit 1a**: *RMBS Structure*.

29. All RMBS investments are subject to a variety of risks.[22] Two important risks associated with RMBS investments are the risk of prepayment and the risk of default.[23] Prepayment risk occurs when some borrowers pay off the full amount owed on their mortgage early, *i.e.*, "prepay" their loan before the full term expires.[24] When a mortgage is prepaid, the duration of the income stream is shortened and the total income to the trust is reduced due to the elimination of the interest income expected from that prepaid mortgage. At the same time, the realization of prepayment risk also eliminates the risk of default for the prepaid mortgage.[25]

30. The risk of default is the risk that the borrower will stop repaying the mortgage loan. It is generally understood in the market that at least some of the mortgage loans underlying a securitization will default over the life of the security.[26] The default risk of a loan can be estimated based on certain loan characteristics, including, for example, loan-to-value ("LTV") ratio, credit score, and occupancy status. The LTV ratio (the loan balance compared to the lesser of the appraised value of the underlying property or its sale price) measures the borrower's equity in the home.[27] Generally, when the borrower has higher equity in the home, the borrower is less likely to default and face foreclosure.[28] A credit score, or a FICO score, is an indicator of the borrower's payment history and may be a predictor of potential default.[29] The occupancy status associated with a loan indicates whether the mortgage is secured by a primary residence,

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[19] Vallee, David E. "A New Plateau for the U.S. Securitization Market." *FDIC Outlook* (Fall 2006): 3-10 at 3.

[20] Fabozzi, Bhattacharya, & Berliner, *supra* note 17, at 31.

[21] *Id*. at 25.

[22] *Id*. at 17-22.

[23] Deng, Yongheng, John M. Quigley, and Robert Van Order. "Mortgage Terminations, Heterogeneity and the Exercise of Mortgage Options." *Econometrica* 68.2 (Mar. 2000): 275-307 at 276.

[24] Fabozzi, Bhattacharya & Berliner, *supra* note 17, at 17.

[25] *Id*. at 96.

[26] Loan defaults may or may not result in less money being distributed to investors, because the collateral underlying the loan may be sold and the proceeds applied to the outstanding balance.

[27] Fabozzi, Bhattacharya & Berliner, *supra* note 17, at 6.

[28] Deng, Quigley, and Van Order, *supra* note 23, at 284; Gerardi, Kristopher, Adam Hale Shapiro, and Paul S. Willen. "Subprime Outcomes: Risky Mortgages, Homeownership Experiences, and Foreclosures." *Federal Reserve Bank of Boston Working Papers* 07–15 (Dec. 3, 2007): 1–57 at 31.

[29] Fabozzi, Bhattacharya & Berliner, *supra* note 17, at 6. *See also*, Bhattacharya, Anand, Wei Wang, and Jonathan Lieber. "Understanding Mortgage Credit." *Mortgage and Real Estate Finance.* Ed. Stefania Perrucci. London: Risk Books (2008): 217-231 at 218.

an investment property, or a second home.[30] Generally, borrowers are less likely to default on a mortgage that is secured by their primary residence.[31]

31. Credit enhancements are often provided by RMBS issuers to offer investors a degree of protection against the default of the underlying mortgages.[32] Forms of RMBS credit enhancements include: subordination,[33] shifting interest,[34] and overcollateralization.[35]

32. The macroeconomic environment affects the performance of mortgage loans. For example:

    a. A strong economy, with a low unemployment rate, stimulates the housing market.[36] Conversely, increases in unemployment and decreases in income have been found to have significantly increased default rates and to have a negative impact on mortgage performance.[37, 38] This makes intuitive sense: it will likely be more difficult for borrowers who lose their jobs to make mortgage payments.

    b. Home prices are another factor related to mortgage default rates.[39] In times of house price appreciation, borrowers who experience cash flow problems often become delinquent on their mortgages, but rarely experience foreclosure, as they may be able to sell or refinance the home.[40] Declining housing prices may impact the ability of a mortgagor to refinance the mortgage or sell the property in the face of difficulty making payments.[41]

    c. Changes in interest rates have also been found to affect the performance of RMBS collateral. Mortgage payments are calculated on the principal balance as well as on

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[30] Bhattacharya, Wang & Lieber, *supra* note 29, at 222.

[31] Capozza, Dennis R., and Thomas A. Thomson. "Optimal Stopping and Losses on Subprime Mortgages." *The Journal of Real Estate Finance and Economics* 30.2 (Mar. 2005): 115–31 at 126; *see also*, Bhattacharya, Wang & Lieber, *supra* note 29, at 222.

[32] Fabozzi, Bhattacharya, & Berliner, *supra* note 17, at 30-33; *See also* Ward, Warrick, and Simon Wolfe. "Asset-Backed Securitization, Collateralized Loan Obligations and Credit Derivatives." *Handbook of International Banking*. Ed. Andrew W. Mullineux and Victor Murinde. Cheltenham, UK: Edward Elgar (2003): 60-101 at 62-63.

[33] Fabozzi, Bhattacharya, & Berliner, *supra* note 17, at 30.

[34] *Id*. at 32.

[35] *Id*.

[36] Harvey, James, and Kenneth Spong. "Home Financing for Low- and Moderate-Income Borrowers: What Are the Trends in Denver?" *Federal Reserve Bank of Kansas City Financial Industry Perspectives* (Oct. 2005): 1-16 at 2.

[37] Deng, Quigley & Van Order, *supra* note 23, at 289; *see also*, Capozza, Dennis R., Dick Kazarian, and Thomas A. Thomson. "Mortgage Default in Local Markets." *Real Estate Economics* 25.4 (1997): 631-655 at 654.

[38] Yang, Tyler T., Henry Buist, and Isaac F. Megbolugbe. "An Analysis of the Ex Ante Probabilities of Mortgage Prepayment and Default." *Real Estate Economics* 26.4 (Dec. 1998): 651–676 at 675.

[39] Gerardi, Shapiro, & Willen, *supra* note 28, at 1.

[40] *Id*. at 3, 31.

[41] Foote, Christopher L., Kristopher Gerardi, Lorenz Goette, and Paul S. Willen. "Just the Facts: An Initial Analysis of Subprime's Role in the Housing Crisis." *Journal of Housing Economics* 17 (2008): 291–305 at 293.

fixed or adjustable interest rates.[42] Interest rates affect the likelihood that a borrower will refinance or default.[43] The risk of losses due to changes in interest rates is referred to as interest rate risk.[44]

33. Structures such as RMBS provide both a means to fund home loans[45] and specific solutions to investors with varying product demands.[46] Investors use RMBS and other derivative products to adjust their risk exposure to their desired risk profile, driving the growth of credit derivative instruments.[47]

CDS

34. A CDS can be thought of as a way to purchase or sell protection for a specified asset, such as an RMBS.[48] It is a bilateral contract in which one party, called the "protection buyer," makes periodic payments (often referred to as "premiums") to another party, called the "protection seller." The protection seller promises to make payments to the protection buyer if a referenced asset or "referenced obligation" (such as an RMBS) suffers a negative credit event.[49] For example, a protection seller can be obligated to make a payment if the RMBS experiences a "failure to pay" or a "bankruptcy."[50] *See* **Exhibit 1b**: *CDS Structure*.

35. The performance of a CDS depends on the performance of the asset it references.

CDOs

36. CDOs are structured finance products backed by a pool of debt instruments, such as tranches of RMBS or tranches of other CDOs.[51] CDOs can be categorized as "cash," "synthetic," or "hybrid."[52] A cash CDO directly holds tranches of bonds or other debt securities. A synthetic

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[42] Fabozzi, Bhattacharya & Berliner, *supra* note 17, at 8.

[43] *Id.* at 18; Campbell, John Y., and João F. Cocco. "A Model of Mortgage Default." *The Journal of Finance* 70.4 (Aug. 2015): 1495–1554 at 1496.

[44] Fabozzi, Bhattacharya & Berliner, *supra* note 17, at 231.

[45] Rosen, Richard J. "The Role of Securitization in Mortgage Lending." *The Federal Reserve Bank of Chicago Essays on Issues* 244 (Nov. 2007): 1-4 at 2.

[46] Vallee, *supra* note 19, at 9.

[47] Gibson, Michael S. "Credit Derivatives and Risk Management." *FEDS Working Paper* 2007-47 (May 22, 2007): 1-20 at 7, 19.

[48] Anson, Mark J., Frank J. Fabozzi, and Moorad Choudhry. *Credit Derivatives Instruments, Applications, and Pricing*. Hoboken, NJ: John Wiley & Sons (2004) at 27.

[49] *Id.* at 23.

[50] Fabozzi, Frank J., Henry A. Davis, and Moorad Choudhry. *Introduction to Structured Finance*. Hoboken, NJ: John Wiley & Sons, Inc. (2006) at 298.

[51] *Id*. at 119.

[52] *Id*. at 120; Lucas, Douglas J., Laurie S. Goodman, and Frank J. Fabozzi. *Collateralized Debt Obligations Structures and Analysis*. 2nd ed. Hoboken, NJ: John Wiley & Sons, Inc. (2006) at 296.

CDO holds a pool of credit derivative instruments (the "reference portfolio") instead of cash assets.[53] The most commonly-traded credit derivative instruments are CDSs (described above).[54] Investors in synthetic CDOs own a claim to the credit protection premiums made by protection buyers on the underlying CDS agreements. A hybrid CDO holds a combination of cash and synthetic assets, with part of the portfolio collateralized by cash assets and part of it collateralized by credit derivatives.[55] *See* **Exhibit 1c**: *STACK CDO Structure*.

37. A CDO can be "static" or "managed." For a static CDO, the assets are selected in advance and held until maturity. [56] A managed CDO has a collateral manager who can continue to update the portfolio after closing, subject to the limits and guidelines determined at the outset of the transaction.[57]

38. Like RMBS, CDOs are themselves divided into tranches which pay differing returns based on their level of risk. CDOs are typically assembled in such a way that their senior tranches receive AAA ratings.[58]

39. A CDO can have a "supersenior" tranche that is senior to another tranche with AAA ratings. The supersenior investor may only be exposed to loss if the AAA-rated tranche below it experiences default.[59]

40. The performance of a CDO depends on the performance of its collateral, which may include RMBS or CDS referencing RMBS, among other asset types. The performance of these collateral assets in turn can depend on the performance of tens of thousands of mortgages.

B. The Collateral in a Managed CDO, Such as STACK, was Subject to Change

41. STACK was a hybrid CDO managed by TCW Asset Management Company ("TCW").[60] STACK had a notional value of $500 million[61] and collateral assets that consisted of

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[53] Fabozzi, Davis, & Choudhry, *supra* note 50, at 120.

[54] Anson, Fabozzi, & Choudhry, *supra* note 48, at 23.

[55] Fabozzi, Davis, & Choudhry, *supra* note 50, at 120; Lucas, Goodman, & Fabozzi, *supra* note 52, at 296.

[56] Fabozzi, Davis, & Choudhry, *supra* note 50, at 147.

[57] Jobst, Andreas A. "A Primer on Structured Finance." *Journal of Derivatives & Hedge Funds* 13.3 (2007): 199–213 at 203-204.

[58] Bomfim, Antulio N. "Understanding Credit Derivatives and their Potential to Synthesize Riskless Assets." *Board of Governors of the Federal Reserve System* 2001-50 (July 11, 2001): 1-30 at 19.

[59] Fabozzi, Davis, & Choudhry, *supra* note 50, at 134.

[60] STACK 2006-1 Ltd., STACK 2006-1 Corp. *Final Offering Memorandum* (July 20, 2006) (CDIB_000532408 at CDIB_000532409) ("Offering Memorandum").

[61] Offering Memorandum at CDIB_000532673.

approximately 35 percent cash assets and 65 percent synthetic assets at the time of closing.[62, 63] The STACK notes were expected to be collateralized by a portfolio of RMBS, commercial mortgage-backed securities ("CMBS"), and CDO tranches.[64]

42. A managed CDO, such as STACK, allowed a manager to select collateral that would be included in the securitization and to update the assets after the deal closed, subject to some limits.[65] While investors in a static CDO "can review and grant approval to credits that are to make up the reference portfolio"[66] that cannot be changed after closing, the collateral in a managed CDO can change after closing.

43. The STACK Offering Memorandum listed guidelines that limited the types of collateral the manager was authorized to purchase.[67] The guidelines included collateral quality tests, portfolio percentage limitations, and coverage tests.[68] For example, due to the portfolio percentage limitations, only five percent of the portfolio could consist of securities that had a rating of BB+ or below, and a maximum of 30 percent of the portfolio could be CMBS assets.[69] There were no guidelines about the percent of the portfolio that would be comprised of tranches of other CDOs.[70] There were also no restrictions based on the loan characteristics underlying the RMBS within the portfolio.

44. The collateral manager was required to ensure that the securities passed a set of collateral quality tests at closing and at any point when assets were purchased for the CDO.[71] For example, the collateral was subject to the "Maximum Moody's Rating Factor Test." This test required that the average portfolio rating be between Baa2 and Baa3.[72]

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[62] STACK Presentation to Investors (July 2006) (MS_CDIB_000093058 at MS_CDIB_000093071).

[63] *See* **Exhibit 2**: *March 2007 STACK Collateral Breakdown*. The Seru Report and Cornaggia Report both refer to the portfolio emailed to CDIB on March 19, 2007 as the March portfolio, even though the email reports the data is current as of February 2007. To avoid confusion, I also refer to it as the March portfolio. *See* STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Frances Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

[64] Offering Memorandum at CDIB_000532409.

[65] Jobst, *supra* note 57, at 203-204.

[66] Fabozzi, Davis, & Choudhry, *supra* note 50, at 147.

[67] Offering Memorandum at CDIB_000532533-5.

[68] Offering Memorandum at CDIB_000532532.

[69] *Id.* at CDIB_000532554, CDIB_000532556.

[70] S&P Summary of Stack 2006-1, Ltd (SP-CDIB-0000027 at SP-CDIB-0000029), attached to email from Todd Jaeger, to Daniel Upton, *CORE Forms* (July 28, 2006) (SP-CDIB-0000011).

[71] Offering Memorandum at CDIB_000532550-3.

[72] The test required that the collateral had a weighted average rating below 550. The rating factor for a security rated Baa2 was 360 and the rating factor for a security rated Baa3 was 610. *See* Offering Memorandum at CDIB_000532551, CDIB_000532679-80.

45. The Offering Memorandum disclosed that the assets in the CDO could change for a variety of reasons, such as if an asset was prepaid or failed to perform.[73] If the collateral manager believed that a security had "a significant risk of declining in credit quality,"[74] it could be sold at any time.[75] If the collateral manager believed an asset had "significantly improved in credit quality,"[76] it could also be sold.[77] Additionally, the collateral manager was authorized to make discretionary sales.[78] Thus, a reasonable investor would have been aware that the collateral underlying the CDO could change.

46. During the reinvestment period, which was scheduled to end in August 2010,[79] the collateral manager, TCW, could reinvest certain funds to purchase any collateral asset that met the reinvestment criteria.[80] Reinvestment collateral was subject to the same collateral quality tests and portfolio percentage limitations, as well as coverage tests.[81] It should be noted that, even if another RMBS with the same rating was purchased, the characteristics of the loans collateralizing the RMBS in STACK could change dramatically.[82]

C. CDIB's Purchase of STACK

47. CDIB and Morgan Stanley entered into the Supersenior Swap on the Relevant Date, more than eight months after the STACK CDO closed in July 2006.[83] Prior to its purchase, CDIB was provided with, among other materials, the Offering Memorandum, a memo describing the deal structure, the July 2006 initial STACK marketing materials, a break-even analysis, a list of the then-current collateral in the portfolio, and draft letters from Moody's and S&P about the expected ratings of the Supersenior Swap.[84] Provided with this information, a reasonable

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[73] Offering Memorandum at CDIB_000532557-8.

[74] *Id.* at CDIB_000532666.

[75] *Id.* at CDIB_000532558.

[76] *Id.* at CDIB_000532666.

[77] *Id.* at CDIB_000532558.

[78] *Id.* at CDIB_000532559.

[79] *Id.* at CDIB_000532429.

[80] *Id.* at CDIB_000532560.

[81] *Id.* at CDIB_000532551, CDIB_000532556-7, CDIB_000532560.

[82] *See* **Exhibit 3**: *Example Loan Characteristics for Certificates Rated Baa3* for examples of loan characteristics corresponding to pools of loans backing certificates with the same rating.

[83] Complaint at ¶ 47; Offering Memorandum at CDIB_000532409.

[84] Email from Helena Chen, to Frances Liu, *Stack 2006-1 Marketing Book* (Mar. 19, 2007) (MS_CDIB_000092760) and attachments; Email from Lydia Lu, to Francis Liu, *FW: Break-even analysis requested by CDIB* (Mar. 21, 2007) (MS_CDIB_000204595) and attachment; Email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616) and attachment; Email from Lydia Lu, to Francis Liu, *FW: shadow rating* (Apr. 4, 2007) (MS_CDIB_000287287) and attachments.

investor could analyze the expected performance of the collateral contained within the CDO at that time, understanding, as discussed above, that the collateral could change.[85]

48. The Offering Memorandum specified that the average portfolio rating must be between Baa2 and Baa3.[86] The July 2006 initial STACK marketing materials summarized the expected initial collateral type distribution and ratings distribution of the collateral in the CDO.[87] For example, at that time, more than half of the collateral had a Moody's rating of Baa3.[88] The Offering Memorandum specified the types of collateral that were allowed to be in the CDO.[89] For example, at that time, the majority of the collateral was RMBS that were labeled as subprime, midprime, and prime.[90] Prior to the Relevant Date, Morgan Stanley provided CDIB with a list of the then-current collateral in STACK, including security name, tranche, rating, value, issue date, and vintage information.[91]

49. The Offering Memorandum disclosed that a significant portion of the collateral assets held by STACK could be subordinate tranches of securities, and therefore would have "a higher risk of loss as a result of delinquencies or losses on the underlying assets."[92] An investor in the Supersenior Swap of STACK could expect some protection against losses within the underlying collateral, as subordinated tranches would be the first to bear losses.[93] Nevertheless, it was understood within the market that senior investments in CDOs were not risk-free.[94]

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[85] For an example of the collateral composition as of March 2007, *see* **Exhibit 4**: *March 2007 STACK Portfolio Composition by Moody's Type.*

[86] *See* Offering Memorandum at CDIB_000532551, CDIB_000532679-80.

[87] STACK Presentation to Investors (July 2006) (MS_CDIB_000093058 at MS_CDIB_000093071).

[88] *Id.*

[89] *See* Offering Memorandum at CDIB_000532641-2, CDIB_000532644, CDIB_000532651.

[90] STACK Presentation to Investors (July 2006) (MS_CDIB_000093058 at MS_CDIB_000093071).

[91] STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Frances Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

[92] Offering Memorandum at CDIB_000532452.

[93] *Id.* ("Thus, the greatest risk of loss relating to defaults on the Collateral Assets is borne by the Holders of the Subordinated Notes.") at CDIB_000532445.

[94] *See* Gibson, Michael S. "Understanding the Risk of Synthetic CDOs," *Board of Government of the Federal Reserve System Finance and Economics Discussion Series* 2004-36 (July 2004): 1-27 ("Figure 5 shows the expected loss on the three tranches across a full range of macroeconomic shocks (1st to 99th percentile). Beyond the 96th percentile common factor shock, corresponding to a less than 4-in-100 or less-than-once-per-25-years shock, the senior tranche begins to see its principal significantly eroded by additional losses. While the senior tranche is not exposed to 'recession risk,' it could be said to be exposed to 'depression risk.'") at 23.

V. RELEVANT BACKGROUND ON THE CREDIT RATINGS OF CDOS

50. Credit rating agencies assign credit ratings, which are "an assessment of an entity's ability to pay its financial obligations."[95] The three largest credit rating agencies are S&P, Moody's, and Fitch Ratings. Rating agencies designate ratings through an alphabetical combination of letters. Fitch and S&P use designators AAA, AA, A, and BBB for investment-grade categories and BB, B, CCC, CC, C, and D for speculative-grade rankings. Moody's uses designators Aaa, Aa, A, Baa for investment-grade categories and Ba, B, Caa, Ca, and C for speculative-grade rankings. In addition, rating agencies may attach modifiers for each classification to distinguish between ratings. S&P and Fitch use pluses (+) and minuses (-), while Moody's uses numerical modifiers 1-3, with 1 indicating the higher end of a generic category.[96] *See* **Exhibit 5**: *Comparison of Credit Rating Categories.*

51. The credit rating agency's assessment of creditworthiness is based on its "analytical models, assumptions, and expectations."[97] The assessment can change at any time and does not reflect liquidity risk, interest rate risk, market risk, or prepayment risk.[98] A credit rating should not be interpreted as a guarantee or a recommendation, but rather a tool that supplements an investor's "own research, analysis, and judgment."[99] The Offering Memorandum specifically disclosed to investors that "[a] credit rating is not a recommendation to buy, sell or hold securities and may be subject to revision or withdrawal at any time by the assigning rating agency."[100]

52. Because CDOs pool diversified assets and include credit enhancement (like subordination), a large portion of the underlying collateral would need to experience losses in order for the AAA tranche of the CDO to experience losses. As a result, CDOs are able to garner AAA ratings for a high percent of the value of the securities issued, despite the fact that they typically package assets with far lower ratings.[101] For example, before 2008 it was common for 70 to 85 percent of a CDO structure to be rated AAA, even though CDOs generally contained collateral with AA-,

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[95] "The ABCs of Credit Ratings." *Securities and Exchange Commission Investor Bulletin* (Oct. 2013). <https://www.sec.gov/investor/alerts/ib_creditratings.pdf> (accessed Nov. 2, 2016): 1-4 at 1.

[96] "Report on the Role and Function of Credit Rating Agencies in the Operation of the Securities Markets." *Securities and Exchange Commission* (Jan. 2003). <https://www.sec.gov/news/studies/credratingreport0103.pdf> (accessed Nov. 29, 2016): 1-45 at 25.

[97] "The ABCs of Credit Ratings," *supra* note 95, at 2.

[98] *Id.* at 2, 3.

[99] *Id.* at 3.

[100] Offering Memorandum at CDIB_000532522.

[101] Benmelech, Efraim, and Jennifer Dlugosz. "The Alchemy of CDO Credit Ratings." *Journal of Monetary Economics* 56.5 (July 2009): 617–34 at 618, 628.

A or BBB ratings.[102] Before 2008, more than 80 percent of CDO tranches were rated by two or more rating agencies.[103]

A. Initial and Ongoing Credit Ratings

53. The initial credit ratings on structured finance transactions "are the assessments of these securities' credit risk at the time a transaction is originated and first sold into the market. These ratings attempt to differentiate securities by their relative expected loss rates as of the origination date."[104] Rating agencies continue to monitor securities after their issuance and update their ratings when they deem it necessary.[105] For example, by September 2008, more than 85 percent of CDO tranches similar to the Supersenior Swap of STACK (AAA-rated CDO tranches collateralized by asset-backed securities from the 2006 vintage) had been downgraded.[106]

54. Rating agencies do not change their credit ratings in response to changes in the macroeconomy that may be temporary. This is known as rating "through the cycle."[107] Rating through the cycle can cause ratings downgrades to be delayed by approximately half a year, which can affect default predictions on a one-year time horizon.[108] This was well-known in the market prior to the Relevant Date,[109] and was acknowledged by the rating agencies themselves.[110] Sources cited

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[102] Benmelech, Efraim, and Jennifer Dlugosz. "The Credit Rating Crisis." *NBER Macroeconomics Annual* 24. Eds. Daron Acemoglu, Kenneth Rogoff, and Michael Woodword. Chicago: University of Chicago Press (2010): 161-207 at 165, 182.

[103] *Id.* at 162.

[104] Hu, Jian, and Richard Cantor. "Defaults and Losses Given Default of Structured Finance Securities." *Journal of Fixed Income* 13.4 (Mar. 2004): 5–24 at 13.

[105] *See*, *e.g.*, Kornfeld, Warren. "Overview of Moody's RMBS Monitoring Process." *Moody's Investors Service* (Aug. 13, 2003): 1-6 at 1, 3.

[106] Newman, Daniel, Frank J. Fabozzi, Douglas J. Lucas, and Laurie S. Goodman. "Empirical Evidence on CDO Performance." *Journal of Fixed Income* 18.2 (Fall 2008): 32–40 at 39.

[107] Cantor, Richard. "Moody's Investors Service Response to the Consultative Paper Issued by the Basel Committee on Bank Supervision 'A New Capital Adequacy Framework.'" *Journal of Banking & Finance* 25.1 (Jan. 2001): 171–85 ("To support this 'through the cycle' approach, a rating action is taken only when it is unlikely to be reversed within a relatively short period of time.") at 175.

[108] Altman, Edward I., and Herbert A. Rijken. "A Point-in-Time Perspective on Through-the-Cycle Ratings." *Financial Analysts Journal* 62.1 (2006): 54–70 at 68.

[109] *See*, *e.g.*, Altman, Edward I., and Herbert A. Rijken. "How Rating Agencies Achieve Rating Stability." *Journal of Banking & Finance* 28.11 (Nov. 2004): 2679–2714 ("A recent survey conducted by the Association for Financial Professionals (2002) reveals that most participants believe that agency ratings are slow in responding to changes in corporate credit quality. Surveys by Ellis (1998) and Baker and Mansi (2002) report the same finding. The slowness in rating adjustments is well recognized by investors. Indeed, it seems that investors anticipate the well documented serial correlation in downgrades.") at 2680.

[110] "Analyzing the Tradeoff Between Ratings Accuracy and Stability." *Moody's Investors Service: Special Comment* (Sept. 2006): 1-8 at 7-8.

in the Cornaggia Report also refer to this phenomenon.[111] Near the beginning of the financial crisis, Claire Robinson, a managing director at Moody's, explained in response to questions about why Moody's had not downgraded more securities, "we don't change our ratings on speculation about what's going to happen."[112]

55. A reasonable investor would not have assumed that ratings for the collateral in STACK (or indeed the ratings of STACK itself) would be updated unless and until the agencies were certain the ratings were "unlikely to be reversed within a relatively short period of time."[113] CDIB was aware that "rating agencies will probably wait for actual losses to occur to take downgrade action rather than act on the current high delinquency levels."[114]

56. Furthermore, a reasonable investor would have known that an investment in a CDO like STACK, even in the Supersenior Swap, was not risk free.[115] Public data from the rating agencies signaled to market participants that there was risk even in an AAA investment. S&P assigned a probability of default to AAA rated securities,[116] and Moody's listed that AAA securities had expected losses.[117] Prior to the Relevant Date, it was understood that structured finance was a relatively young sector, and rating agencies did not have historical data that spanned several credit cycles with which to evaluate default risk.[118] Investors prior to the Relevant Date understood that not all AAA-rated securities were the same and looked at credit ratings as "one check in a broader due diligence and risk management process."[119]

B. S&P Methodology for Rating CDOs

57. S&P's methodology to rate CDOs is comprised of two components: a default analysis and a cash flow analysis.[120] I describe both in more detail below. Generally speaking, the default

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[111] White, Lawrence J. "Markets: The Credit Rating Agencies." *The Journal of Economic Perspectives* 24.2 (2010): 211–26 at 218; Alp, Aysun. "Structural Shifts in Credit Rating Standards." *Journal of Finance* 68.6 (Dec. 2013): 2435–70 at 2439 n. 3.

[112] Farzad, Roben. "Let The Blame Begin." *Bloomberg Business Week* (Aug. 5, 2007). <https://www.bloomberg.com/news/articles/2007-08-05/let-the-blame-begin> (accessed Dec. 20, 2016).

[113] Cantor, *supra* note 107, at 175.

[114] "U.S. Housing Market Update." *Trust Company of the West Credit Mortgage Group* (Mar. 13, 2007) (CDIB_000227591 at CDIB_000227593). *See also* Email from Frances Liu, *ABS CDOs backed by RMBS held by Credit trading desk* (Mar. 16, 2007) (CDIB_000407633).

[115] *See* Gibson, "Understanding the Risks of Synthetic CDOs," *supra* note 94, (While the senior tranche is not exposed to 'recession risk,' it could be said to be exposed to 'depression risk.'") at 23.

[116] *See*, *e.g.*, Cornaggia Report (reproducing S&P's CDO Evaluator 2.4.3 probability of default table) at 16.

[117] "Moody's Idealised Cumulative Expected Default and Loss Rates." *Moody's Investors Service* (2016). <https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBS_SF434522> (accessed Jan. 5, 2017).

[118] Hu & Cantor, *supra* note 104, at 19.

[119] Committee on the Global Financial System. "The Role of Ratings in Structured Finance: Issues and Implications." *Bank for International Settlements* (Jan. 2005): 1-59 at 43.

[120] Ghetti, Belinda, David C. Tesher, Henry C. Albulescu, Katrien Van Acoleyen. "CDO Spotlight: Generalized Cash Flow Analytics for CDO Securitizations." *Standard & Poor's Credit Research* (Aug. 25, 2004): 1-27 at 4.

analysis determines expected collateral default, and the cash flow analysis determines the level of collateral default a tranche should be able to withstand for a given rating. A CDO rating from S&P thus reflects the likelihood that a given tranche will experience the first-dollar-of-loss of interest or principal.[121]

S&P Default Analysis

58. The S&P default analysis is performed using the CDO Evaluator.[122] Users enter a desired portfolio into the CDO Evaluator, including the current ratings associated with each asset in the CDO portfolio. S&P associates each asset's rating with a probability of default.[123] For example, a corporate bond with a BBB rating is associated with a 6.08 percent probability of default on a 10-year horizon.[124]

59. The CDO Evaluator produces a default distribution for the portfolio through a commonly used technique called Monte Carlo simulation.[125] Essentially, the CDO Evaluator estimates the probability that a given proportion of the portfolio will default. For example, in the sample portfolio below, the CDO Evaluator estimates that 17 percent of the portfolio will default approximately 14.2 percent of the time.[126] *See* **Figure 1**: *Example Probability Distribution of Portfolio Default Rates*.[127]

[121] "Global Cash Flow and Synthetic CDO Criteria." *Standard & Poor's Structured Finance* (Mar. 21, 2002): 1-167 at 13.

[122] *Id.* at 40.

[123] *Id.* at 15.

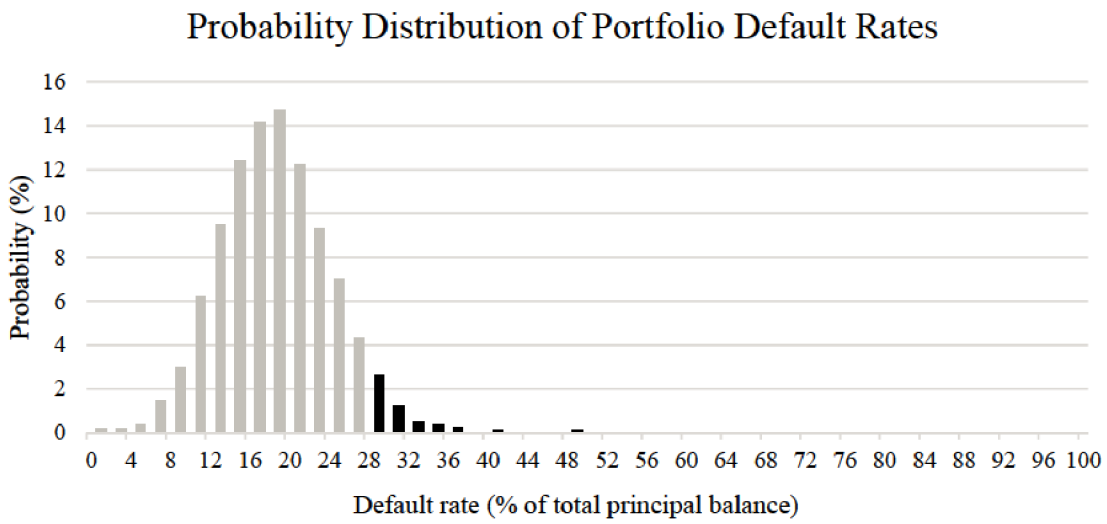
[124] *Id.* at 46.

[125] *Id.*at 40.

[126] The portfolio default rate is expressed as a percent (in terms of dollar value) of the portfolio. *See id.*

[127] *Id.* at 41.

Figure 1: Example Probability Distribution of Portfolio Default Rates



60. Using the probability distribution of portfolio default rates, the CDO Evaluator generates a list of Scenario Default Rates ("SDRs"), one for each rating category. An SDR is calculated by first finding the portfolio default rate at which the default probability is no greater than the default probability of a corporate bond of the same rating. Then the portfolio default rate is multiplied by an adjustment factor determined by S&P.[128] For example, a 10-year A-rated corporate bond has approximately a three percent probability of default. In the above example, the probability of exceeding a 28 percent default rate is no greater than three percent. Therefore, the portfolio default rate is 28 percent. This default rate is then multiplied by 1.02, which is the adjustment factor for an A rating. The portfolio SDR is therefore 28.56 percent.

61. S&P's calculation of SDRs also takes into account correlations between assets in the portfolio.[129]

S&P Cash Flow Analysis

62. S&P's CDO cash flow analysis (also referred to as Genesis) determines whether funds will be available to make full payments of interest and principal for each tranche.[130] The cash flow analysis evaluates the structure of the transaction, including the priority of payments of interest and principal (subordination), the amount of overcollateralization, excess spread, reinvestment of proceeds, amortization and other payment scenarios, and reserve levels.[131]

[128] S&P multiplies the portfolio default rate by an adjustment factor as the probabilities of default associated with each asset are estimates of the likelihood of default. The adjustment factor may be less than or greater than 1. *See id.*

[129] *Id.* at 42-43.

[130] Ghetti, *supra* note 120, at 5.

[131] *Id.*

63. The cash flow analysis subjects the CDO tranche to a set of stress scenarios.[132] For example, a CDO tranche is subjected to prepayment and interest rate stress scenarios, as well as stress scenarios related to the timing of defaults.[133] The severity of the stress scenarios depends on the desired rating. The stress scenarios produce outputs in the form of breakeven default rates ("BDRs"). Each BDR represents the default rate that the portfolio can withstand before it fails to make timely payments of principal and interest.[134]

64. The lowest BDR represents the worst resulting performance of a tranche under all the stress scenarios.

Assigning the Rating

65. The lowest BDR for a tranche is compared with the SDR from the CDO Evaluator. A rating is granted when the BDR (the level of default the portfolio can withstand) is the same as or higher than the SDR (the level of expected defaults).[135] If the collateral backing a CDO is of lower quality, it will have a higher SDR, because it will be more likely that a higher percent of the assets will default.[136] Therefore, it will need to demonstrate it can withstand the additional risk of losses (though additional credit enhancement) to achieve a rating.[137]

66. If the BDR is higher than the SDR for a given rating, then the rating can be said to have a "cushion."[138] For example, the Cornaggia Report lists the lowest BDR of the Supersenior Swap for STACK as 41.05 percent for an AAA rating. The original SDR for the tranche was 22.55 percent.[139] Because the BDR of the Supersenior Swap was greater than the SDR for an AAA rating, the Supersenior Swap could be rated AAA.

C. The Practice of Notching

67. Both S&P and Moody's CDO rating methodologies require as input the ratings of the underlying securities. If the ratings agency has not rated a security, it may utilize an industry practice called "notching."[140]

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[132] *Id.*

[133] *Id.* at 8, 16.

[134] *Id.* at 5.

[135] *Id.*

[136] *Id.* at 11.

[137] For information on credit support in CDO transactions, *see* "Global Cash Flow and Synthetic CDO Criteria," *supra* note 121, at 67-69.

[138] Ghetti, *supra* note 120, at 5.

[139] Cornaggia Report at Appendix B, Table B.2.

[140] "Report on the Role and Function of Credit Rating Agencies," *supra* note 96, at 24.

68. The Offering Memorandum outlined the notching schedules that would be applied by Moody's and S&P for STACK collateral that had only been rated by another agency.[141] For example, Moody's would consider an RMBS security that had been rated between AA+ and BBB- by S&P to be two notches lower in its CDO model.[142]

69. The rating agencies also used notching to temporarily downgrade certain RMBS and CDO ratings in 2007.[143] In that case, notching was a temporary measure used for modeling purposes only until a full review of certain RMBS investments could be completed. The notching was not intended to imply that these assets should have been rated differently or that the asset ratings would change. Instead, it was "intended to increase levels of credit support for new CDO transactions to help mitigate the impact of future changes in the ratings on the underlying U.S. RMBS collateral and CDO collateral."[144]

VI. PLAINTIFF'S LOAN CHARACTERISTIC AND HPA-RELATED CLAIMS WOULD NOT HAVE HAD A MATERIAL IMPACT ON INVESTORS' DECISIONS REGARDING WHETHER TO INVEST IN STACK

70. Plaintiff's expert Dr. Seru alleges that the characteristics of the mortgage loans underlying the RMBS in STACK were misrepresented.[145] Dr. Seru makes loan-level claims regarding the LTV ratio based on an Automated Valuation Model ("AVM"), the property's occupancy status, borrower income, and the presence or absence of a second lien on the property (hereafter, "Plaintiff's Loan Characteristic Claims").[146]

71. Dr. Seru also claims that Morgan Stanley's knowledge of HPA forecasts and "internal and proprietary modeling of HPA" allowed it to foresee STACK's losses.[147]

72. The fact that a pool of loans experienced losses does not indicate that the loans generating cash flows had defects or that any purported defects were significant. Rather, one must determine whether or not an investor's assessment of the risk of the loans that collateralized the RMBS in STACK as of March 2007 (the "Underlying Loan Pool") would have changed if Plaintiff's Loan Characteristic Claims and Morgan Stanley's alleged HPA-related knowledge had been known prior to CDIB's purchase. Thus, I ultimately analyzed whether Plaintiff's Loan Characteristic Claims and HPA-related allegations, if assumed to be true and known at the time of purchase, would have been material to a reasonable investor.

73. Because Plaintiff's Loan Characteristic Claims concern loan-level characteristics, it is necessary to model the collateral backing the securities in STACK at the loan level. To do this, I used an

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[141] Offering Memorandum at CDIB_000532646-50.

[142] *Id.* at CDIB_000532646.

[143] "ARCHIVE: S&P Comments On Process For Rating New CDOs With U.S. RMBS Exposure." *S&P Global Ratings' Credit Research* (July 18, 2007).

[144] *Id.*

[145] Seru Report at ¶¶ 35 *et seq.*, 44 *et seq.*, 62 *et seq.*, 65 *et seq.*, 72 *et seq.*

[146] *Id.* at ¶¶ 44 *et seq.*, 62 *et seq.*, 65 *et seq.*, 72 *et seq.,* supporting materials.

[147] *Id.* at ¶ 43.

industry-standard Cox proportional hazards model (the "Model"), to estimate the prepayment and default hazards of a loan,[148] which then enabled me to determine the probability of default loss for the Underlying Loan Pool. These hazards showed the predicted month-specific rates of prepayment and default for a loan, based on its characteristics and historical data on the performance of similar loans. The Model estimated prepayment and default hazards using information on credit scores, LTV ratios, loan purpose, occupancy status, property type, documentation type, prepayment penalty indicator, adjustable rate mortgage indicator, lien position, whether the property had a second lien, the state in which the property was located, the unemployment rate of the state in which the property was located, and borrower's income growth.[149]

74. I ran three tests. *First*, I tested whether Plaintiff's Loan Characteristic Claims would have resulted in levels of risk above those expected by a reasonable investor.[150] *Second*, I re-ran the same test, but incorporating HPA. *Finally*, I tested whether Plaintiff's Loan Characteristic Claims would have led to greater risk than would have been expected for a managed CDO based on the Offering Memorandum disclosures.

75. For each test, I compared two scenarios, one that reflected the risk resulting from Plaintiff's allegations (including Plaintiff's Loan Characteristic Claims and HPA-related allegations), and one that reflected the risk that an investor should have expected based on information available prior to CDIB's purchase. If the risk resulting from Plaintiff's allegations fell below the risk that an investor should have expected, the impact of Plaintiff's allegations was empirically immaterial.

A. Test 1: Empirical Analysis of the Materiality of Plaintiff's Loan Characteristic Claims

76. Using the Model, I first estimated the prepayment and default risk associated with the Underlying Loan Pool. For both the prepayment estimation and the default estimation of the proportional hazards model, I used only data available to an investor at the time of CDIB's purchase (*i.e.*, historical loan data from 1998 to March 2007).[151]

    a. To estimate prepayment risk, the Model determined the relationship between a given set of loan characteristics and the probability of prepayment by estimating the relationship between certain loan and economic characteristics (credit scores, LTV ratios, loan purpose, occupancy status, property type, documentation type, prepayment penalty indicator, adjustable rate mortgage indicator, lien position,

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[148] Elul, Ronel. "Residential Mortgage Default." *Philadelphia Federal Reserve Business Review* (Q3 2006): 21-30 at 25; *See also* Fuster, Andreas, and Paul S. Willen. "Payment Size, Negative Equity, and Mortgage Default." *Federal Reserve Bank of New York. Staff Reports* No. 582 (Aug. 2013): 1-67 at 16; Ding, Yufeng. "Decomposing Mortgage Portfolio Risk: Default, Prepayment, and Severity." *Moody's Research Labs* (Nov. 19, 2010): 1-27 at 6. Additional detail on the Model is available in **Appendix Ca**: *Technical Appendix - Analyses of Materiality and Other Seru Analyses*.

[149] Models prior to the Relevant Date consistently took into account contemporaneous macroeconomic variables. *See, e.g.*, Fuster & Willen, *supra* note 148, at 11 and Ding, *supra* note 148, at 19.

[150] *See* **Appendix Ca**: *Technical Appendix - Analyses of Materiality and Other Seru Analyses* for a description of how Plaintiff's Loan Characteristic Claims were applied in the Model.

[151] For information on the ABSNet calibration set, *see* **Appendix Ca**: *Technical Appendix - Analyses of Materiality and Other Seru Analyses*.

whether the property had a second lien, the state in which the property was located, the unemployment rate of the state in which the property was located, and borrower's income growth) and prepayment using information on approximately 20 million loans from ABSNet, a commercially available database.[152]

b. To estimate default risk, the Model determined the relationship between a given set of loan characteristics and the probability of default by estimating the relationship between certain loan and economic characteristics and default using information on approximately 20 million loans from ABSNet.[153]

77. With the statistical relationship between certain loan characteristics and expected loan performance (default and prepayment) established, I then ran two scenarios. In each scenario described below, the expectation of default for each loan was calculated using the loan's characteristics and the default and prepayment relationships described above. The expectation of default for the loans was then aggregated to form an expectation of cumulative default, expressed as a percentage of the aggregate current principal balance as of March 2007. To be conservative, my analysis assumed 100 percent loss severity in the event of default. In other words, I assumed that no proceeds would be recovered from a foreclosure sale of a property that secured a defaulted loan.

78. The two scenarios I ran are: (i) *Plaintiff's allegations scenario* (reflecting Plaintiff's Loan Characteristic Claims) and (ii) *collateral risk scenario*. These two scenarios allowed me to determine empirically whether Plaintiff's Loan Characteristic Claims had a material impact on the expected risk of the Underlying Loan Pool.

79. In the *Plaintiff's allegations scenario*, I took as true Plaintiff's Loan Characteristic Claims and applied these findings to the Underlying Loan Pool. Because the Seru Report provides allegations on a loan-level basis, I applied his alleged actual findings to the loans.

80. Based on the loan characteristics derived from Plaintiff's Loan Characteristic Claims, I calculated the predicted prepayment and default rates for the Underlying Loan Pool, which I called the *Plaintiff's allegations scenario.*

81. In the *collateral risk scenario*, I took into account that the assets in STACK could change and created hypothetical pools of loans with characteristics consistent with the Underlying Loan Pool. There were no restrictions for the collateral manager based on loan characteristics. However, to be conservative, I assumed that the loan characteristics of any assets purchased for STACK would preserve the same distribution of loan characteristics as the Underlying Loan Pool.[154]

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[152] For a similar prepayment likelihood estimation, *see* Quigley, John M., and Robert Van Order. "Efficiency in the Mortgage Market: The Borrower's Perspective." *American Real Estate and Urban Economics Association Journal* 18.3 (Sept. 1990): 237-52 at 242-7.

[153] For a similar default likelihood estimation, *see* Quigley, John M., and Robert Van Order. "Explicit Tests of Contingent Claims Models of Mortgage Default." *The Journal of Real Estate Finance and Economics* 11.2 (Sept. 1995): 99-117 at 104.

[154] This is a conservative assumption, because a collateral manager could well have chosen assets with loan characteristics with greater risk of loss than those in the Underlying Loan Pool.

82. I then calculated the predicted prepayment and default loss rates for each of these hypothetical supporting loan pools. Because each of the hypothetical loan pools could have collateralized the assets in the CDO, all of those predicted default loss rates were possible. The *collateral risk scenario* reflects the risk associated with the hypothetical loan pool that had the greatest expected risk of default.

83. Specifically, I calculated the range of outcomes that a reasonable investor should have expected. I did so by simulating pools of loans as follows:

    a. *First*, I identified the set of loan characteristics that were consistent with the Underlying Loan Pool. For categorical characteristics (such as, occupancy status, property type, or documentation type), I determined what percentage of the loans fell into each category. For quantitative characteristics (such as, LTV, credit score and loan balance), I created 10 bins with approximately the same number of loans in each. For example, the first bin for the variable credit score took values from 503 to 550 and consisted of approximately 10.02 percent of loans in the Underlying Loan Pool. The second bin for credit score took values ranging from 551 to 580 and contained about 10.44 percent of the loans.[155]

    b. *Second*, I generated 300 hypothetical pools of loans by drawing from the distributions of loan characteristics described in paragraph (a). For each loan in each pool, I created a set of characteristics consistent with the Underlying Loan Pool. The Underlying Loan Pool contained 610,721 loans. I created 610,721 hypothetical loans, each of which had characteristics (*e.g.*, LTV ratio, credit scores, loan balance, documentation type) consistent with the Underlying Loan Pool. I then repeated this process of creating 610,721 hypothetical loans another 299 times. At the end, I had created 183,216,300 possible loans in a total of 300 equally-sized pools. Every one of the pools was drawn from the distribution of characteristics derived from the Underlying Loan Pool.

    c. *Third,* I calculated the expected cumulative default loss rates for each of the 300 pools, which represented the range of risk an investor should have expected. The highest expected cumulative default loss rate among the 300 pools was considered the maximum risk in the *collateral risk scenario*.

84. I then compared the cumulative default loss under each scenario. If the *collateral risk scenario*'s maximum cumulative default loss was greater than the *Plaintiff's allegations scenario*'s expected cumulative default loss, the risk resulting from Plaintiff's Loan Characteristic Claims was immaterial. In other words, even if Plaintiff's Loan Characteristic Claims were true and known at the time of CDIB's purchase, the performance expectations would have been within the range of performance that would have been expected by a reasonable investor.

85. My analysis showed that, even when accepting Plaintiff's Loan Characteristic Claims as true, the expected risk of loss was below the maximum risk of loss for loans with characteristics consistent with the Underlying Loan Pool. *See* **Exhibit 7**: *Model Results*.

[155] *See* **Exhibit 6**: *Stratification of STACK*.

86. As a result, Plaintiff's Loan Characteristic Claims would not have had a material impact on investors' decisions regarding whether to invest in STACK.

B. Test 2: Empirical Analysis of the Materiality of Plaintiff's Loan Characteristic Claims, Incorporating HPA

87. In order to test whether Plaintiff's allegations surrounding HPA were material, I incorporated HPA into the Model. This allowed me to test whether Plaintiff's Loan Characteristic Claims would have materially increased a reasonable investor's expectations of default if Morgan Stanley's allegedly unique knowledge regarding HPA were known.

88. To be clear, there is little reason to believe that changes in expectations about HPA would lead to a different conclusion than in Test 1 above. Dr. Seru's HPA allegations will impact both the *collateral risk scenario* and the *Plaintiff's allegations scenario* in broadly similar ways. Nonetheless, I conducted the analysis to assess the materiality of these allegations.

89. In this second test, the Model estimated prepayment and default hazards using information on HPA in addition to the set of loan characteristics listed in ¶ 76.

90. The Seru Report claims that Morgan Stanley had projected national HPA slowing to zero by September 2007.[156] Thus, for the *Plaintiff's allegations scenario (with HPA)* in this test, I set HPA to zero.

91. For the *collateral risk scenario (with HPA),* I proceeded as above in ¶ 83, utilizing the same method to generate 300 hypothetical loan pools. I calculated cumulative default loss rates for each of the 300 pools under seven different HPA values. The HPA values were based on the range of HPA values forecasted by the *Wall Street Journal* in September 2006.[157] I utilized this forecast because it was cited as the source for what Dr. Seru calls "Morgan Stanley's [p]rojection of HPA."[158] Each calculation of cumulative default loss assumed a single national HPA value, which ranged from -8 percent to 7.5 percent. The highest expected cumulative default loss rate among the 300 pools and various HPA values was again considered the maximum risk in the *collateral risk scenario (with HPA)*.

92. I then compared the cumulative default loss under both scenarios. I compared the *Plaintiff's allegations scenario (with HPA)* to the *collateral risk scenario (with HPA)*, using both a zero HPA value as well as the full range of HPA values, including the lowest forecasted value.

93. My analysis again showed that, even when accepting Plaintiff's Loan Characteristic Claims as true, the expected default loss rate was below the maximum risk when HPA was zero. That is, the expected loss in *Plaintiff's allegations scenario (with HPA)* is lower than in the *collateral risk scenario (with HPA)*, with HPA set to zero. Furthermore, when taking into account the full range of possible HPA values, the gap between the expected risk assuming Plaintiff's

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[156] Seru Report at ¶ 41.

[157] "Economic Forecasting Survey Data." *Wall Street Journal* (Sept. 1, 2006). <http://online.wsj.com/public/resources/documents/wsjecon0906.xls> (accessed Nov. 22, 2016).

[158] Seru Report at Figure 8. *See also* "Capitalizing on Housing Declines." *Morgan Stanley* (Oct. 2006) (MS_CDIB_000485536 at MS_CDIB_000485543).

allegations to be true and the maximum expected risk rises even further. *See* **Exhibit 7**: *Model Results*.

94. I also compared the result of the materiality analysis that excluded HPA (Test 1) with the results of the analysis that incorporated an HPA of zero percent. As reflected in **Exhibit 7**: *Model Results*, for each of these analyses, the results of the *collateral risk scenario* were approximately two percent *higher* than under *Plaintiff's allegations scenario.* Consequently, I determined that including HPA in the Model did not change the conclusions reached in the initial materiality analysis. On the contrary, taking into account all possible ranges of HPA forecasts only increases the maximum risk in the *collateral risk scenario*.

95. Based on all of the above analyses, I concluded that Plaintiff's Loan Characteristic Claims and Morgan Stanley's alleged knowledge of HPA forecasts would not have had a material impact on a reasonable investor's decision regarding whether to invest in STACK.

C. Test 3: Empirical Analysis of the Materiality of Plaintiff's Loan Characteristic Claims in the Context of a Managed CDO

96. Although for the two tests described above, I conservatively assumed that any variation in the CDO collateral would retain the same distribution of loan characteristics, the collateral manager was in fact allowed to modify the collateral of the CDO, and by extension the underlying mortgage loans supporting the collateral. The collateral manager was not subject to any restrictions based on loan characteristics, and therefore could have purchased collateral with underlying mortgage loan pools with different characteristics. A reasonable investor would understand that the collateral could change more than what the *collateral risk scenario* reflects.

97. For the third test, then, I considered the risk inherent in a managed CDO such as STACK.[159] I used the Model to calculate a new scenario, the *managed CDO risk scenario*, in which I calculated the maximum expected cumulative default loss rate of a pool of loans with the same credit rating distribution as the STACK portfolio sent to CDIB in March 2007.

98. For the *managed CDO risk scenario*, I applied the Model to all *actual* supporting loan groups backing RMBS certificates issued between 2004-2006 (the vintages represented in STACK) to estimate expected cumulative default losses.[160] I specifically looked at RMBS certificates with credit ratings that were the same as certificates held by STACK. For each rating category, I ranked the RMBS certificates by the expected cumulative default losses of their underlying supporting loan groups.[161]

99. I then created a CDO containing RMBS assets following the portfolio percentage limitations and collateral quality tests in the Offering Memorandum and having the same rating composition as STACK in March 2007. It was comprised of the RMBS certificates with the highest expected cumulative loss. Because the collateral manager was authorized to update the STACK portfolio, a reasonable investor would have known that such a portfolio could have

[159] For this test, I did not include HPA in the Model.

[160] STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Frances Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

[161] *See*, *e.g.*, **Exhibit 8**: *Comparison of Loan Characteristics by Tranche Rating and Expected Default Loss*.

backed STACK. The *managed CDO risk scenario* represents the expected cumulative default loss of the pool of loans within this CDO.

100. When I compared the results of the *managed CDO risk scenario* with the results of the *Plaintiff's allegations scenario*, the results again showed that, even when accepting Plaintiff's Loan Characteristic Claims as true, the expected default loss rates are below the maximum expected default loss rate of a portfolio of loans that could have backed the RMBS assets of STACK. *See* **Exhibit 7**: *Model Results*.

101. Therefore, Plaintiff's Loan Characteristic Claims would not have a material impact on a reasonable investor's decision regarding whether to invest in STACK.

102. The results of all three tests empirically demonstrate that Plaintiff's Loan Characteristic Claims would not have materially affected the expected risk of the Underlying Loan Pool. First, I determined that the risk of loans incorporating Plaintiff's Loan Characteristic Claims was below the risk of loans with characteristics that were consistent with the Underlying Loan Pool. Second, I determined that incorporating Plaintiff's allegations regarding HPA did not affect the results. Finally, I determined that the risk of loans incorporating Plaintiff's Loan Characteristic Claims was lower than the risk of loans supporting actual RMBS securities with the same ratings as the collateral within STACK.

VII. THE SERU REPORT DRAWS A FAULTY INFERENCE FROM INCOMPLETE HPA DATA

103. The Seru Report contends that Morgan Stanley utilized proprietary information regarding HPA forecasts, and purports to extrapolate this data to reach conclusions regarding expected losses for STACK. The empirical analysis described above shows that the HPA-related allegations would have been immaterial to a reasonable investor. Moreover, the Seru Report suffers from at least three additional flaws with regards to HPA. First, it fails to provide evidence that Morgan Stanley had information that was unavailable to other investors. Second, the extrapolation techniques employed by Dr. Seru are invalid and unreliable. Third, it incorrectly infers losses for STACK's Supersenior Swap based on a simplistic relationship between HPA and expected default losses.

A. The Seru Report Fails to Demonstrate that Morgan Stanley Had Proprietary Information Regarding HPA

104. The Seru Report's allegations regarding Morgan Stanley's purportedly unique access to information regarding housing forecasts are based on two presentations,[162] dating from September 2005[163] and October 2006[164] (the "2005 Presentation" and the "2006 Presentation," or collectively, the "Presentations"). What the Seru Report fails to note, however, is that the Presentations rely on publicly available information. The 2005 Presentation cites publicly

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[162] *See* Seru Report ("The October 2006 'Capitalizing on Housing Declines' presentation, for instance, lists **at least 22 reasons** why lower rated RMBS tranches backed by mortgages were expected to perform poorly, and **no reasons** why they were expected to perform well, as discussed in this report.") (emphasis in original) at ¶ 30.

[163] Hubler, Howard. Deposition (Feb. 18, 2016) Exhibit 27; "Housing Market Risk and Mortgage Credit Losses." *Morgan Stanley* (Sept. 28, 2005) (MS_RHI_001323157 at MS_RHI_001323180).

[164] "Capitalizing on Housing Declines." *Morgan Stanley* (Oct. 2006) (MS_CDIB_000485536 at MS_CDIB_000485617).

available information from the Office of Federal Housing Enterprise Oversight (OFHEO) house price index, the National Association of Realtors, Freddie Mac Primary Mortgage Market Survey, Home Mortgage Disclosure Act Data, the Bureau of Labor Statistics, Loan Performance, and S&P Levels.[165] Similarly, the 2006 Presentation relies on publicly available information from the *Wall Street Journal*, National Association of Home Builders, Bloomberg, National Association of Realtors, Fair Isaac, Bond Market Association, SDC, Intex, and Moody's.[166] In other words, the analyses contained in the Presentations were based on public information, not on material non-public information as claimed by Plaintiff.[167]

105. Indeed, the Seru Report offers no evidence that Morgan Stanley possessed any internal and sophisticated models based on proprietary information, and the Presentations show no evidence of such models. The 2006 Presentation is mostly a collection of plots of public data and basic assumptions about a typical CDO structure. A sophisticated institutional investor, such as CDIB, would have had access to this same public data. Indeed, any investor could have modeled pessimistic house price scenarios to estimate the anticipated impact on subprime loan performance.[168]

106. Moreover, prior to the Relevant Date, there was a lack of consensus regarding the presence or absence of a housing bubble.[169] Morgan Stanley economists had published articles warning of a

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[165] 2005 Presentation at MS_RHI_001323158-76.

[166] 2006 Presentation at MS_CDIB_000485543-73.

[167] Complaint at ¶ 14; Seru Report at ¶ 33.

[168] Amromin, Gene, and Anna L. Paulson. "Comparing Patterns of Default Among Prime and Subprime Mortgages." *Federal Reserve Bank of Chicago Economic Perspectives* (2Q 2009): 18-37 ("We find that pessimistic forecasts of home price appreciation could have helped to generate predictions of subprime defaults that were closer to the actual default experience for loans originated in 2006 and 2007.") at 20.

[169] A financial "bubble" exists where market prices diverge significantly from the fundamental value of a given product. Claessens, Stijn, and M. Ayhan Kose. "Financial Crises: Explanations, Types, and Implications." *Financial Crises: Causes, Consequences, and Policy Responses.* Eds. Stijn Claessens, M. Ayhan Kose, Luc Laeven, and Fabián Valencia. Washington, DC: International Monetary Fund (2014): 3-59 at 6.

Some voices from government, academia, and the financial industry claimed there was no evidence of a bubble. Henderson, Nell. "Bernanke: There's No Housing Bubble to Go Bust." *The Washington Post* (Oct. 27, 2005). <http://www.washingtonpost.com/wp-dyn/content/article/2005/10/26/AR2005102602255 html> (accessed Feb. 1, 2016); Himmelberg, Charles, Christopher Mayer, and Todd Sinai. "Assessing High House Prices: Bubbles, Fundamentals, and Misperceptions." *Federal Reserve Bank of New York Staff Reports* 218 (Sept. 2005): 1-40 at 2; McCarthy, Jonathan, and Richard W. Peach. "Are Home Prices the Next 'Bubble'?" *Federal Reserve Bank of New York Economic Policy Review* 10.3 (Dec. 2004): 1–17 at 12; Barsky, Neil. "What Housing Bubble?" *Wall Street Journal* (July 28, 2005). <http://www.wsj.com/articles/SB112250505320798017> (accessed July 9, 2015).

Others warned of imminent house price declines in 2004, 2005, and 2006. Wallace-Wells, Benjamin. "There Goes the Neighborhood." *Washington Monthly* (Apr. 2004). <http://samizdat.cc/shelf/documents/2004/04.02-bubble/bubble.pdf> (accessed Jan. 9, 2017); Fry, Eric J. "Housing Bubble." *Daily Reckoning* (Aug. 15, 2005). <http://dailyreckoning.com/housing-bubble/> (accessed Jan. 9, 2017); Tully, Shawn. "Welcome to the Dead Zone." *CNN Money* (May 5, 2006). <http://money.cnn.com/2006/05/03/news/economy/realestateguide_fortune/> (accessed Jan. 9, 2017).

See also Gerardi, Kristopher, Christopher L. Foote, and Paul Willen. "Reasonable People Did Disagree: Optimism and Pessimism About the U.S. Housing Market Before the Crash." *Federal Reserve Bank of Boston Public Policy Discussion Papers* 10–5 (Sept. 10, 2010): 1–31 ("Ultimately, our paper argues that the academic research available

housing bubble since at least 2004.[170] The future of the housing market was the subject of contrasting and shifting viewpoints.[171]

107. In September 2006, the *Wall Street Journal* economic forecasting survey asked participants to predict the future path of HPA.[172] This survey was referenced in the 2006 Presentation.[173] According to the *Wall Street Journal*, on average, economists predicted that house prices would increase by .43 percent between Q4 2006 and Q4 2007.[174] However, the average house price forecast masks the wide range of views surrounding the housing market at that time. Economists predicted a wide range of outcomes, with some predicting growth of 7.5 percent, and others predicting a decline of 8 percent.[175] The *Wall Street Journal* further reported some selected comments from economists, including: "Prices will flatten, not decline," "National slow down, no collapse," and "Real home price deflation seems inevitable."[176]

108. A publication in December 2006 by Lehman Brothers offered an additional opinion, claiming that "our outlook for HPA remains bleak. […] [W]e expect HPA to be flat to slightly up for 2007."[177] This information was publicly available, and demonstrates a range of views about the future of the housing market.

109. Changes in house prices may affect mortgage and RMBS collateral performance.[178] Historical data and academic research regarding the effect of housing prices was available to market

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in 2006 was basically inconclusive and could not convincingly support or refute any hypothesis about the future path of asset prices.") at 5.

[170] *See* **Appendix D**: *Statements Regarding the Housing Bubble by Morgan Stanley Economists, 2004-2006.*

[171] Nowhere is this more apparent than in the contrasting statements published in the State of the Nation's Housing from 2006 and 2007. *See* Joint Center for Housing Studies. "State of the Nation's Housing 2006." *Harvard University* (June 13, 2006): 1-40 ("The greatest threat to housing markets is a precipitous drop in house prices. Fortunately, sharp price declines of five percent or more seldom occur in the absence of severe overbuilding, dramatic employment losses, or a combination of the two. […] With building levels still in check and the economy expanding, large house price declines appear unlikely for now. But if the economy falters, both job growth and housing prices will come under renewed pressure. This would spark higher default rates, especially among subprime borrowers, and turn housing from an engine of economic growth to a drag.") at 2; Joint Center for Housing Studies. "State of the Nation's Housing 2007." *Harvard University* (June 11, 2007): 1-40 ("Now that the downturn is in full swing, the question of its depth and duration hangs over the market. Much depends on what happens with the economy, interest rates, and credit availability. But it also depends importantly on just how much demand was inflated during the housing market run-up and how fast builders can work off the oversupply of homes.") at 2.

[172] "Economic Forecasting Survey." *Wall Street Journal* (Sept. 1, 2006). <http://projects.wsj.com/econforecast/#ind=gdp&r=20&e=37> (accessed Nov. 22, 2016).

[173] 2006 Presentation at MS_CDIB_000485543.

[174] "Economic Forecasting Survey Data," *supra* note 157.

[175] *Id. See also* **Exhibit 9**: *Historical and Forecasted HPA (2000-2007).*

[176] *Id.*

[177] "Securitized Products Outlook 2007: Bracing for a Credit Downturn." *Lehman Brothers Fixed Income Research* (Dec. 12, 2006): 1-22 at 4.

[178] Case, Karl E., and Robert J. Shiller. "Mortgage Default Risk and Real Estate Prices: The Use of Index-Based Futures and Options in Real Estate." *Journal of Housing Research* 7.2 (1996): 243-258 ("Strong evidence, discussed

participants prior to the Relevant Date.[179] By the outset of 2006, it was known that a change in the housing market could expose RMBS investors to losses.[180]

110. In short, a reasonable investor would have understood that price declines could have deleterious effects and would have been aware of the substantial disagreement about the potential direction of prices. CDIB was aware that declining HPA could lead to "an increase in foreclosure and loss severities."[181]

B. The Seru Report Incorrectly Extrapolates HPA Data to Infer Collateral Loss

111. The 2006 Presentation presents a graph showing historical subprime loan collateral losses for given HPA values. The graph, however, is incomplete, and does not present data reflecting the effect on subprime mortgages when HPA drops below 2 percent. *See* the left-hand graph in **Figure 2**: *2006 Presentation Graphs on HPA*.[182]

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below, shows that the best single predictor of default is the current ratio of loan to market value for each property. This suggests that as prices fall, the probability of defaults will rise. Unfortunately, the cost to lenders of default also rises as prices fall. While default probabilities and default losses rise with falling prices, default losses will rise nonlinearly and faster than house prices fall.") at 245. *See also* Gerardi, Shapiro & Willen, *supra* note 28, at 1; Doms, Mark, Fred Furlong, and John Krainer. "Subprime Mortgage Delinquency Rates." *Federal Reserve Bank of San Francisco Working Paper* 2007–33 (Nov. 2007): 1-29 at 5-6; Foote, Gerardi, Goette, & Willen, *supra* note 41, at 293; Calem, Paul S., and Michael LaCour-Little. "Risk-Based Capital Requirements for Mortgage Loans." *Journal of Banking & Finance* 28.3 (2004): 647-672 at 658.

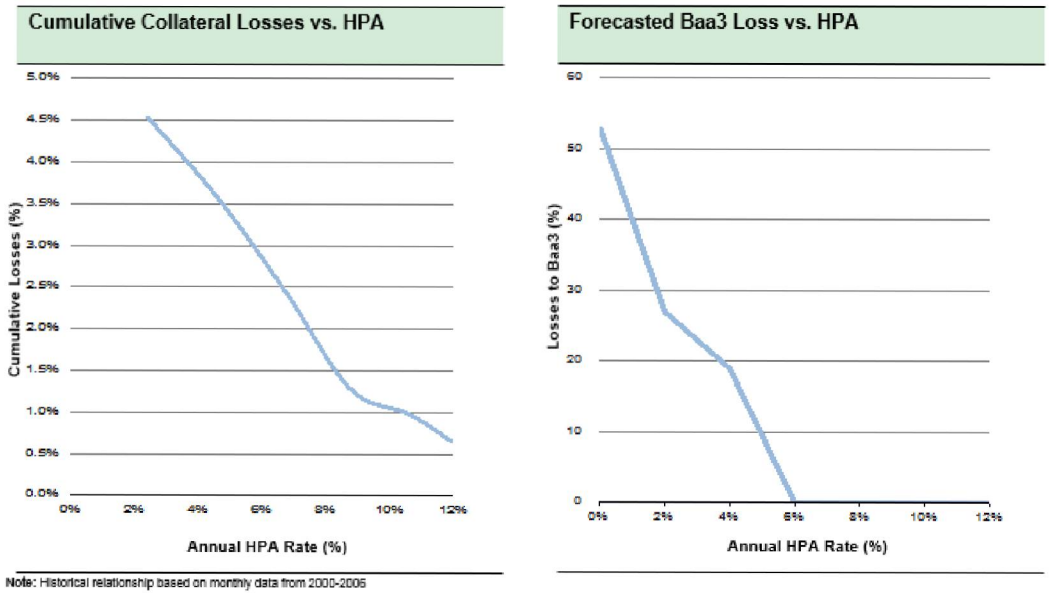
[179] For example, Case and Shiller studied former cases of house price declines and explained, "In all four cases, housing prices dropped sharply. While the number of defaults increased, actual losses soared. In other areas of the country, default rates rise and fall with economic conditions, but actual deficiencies are kept to reasonable levels by collateral values when real estate prices have not fallen." Case & Shiller, *supra* note 178, at 249.

[180] Frankel, Allen. "Prime or Not so Prime? An Exploration of US Housing Finance in the New Century." *BIS Quarterly Review* (Mar. 2006): 67-78 ("Because the US housing market has not been weak since the proliferation of new mortgage products, the scale of the resulting exposure should not be underestimated. […] There are signs that the US housing market is cooling. As house price appreciation slows, mortgage defaults become more likely and, at the same time, voluntary prepayments become less likely. To the extent that some investors may have failed to recognise the degree of sensitivity of their MBS investments to housing market developments, they may be exposed to losses in excess of what they had anticipated.") at 76-77.

[181] "U.S. Housing Market Update." *Trust Company of the West Credit Mortgage Group* (Mar. 13, 2007) (CDIB_000227591 at CDIB_000227592). *See also* Email from Frances Liu, *ABS CDOs backed by RMBS held by Credit trading desk* (Mar. 16, 2007) (CDIB_000407633 at CDIB_000407636),

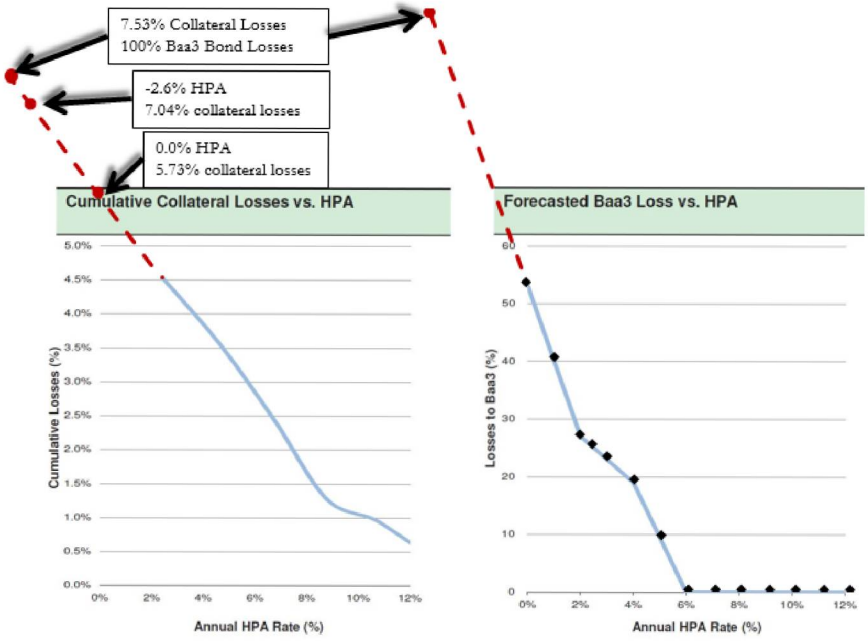
[182] 2006 Presentation at MS_CDIB_000485570.

Figure 2: 2006 Presentation Graphs on HPA



112. The Seru Report purports to extrapolate the missing data to make claims about collateral losses for lower HPA values. *See* **Figure 3**: *Seru's Re-Drawing of 2006 Presentation Graphs*.[183]

Figure 3: Seru's Re-Drawing of 2006 Presentation Graphs



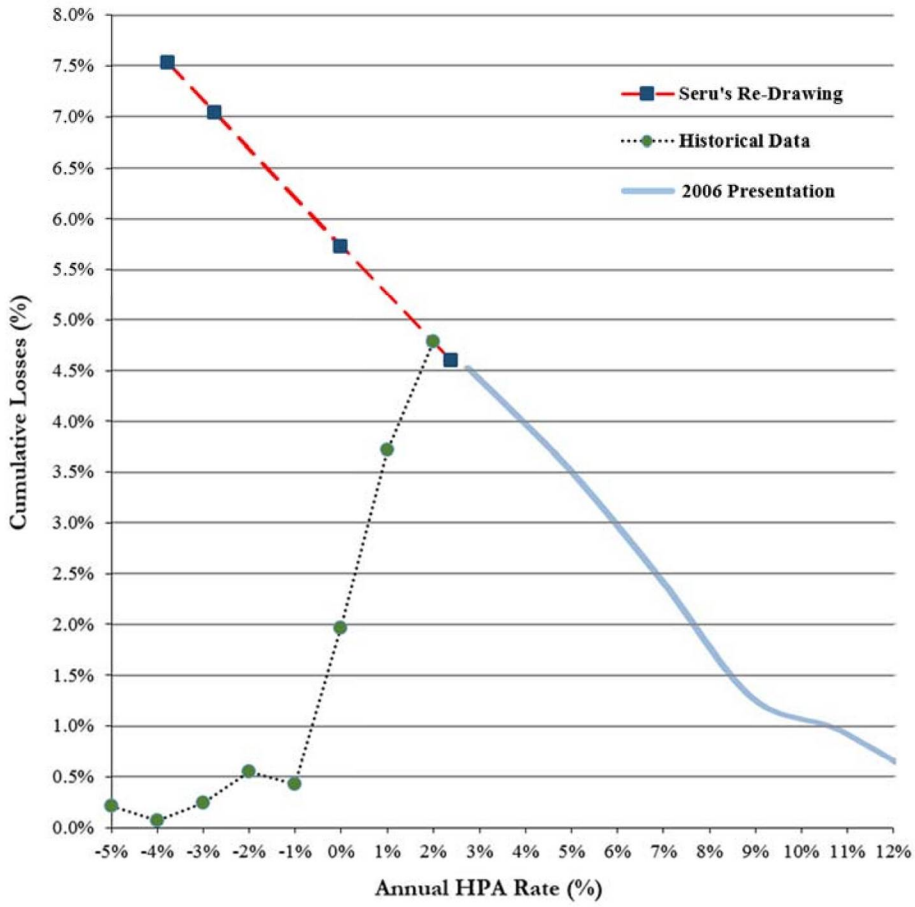
113. These purported extrapolations, however, lack any economic or statistical justification. Neither graph depicts a simple linear relationship between collateral losses and HPA. Rather, the graphs

[183] Seru Report at Figure 12.

show curves or kinks at various inflection points. The Seru Report merely extends the line out without providing any justification and, importantly, without confirming that such a pattern is supported by the data.

114. By analyzing historical data, I found that the data strongly contradicts Seru's linear extrapolation. The 2006 Presentation specifically cited that the relationship between collateral losses and HPA came from analysis of loan-level detail from a publicly available data source.[184] Using similar publicly available data from the same date range, I reproduced the left-hand side of **Figure 3**: *Seru's Re-Drawing of 2006 Presentation Graphs* with four-year cumulative collateral loss observations for local HPA values below 2 percent added. As evident in the figure below, the data points are dramatically different from Seru's extrapolated points. *See* **Figure 4**: *Relationship Between Collateral Losses and HPA in the 2006 Presentation, Seru's Re-Drawing, and Historical Data*.

Figure 4: Relationship Between Collateral Losses and HPA in the 2006 Presentation, Seru's Re-Drawing, and Historical Data



115. Contrary to Seru's purported extrapolation, I found that historical data supported a different relationship. This relationship was not linear and collateral losses did not continue to increase

[184] *See* 2006 Presentation at MS_CDIB_000485570.

each time HPA declined. Therefore, all conclusions in the Seru Report based on his purported extrapolation are unreliable.

C. The 2006 Presentation and Seru's Purported Extrapolation Cannot Be Used to Infer Bond Losses or STACK Losses

116. The Seru Report contends that, based on the forecasted relationship of Baa3 bond losses and HPA depicted in the 2006 Presentation, an investor would have expected Baa3 bonds to suffer losses whenever HPA was below 6 percent.[185] This statement is, however, neither backed by historical data available prior to the Relevant Date nor supported by a reliable model.

117. To calculate the impact of HPA allegations on bond losses, the Seru Report uses the right-hand side graph of **Figure 3**: *Seru's Re-Drawing of 2006 Presentation Graphs*, which depicts a purported forecasted relationship between Baa3 bond losses and HPA. Dr. Seru's line graphing bond losses, however, is based on the line graphing collateral losses (left-hand side). As discussed above, Seru's graphing of this line is not supported by historical data. Because the line purporting to graph bond losses is based on the line purporting to graph collateral losses, it is by definition unreliable as well.

118. Using actual historical data, I applied Dr. Seru's methodology to calculate average Baa3 bond losses for years in which HPA was below 6 percent. I found that historical bond losses were significantly lower than implied by Dr. Seru. *See* **Table 1**: *Baa3 Bond Losses by HPA*.

Table 1: Baa3 Bond Losses by HPA

HPA in a Given Year	Average Bond Losses (%)
Less than 6%	4.045
More than 6%	1.636

119. As demonstrated by **Table 1**: *Baa3 Bond Losses by HPA*, the average bond losses supported by historical data are not consistent with Dr. Seru's graph. Moreover, HPA slowed between October 2006 and March 2007, during the forecasted period covered by the 2006 Presentation. In constrast with what the Seru Report contends, I found that only two percent (40 out of 1972) of outstanding Baa3 tranches experienced a principal loss during that period of time. Finally, as I have previously mentioned, I have seen no evidence from the 2006 Presentation or from the Seru Report showing that this forecast was the product of a sophisticated model, as stated in the Seru Report.[186] Instead, it appears to be an ad-hoc construction using the historical data depicting collateral losses and HPA (the left-hand side graph) and the characteristics of a typical CDO structure.

120. In addition to its incorrect data extrapolation, the Seru Report incorrectly infers losses for STACK's Supersenior Swap based on the previously discussed simple plot of two variables of interest (HPA and bond losses). This approach is conceptually flawed. HPA cannot be considered independently and its effect simply added on top of the risk inherent in RMBS

[185] Seru Report at ¶ 90.

[186] *See* Seru Report at ¶¶ 80, 82, 83.

investments.[187] Focus on a single factor is a narrow and erroneous view of understanding default risk for the Underlying Loan Pool. There are many other macroeconomic, local, and individual factors that affect default. In order to measure the effect of HPA on default, it is necessary to consider all relevant loan characteristics and macroeconomic factors simultaneously.

121. By contrast, my empirical analysis of materiality considered HPA as well as loan characteristics and local factors and determined that the impact of Plaintiff's Loan Characteristic Claims was not material.

122. Because the inference made by Dr. Seru from the 2006 Presentation with regards to the relationship between Baa3 bond losses and HPA is incorrect, his HPA analysis and alleged STACK loss estimation is unreliable.

VIII. THE SERU REPORT MAKES UNFOUNDED INCOME OVERSTATEMENT ALLEGATIONS

123. The Seru Report contends that borrower income may have been overstated for loans underlying STACK.[188] In reaching the conclusion that there was evidence of income overstatement, Dr. Seru did not examine the loan files directly. Rather, he compared average income data collected from mortgage applications, as reported according to the Home Mortgage Disclosure Act ("HMDA"), with average income reported by the Bureau of Economic Analysis ("BEA") and the Internal Revenue Service ("IRS").[189] He flags a loan as having overstated income whenever the relevant property was located in a county or zip code where HMDA income grew more than five percent faster than income as reported by the BEA or IRS, respectively.[190] He tabulates his results and concludes that over 60 percent of loans had overstated incomes.

124. All the income data sources used in Dr. Seru's analyses are publicly available and not proprietary to Morgan Stanley. The Seru Report offers no evidence that Morgan Stanley had information about income overstatement that would have been unavailable to an investor such as CDIB.

125. The Seru Report does not provide evidence of income overstatement for any individual loans, as it does not consider loan-level data regarding borrower income. Additionally, Dr. Seru contradicts the academic literature he cites when he does not consider which loans were full documentation and instead flags all loans in a given county or zip code as having overstated income.[191] Thus, Dr. Seru does not offer a reliable percentage of loans within STACK that were subject to alleged income overstatement. Furthermore, he fails to offer any information to

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[187] As discussed below in section IX, this is also a fundamental problem in the Cornaggia Report.

[188] Seru Report at ¶¶ 44-48.

[189] *Id.* at ¶ 47.

[190] *Id.* at ¶ 47.

[191] Dr. Seru's supporting materials count all loans as having misrepresented borrower income if they are located in a county or zip code where HMDA income grew five percent faster than the BEA or IRS income in that area. However, Jiang, Nelson, and Vytlacil state that for full documentation loans, the average reported income "should be approximately equal to average true income." Seru Report at ¶ 44 n. 78. *See* Jiang, Wei, Ashlyn Aiko Nelson, and Edward Vytlacil. "Liar's Loan? Effects of Origination Channel and Information Falsification on Mortgage Delinquency." *The Review of Economics and Statistics* 96.1 (Mar. 2014): 1-18 at 13.

suggest the percent of income overstatement that may affect any loan. He therefore does not quantify his claim that borrower income was overstated in the loans underlying STACK.

126. Instead, the Seru Report relies entirely on the 2005 Presentation to demonstrate "Morgan Stanley's concerns about income overstatement in the RMBS universe."[192] The 2005 Presentation, however, offers two additional potential explanations for why HMDA income was growing faster than BEA income in certain cities: increasing income inequality and in-migration of high income residents.[193] The Seru Report offers no analysis to determine whether one or both of these factors were driving the changes in the data. Instead, the Seru Report marks all loans in areas with HMDA income growth outpacing BEA or IRS income growth as being subject to overstated income. Doing so is in direct conflict with the 2005 Presentation on which Dr. Seru relies. Dr. Seru's analysis is not granular enough to draw conclusions about the percentage of loans that are potentially subject to income overstatement.

127. Dr. Seru's comparison of HMDA data with IRS and BEA data is also flawed. As described more fully below, Dr. Seru treats HMDA data as comparable with BEA and IRS data, when in fact they are fundamentally different sets of information. Furthermore, the analysis of the relationship between the HMDA and the BEA income growth rates does not provide evidence of income overstatement.

A. The Seru Report Compares Fundamentally Different Data Sets

128. Dr. Seru does not consider how fundamental differences in the populations from which the income data was collected may have affected his results. HMDA data only includes wage information for people who have applied for a mortgage.[194] IRS data includes wage information for anyone who has filed a tax return, while BEA data includes comprehensive wage information for all residents of a given county. The data published by the BEA includes income reported by employers, as well as additional income types, including capital gains, trust funds, and pension funds. The BEA data also includes adjustments for estimated misreported wage and salary data.[195]

129. Analyses using the HMDA data "can create biases because the selected sample of people who decide to apply for a loan can differ across markets or years."[196] For example, when house prices are increasing rapidly in a zip code in a given year, it may affect the ability of some

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[192] Seru Report at ¶ 46.

[193] 2005 Presentation at MS_RHI_0001323164.

[194] HMDA data contains information about every mortgage loan application filed, including whether it was denied or accepted, the property location (including the census tract), and the income reported on the mortgage application. The HMDA requires an eligible institution to report the annual gross income it relied upon in making its credit decision. "Frequently Asked Questions about the New HMDA Data." *Federal Reserve Board* (Mar. 31, 2005). <https://www.federalreserve.gov/boarddocs/press/bcreg/2005/20050331/attachment.pdf> (accessed Oct. 26, 2016): 1-9 at 1; and "A Guide to HMDA Reporting: Getting it Right!" *Federal Financial Institutions Examination Council* (2006). <https://www ffiec.gov/hmda/pdf/2006guide.pdf> (accessed Oct. 26, 2016): 1-29 at 15 and D-13.

[195] "Local Area Personal Income Methodology." *Bureau of Economic Analysis* (Nov. 2015) <http://www.bea.gov/regional/pdf/lapi2014.pdf> (accessed Oct. 26, 2016): I-1-VIII-12 at I-12 and II-2.

[196] Nathanson, Charles Gordon. "Housing Dynamics: An Urban Approach." *Mean Reversion in Housing Markets*. Harvard University (2014): 1-30 at 16.

borrowers to afford a home and may reduce mortgage applications from mid-to-low income borrowers as compared with former years.[197] If the population of those applying for mortgages changes, it would affect the HMDA data, but would not affect the IRS or BEA data.

130. Despite the differences in the populations covered by the data, Dr. Seru compares the ratio of HMDA to BEA/IRS income to measure misreported income. The methodology used by Dr. Seru[198] has been critiqued extensively in academic literature.[199] Adelino, Schoar and Severino explain that home buyers have different income dynamics and generally higher incomes than other residents in a given area.[200] Therefore, "misreporting cannot explain the estimates we obtain with respect to buyer income growth and mortgage growth, nor does it affect the results on the distribution of originations and delinquencies."[201] The problems with comparing the growth rates of HMDA and IRS income data identified by Adelino, Schoar and Severino apply directly to Dr. Seru's methodology used in this case.

131. Moreover, neither BEA nor IRS data are ideal datasets to analyze mortgagor income. Dr. Seru's comparison of HMDA data to IRS data assumes that the IRS data is accurate. Research by academics and the IRS has shown that IRS income is likely to be understated,[202] and opportunities to understate income are most frequent for those with high incomes.[203] Using the BEA data to measure income for mortgage transactions is problematic, since it includes incomes of many people who are not potential homebuyers and is reported at the individual

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[197] *See*, *e.g.*, Joint Center for Housing Studies (2007), *supra* note 171, ("The turning point came in late 2005 when the combined impact of rising mortgage interest rates and higher house prices finally forced out some buyers.") at 2. *See also* Dell'ariccia, Giovanni, Deniz Igan, and Luc Laeven. "Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market." *Journal of Money, Credit and Banking* 44.2–3 (Mar. 2012): 367–84 ("A reverse causality problem may arise as potential borrowers may be deterred from applying for a loan if loan denials are high.") at 377.

[198] The Seru Report cites a paper by Mian and Sufi as evidence of this practice in academic literature. Seru Report at ¶ 45, referencing Mian, Atif R., and Amir Sufi. "Fraudulent Income Overstatement on Mortgage Applications during the Credit Expansion of 2002 to 2005." *National Bureau of Economic Research Working Paper* 20947 (Feb. 2015): 1-50.

[199] Adelino, Manuel, Antoinette Schoar, and Felipe Severino. "Loan Originations and Defaults in the Mortgage Crisis: Further Evidence." *National Bureau of Economic Research Working Paper* 21320 (July 2015): 1-31. *See also* Adelino, Manuel, Antoinette Schoar, and Felipe Severino. "Loan Originations and Defaults in the Mortgage Crisis: The Role of the Middle Class." *Review of Financial Studies* 29.7 (July 2016): 1635–70. *See also* Piazzesi, Monika, and Martin Schneider. "Housing and Macroeconomics." *National Bureau of Economic Research Working Paper* 22354 (June 2016): 1-90 at 16.

[200] Adelino, Schoar, & Severino (2016), *supra* note 199, at 1662-64; Adelino, Schoar, & Severino (2015), *supra* note 199, at 11-12.

[201] Adelino, Schoar, & Severino (2015), *supra* note 199, at 5.

[202] *See*, *e.g.*, Internal Revenue Service. *Federal Tax Compliance Research: Individual Income Tax Gap Estimates for 1985, 1988 and 1992*. Publication 1415 (1996): i-v, 1-71 at v; Ledbetter, Mark. "Comparison of BEA Estimates of Personal Income and IRS Estimates of Adjusted Gross Income." *Survey of Current Business* (Nov. 2007): 35-41 at 36; Bloomquist, Kim M. "Tax Evasion, Income Inequality and Opportunity Costs of Compliance." *Paper Presented at the 96th Annual Conference of the National Tax Association*. Chicago, IL (Nov. 2003): 1-26.

[203] Research has demonstrated that taxpayers in the top five percent income brackets received increasing amounts of non-matchable income between 1980-2000; indeed, they received over a third of their income from non-matchable sources in 2000. Bloomquist, *supra* note 202, at 11.

level, whereas "[h]ouseholds, not individuals, purchase housing units."[204] Dr. Seru's comparison of HMDA data with IRS and BEA data is flawed because these data sets are fundamentally different and not open to direct comparison.

B. The HMDA and BEA Income Growth Rates Provide No Evidence for Income Overstatement

132. Despite the fundamental issues with the data sources used in the Seru Report, I nonetheless examined his analysis of the relationship between the HMDA and BEA income growth rates. The Seru Report claims that "[f]rom 1996-2001, HMDA and BEA data showed largely similar rates of growth—close to the diagonal[.]"[205]

133. Because Dr. Seru does not allege income overstatement for the period of 1996-2001 (and, indeed, compares HMDA and BEA income growth from 1996-2001 to other periods to show the purported income overstatement), it is plausible to conclude that the variation in growth rates observed during that time period is natural, given that the two income measures differ from each other in many fundamental ways. I therefore determined the actual relationship between HMDA and BEA income growth rates using data for the period of 1996-2001.

134. To test Dr. Seru's claim that the income growth rates in this period were "largely similar,"[206] I performed a linear regression analysis with HMDA growth rate as the dependent variable and BEA income growth as the explanatory variable with data from 1996-2001. Had the relationship been one-to-one, the constant term in the regression would have been zero and the slope would have been one. Instead, I found that the constant term was greater than zero and the slope was less than one. These results were statistically significant, with 99 percent statistical confidence. I used this actual statistical relationship in my analysis.

135. During 1996-2001, for each level of BEA income growth, there was a wide range of corresponding values for HMDA income growth. For example, when BEA income grew between 20 and 21 percent, HMDA income grew between -19.35 percent and 84.98 percent.[207] To account for this variation, I used the actual statistical relationship described above to calculate a 95 percent confidence interval. That is, for each BEA income growth rate, the confidence interval gives the range of values within which the HMDA income growth is expected to lie, 95 percent of the time.[208]

136. I then used the confidence interval calculated for HMDA income growth between 1996-2001 and compared the income growth rates between 2001-2006. That is, using the confidence interval, I compared the income growth rates alleged to be overstated with the relationship between HMDA and BEA data he claims was not overstated. If the HMDA income growth rate

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[204] Nathanson, *supra* note 196, at 16.

[205] Seru Report at ¶ 46. Dr. Seru provides no statistical evidence for his claim.

[206] Seru Report at ¶ 46.

[207] Seru Report at Supporting Materials (SERU_0000406 and SERU_0024600).

[208] Smithson, Michael. *Confidence Intervals*. Thousand Oaks, CA: Sage (2003) ("[A] confidence interval contains all the hypothetical values that cannot be ruled out (rejected).") at 2.

in a given county between 2001-2006 is lower than the upper bound of the confidence interval, it cannot be statistically argued that income is overstated.

137. I found that only .04 percent of the loans underlying the RMBS in STACK came from counties where income growth was above the upper bound of the confidence interval. This is in sharp contrast to the Seru Report, which used HMDA and BEA data to make income overstatement allegations for 64.6 percent of loans in STACK.[209] Therefore, even if one compares HMDA and BEA income growth rates, the Seru Report provides no evidence of income overstatement. *See* **Exhibit 10**: *Income Overstatement Analysis Results.*

138. Therefore, I concluded that the Seru Report's allegations of income overstatement are unsubstantiated.

IX. THE CORNAGGIA REPORT REFLECTS UNSUPPORTED THEORIES AND RELIES UPON UNFOUNDED ANALYSES CONTRARY TO RATING AGENCY INDUSTRY PRACTICE

139. The Cornaggia Report claims that Morgan Stanley misrepresented the risk of STACK because it knew the ratings assigned to STACK collateral were not accurate.[210] The Cornaggia Report provides allegedly "[m]ore [a]ccurate [r]atings" for STACK.[211]

140. The Cornaggia Report, however, provides only an incomplete assessment of the ratings of STACK. STACK, in line with industry practice at the time, was rated by both Moody's and S&P.[212] The Cornaggia Report, however, only utilizes the S&P ratings model.[213] Moody's specifically commented that its approach was more favorable to large senior tranches—like the STACK Supersenior Swap tranche—than an approach based on probability of default, like S&P's.[214] Given this divergence in approach, and consistent with industry practice, the Cornaggia Report should have considered the Moody's model as well.

141. The Cornaggia Report also mischaracterizes the rating of the Supersenior Swap of STACK by erroneously comparing its credit risk to the credit risk of corporate bonds and U.S. treasury bonds.[215] Rating agency materials indicated a different characterization. Moody's cautioned that the credit risk of an AAA-rated CDO was not necessarily comparable to the credit risk of

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[209] Seru Report at ¶ 47.

[210] Cornaggia Report at 3.

[211] Cornaggia Report at 25.

[212] The tranches below the Supersenior Swap were rated at origination, and the Supersenior Swap was rated prior to the Relevant Date. *See* Offering Memorandum at CDIB_000532409; Email from Lydia Lu, to Francis Liu, *FW: shadow rating* (Apr. 4, 2007) (MS_CDIB_000287287) and attachments.

[213] Cornaggia Report at 3.

[214] Cantor, Richard, Gus Harris, Jian Hu, and Noel Kirnon. "Comparing Ratings on Jointly-Rated U.S. Structured Finance Securities: 2007 Update." *Moody's Investors Service Structured Finance Special Report* (Mar. 30, 2007): 1-16 at 9.

[215] Cornaggia Report at 5.

corporate bonds.[216] S&P's probability of default tables published in CDO Evaluator expressly offered different default probabilities for different asset classes.[217] As noted above, an investor in the Supersenior Swap was exposed to risk.

142. The analyses and conclusion set out in the Cornaggia Report also suffer from a number of flaws. First, the Cornaggia Report, like the Seru Report, fails to provide any support for the theory that relevant risk factors were somehow exclusively known by Morgan Stanley. Second, the Cornaggia Report incorrectly utilizes a single macroeconomic factor, namely HPA, to suggest that the ratings of STACK's collateral were inappropriately high, despite the fact that CDO rating models did not explicitly incorporate HPA, but instead took into account multiple other factors. Third, the notching exercise carried out by Dr. Cornaggia does not follow industry practice and is based on incorrect assumptions.

143. Finally, my rating analysis shows that if the collateral within STACK had been notched in a way that was consistent with industry practice, the rating for STACK's Supersenior Swap would have remained unchanged.

A. The Risk Factors Discussed in the Cornaggia Report Were Known in the Market

144. A major premise behind the Cornaggia Report is that Morgan Stanley possessed information that suggested that the credit ratings of the RMBS underlying the Supersenior Swap were incorrect and overstated.[218] Cornaggia implies that this information was proprietary, referencing "internal reports."[219] What Cornaggia fails to acknowledge, however, is that information regarding the condition of the housing market and issues related to mortgage loans and mortgage loan securitizations was widely available, both to the rating agencies tasked with assigning credit ratings and to reasonable investors, including CDIB.

145. The Cornaggia Report points to seven "pessimistic factors" detailed in the 2006 Presentation that Morgan Stanley could allegedly use to forecast significant losses.[220] These factors include: a housing price slowdown, housing affordability worsening, the fact that subprime mortgages involved the riskiest homeowners, the prospect of payment shocks, and worsening trends regarding loan characteristics.[221]

146. None of these factors, however, was uniquely known to Morgan Stanley. Each of these risk factors was known in the market; for example, they had been addressed in speeches by the Federal Reserve in the year before CDIB purchased STACK.[222]

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[216] Nazarian, Danielle. "Credit Migration of CDO Notes, 1996-2005, for US and European Transactions." *Moody's Investors Service Special Report* (Mar. 17, 2006): 1-66 at 14.

[217] CDOevaluator2.4.3.

[218] Cornaggia Report at 3.

[219] *Id.; see also id.* at 9-11.

[220] *Id.* at 10-11.

[221] *Id*. at 11.

[222] *See* **Appendix E**: *Statements Regarding the Housing Market by the Federal Reserve, 2006-2007.*

147. The Cornaggia Report points to two additional risk factors that were specific to RMBS structured finance securities: the level of leverage and the structural risks of RMBS transactions.[223] Each of these risks, however, was discussed in the Offering Memorandum,[224] and was widely known by persons familiar with RMBS and CDOs.[225]

148. The rating agencies were aware of these risk factors, as they were well known in the market. For example, all seven pessimistic factors listed in the Cornaggia Report were announced publicly by Moody's prior to the Relevant Date.[226] When analyzing ongoing RMBS performance, Moody's commented on macroeconomic trends and mortgage industry practices, and performed rating reviews based on its findings.[227] S&P considered macroeconomic scenarios when determining ratings and could (and would) update its methodology in light of new macroeconomic developments.[228]

149. As such, Dr. Cornaggia's implication that Morgan Stanley possessed unique knowledge regarding RMBS, which should have made it question the accuracy of ratings issued by the rating agencies, is unfounded.

B. Cornaggia's Focus on HPA is Misguided, and Reflects a Misunderstanding of RMBS and CDO Rating Models

150. Beyond the "pessimistic factors" discussed above, Cornaggia argues that "one particular factor – HPA – is quantifiable and more than sufficient to show" that Morgan Stanley could not have believed that the RMBS underlying STACK were rated correctly.[229]

151. This argument is highly flawed. The Cornaggia Report oversimplifies the processes and models used in rating securities. It is not appropriate—and is contrary to rating agency industry practice—to notch the credit ratings of securities based on a single macroeconomic factor, such as HPA. To the contrary, the rating models for CDOs and RMBS were complex, and relied on many factors.

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[223] Cornaggia Report at 11.

[224] *See* **Appendix F**: *Statements Regarding Structural Risk in the Offering Memorandum*.

[225] For example, the fact that the subordinate tranches comprised only a small portion of an RMBS was well known. *See* Fabozzi, Bhattacharya, & Berliner, *supra* note 17, at 31. The increased leverage (and therefore increased risk) associated with CDOs was well known. *See* Gibson, "Understanding the Risks of Synthetic CDOs," *supra* note 94, at 12-13. *See also* Committee on the Global Financial System, *supra* note 119, at 11-12.

[226] *See* **Appendix G**: *Statements Regarding the Housing Market by Moody's, 2005-2007*.

[227] Rocco, Joseph A. "Early Defaults Rise in Mortgage Securitizations." *Moody's Investors Service Special Report* (Jan. 18, 2007): 1-6 at 5-6.

[228] "Principles of Credit Ratings." *Standard & Poor's Credit Research* (Feb. 16, 2011): 1-9 at 2. *See also* "S&PCORRECT: 612 U.S. Subprime RMBS Classes Put On Watch Neg; Methodology Revisions Announced." *Standard & Poor's RatingsDirect* (July 11, 2007): 1-24 at 3, 5-6.

[229] Cornaggia Report at 12.

152. CDO ratings take into account the ratings of the underlying CDO collateral, such as the ratings of RMBS securities.[230] When credit rating agencies rate securities, such as RMBS, they review historical data and estimate the default and loss severity based on a number of factors. S&P claimed that, "the anticipated ups and downs of business cycles—whether industry-specific or related to the general economy—should be factored into the credit rating all along."[231]

153. Moody's specifically remarked that house prices affected the performance of mortgage loans, causing strong performance for RMBS during the housing boom and contributing to declining performance as house prices leveled off.[232] In March[233] and April 2007,[234] Moody's publicly discussed recent house price trends. It updated its expected loss figures for subprime securitizations in May 2007.[235] Moody's made its own determination regarding when securities should have their ratings assumptions adjusted due to a changing macroeconomic environment.

154. The rating agencies were aware that house price changes could affect RMBS performance, and factored this into their ratings of the securities that backed STACK. For instance, S&P stated that their modeling for RMBS rated BBB or lower assumed a 22 percent HPA decline in stress environments.[236]

155. When credit rating agencies determined the ratings for CDOs, such as STACK, however, HPA was not an explicit input into the rating models,[237] a fact acknowledged in the Cornaggia Report.[238] Thus, Cornaggia's suggestion that HPA forecasts should have caused Morgan Stanley to wholly discredit agency ratings is unfounded.

156. Moreover, Morgan Stanley had no way of incorporating HPA into the credit rating models it ran to analyze the ratings of the transaction, nor did it have influence over the methods employed by the credit rating agencies themselves. A Morgan Stanley employee testified that the credit rating agencies spent significant time and resources modeling default probabilities and did not take guidance from parties such as Morgan Stanley in CDO modeling.[239]

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[230] Adelson, Mark H. "Bond Rating Confusion." *Journal of Structured Finance* 12.4 (Winter 2007): 41–48 at 44.

[231] "Corporate Ratings Criteria." *Standard & Poor's* (2001): 1-110 at 41.

[232] Rocco, *supra* note 227, at 2, 5.

[233] Chatterjee, Debash. "Challenging Times for the US Subprime Mortgage Market." *Moody's Investors Service* (Mar. 7, 2007): 1-8 at 2-3.

[234] Kornfeld, Warren. "Testimony of Warren Kornfeld Before the Subcommittee on Securities, Insurance and Investment." *United States Senate* (April 17, 2007): 1-16 at 7.

[235] Kornfeld, Warren. "Testimony of Warren Kornfeld Before the Subcommittee on Financial Institutions and Consumer Credit." *United States House of Representatives* (May 8, 2007): 1-20 at 16.

[236] "S&PCORRECT: 612 U.S. Subprime RMBS Classes Put On Watch Neg," *supra* note 228, at 3.

[237] Jones, Graham. Deposition. (Feb. 10, 2016) ("Q. Your models don't take into consideration house price declines? […] A. That is correct. That is not the nature of the models which we run.") at 97:11-16.

[238] Cornaggia Report at 16-17 n. 60.

[239] Jones, Graham. Deposition. (Feb. 10, 2016) ("It is core and fundamental to what these organizations do, and they put an incredibly large amount of time and resources into understanding or taking a view on what default

157. For all these reasons, Cornaggia's suggestion that Morgan Stanley should have second-guessed the credit ratings assigned by the applicable agencies, made different marketing decisions, or otherwise acted based on HPA forecasts, is baseless.

C. Cornaggia's Ad-Hoc "Notching" Is Unsupported and Misleading

158. The Cornaggia Report contends that to generate accurate credit ratings for STACK, the ratings for all the RMBS in its portfolio should have been moved downward by eight notches.[240] This conclusion is completely lacking in foundation, because the information on which the Cornaggia Report relies was not available before the Relevant Date and because it does not differentiate between which types of RMBS are notched or provide any basis for its approach.

159. As described above, at certain junctures, ratings agencies will engage in a process known as "notching." The Cornaggia Report describes "notching" as an industry practice designed to "account for the fact that the collateral might be downgraded in the future."[241] The so-called notching of the STACK collateral proposed by Cornaggia, however, is wholly at odds with the industry standards and practices associated with notching.

160. An internal notching of subprime (or any other RMBS) tranches held by STACK would not have been appropriate at the time of CDIB's purchase. As of that date, no credit rating agency had suggested a downgrade. Indeed, in March 2007, less than one month before Moody's rated the Supersenior Swap of STACK, Moody's published a report about the state of the subprime RMBS market, explaining that, "for lower-rated Baa bonds to be at risk of loss, performance would have to continue to decline materially."[242] It made this claim despite its acknowledgement that HPA had slowed to less than zero and that more loans originated in 2006 were delinquent than in prior years.[243] As of March 2007, Moody's concluded that it was "generally too soon to tell whether ultimate losses [would] materially exceed [Moody's] original loss expectations for 2006 securitized subprime mortgage pools."[244] In other words, Moody's specifically reviewed the subprime mortgage market prior to CDIB's purchase and concluded that there was no reason to make widespread adjustments to credit ratings on RMBS tranches.

161. The Cornaggia Report arbitrarily notches all the collateral by eight notches, a number that is not supported by any rating agency document or empirical analysis, including the 2006 Presentation as explained in section B above. The only support Dr. Cornaggia offers for her assumption that the ratings for *all* the RMBS collateral in STACK should have been moved downward by eight

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probabilities are and assigning ratings to home equity loans among other things. They don't take guidance from other parties -- I don't see them taking guidance from us in terms of how they should rate a CDO[.]") at 134:19-135:5.

[240] Cornaggia Report at 18.

[241] *Id.* at 17.

[242] Chatterjee, *supra* note 233, at 1.

[243] *Id.* at 2-3.

[244] *Id.* at 6.

notches is a single slide in the 2006 Presentation,[245] which did not specifically discuss STACK or its underlying collateral.[246] The assumption that all the RMBS collateral in STACK should be moved downward by eight notches is therefore unsupported and flawed.

162. In fact, notching all RMBS collateral is unwarranted because the Presentations specifically limit their analyses to subprime mortgages. While the Presentations report data surrounding the housing market in general, they become more specific when they begin to discuss potential losses for RMBS tranches. The 2005 Presentation specifically mentions that its graphs present information relating to subprime loans.[247] From the outset, the 2006 Presentation is also specifically limited to subprime loans.[248]

163. The notching in the Cornaggia report is also flawed for several other reasons, including because Dr. Cornaggia notches all of the RMBS collateral in STACK, regardless of whether the tranche had a rating of Baa3 or lower.[249] The Cornaggia Report claims that "[t]he same presentation has similar, only slightly less negative projections" for Baa1 and Baa2 tranches.[250] However, the 2006 Presentation makes no comment on losses for any tranche other than Baa3 based on HPA.[251] Notching all tranches, regardless of whether they were rated Baa3, is contrary to Dr. Cornaggia's own acknowledgment that the slide in the 2006 Presentation on which her analysis is based only relates to predicted losses for subprime tranches rated Baa3.[252] In fact, subprime tranches with a Baa3 or lower rating represented only 30 of 110 RMBS tranches within STACK as of the Relevant Date.[253]

164. Dr. Cornaggia also erroneously notches all collateral types and ratings the *same* amount, again, despite acknowledging the limited scope of the 2006 Presentation. As noted above, the Cornaggia Report admits that Baa1 and Baa2 tranches had different loss projections than Baa3 tranches.[254] Dr. Cornaggia claims further that "it is unrealistic to assume that Alt-A (or even prime) RMBS tranches are unaffected by HPA that reduces subprime RMBS credit quality by

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[245] Cornaggia Report ("[O]ur empirical analysis relies primarily on Figure 1 (taken from the October 2006 presentation[.]") at 13.

[246] Cornaggia Report at 17-18.

[247] 2005 Presentation at MS_RHI_001323174-6.

[248] 2006 Presentation at MS_CDIB_000485536.

[249] Cornaggia Report at 9, 12.

[250] Cornaggia Report at 17.

[251] The only discussion of potential losses for Baa1 and Baa2 tranches is unrelated to HPA, and instead relates to triggers which release funds to equity investors. There is therefore no support for the assertion in the Cornaggia Report that the 2006 Presentation presents similar projections based on HPA for tranches above Baa3. *See* 2006 Presentation at MS_CDIB_00485573.

[252] Cornaggia Report at 12; 2006 Presentation at MS_CDIB_000485570.

[253] *See* **Exhibit 11**: *March 2007 STACK RMBS Collateral Breakdown by Industry and Rating.*

[254] Cornaggia Report at 17.

eight notches."[255] The Cornaggia Report offers no support for this claim, and it is contradicted in academic literature. For example, to anticipate impairments to other RMBS collateral, "[c]ontemporary observers would have also had to anticipate that default among prime loans would become much more sensitive to changes in home prices."[256]

165. I am not aware of any instance when rating agencies applied notching in the ad-hoc manner proposed by the Cornaggia Report. For these reasons, Dr. Cornaggia's notching is unsupported and her conclusions are misleading.

D. My Rating Analysis Shows Notching STACK Collateral Using Rating Agency Methods Does Not Affect the Ratings of the Supersenior Swap

166. Rather than using the ad-hoc notching in the Cornaggia Report, I performed three rating analyses to determine whether notching the collateral in STACK consistent with industry practice would affect the ratings of STACK's Supersenior Swap.[257]

Notching Subprime Collateral According to a Rating Agency Stress Test Demonstrates No Change in Ratings

167. During March 2007, Moody's conducted a study that reviewed CDOs backed by subprime RMBS collateral, which analyzed the impact of a variety of scenarios on their ratings.[258] This study performed tests on a hypothetical CDO with 40 percent exposure to subprime RMBS, which was roughly similar to STACK. It concluded that even if subprime RMBS were downgraded by up to five notches, there would be no expected change in ratings for the supersenior CDO tranche.[259]

168. I performed a rating analysis to test whether notching the tranches discussed in the 2006 Presentation (subprime tranches rated Baa3 or below), using the stress scenario proposed by Moody's, would affect the rating of STACK's Supersenior Swap.[260] To do so, I notched each tranche rated Baa3 and classified as subprime according to Moody's definition[261] by the maximum number of notches used in the stress test, five notches. Even though the 2006 Presentation did not discuss possible losses for subprime tranches rated Baa2 or Baa1,[262] I

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[255] Cornaggia Report at 24.

[256] Amromin & Paulson, *supra* note 168, at 20.

[257] For information on my rating analyses, *see* **Appendix Cb**: *Technical Appendix – Credit Ratings Analysis.*

[258] Park, John. "The Impact of Subprime Residential Mortgage-Backed Securities on Moody's-Rated Structured Finance CDOs: A Preliminary Review." *Moody's Investors Service* (Mar. 23, 2007): 1-8.

[259] *Id.* at 6.

[260] Notching subprime tranches according to a Moody's stress test for use in the S&P rating model would not have been appropriate or necessary prior to the Relevant Date. Nonetheless, I performed this analysis as it is broadly consistent with rating agency practice, as opposed to the analysis performed in the Cornaggia Report.

[261] Offering Memorandum at CDIB_000532651.

[262] 2006 Presentation at MS_CDIB_000485570.

conservatively applied notching to these as well. I then ran the S&P CDO rating model—the same model used by the Cornaggia Report.

169. I found that, when notching the subprime collateral in STACK, the rating for the Supersenior Swap was unaffected.

Notching STACK Collateral Placed on Watch Negative Demonstrates No Change in Ratings

170. If a rating agency determines that collateral is performing poorly, but its fundamentals do not yet warrant a rating action, it may place that security on a negative watch. This action serves to alert market participants to potential future changes in a rating.[263]

171. In July 2007, S&P published a list of 612 Subprime RMBS securities that were placed on negative watch.[264] This list contained 16 tranches held by STACK.[265]

172. I performed an analysis to test whether aggressively notching this collateral would have affected the rating of the Supersenior Swap. To do so, I notched each of these tranches downward until it received a CCC rating, as this was the harshest possible future rating action announced by S&P.[266] Assuming the harshest possible rating action is a conservative approach.[267]

173. I found that, even notching all tranches in STACK placed on negative watch in July 2007 until they received a CCC rating, the rating of the Supersenior Swap of STACK was unaffected.

Notching All STACK RMBS and CDO Collateral Using S&P Methodology Also Demonstrates No Change in Ratings

174. The Cornaggia Report cites an S&P report as an example of how notching could be applied to collateral in CDOs.[268] This report, which was published by the ratings agency three months after CDIB's purchase, proposed the notching schedule in **Table 2**: *S&P Notching Schedule, July 2007.*

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[263] "General Criteria: Use of CreditWatch and Outlooks." *S&P Global Ratings* (Sept. 14, 2009). <https://www.standardandpoors.com/en_US/web/guest/article/-/view/sourceId/5612636> (accessed Jan. 4, 2017); "Report on the Role and Function of Credit Rating Agencies," *supra* note 96, at 27.

[264] "S&PCORRECT: 612 U.S. Subprime RMBS Classes Put On Watch Neg," *supra* note 228.

[265] The RMBS in STACK affected by this ratings action were: ACE 2006-HE2, ARSI 2006-W1, ARSI 2006-W2, ARSI 2006-W5, CMLTI 2005-HE4, FFML 2006-FF10, IXIS 2006-HE1, IXIS 2006-HE2, LXS 2006-7 (tranches M7 and M8), NCHET 2006-1, RAMP 2006-NC2, RAMP 2006-NC3, SABR 2005-FR5, SABR 2006-NC1, and SAIL 2005-9.

[266] "S&PCORRECT: 612 U.S. Subprime RMBS Classes Put On Watch Neg," *supra* note 228, at 5.

[267] On average, the tranches were notched downward by more than nine notches each. When S&P announced new ratings for these tranches in July 2007, the average downgrade was less than four notches. Bloomberg, L.P. (accessed Jan. 11, 2017).

[268] Cornaggia Report at 17 n. 62, referencing "ARCHIVE: S&P Comments On Process For Rating New CDOs With U.S. RMBS Exposure," *supra* note 143.

Table 2: S&P Notching Schedule, July 2007

Rating Category	Notch Downgrade
AAA to AA-	0
AAA/Watch Neg to AA-/Watch Neg	1
A+ to BBB-	1
BB+ and lower	2

175. These notches were proposed for the purposes of modeling new CDO transactions, and would not have applied to existing transactions. If STACK had been structured in July 2007, S&P would have notched the specified collateral[269] by one for the purposes of making a ratings determination.

176. To be conservative, I tested whether downgrading each RMBS and CDO tranche held by STACK by two notches would affect the rating of the Supersenior Swap of STACK. This was double the amount of notches suggested, and corresponds to the maximum number of notch downgrades proposed in July 2007, a full three months after CDIB's purchase. When I ran the S&P CDO rating model using this notching and Cornaggia's other inputs, the rating of CDIB's tranche was unaffected. *See* **Table 3**: *Results of Notching According to S&P's Notching Schedule*.

Table 3: Results of Notching According to S&P's Notching Schedule

Class	BDR	SDR using S&P Notching Schedule	Cushion	Consistent with AAA Rating?
Class I	41.05%	38.15%	2.90%	Yes

177. My conservative analysis demonstrates that, even three months after purchase, the ratings of the Supersenior Swap would have been unaffected even by a notching schedule that was more aggressive than the one actually proposed by S&P.

178. My analyses demonstrate that the rating of the Supersenior Swap of STACK would have been unaffected when using notching methodologies consistent with industry practice. *See* **Exhibit 12**: *Rating Analysis Results*. Therefore, there is no basis for the Cornaggia Report's claim that Morgan Stanley misrepresented the risk of STACK because it knew it was misrated.

X. CONCLUSION

179. My analyses show that the impact of the allegations in the Seru Report and the Cornaggia Report are not empirically material.

[269] The S&P document specified this notching scheme for certain RMBS tranches (subprime and Alt-A) as well as CDO tranches with exposure to RMBS. *See id.*

180. Plaintiff's Loan Characteristic and HPA-related claims would not have had any impact on a reasonable investor's expected risk and, therefore, would not have been material at the time of purchase. Even if one accepts Plaintiff's Loan Characteristic Claims as true, the expected risk at the time of purchase falls below the maximum risk that would have been expected by an investor in a managed CDO such as STACK. These results do not change when I include HPA in my analysis.

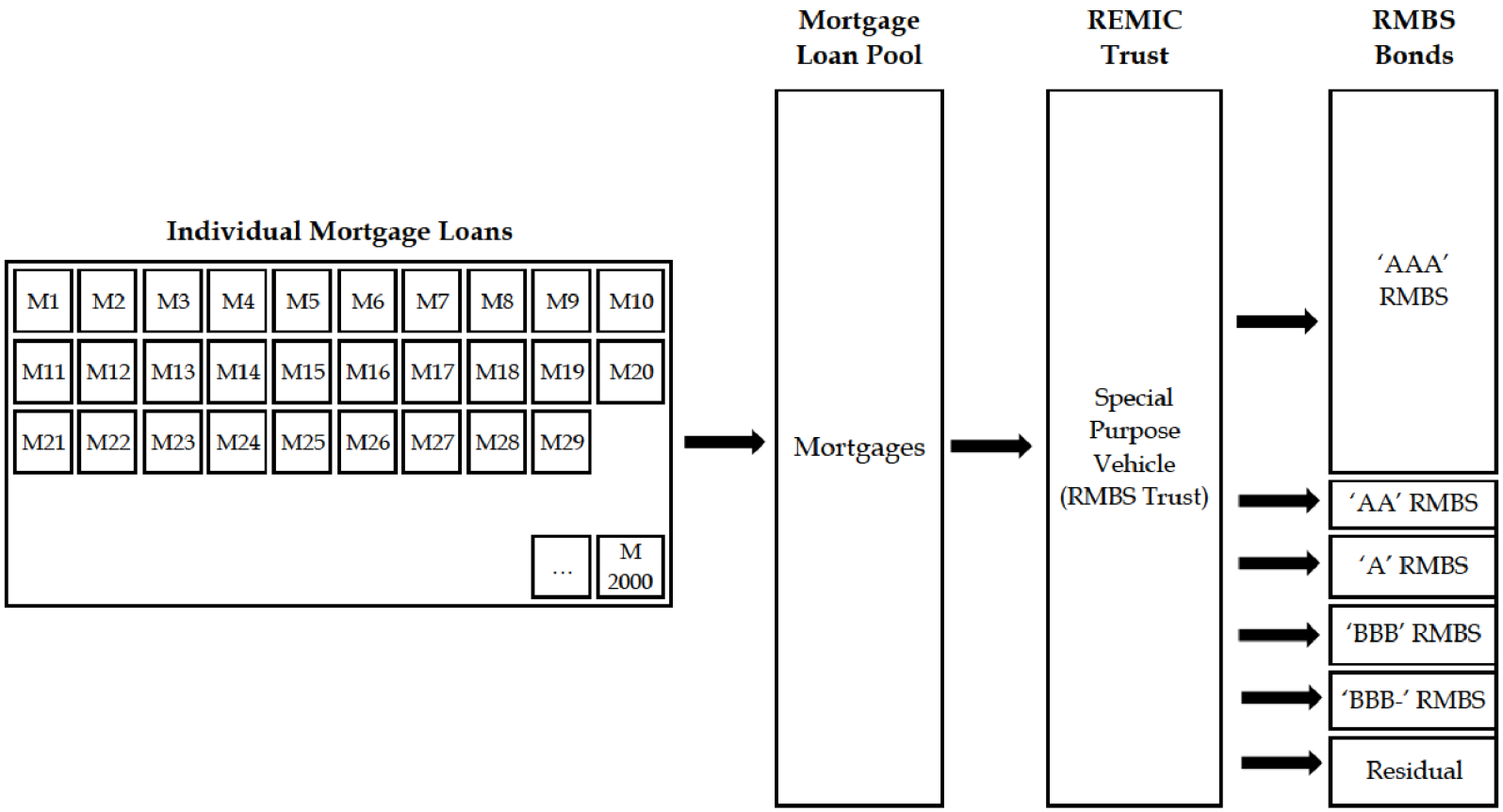
181. Errors within the Seru Report render its other allegations surrounding Morgan Stanley's alleged knowledge of HPA forecasts and income overstatement unreliable and unusable.

182. The Cornaggia Report fails to demonstrate that Morgan Stanley believed that STACK was misrated. The notching applied by Dr. Cornaggia is incorrect and misleading. Indeed, when notching collateral in STACK using methodologies consistent with industry practice, the rating of the Supersenior Swap remained unchanged.

Dated: January 13, 2017

Ethan Cohen-Cole, Ph.D.

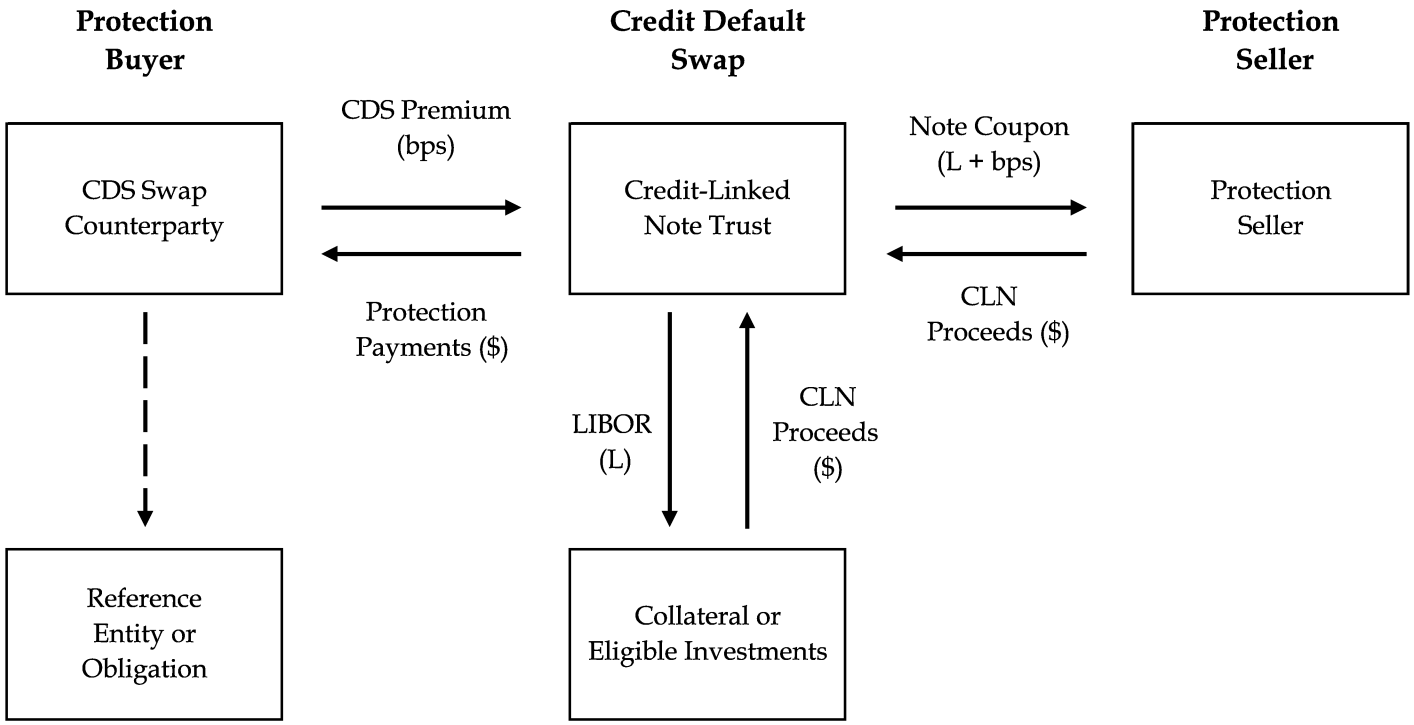
Exhibit 1a
RMBS Structure



Source:

Kendra, Kevin. "Tranche ABX and Basis Risk in Subprime RMBS Structured Portfolios." *Derivative Fitch* (Feb. 20, 2007) at 9.

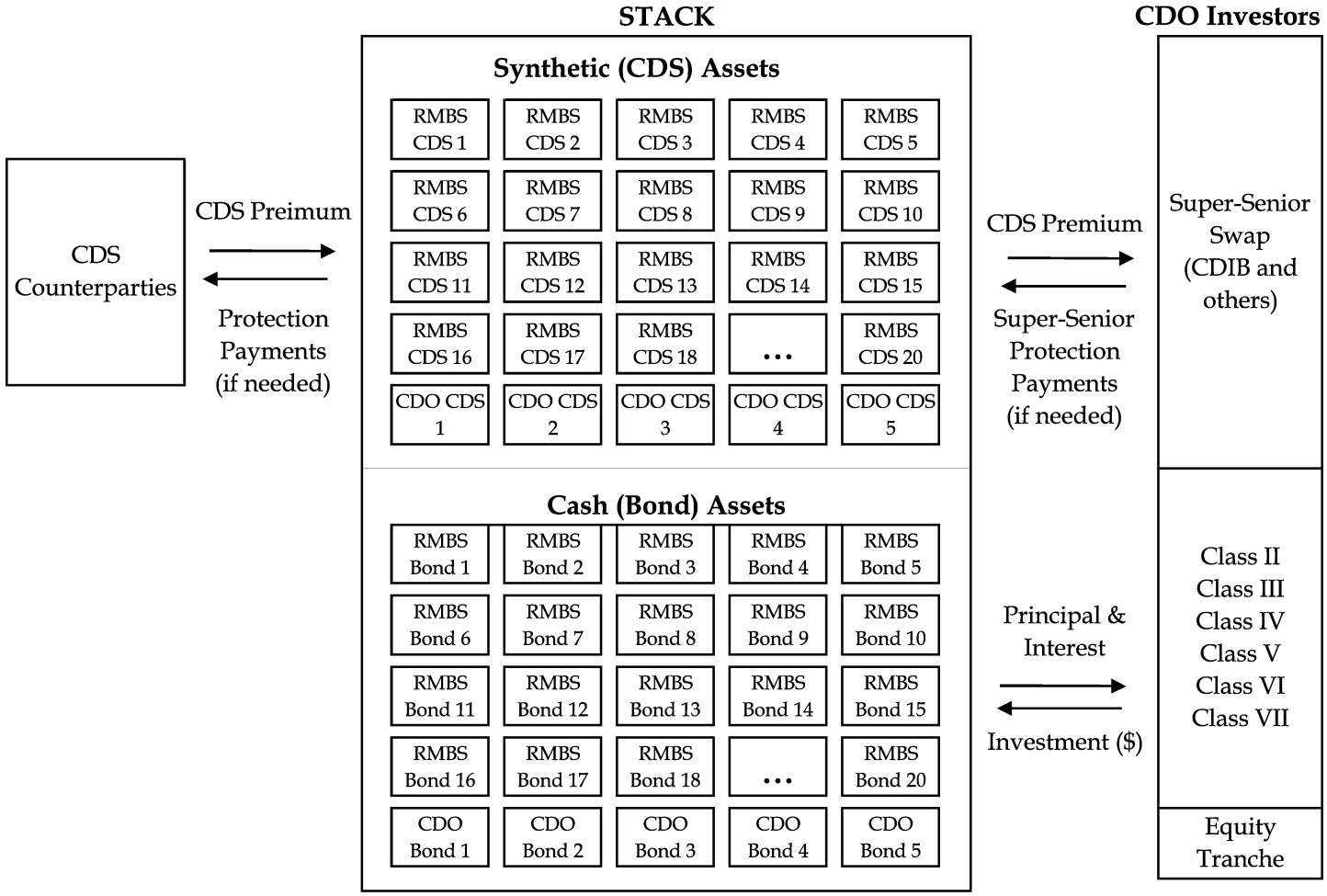
Exhibit 1b
CDS Structure



Source:

Kendra, Kevin. "Tranche ABX and Basis Risk in Subprime RMBS Structured Portfolios." *Derivative Fitch* (Feb. 20, 2007) at 20.

Exhibit 1a
STACK CDO Structure



Source:
STACK 2006-1 Ltd., STACK 2006-1 Corp. *Final Offering Memorandum* (July 20, 2006) (CDIB_000532408).

Exhibit 2
March 2007 STACK Collateral Breakdown

Cash Assets					Synthetic Assets				
RMBS	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)	RMBS CDS	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)
ABSHE 2006-HE4	M6	Baa1	BBB+	2,500,000	ACE 2005-HE1	M9	Baa3	BBB-	5,000,000
ACE 2006-ASP3	M7	Baa1	BBB+	2,000,000	ACE 2005-HE3	M8	Baa2	BBB	5,000,000
AMSI 2005-R2	M11	Ba2	BB	1,000,000	ACE 2006-ASP2	M9	Baa3	A	5,000,000
AMSI 2005-R3	M10	Ba2	BB+	5,000,000	ACE 2006-HE2	M9	Baa3	BBB	5,000,000
ARSI 2006-W5	M7	Baa1	A	5,000,000	ACE 2006-OP1	M9	Baa3	BBB	5,000,000
BALTA 2006-2	1B2	Baa3	BBB-	3,360,000	AMSI 2005-R10	M9	Baa3	BBB	5,000,000
BALTA 2006-3	1B1	Baa2	BBB	2,500,000	AMSI 2005-R5	M9	Baa3	BBB-	5,000,000
BALTA 2006-3	1B2	Baa3	BBB-	2,303,000	ARSI 2005-W5	M8	Baa2	A-	5,000,000
BALTA 2006-4	1B1	Baa2	BBB	5,000,000	ARSI 2006-W1	M9	Baa3	BBB+	5,000,000
BSABS 2005-AQ1	M4	Baa1	NR	1,000,000	ARSI 2006-W2	M9	Baa3	BBB-	5,000,000
CARR 2006-RFC1	M7	Baa1	A	3,095,000	ARSI 2006-W4	M9	Baa3	BBB	5,000,000
CMLTI 2005-OPT3	M11	Ba2	BB+	6,277,000	BSABS 2005-HE11	M8	Baa3	BBB-	5,000,000
CWALT 2006-OC3	M7	Baa1	A+	2,475,000	BSABS 2005-HE12	M8	Baa3	BBB-	5,000,000
CWALT 2006-OC3	M8	Baa2	A	1,750,000	BSABS 2005-HE5	M5	Baa2	BBB+	5,000,000
CWALT 2006-OC4	M7	Baa1	A	950,000	CARR 2005-NC1	M8	Baa3	BBB-	5,000,000
CWALT 2006-OC5	M8	Baa2	BBB+	2,961,000	CMLTI 2005-HE4	M9	Baa3	BBB	5,000,000
CWHL 2005-HYB7	B2	Baa2	BBB	5,000,000	CWL 2005-11	MV9	Baa3	BBB-	5,000,000
CWL 2006-7	M7	Baa1	BBB+	4,000,000	CWL 2005-13	BV	Baa3	BBB-	5,000,000
CWL 2006-ABC1	M7	Baa1	A+	4,000,000	CWL 2005-14	B	Baa3	BBB-	5,000,000
DBALT 2006-AR2	M7	Baa1	A+	2,245,000	CWL 2005-3	BV	Baa3	BBB-	5,000,000
FFML 2006-FF10	B2	Ba2	BB	1,250,000	CWL 2006-3	B	Baa3	BBB-	5,000,000
FFML 2006-FF10	M7	Baa1	BBB+	2,000,000	CWL 2006-5	B	Baa3	BBB-	5,000,000
FFML 2006-FF15	M9	Baa3	BBB-	500,000	CWL 2006-BC2	M9	Baa3	BBB-	5,000,000
FFML 2006-FF7	M7	Baa1	BBB+	3,000,000	FHLT 2005-1	M8	Baa2	BBB	5,000,000
FFML 2006-FF8	M7	Baa1	A	2,000,000	FHLT 2005-D	M9	Baa3	BBB+	5,000,000
GSAA 2006-10	B2	Baa2	BBB	1,523,000	FHLT 2005-E	M9	Baa3	BBB+	5,000,000
GSAA 2006-10	B3	Baa3	BBB-	3,523,000	GSAMP 2005-HE4	B2	Baa2	BBB+	5,000,000
GSAA 2006-11	B3	Ba2	BB	5,000,000	HEAT 2005-5	B2	Baa3	BBB-	5,000,000
GSAA 2006-12	B3	Ba2	BBB-	3,000,000	HEAT 2005-7	B2	Baa3	BBB	5,000,000
GSAA 2006-14	B2	Ba2	BB	1,900,000	HEAT 2005-9	B1	Baa3	A-	5,000,000
GSAA 2006-9	B1	Baa2	A	1,000,000	HEAT 2006-1	B1	Baa3	BBB+	5,000,000
GSAA 2006-9	B2	Baa3	BBB+	2,012,000	HEAT 2006-2	M8	Baa2	A-	5,000,000
IMM 2004-8	3B	Baa2	BBB	1,500,000	IXIS 2005-HE4	B3	Baa3	BBB	5,000,000
IMSA 2006-2	1M7	Baa1	BBB+	2,924,000	IXIS 2006-HE1	B3	Baa3	BBB	5,000,000
IMSA 2006-2	1M8	Baa2	BBB	894,323	MABS 2005-HE1	M9	Baa3	BBB	5,000,000
IXIS 2006-HE2	B1	Baa1	A-	2,000,000	MSAC 2005-HE7	B3	Baa3	BBB	5,000,000
JPMAC 2006-CW1	M7	Baa1	A-	5,000,000	MSAC 2006-NC1	B3	Baa3	BBB	5,000,000
LXS 2006-5	M8	Baa2	BBB	2,198,000	NCHET 2005-1	M9	Baa3	BBB-	5,000,000
LXS 2006-7	M7	Baa1	BBB+	2,000,000	NCHET 2005-3	M9	Baa3	BBB-	5,000,000
LXS 2006-7	M8	Baa2	BBB	2,296,000	NCHET 2005-4	M9	Baa3	BBB-	5,000,000
LXS 2006-8	M7	A2	BBB+	5,000,000	NCHET 2005-C	M9	Baa3	BBB	5,000,000
MSAC 2006-NC4	B1	Baa1	BBB+	4,000,000	NCHET 2006-1	M8	Baa2	BBB	5,000,000
MSM 2006-16AX	B1	Baa1	A	500,000	OOMLT 2005-3	M9	Baa3	BBB-	5,000,000
MSM 2006-6AR	1B1	Baa1	A	2,733,000	OOMLT 2006-1	M9	Baa3	A	5,000,000
MSM 2006-6AR	1B2	Baa2	A-	163,000	PPSI 2005-WHQ3	M9	Baa3	BBB+	5,000,000
MSM 2006-8AR	1B1	Baa1	A	806,000	RAMP 2005-EFC4	M9	Baa3	BBB	5,000,000
MSM 2006-8AR	1B2	Baa2	A-	806,000	RAMP 2005-EFC5	M9	Baa3	BBB	5,000,000
MSM 2006-8AR	1B3	Baa3	BBB+	1,150,000	RAMP 2006-NC2	M9	Baa3	BBB-	5,000,000

Exhibit 2
March 2007 STACK Collateral Breakdown

Cash Assets

RMBS	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)
MSM 2006-8AR	2B3	Baa2	BBB	2,172,000
RALI 2006-QA4	M10	Ba2	BBB	1,533,000
RASC 2006-KS4	M7	Baa1	BBB+	2,500,000
SAST 2006-2	B1	Baa1	A-	3,000,000
WFHET 2006-1	M7	Baa1	A	3,000,000
			Total:	135,299,323

Synthetic Assets

RMBS CDS	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)
RAMP 2006-NC3	M9	Baa3	BBB	5,000,000
RASC 2005-KS5	M9	Baa3	BBB-	5,000,000
RASC 2005-KS8	M8	Baa2	BBB+	5,000,000
SABR 2005-FR1	B3	Baa3	BBB-	5,000,000
SABR 2005-FR2	B3	Baa3	BBB-	5,000,000
SABR 2005-FR5	B3	Baa3	BBB	5,000,000
SABR 2006-NC1	B2	Baa2	BBB	5,000,000
SAIL 2005-7	M9	Baa3	BBB-	5,000,000
SAIL 2005-9	M8	Baa2	BBB	5,000,000
			Total:	285,000,000

CDO	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)
VERT 2006-2A	B	Baa2	BBB	2,500,000
			Total:	2,500,000

CDO CDS	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)
ACABS 2006-1A	B1L	Baa2	BBB	5,005,081
ALEXP 2004-1A	D1	Baa2	BBB	5,108,123
GLCR 2004-1A	C	Baa2	BBB	5,362,299
GLCR 2005-3A	C	Baa2	BBB	5,088,421
INDE6 6A	D	Baa2	BBB	5,055,261
NEPTN 2006-3A	C	Baa2	BBB	5,000,000
VERT 2006-1A	B	Baa2	BBB	5,000,000
			Total:	35,619,186

CMBS	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)
BAYC 2006-3A	B2	Baa3	BBB	2,000,000
COMM 2006-FL12	FSH2	Baa2	BBB-	500,000
CSMC 2006-C2	G	Baa2	BBB	5,000,000
CSMC 2006-TFLA	J	Baa2	BBB	2,000,000
GSMS 2006-FL8A	H	Baa3	BBB+	2,000,000
JPMCC 2006-CB14	G	Baa2	BBB	7,000,000
JPMCC 2006-CB15	F	Baa1	NR	4,000,000
JPMCC 2006-LDP7	J	Baa3	BBB-	5,000,000
LBUBS 2006-C4	K	Baa3	BBB-	5,000,000
MLCFC 2006-2	G	Baa2	BBB	2,915,000
MLMT 2006-C2	G	Baa2	BBB	3,000,000
			Total:	38,415,000
			Overall Total:	176,214,323

CMBS CDS	Tranche	Moody's Rating[1]	S&P Rating[1]	Original Face Value ($)
JPMCC 2005-LDP1	H	Baa3	BBB-	5,000,000
			Total:	5,000,000
			Overall Total:	325,619,186

Note:

1. Moody's and S&P ratings as of March 2007.

Source:

STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

Exhibit 3
Example Loan Characteristics for Certificates Rated Baa3

Summary Statistics	RESIF 2005-B	MSAC 2004-HE5	GSMPS 2005-RP1
Credit Score[1]	744	621	541
LTV Ratio (%)[1]	63.90	80.01	95.84
Owner Occupied (%)[2]	89.54	94.23	48.47

Notes:

1. This value represents the weighted average Credit Score or LTV Ratio of the loans backing a certificate rated Baa3.

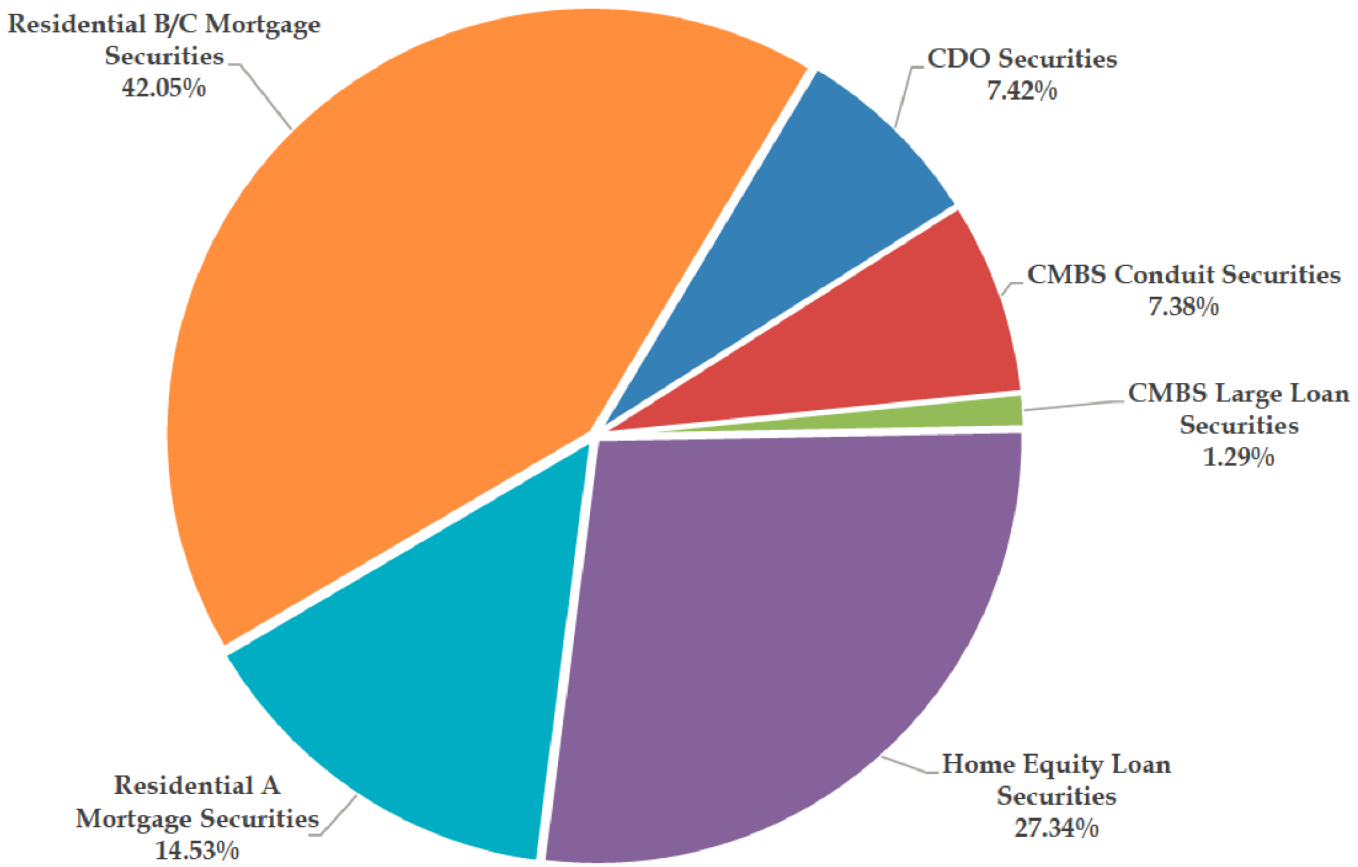
2. This value represents the percentage of loans backing a certificate rated Baa3 that were owner occupied, weighted by the original loan balance.

Source:

ABSNet Database.

Exhibit 4

March 2007 STACK Portfolio Composition by Moody's Type[1, 2]



Note:

1. Portfolio composition is weighted by current balance, using the portfolio emailed in March 2007.
2. Moody's Type is taken from the Moody's Specificed Type column in the November 2006 portfolio.

Sources:

-STACK Portfolio (MS_CDIB_000382057), attached to email from Graham Jones, to Ashish Khanna, et al., *RE: Stack/basis* (Nov. 13, 2006) (MS_CDIB_000382055).
-STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

Exhibit 5
Comparison of Credit Rating Categories

Investment Grade	
Moody's	**S&P/Fitch**
Aaa	AAA
Aa1	AA+
Aa2	AA
Aa3	AA-
A1	A+
A2	A
A3	A-
Baa1	BBB+
Baa2	BBB
Baa3	BBB-

Speculative Grade	
Moody's	**S&P/Fitch**
Ba1	BB+
Ba2	BB
Ba3	BB-
B1	B+
B2	B
B3	B-
Caa1	CCC+
Caa2	CCC
Caa3	CCC-
-	CC
Ca	SD
C	D

Source:

"Reuters Guide to Credit Ratings, Scales and Terms." *Reuters* (June 2008). <http://www.reuters.com/article/reuters-ratings-guide-idUSRATINGS20080605> (accessed Dec. 22, 2016).

Exhibit 6a
Stratification of STACK (Original Loan Balance)

Bin Number	Minimum	Maximum	Frequency (%)[1, 2]
1	40,180.00	72,304.00	10.000
2	72,315.68	96,000.00	10.185
3	96,001.00	117,040.00	9.815
4	117,044.00	140,000.00	10.121
5	140,008.00	166,500.00	9.893
6	166,515.00	199,800.00	9.998
7	199,800.52	240,000.00	10.236
8	240,020.00	297,600.00	9.760
9	297,620.00	390,950.00	9.993
10	390,957.50	1,400,000.00	10.000

Notes:

1. Frequency refers to the percentage of loans in a given bin.
2. Total may not equal 100% due to rounding.

Sources:

-ABSNet Database.

-Bloomberg L.P. (accessed Sept. 21-22, 2016).

-STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

-Seru, Amit. Expert Report of Amit Seru. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) at supporting materials (SERU_0001639).

Exhibit 6b
Stratification of STACK (Credit Score)

Bin Number	Minimum	Maximum	Frequency (%)[1, 2]
1	503	550	10.020
2	551	580	10.443
3	581	599	9.589
4	600	616	10.495
5	617	630	9.731
6	631	645	10.187
7	646	662	9.566
8	663	686	10.193
9	687	713	9.854
10	714	797	9.922

Notes:

1. Frequency refers to the percentage of loans in a given bin.
2. Total may not equal 100% due to rounding.

Sources:

-ABSNet Database.

-Bloomberg L.P. (accessed Sept. 21-22, 2016).

-STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

-Seru, Amit. Expert Report of Amit Seru. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) at supporting materials (SERU_0001639).

Exhibit 6c
Stratification of STACK (Original LTV)

Bin Number	Minimum	Maximum	Frequency (%)[1, 2]
1	20.000	60.210	10.000
2	60.217	73.100	10.012
3	73.100	79.760	9.988
4	79.762	80.000	36.299
5	80.000	85.000	8.664
6	85.005	90.000	14.524
7	90.000	94.000	0.538
8	94.004	100.000	9.975

Notes:

1. Frequency refers to the percentage of loans in a given bin.
2. Total may not equal 100% due to rounding.

Sources:

-ABSNet Database.

-Bloomberg L.P. (accessed Sept. 21-22, 2016).

-STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

-Seru, Amit. Expert Report of Amit Seru. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) at supporting materials (SERU_0001639).

Exhibit 7
Model Results

Test 1: Empirical Analysis of Plaintiff's Allegations	
Scenario Results (%)[1]	
Plaintiff's Allegations	**Collateral Risk[2]**
16.23	18.35

Test 2: Empirical Analysis of Plaintiff's Allegations and HPA		
Scenario Results (%)[1]		
Plaintiff's Allegations[3]	**Collateral Risk With HPA Set to Zero[2]**	**Maximum Collateral Risk Across All HPA Values[2]**
22.34	24.12	28.94

Test 3: Empirical Analysis of Plaintiff's Allegations and Managed CDO Risk	
Scenario Results (%)[1]	
Plaintiff's Allegations[1]	**Managed CDO Risk[4]**
16.23	21.26

Notes:

1. Results for the *Plaintiff's claims scenario* and *collateral risk scenario* represent the expected cumulative default losses of the pool. The expected cumulative default losses above are calculated assuming 100 percent loss severity.
2. The value reported is equal to the maximum expected cumulative default loss of the 300 hypothetical loan pools generated.
3. Based on the Seru Report's HPA allegations, for the *Plaintiff's allegations scenario* in my second test, I set HPA to zero.
4. The Managed CDO Risk represents the expected cumulative default loss of loans in RMBS certificates with the same credit rating distribution as STACK.

Sources:

-"Economic Forecasting Survey Data." *Wall Street Journal* (Sept. 2006).
<http://online.wsj.com/public/resources/documents/wsjecon0906.xls> (accessed Nov. 22, 2016).
-ABSNet Database.
-Seru, Amit. Expert Report of Amit Seru. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) at supporting materials (SERU_0001639).

Exhibit 8

Comparison of Loan Characteristics by Tranche Rating and Expected Default Loss[1]

Rating: Baa1			
Summary Statistics	**RAMP 2004-SL1 (MI5) (Lower Expected Loss)**	**HASC 2006-HE1 (M7) (Medium Expected Loss)**	**BSABS 2006-4 (M5) (Higher Expected Loss)**
Total Expected Default Loss (%)[2]	2.093	14.259	26.248
Credit Enhancement (%)[3]	2.250	3.450	9.350
Original Loan Balance ($)	238,653.40	207,028.40	159,772.50
Credit Score[4]	678.748	634.422	553.980
LTV Ratio[4]	71.209	75.790	80.874
Rate/Term Refinance (%)	27.117	2.842	9.141
Single Family (%)	78.514	71.431	81.328
Full Doc Type (%)	83.559	70.278	80.234
Owner Occupied (%)	92.793	96.346	88.359
Adjustable Rate Mortgage (True)	37.207	64.918	71.094

Rating: Baa2			
Summary Statistics	**RESIF 2004-B (B5) (Lower Expected Loss)**	**EQABS 2004-1 (B1) (Medium Expected Loss)**	**BSABS 2006-4 (M6) (Higher Expected Loss)**
Total Expected Default Loss (%)[2]	1.805	11.163	26.248
Credit Enhancement (%)[3]	0.500	1.250	7.900
Original Loan Balance ($)	470,800.90	135,589.90	159,772.50
Credit Score[4]	751.858	636.513	553.980
LTV Ratio[4]	67.445	86.275	80.874
Rate/Term Refinance (%)	54.419	13.798	9.141
Single Family (%)	77.467	89.553	81.328
Full Doc Type (%)	48.977	86.670	80.234
Owner Occupied (%)	97.035	95.260	88.359
Adjustable Rate Mortgage (True)	0.000	25.091	71.094

Exhibit 8

Comparison of Loan Characteristics by Tranche Rating and Expected Default Loss[1]

Rating: Baa3			
Summary Statistics	**RESIF 2004-B (B6) (Lower Expected Loss)**	**CWALT 2006-OC7 (M8) (Medium Expected Loss)**	**BSABS 2006-4 (M7) (Higher Expected Loss)**
Total Expected Default Loss (%)[2]	1.805	13.339	26.248
Credit Enhancement (%)[3]	0.420	0.350	6.250
Original Loan Balance ($)	470,800.90	260,054.40	159,772.50
Credit Score[4]	751.858	689.904	553.980
LTV Ratio[4]	67.445	77.242	80.874
Rate/Term Refinance (%)	54.419	12.756	9.141
Single Family (%)	77.467	68.889	81.328
Full Doc Type (%)	48.977	0.089	80.234
Owner Occupied (%)	97.035	88.400	88.359
Adjustable Rate Mortgage (True)	0.000	82.844	71.094

Notes:

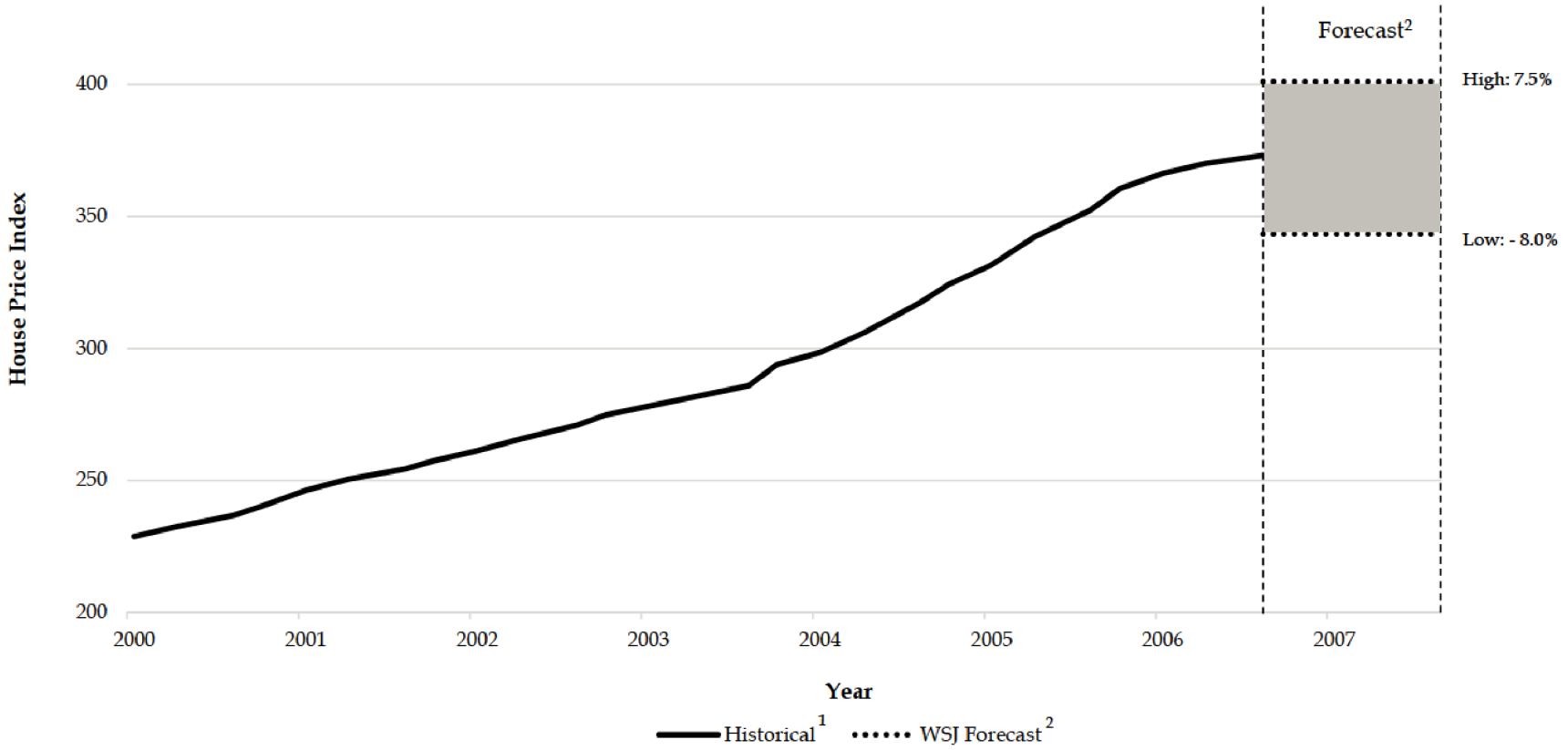
1. This table provides loan characteristics and expected cumulative default losses for selected trusts by credit ratings.
2. The Total Expected Default Loss percentage is taken from the Model.
3. Credit enhancement is generally measured as a percentage of the total supporting loan group that can withstand losses before a certificate holder's expected cash flow declines. The credit enhancement percentage reflects the original credit enhancement for the tranche, as reported by Bloomberg.
4. This value is the average of the Summary Statistic weighted by the original loan balance.

Sources:

-ABSNet Database.

-Bloomberg, L.P. (accessed Jan. 16, 2017).

Exhibit 9
Historical and Forecasted HPA
(2000 - 2007)



Notes:

1. The FHFA House Price Index (HPI) is a broad measure of the movement of single-family house prices. The HPI is a weighted, repeat-sales index, meaning that it measures average price changes in repeat sales or refinancings on the same properties.
2. Wall Street Journal forecasts are year over year growth rates from the fourth quarter of 2006 to the fourth quarter of 2007.

Sources:

-"HOUSE PRICE INDEX DATASETS." *Federal Housing Finance Agency.* <http://www.fhfa.gov/DataTools/Downloads/Documents/HPI/HPI_master.csv> (accessed Dec. 7, 2016).
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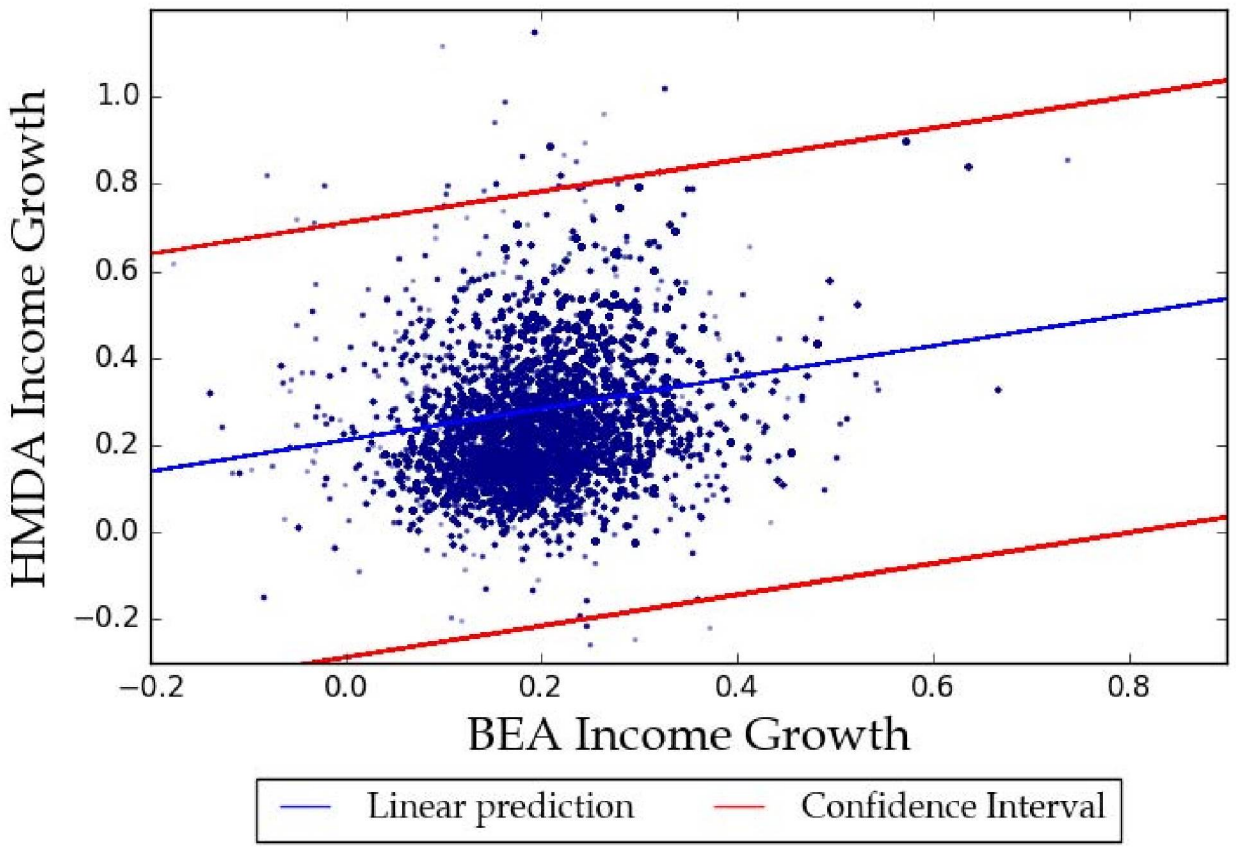
Exhibit 10

Income Overstatement Analysis Results[1]



Note:

1. The figure plots HMDA income growth rates versus BEA income growth rates from 2001 through 2006. Each dot represents a county with loans in the Underlying Loan Pool. The linear prediction and the 95% confidence interval were obtained using 5 year HMDA income and BEA income growth rates from 1996 through 2001.

Source:

Seru, Amit. Expert Report of Amit Seru. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) at supporting materials (SERU_0024600, SERU_0000406, SERU_0000408, SERU_0001674).

Exhibit 11

March 2007 STACK RMBS Collateral Breakdown by Industry and Rating

Moody's Industry Type	Moody's Rating					
	A2	Baa1	Baa2	Baa3	Ba2	Total[1]
First and Second Lien Prime[2]	0	2	6	4	4	16
Midprime[3]	1	12	14	22	1	50
Subprime[4]	0	10	4	27	3	44

Notes:

1. The total represents the number of tranches within each industry type.
2. First and Second Lien Prime represents Moody's Industry Number 39.
3. Midprime represents Moody's Industry Number 40.
4. Subprime represents Moody's Industry Number 41.

Sources:

-STACK Portfolio (MS_CDIB_000373406), attached to email from Shalini Sriram, to Ewan Labrom, *RE: Investec: STACK 2006-1* (Nov. 2, 2006) (MS_CDIB_000373403).

-STACK Portfolio (MS_CDIB_000382057), attached to email from Graham Jones, to Ashish Khanna, et al., *RE: Stack/basis* (Nov. 13, 2006) (MS_CDIB_000382055)

Exhibit 12
Rating Analysis Results

Analysis	Collateral Types Notched[1]	Scenario Default Rate (%)[2]	Consistent with AAA Rating[3]
Moody's Stress Test	Subprime RMBS[4]	40.19	Yes
S&P Negative Watch List	RMBS Watch Negative[5]	32.70	Yes
S&P's Notching Schedule	All RMBS & CDO[6]	38.15	Yes

Notes:

1. This represents the type of collateral downgraded in the various analyses.
2. The Scenario Default Rate is calculated by first finding the portfolio default rate at which the default probability is no greater than the default probability of a corporate bond of the same rating.
3. If the Scenario Default Rate is lower than 41.05% (the Breakeven Default Rate), then the tranche could be rated AAA.
4. In this specification, each Baa3 tranche classified as subprime by Moody's was downgraded five notches (the maximum number used in Moody's stress test). Each tranche rated Baa1 or Baa2 classified as subprime by Moody's was downgraded four notches.
5. In this specification, 16 tranches placed on the negative watch list published by S&P in 2007 were notched downward until they would be rated CCC.
6. The tranches notched in this specification included S&P categories 50 (CDO), 56 (RMBS A), and 57 (RMBS B/C, HELs, HELOCs and Tax Liens). A total of 118 tranches were notched.

Sources:

-"ARCHIVE: S&P Comments On Process For Rating New CDOs With U.S. RMBS Exposure." *S&P Global Ratings' Credit Research* (July 18, 2007).
-"S&PCORRECT: 612 U.S. Subprime RMBS Classes Put On Watch Neg; Methodology Revisions Announced." *Standard & Poor's RatingsDirect* (July 11, 2007): 1-24.
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Appendix A

Curriculum Vitae

Ethan Cohen-Cole Ph.D., MPA, MA

Econ One Research
Managing Director
Financial Services Practice Lead
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Berkeley, CA 94709
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Ethan Cohen-Cole is a Managing Director with Econ One Research. Dr. Cohen-Cole is an expert in banking, financial regulation, consumer credit, structured finance (RMBS, CMBS, CDS, CDO, ABS, etc.), financial markets, econometric methods, capital markets, analysis of networks, and systemic risk. Dr. Cohen-Cole is a former finance professor and has taught executives, MBA, and Masters in Finance candidates and undergraduates in a range of topics including corporate finance, macroeconomics, valuation, financial risk management, banking, and financial institution management.

Dr. Cohen-Cole has more than 17 years of experience in financial services, litigation consulting and bank supervision, including experience with the Federal Reserve System as a bank regulator, and as a policy and regulation expert. Dr. Cohen-Cole has worked with clients across the world such as central banks, including the Bank of France, the Bank of Austria, the Central Bank of Brazil, and the Bank for International Settlements ("BIS"). His financial sector clients have included the largest multinational banks in the US and Europe. Broadly experienced, Dr. Cohen-Cole has worked on client engagements in more than 25 countries in Europe, Asia, Africa, and the Americas.

Dr. Cohen-Cole has also been an invited visitor or speaker at more than 175 professional and academic seminars and training sessions. These have included programs sponsored by the Federal Reserve System, Central Bank of Chile, BIS, Bank of France, Bank of Austria, European Economic Association, Chicago/London Conferences on Financial Markets, Financial Management Association (US and Europe), RiskMinds Europe, University of California – Berkeley, Harvard University, FDIC, European Central Bank, Bank of Italy, American Finance Association, American Economic Association, and Cambridge University.

Dr. Cohen-Cole has worked in the banking sector in roles related to risk management. As financial economist in the Supervision and Regulation function of the U.S. Federal Reserve System, Dr. Cohen-Cole led quantitative reviews of large bank risk modeling efforts and was a designated system quantitative expert on risk management and Basel II. Dr. Cohen-Cole evaluated the credit, market, and operational risk models for many top-20 financial institutions and evaluated bank-wide risk management systems from a technical as well as a policy and governance perspective.

Dr. Cohen-Cole has also been closely involved with the creation of financial sector regulations. He was a steering committee member of the Center for Financial Policy at the University of Maryland, where he served on an advisory committee to the BIS in the drafting of Basel I and II, and served as an advisor to three central banks on systemic risk management.

He has written widely on topics including commodities markets, municipal bond markets, systemic risk, and financial markets in general. He has been published in *The Journal of Financial Economics, The Journal of Banking and Finance, Review of Economics and Statistics, The Journal of Macroeconomics, American Law and Economic Review, The Journal of Health Economics,* and *Economic Letters.*

RECENT PROFESSIONAL HISTORY

Econ One Research 2013-*present*
Managing Director, Financial Services Practice Lead

Alvarez & Marsal 2012-2013
Managing Director

NERA Economic Consulting 2010-2012
Special Consultant

University of Maryland 2009-2012
Finance Professor

Federal Reserve Bank of Boston 2006-2009
Financial Economist, Bank Supervisor

EDUCATION

Harvard University
BA, *History*

Princeton University
MPA, *Public Policy*

University of Wisconsin-Madison
MA, *Economics*

University of Wisconsin-Madison
Ph.D., *Economics*

BOARD MEMBERSHIP

Legal Momentum 2015-*present*
Board of Directors

El Camino Hospital 2012-2015
Investment Committee

SELECT AREAS OF EXPERTISE

Bank Regulation and Supervision
Structured Finance (CDO, RMBS, CLN)
Derivatives
Risk Management
Pricing Models
Systemic Risk
OTC Markets
High Frequency / Algorithmic Trading
Advisor to BIS for Basel II Creation
Market Risk
Operational Risk
Foreign Exchange
Capital Markets
Macroeconomics
Merchant Acquiring
Consumer Payments
Payment Systems
Consumer Credit
Credit Cards
Commodities Markets
Macro Prudential Regulation
Repo Markets, Securities Lending
Credit Risk

Comprehensive Publication List: 2005 - Present

2005

Cohen-Cole, Ethan, and Steven N. Durlauf. "Evaluating Claims of Bias in Academia: A Comment on Klein and Western's 'How many Democrats per Republican at UC-Berkeley and Stanford?'" Working Paper, University of Wisconsin Madison (2005).

2006

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2009

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---. "Consumer Protection and Regulatory Changes in the Dodd-Frank Bill." *NERA Economic Consulting* (2010).

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Cohen-Cole, Ethan, and Jonathan Morse. "Your House or Your Credit Card, Which Would You Choose?: Personal Delinquency Tradeoffs and Precautionary Liquidity Motives." Working Paper No. QAU09-5, Federal Reserve Bank of Boston (2010).

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Cohen-Cole, Ethan, Kyle Herkenhoff, and Gordon Phillips. "How Credit Constraints Impact Job Finding Rates, Sorting & Aggregate Output." Working Paper (Aug. 27, 2015).

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2012

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2013

People of the State of California v. Pascual Bustamante (Cal. Super. S.F. No. 12027779).

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2015

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Federal Home Loan Bank of Seattle v. RBS Securities, Inc., f/k/a Greenwich Capital Markets, Inc., Greenwich Capital Acceptance, Inc., and RBS Holdings USA, Inc. f/k/a Greenwich Capital Holdings, Inc. (Wash. Super. King County No. 09-2-46347-6).

Federal Home Loan Bank of Seattle v. Bear, Stearns & Co., Inc., Structured Asset Mortgage Investments II, Inc., and the Bear Stearns Companies, Inc. (Wash. Super. King County No. 09-2-46298-4).

Federal Home Loan Bank of Seattle v. Barclays Capital Inc., BCAP LLC, and Barclays Bank PLC (Wash. Super. King County No. 09-2-46320-4).

Fort Worth Employees' Retirement Fund v. JP Morgan Chase & Co. et. al. (S.D.N.Y. No. 1:09-cv-03701).

In re: Goldman Sachs Group, Inc. Securities Litigation (S.D.N.Y. No. 1:10-cv-03461).

National Credit Union Administration Board, as Liquidating Agent of Southwest Corporate Federal Credit Union and Members United Corporate Federal Credit Union v. Credit Suisse

Securities (USA) LLC, Credit Suisse First Boston Mortgage Securities Corp. (S.D.N.Y. No. 13-cv-6736).

National Credit Union Administration Board, as Liquidating Agent of U.S. Central Federal Credit Union and of Western Corporate Federal Credit Union v. Goldman, Sachs & Co., and GS Mortgage Securities Corp. (C.D. Cal. No. 11-cv-6521.).

National Credit Union Administration Board, as Liquidating Agent of Southwest Corporate Federal Credit Union v. Goldman, Sachs & Co., and GS Mortgage Securities Corp. (S.D.N.Y. No. 13-cv-6721).

National Credit Union Administration Board, as Liquidating Agent of Southwest Corporate Federal Credit Union and Members United Corporate Federal Credit Union v. UBS Securities LLC (S.D.N.Y. No. 13-cv-6731).

National Credit Union Administration Board, as Liquidating Agent of Western Corporate Federal Credit Union v. RBS Securities, Inc. et al. (C.D. Cal. No. 11-cv-05887).

National Credit Union Administration Board, as Liquidating Agent of U.S. Central Federal Credit Union v. RBS Securities Inc. et al. (D. Kan. No. 11-cv-2340).

2016

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Appendix B

Documents Considered

Documents Considered

LEGAL

Complaint. *China Development Industrial Bank v. Morgan Stanley & Co. Incorporated, et al.* (N.Y. Sup. No. 650957/10) (July 15, 2010).

EXPERT REPORTS

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Email from Lydia Lu, to Francis Liu, *FW: Break-even analysis requested by CDIB* (Mar. 21, 2007) (MS_CDIB_000204595) and attachment (MS_CDIB_000204596).

Email from Lydia Lu, to Francis Liu, *FW: shadow rating* (Apr. 4, 2007) (MS_CDIB_000287287) and attachments (MS_CDIB_000287288, MS_CDIB_000287290).

Email from Todd Jaeger to Daniel Upton, *CORE Forms* (July 28, 2006) (SP-CDIB-0000011) and attachments (SP-CDIB-0000012, SP-CDIB-0000027, SP-CDIB-0000042).

MS_CDIB_000051595.

MS_CDIB_000055675.

MS_CDIB_000077599.

MS_CDIB_000077906.

MS_CDIB_000087368.

SP-CDIB-0014502.

STACK Portfolio (MS_CDIB_000373406), attached to email from Shalini Sriram, to Ewan Labrom, *RE: Investec: STACK 2006-1* (Nov. 2, 2006) (MS_CDIB_000373403).

STACK Portfolio (MS_CDIB_000382057), attached to email from Graham Jones, to Ashish Khanna, *et al.*, *RE: Stack/basis* (Nov. 13, 2006) (MS_CDIB_000382055) and additional attachment (MS_CDIB_000382058).

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STACK 2006-1 Ltd., STACK 2006-1 Corp. *Final Offering Memorandum* (July 20, 2006) (CDIB_000532408).

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Appendix C

Technical Appendix

Appendix Ca

Technical Appendix

Analyses of Materiality and Other Seru Analyses

Technical Appendix – Analyses of Materiality and Other Seru Analyses

I. Overview of Materiality Analyses

1. I performed the following three tests to analyze whether Plaintiff's Loan Characteristic Claims would have had a material impact on investors' decisions regarding whether to invest in STACK:

    a. Analysis of the materiality of Plaintiff's Loan Characteristic Claims;

    b. Analysis of the materiality of Plaintiff's Loan Characteristic Claims incorporating HPA; and

    c. Analysis of the materiality of Plaintiff's Loan Characteristic Claims in the context of a managed CDO.

2. For these analyses, I compiled data from several sources, and carried out certain steps to prepare the data for use. I first describe the data used in my analyses and, later, the analyses themselves.

A. Loan Performance Database

3. I created and utilized a database of information regarding loans that served as collateral in RMBS securitizations issued between January 1, 1998 and March 2007.[1] As described below, loans from the RMBS underlying STACK were not included in this database.

4. The initial dataset of loan information was acquired from ABSNet, a data vendor that provides historical performance information on mortgage loans as well as the market in general.[2]

5. The initial ABSNet dataset contained information relating to more than 20 million loans. It included loan-level information for a variety of loan characteristics, including but not limited to: loan origination date, borrower's credit score, original loan-to-value ("LTV") ratio, original combined loan-to-value ("CLTV") ratio, occupancy status, property type (*e.g.,* single family, 2-4 family, etc.), loan purpose (*e.g.,* purchase or refinance), documentation type, lien position, state in which the relevant property was located, the presence or absence of a prepayment penalty, and whether the loan had an adjustable rate. The dataset also included information on the payment history for each loan.

6. I made certain modifications and created additional fields to facilitate my analysis.

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[1] According to the Complaint, the swap confirmation was signed on April 10, 2007. (Complaint at ¶ 47.) To facilitate my analysis, I model using data through March 2007.

[2] ABSNet Database.

7. The ABSNet database was modified to exclude loans associated with the collateral[3] contained within STACK.[4]

8. The ABSNet dataset was further modified to remove duplicate loans. Where I found a pair of loans for which: (a) the loans were in the same trust and had the same loan ID; and (b) the loans had identical loan characteristics, I removed one loan.[5]

9. I created a field that designated the loan status for each loan as defaulted, prepaid, or current as follows:

    a. A loan was considered to have prepaid if the ABSNet "PrepaymentsInFull" field was greater than 0 and if the prepayment date was on or before the end of March 2007.

    b. A loan was considered to have defaulted if it was at least 90-days delinquent according to the ABSNet "HistDelinqDaysOts" field and if the default date was on or before the end of March 2007.

    c. In certain instances, a loan was identified as both prepaid and defaulted in the ABSNet database. If a loan was identified as having both prepaid and defaulted, I made a determination based on the sequence of events:

        i. If prepayment occurred before default, I excluded the loan from the dataset.

        ii. If default occurred before prepayment, I deemed the loan to have prepaid.

    d. If a loan had neither prepaid nor defaulted, I marked the loan as current.

10. I identified an exit date for each loan. The exit date was defined as the date of (a) prepayment, (b) default, or (c) the earlier of the ABSNet "historical end date" or the end of March 2007. I then calculated the loan age for the loans in the ABSNet dataset by calculating the difference between the exit date and the loan origination date.

11. I generated indicator variables for the following categorical variables: occupancy status, property type, loan purpose, documentation type, lien position, prepayment penalty, and location of the relevant property (by state), adjustable rate mortgage, and monthly loan status.

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[3] STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616); STACK Portfolio (MS_CDIB_000373406), attached to email from Shalini Sriram, to Ewan Labrom, *RE: Investec: STACK 2006-1* (Nov. 2, 2006) (MS_CDIB_000373403).

[4] For a list of trusts excluded from ABSNet, *see* **Appendix H**: *Trusts Excluded from ABSNet Calibration Set.*

[5] To ensure that I found all duplicates, I looked for loans that: (1) had the same loan ID; (2) were in the same certificate; and (3) had the same characteristics (allowing for up to a 0.1% variance in each characteristic). The loan characteristics I analyzed were: original LTV ratio, original CLTV ratio, FICO score, original loan balance, occupancy status, property type, loan purpose, documentation type, prepayment penalty, whether the loan was an adjustable rate mortgage, lien position, first payment date, and state in which the property was located.

For example, if lien position was indicated with the values of 1, 2 and 3 in the original ABSNet dataset, I created three indicator variables ('lienposition_1,' 'lienposition _2,' and 'lienposition _3').

12. I edited the ABSNet dataset as follows:

    a. If the reported CLTV or LTV ratio was equal to 0, I replaced the given value with an entry that indicated the value was missing.

    b. If the reported credit score value was less than 300 or greater than 850, I replaced the given value with an entry that indicated that the value was missing.

13. I generated an additional indicator variable "hassecondlien." This variable took value 1 if the CLTV ratio was greater than the LTV ratio and took value 0 otherwise.

14. Consequently, the dataset included numerical values for credit score, LTV ratio, CLTV ratio, original loan balance, and loan age. In addition, the dataset included indicators for the following characteristics: occupancy status, property type, loan purpose, documentation type, lien position, whether the property had a second lien, the state in which the relevant property was located, prepayment penalty, and adjustable rate mortgage.

15. I collected state-level monthly unemployment rate data from January 1976 to December 2015 from the Bureau of Labor Statistics.[6, 7] I merged this information into the database so that each loan had a field that reflected the state unemployment rate as of the loan origination date.

16. The ABSNet dataset contained a field reflecting zip codes for the properties securing the loans. I created an additional field to reflect the county for the properties securing the loans. I populated this field using the zip code information from ABSNet and the same zip code-to-county mapping information used by Dr. Seru.[8]

17. I created a field to reflect the county-level HMDA income growth rate as of one year prior to the loan origination date ("lagged income growth").

    a. To do so, I first retrieved the raw HMDA income data from the supporting materials of the Seru Report.[9] Using the same data preparation methodology employed by Dr.

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[6] "State Level Unemployment Rate." Unemployment Data. *Bureau of Labor Statistics*. <http://download.bls.gov/pub/time.series/la/la.series>; <http://download.bls.gov/pub/time.series/la/la.data.2.AllStatesU> (accessed Feb. 3, 2016).

[7] Although I collected information that included data relating to the period after March 2007, any information relating to the period after March 2007 was ultimately dropped and was not incorporated into my analysis.

[8] Seru Report supporting materials at SERU_0000408.

[9] Seru Report supporting materials at SERU_0001561-SERU_0001584.

Seru,[10] I extracted yearly HMDA income data for the years 1996 through 2007.[11] This data reflected, by county, the incomes reported by borrowers for loans originated in each year.

b. I then calculated the average HMDA income at the county level for each of those years.

c. I calculated annual HMDA income growth rates by taking the difference between the average HMDA income in a given year and in the year prior and dividing by the income in the year prior.

d. I used annual HMDA income growth to create a field for each loan that reflected the HMDA income growth rate for the year prior to its origination. For example, if a loan had an origination date of June 30, 2006, the "income_growth_lag" field reflected the HMDA income growth rate for 2005.

18. I also created and populated a field to reflect annual House Price Appreciation for the year after loan origination.

a. To do so, I collected state-level quarterly House Price Index (HPI) data from the first quarter of 1976 to the second quarter of 2016.[12, 13] Annual House Price Appreciation (HPA) was calculated by taking the difference between the logarithm of the HPI for a given state in a given year and quarter with the logarithm of the HPI in the same state and quarter one year before.

b. I used this information in a field named "hpa_1yr_after," which reflected, for each loan, the HPA for the year after the loan's year of origination. For example, if a loan had a loan origination date within the first quarter of 2005, the "hpa_1yr_after" field reflected the HPA for the first quarter of 2006.

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[10] Seru Report supporting materials at SERU_0000402, SERU_0000403.

[11] As noted elsewhere, although I downloaded information that included data relating to the period after March 2007, any information relating to the period after March 2007 was ultimately dropped and was not incorporated into my analysis.

[12] "House Price Index Data: State Level." *Federal Housing Finance Agency.* <https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx > (accessed Oct. 18, 2016).

[13] As noted elsewhere, although I downloaded information that included data relating to the period after March 2007, any information relating to the period after March 2007 was ultimately dropped and was not incorporated into my analysis.

19. The resulting database ("Loan Performance Database") contained information on loan characteristics, state level unemployment at origination, the county for each loan, lagged HMDA income growth data, and annual house price appreciation.

B. STACK DATABASE

20. I compiled a database that contained loan characteristic information for each of the mortgage loans underlying the RMBS included in the collateral of STACK (the "STACK Database") as of March 2007.

21. I began by reviewing a listing of STACK collateral as of March 2007 produced by Dr. Seru[14] and identifying the RMBS securitizations supporting STACK.

22. I next identified the loans that supported RMBS tranches in STACK, by referencing the loan-level information contained in the supporting materials for the Seru Report.[15]

23. I obtained loan characteristic information for these loans from ABSNet.[16]

24. For certain loans, ABSNet was missing information regarding loan characteristics. For these instances, I retrieved the missing loan-level data from Bloomberg.[17] I modified the Bloomberg data as follows:

    a. I renamed the variables in the Bloomberg data to match the variable names in ABSNet.

    b. In some cases, the variable values in the Bloomberg loan-level data did not conform to the format used in ABSNet (for example, Bloomberg lists "Owner Occupied" as a value for occupancy status while ABSNet lists the value as "OO"). Therefore, I reformatted the variable values used in Bloomberg to match the variable values utilized in ABSNet.

25. In a few instances, information regarding a STACK tranche was completely missing in ABSNet. In those cases, I obtained all the loan-level information from Bloomberg.

26. Using a similar data preparation methodology as Dr. Seru, I further updated missing loan level information by utilizing information from the FWP (Free Writing Prospectus) data produced as supporting material for the Seru Report.[18] Specifically, I updated CLTV, occupancy status and

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[14] Seru Report supporting materials at SERU_0000381.

[15] Seru Report supporting materials at SERU_0001637.

[16] ABSNet Database.

[17] Bloomberg, L.P. (accessed Sept. 21-22, 2016).

[18] Seru Report supporting materials at SERU_0001639.

lien position information using the FWP data whenever they were missing in both ABSNet and Bloomberg.

27. Finally, I generated additional fields required for my analysis:

    a. I created the variable "ltvdiff," which reflected the difference between LTV and CLTV for each loan.

    b. I created fields that reflected loan origination year, loan origination month, and origination months (months since origination as of March 2007) using data from the "loan origination date" field.

28. I refer to this compilation of information as the "STACK Database."

C. PLAINTIFF'S LOAN CHARACTERISTIC CLAIMS DATABASE

29. I created a dataset reflecting Plaintiff's Loan Characteristic Claims[19] ("Plaintiff's Loan Characteristics Claims Database").

30. In order to compile a set of information relating to all the variables needed for my analysis, I first merged two datasets containing loan-level information for the loans supporting RMBS certificates in STACK. These datasets were included in the supporting materials of the Seru Report (the "Seru Loan-Level Datasets").[20] These datasets together contained information for all the relevant variables.

31. Because the Seru Loan-Level Datasets did not identify the states where the properties securing the loans were located, I used ABSNet to determine the relevant state for each loan and created a new field reflecting the applicable state.

32. In certain instances, the Seru Loan-Level Datasets were missing an entire tranche from STACK. In these instances, I obtained all the loan level information for that tranche from Bloomberg[21] and added it to the dataset.

33. In other instances, the Seru Loan-Level Datasets were missing some loan-level information for some tranches. In these cases, I obtained the missing loan-level information from Bloomberg and used it to complete the loan-level information in the dataset.

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[19] Plaintiff's Loan Characteristic Claims are derived from the Seru Report and supporting materials and relate to: LTV ratio based on an Automated Valuation Model ("AVM"), the property's occupancy status, the incomes stated by borrowers, and the presence or absence of a second lien on the property.

[20] Seru Report supporting materials at SERU_0001661, SERU_0001637.

[21] Bloomberg, L.P. (accessed Sept. 21-22, 2016).

34. To the extent that CLTV, occupancy status or lien position information remained missing for any loan, I obtained such information using information found in the supporting materials of the Seru Report.[22]

35. To facilitate my analysis, I created two additional fields that reflected the year and month of origination, using the loan origination date.

36. I then merged the resulting dataset with other datasets created by Dr. Seru that reflected Plaintiff's Loan Characteristic Claims (the "Seru Allegations Dataset").[23] These datasets contained, among other data:

    a. Dr. Seru's AVM-LTV values, and an indicator variable to reflect a flag for LTV misrepresentation,

    b. Indicator variables to reflect flags for the presence of an alleged "silent second" lien, alleged occupancy status misrepresentation, and alleged income overstatement.[24]

37. I created an additional field to reflect the county for the properties securing the loans. I populated this field using the same zip code-to-county mapping used by Dr. Seru.[25]

38. I then created additional fields to reflect the county-level HMDA and BEA income growth rates as of one year prior to a loan's origination date.

    a. To do so, I first retrieved annual county-level HMDA and BEA income data produced in Dr. Seru's supporting materials.[26]

    b. I calculated annual HMDA and BEA income growth rates by taking the difference between the average HMDA or BEA income in a given year and the average income in the year prior and dividing by the income in the year prior.

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[22] Seru Report supporting materials at SERU_0001639.

[23] Seru Report supporting materials at SERU_0001650, SERU_0001674, and SERU_0024527.

[24] As I understand it, whenever the five-year HMDA growth rate for an applicable county was at least five percent percentage points higher than the five-year BEA growth rate for the same county, the loans originated in that county were flagged by Dr. Seru as having "income overstatement." Dr. Seru also flags loans to reflect alleged income overstatement if the five-year zip code-level HMDA income growth rate exceeded the income reported to the IRS by five percent or more in the zip code where the loan originated. I chose to utilize the results of Dr. Seru's comparison of HMDA and BEA growth rates, because it resulted in a higher percentage of loans being flagged as having "income overstatement." This selection reflects my conservative approach.

[25] Seru Report supporting materials at SERU_0000408.

[26] Seru Report supporting materials at SERU_0000406 and SERU_0024600.

c. I used annual HMDA and BEA income growth to create a field for each loan that reflected the HMDA and BEA income growth rates for the year prior to its origination.

39. Finally, I merged the state level unemployment rate data described above into the dataset.[27] That is, I created an additional field for each loan that reflected the unemployment rate as of the loan origination date.

II. ANALYSIS OF MATERIALITY OF PLAINTIFF'S LOAN CHARACTERISTIC CLAIMS (TEST 1)

40. In my first materiality test, I calculated and compared expected default losses for the loans that collateralized the RMBS securities in STACK as of March 2007 (the "Underlying Loan Pool") under two scenarios.

A. MODEL CALIBRATION

41. To establish loan performance expectations, I calibrated the Model based on the data reflected in the Loan Performance Database described above. My process proceeded as follows.

42. *First*, the Loan Performance Database was narrowed to include only the timeframe relevant to the purchase of STACK—specifically, the period beginning with January 1998 and ending with March 2007. By restricting the data in this way, I only utilized information that was available to a prospective investor at or near the time of purchase.

43. *Second,* I created three sets of variables to calibrate the Model to address the fact that, for certain supporting loan groups underlying RMBS in STACK, all credit scores were missing, and for other supporting loan groups, all prepayment penalty flags were missing.

a. Set (a), the "All Variables" set, included credit score, LTV ratio, lagged income growth in the county where the loan was originated, occupancy status, property type, loan purpose, prepayment penalty flag, document type, lien position, adjustable rate mortgage flag, whether the loan had a second lien, the state in which the relevant property was located, and the unemployment rate in that state as of the loan origination date.

b. Set (b) was comprised of the same variables as set (a) except credit score,

c. Set (c) was comprised of the same variables as set (a) except prepayment penalty flag.

44. *Third*, I used each of the three sets of variables in a Cox proportional hazards model to estimate three prepayment hazard functions. The hazard functions showed the predicted probability of

[27] "State Level Unemployment Rate." Unemployment Data. *Bureau of Labor Statistics.* <http://download.bls.gov/pub/time.series/la/la.series>; <http://download.bls.gov/pub/time.series/la/la.data.2.AllStatesU> (accessed Feb. 3, 2016).

prepayment for each month from the time of deal issuance for 85 months. In other words, the Model established a relationship between loan characteristics, macroeconomic variables, and prepayment likelihood.

45. *Fourth,* I used the same sets of variables in a Cox proportional hazards model to estimate default hazard functions. These functions, like the ones for prepayment, provided monthly estimates of expected default from the time of deal issuance for 85 months. In other words, the Model established a relationship between loan characteristics, macroeconomic variables, and default likelihood.

46. I used the results of these estimations in the *Plaintiff's allegations scenario* and *collateral risk scenario* described below.

B. PLAINTIFF'S ALLEGATIONS SCENARIO

47. I estimated the performance of the Underlying Loan Pool as modified to reflect the Plaintiff's Loan Characteristic Claims. For the purposes of my materiality analysis, I am not offering an opinion as to whether Plaintiff's Loan Characteristic Claims are correct.

48. To estimate performance, I carried out the following modifications to the Plaintiff's Loan Characteristic Claims Database described above:

    a. If Dr. Seru flagged a loan as having a misrepresented LTV ratio, I replaced the "originalltv" value with the "avm_ltv" value as provided by Dr. Seru.

    b. If Dr. Seru alleged that a loan had a so-called "silent second" lien, I set the value for the "hassecondlien" variable to 1.

    c. If Dr. Seru flagged the occupancy status as being misrepresented, I set the occupancy status value to "NO" (indicating that the property was an investor property).

    d. If Dr. Seru flagged a loan as having an overstated income in the "income_flag_county" field, I replaced the annual lagged HMDA income growth variable with the corresponding annual lagged BEA income growth variable.[28]

49. The Model estimates were then used to generate expected pool performance for the Underlying Loan Pool as modified to incorporate Plaintiff's Loan Characteristic Claims. This performance was estimated by associating each loan with both a monthly expectation of prepayment and a monthly expectation of default, and then aggregating loan expectations for each supporting loan group.

[28] As noted above, Dr. Seru flags a loan as having an income overstatement whenever the five-year HMDA growth rate for 2001-2006 for the applicable county exceeded the corresponding five-year BEA growth rate by five percent or more. Therefore, to incorporate these income-overstatement allegations, I replaced HMDA income growth rate values with BEA values, to represent Seru's implicit assertion that the incomes reported by borrowers generally (as represented in HMDA income growth rate data) were overstated vis-à-vis BEA income growth rate data.

50. For a given supporting loan group, I determined which estimate to use based on the information available for that supporting loan group. Thus, for those supporting loan groups where all credit scores were missing, I utilized the estimates derived from set (b), and for those supporting loan groups where prepayment penalty information was missing, I utilized the estimates derived from set (c). For all other supporting loan groups, I utilized set (a).

51. In generating these performance expectations, I utilized the entire Underlying Loan Pool. That is, for the purpose of this analysis, I made the assumption that no loan in the Underlying Loan Pool had defaulted or prepaid as of March 2007. Doing so allowed me to incorporate all of Dr. Seru's loan-level allegations, rather than excluding the allegations relating to loans that had, in fact, defaulted or prepaid as of March 2007.

52. The prepayment and default hazards reflected expectations that the size of the loan pool would decrease over time as a result of prepayments and defaults.

53. Monthly default loss expectations were then aggregated to obtain the expected cumulative default loss under the *Plaintiff's allegations scenario*.

C. COLLATERAL RISK SCENARIO

54. Under the *collateral risk scenario,* I calculated the range of outcomes that a reasonable investor in STACK should have expected, given the qualities of the Underlying Loan Pool and the fact that the Underlying Loan Pool could change.

55. To calculate this range of outcomes, I created 300 hypothetical loan pools. Each of these pools reflected the same loan characteristics as the loans in the "STACK Database" described above.

56. I created each hypothetical loan by assigning it loan characteristics based on a random draw. To determine each value for each loan, I took the following steps:

    a. For quantitative variables (*e.g.,* LTV, credit score, loan balance, and months since origination), I assigned values using a randomly generated number and bins created from the Underlying Loan Pool.

        i. I created 10 bins with approximately the same number of loans in each bin. I based this distribution on the distribution of loans in the Underlying Loan Pool, as reflected in the STACK Database. That is, I determined the range of FICO scores that corresponded to roughly the lowest 10% of FICO scores for loans in the Underlying Loan Pool, and did the same for 20%, 30%, etc. For example, the first FICO score bin took values from 503 to 550 and consisted of 10.02% loans in the Underlying Loan Pool. In this manner, I determined the FICO score ranges for ten bins.

        ii. I then drew a random number between zero and one and used it to assign each hypothetical loan to a bin. For example, to assign a value for credit score, if the random draw was lower than 0.1002, it would be assigned to the first bin. I assigned the loan the lowest FICO score associated with its bin.

b. Categorical characteristics for each loan (*e.g.*, documentation type, occupancy status, and property type) were determined in a similar fashion. For example, if the documentation type in the Underlying Loan Pool consisted of approximately 75 percent full documentation and approximately 25 percent low documentation, I designated a loan to have full documentation if the randomly generated number assigned to the documentation type was below or equal to 0.75; otherwise I designated this loan as low documentation.

57. I assigned a loan origination date to each of these loans. To do this, I used the value generated based on the bins I created for the variable "origination months," which reflected the number of months between the loan origination date and March 2007. I then arrived at the loan origination date for each loan by subtracting the months since origination from March 2007.

58. I also collected a comprehensive set of county-level unemployment rates in monthly intervals from January 1, 1990 to December 31, 2009.[29, 30] I merged the unemployment rate data with the hypothetical loan pools generated above. As a result, the dataset included an additional field that reflected the county-level unemployment rate associated with the hypothetical loan's assigned origination date.

59. I then aggregated these loans into pools. I repeated this process to create 300 possible loan pools. Because the Underlying Loan Pool contained approximately 610,721 loans, I created 300 loan pools each comprised of 610,721 loans. Each of these loan pools reflected loan characteristics (*e.g.,* LTV ratios, credit scores) consistent with the Underlying Loan Pool.

60. The Model determined performance expectations for each of the 300 pools. I totaled the expected cumulative default loss for each of the 300 pools.

61. The pool among the 300 pools with the highest expected cumulative default loss rate represented the maximum collateral risk in the *collateral risk scenario*.

D. RESULTS

62. I compared the cumulative default loss under the *Plaintiff's allegations scenario* and the *collateral risk scenario*. The results are reflected in **Exhibit 7**: *Model Results.*

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[29] "Unemployment Rate." Time Series Data. *Bureau of Labor Statistics*.
<http://download.bls.gov/pub/time.series/la/la.series>;
<http://download.bls.gov/pub/time.series/la/la.data.0.CurrentU00-04>;
<http://download.bls.gov/pub/time.series/la/la.data.0.CurrentU05-09>;
<http://download.bls.gov/pub/time.series/la/la.data.0.CurrentU90-94>;
<http://download.bls.gov/pub/time.series/la/la.data.0.CurrentU95-99> (accessed Feb 3, 2016).

[30] As noted elsewhere, although I downloaded information that included data relating to the period after March 2007, any information relating to the period after March 2007 was ultimately dropped and was not incorporated into my analysis.

III. ANALYSIS OF MATERIALITY OF PLAINTIFF'S LOAN CHARACTERISTIC CLAIMS INCORPORATING HPA (TEST 2)

63. In my second test, I incorporated data reflecting housing price appreciation.

A. MODEL CALIBRATION INCORPORATING HPA

64. In order to perform my second test, the Model was calibrated to establish loan performance expectations based on the variables used in Test 1, as well as House Price Appreciation data.

65. I repeated each step described in the Model Calibration section for Test 1 but also incorporated HPA into my analysis. To do so, I included an additional variable that reflected the house price appreciation (HPA) one year after the loan origination date for the state where the relevant property was located.

66. The "All Variables" set (set (a)) for my second test included credit score, LTV ratio, lagged income growth in the county where the loan was originated, occupancy status, property type, loan purpose, prepayment penalty flag, document type, lienposition, ARM flag, whether the loan had a second lien, the state where the property securing the loan was located, unemployment rate for that state as of the date of origination, and HPA one year after loan origination in the relevant state. Similar to the first test, to predict the performance of all RMBS certificates included in STACK, the three sets of variables I considered included: (a) All Variables, (b) All Variables except for credit score, and (c) All Variables except for prepayment penalty flag.

B. PLAINTIFF'S ALLEGATIONS SCENARIO INCORPORATING HPA

67. To predict the performance of the Underlying Loan Pool, incorporating the alleged misstatements of loan characteristics as well as slowing house price appreciation, I set HPA one year after origination to zero for all loans.

68. As in the *Plaintiff's allegations scenario* for Test 1, to estimate performance, I carried out the following modifications to the Plaintiff's Loan Characteristic Claims Database described above:

    a. If Dr. Seru flagged a loan as having a misrepresented LTV ratio, I replaced the "originalltv" value with the "avm_ltv" value as provided by Dr. Seru.

    b. If Dr. Seru alleged that a loan had a so-called "silent second" lien, I set the value for the "hassecondlien" variable to 1.

    c. If Dr. Seru flagged the occupancy status as being misrepresented, I set the occupancy status value to "NO" (indicating that the property was an investor property).

d. If Dr. Seru flagged a loan as having an overstated income in the "income_flag_county" field, I replaced the annual lagged HMDA income growth variable with the corresponding annual lagged BEA income growth variable.[31]

69. I then calculated performance expectations for the loans in the Underlying Loan Pool, as modified to reflect Plaintiff's Loan Characteristic Claims and Dr. Seru's HPA-related allegations, using the estimates resulting from the calibration described above.

70. Monthly default loss expectations were then aggregated to form the expected cumulative default loss under the *Plaintiff's allegations scenario (with HPA)*.

C. COLLATERAL RISK SCENARIO INCORPORATING HPA

71. In the *collateral risk scenario (with HPA)*, I calculated cumulative default loss rates using a range of HPA values. The HPA values ranged from -8 percent to 7.5 percent as forecasted by the *Wall Street Journal* in September 2006.[32]

72. To calculate these default loss rates, I utilized the same 300 hypothetical loan pools used in the *collateral risk scenario* for Test 1.

73. For each of these 300 pools, I utilized the estimates from the Model (incorporating HPA) as described above to generate cumulative default loss rates under the following seven HPA values: -8%, -6%, -2%, 0%, 2%, 6% and 7.5%.

74. For each of the seven HPA values, I considered the highest expected cumulative default loss rate among the 300 pools to reflect the maximum risk under this scenario.

D. RESULTS

75. I then compared the cumulative default loss under the *Plaintiff's allegations scenario (with HPA)* to the cumulative default losses under the *collateral risk scenario (with HPA)* using the full range of HPA values, including 0% and the lowest forecasted value. The results are reflected in **Exhibit 7**: *Model Results*.

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[31] As noted above, Dr. Seru flags a loan as having an income overstatement whenever the five-year HMDA growth rate for 2001-2006 for the applicable county exceeded the corresponding five-year BEA growth rate by five percent or more. Therefore, to incorporate these income-overstatement allegations, I replaced HMDA income growth rate values with BEA values, to represent Seru's implicit assertion that the incomes reported by borrowers generally (as represented in HMDA income growth rate data) were overstated vis-à-vis BEA income growth rate data.

[32] Economic Forecasting Survey Data." *Wall Street Journal* (Sept. 2006). <http://online.wsj.com/public/resources/documents/wsjecon0906.xls> (accessed Nov. 22, 2016).

IV. MANAGED CDO RISK (TEST 3)

76. For the third test, I considered the risk inherent in a managed CDO such as STACK. I used the Model to calculate a new scenario, the *managed CDO risk scenario*. In this scenario, I calculated the maximum expected cumulative default loss rate of a pool of loans with approximately the same credit rating distribution as the STACK RMBS portfolio sent to CDIB in March 2007.[33]

77. Using ABSNet, I first identified all RMBS securitizations that originated in the years 2004 through 2006. I did this because all RMBS collateral in STACK belonged to securitizations originated in the years 2004 through 2006.

78. I then obtained Moody's credit ratings information for the tranches of these securitizations. To obtain information on ratings, I used supporting materials from the Seru Report.[34] For securitizations with no credit ratings information in Dr. Seru's supporting materials, I retrieved the ratings from Bloomberg.[35] I then identified the tranches with an original Moody's rating of A2, Baa1, Baa2, Baa3, or Ba2 (the ratings of the RMBS in STACK as of March 2007).

79. For each of the tranches with Moody's ratings A2, Baa1, Baa2, Baa3, or Ba2, I obtained loan-level information for all loans collateralizing that securitization, using ABSNet.

80. I then used the Model estimates derived in Test 1 to generate expected pool performance for each of the loan groups.[36] Following the same method, this performance was estimated by associating each loan with a monthly expectation of prepayment and a monthly expectation of default, and then aggregating expected default losses at the loan-group level.

81. For each rating category, I ranked the loan groups based on their expected cumulative default loss.

82. I then constructed a portfolio (the "Managed CDO Risk Portfolio") consisting of 75 tranches from 75 securitizations. The tranches altogether had the same rating composition as the RMBS

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[33] STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Frances Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).

[34] Seru Report supporting materials at SERU_0000370.

[35] Bloomberg, L.P. (accessed Nov. 8-28, 2016).

[36] If characteristics such as occupancy status, loan purpose, documentation type were missing for all loans in a loan group, I dropped the loan group from my analysis. I only predicted the performance of loan groups for which at least 2/3 of the mortgage loans in the loan group had information on all the covariates used in the Model.

collateral in STACK.[37] In constructing this portfolio, I selected the tranches with the highest cumulative default losses within each rating category, subject to the constraint that the resulting portfolio met certain collateral quality tests and portfolio percentage limitations.

83. Specifically, I confirmed that the Managed CDO Risk Portfolio passed certain collateral quality tests and met the relevant portfolio percentage limitations set forth in the Offering Memorandum.[38] Specifically, regarding the collateral quality tests, I performed the Maximum Moody's Rating Factor Test, the Minimum Coupon Test, the Asset Correlation Test (using Moody's CDOROMv2.2), the Weighted Average Life Test and Moody's Recovery Test.[39]

84. I then calculated the average cumulative default loss for the constructed portfolio, the results of which reflect the *managed CDO risk scenario*.

85. Finally, I compared the cumulative default loss under the *Plaintiff's allegations scenario* and *managed CDO risk scenario*. The results are reflected in **Exhibit 7**: *Model Results.*

V. COLLATERAL LOSS AND HPA

86. The Seru Report contends that Morgan Stanley utilized proprietary information regarding HPA forecasts and extrapolates this data to reach conclusions regarding expected collateral losses and bond losses. Dr. Seru's so-called "extrapolation"[40] is based on extending a line from a single slide in the 2006 Presentation.[41] Rather than simply drawing a line, I tested the historical relationship between HPA and collateral losses and bond losses.

87. To perform my analysis, I used the same database I used in the Model, that is, a dataset of loan information acquired from ABSNet.

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[37] The March 2007 STACK portfolio reflected the following distribution: A2 (0.9%), Baa1 (21.8%), Baa2 (21.8%), Baa3 (48.2%), Ba2 (7.3%). The Managed CDO Risk Portfolio reflected the following distribution: A2 (1.3%), Baa1 (21.3%), Baa2 (21.3%), Baa3 (48.0%), Ba2 (8.0%).

[38] Offering Memorandum at CDIB_000532550-CDIB_000532556.

[39] Because the Managed CDO Risk Portfolio had the same ratings distribution as the RMBS collateral of STACK in March 2007, the Maximum Moody's Rating Factor Test was automatically satisfied. Furthermore, because the Moody's Recovery Test depends upon the Moody's credit rating distribution, the portfolio I constructed automatically satisfied this test as well. Because I did not have access to all relevant information, I was unable to perform the S&P CDO Monitor Test or the S&P Minimum Average Recovery Rate Test.

[40] Seru Report at Figure 12.

[41] 2006 Presentation at MS_CDIB_000485570.

88. I removed duplicate loans from the ABSNet dataset.[42]

89. I designated the loan status for each loan as defaulted, prepaid, or current as of October 31, 2006[43] as follows:

    a. A loan was considered to have prepaid if the ABSNet "PrepaymentsInFull" field was greater than 0 and if the prepayment date was on or before October 31, 2006.

    b. A loan was considered to have defaulted if it was at least 150-days delinquent according to the ABSNet "HistDelinqDaysOts" field and if the default date was on or before October 31, 2006.[44]

    c. In certain instances, a loan was identified as both prepaid and defaulted in the ABSNet database. If prepayment occurred before default, I excluded the loan from the dataset. If default occurred before prepayment, I deemed the loan to have prepaid.

    d. If a loan had neither prepaid nor defaulted, I marked the loan as current.

90. Finally, if the reported CLTV or LTV ratio was equal to 0, I replaced the given value with an entry that indicated the value was missing. If the reported credit score value was less than 300 or greater than 850, I replaced the given value with an entry that indicated that the value was missing.

91. I dropped certain loans to be consistent with the 2006 Presentation. A loan remained in the dataset if any of these conditions were met:

    a. it had a credit score below 700,

    b. its purpose was cash-out refinance, or

    c. it had a prepayment penalty.[45]

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[42] To ensure that I found all duplicates, I looked for loans that: (1) had the same loan ID; (2) were in the same certificate; and (3) had the same characteristics (allowing for up to a 0.1% variance in each characteristic). The loan characteristics I analyzed were: original LTV ratio, original CLTV ratio, FICO score, original loan balance, occupancy status, property type, loan purpose, documentation type, prepayment penalty, whether the loan was an adjustable rate mortgage, lien position, first payment date, and state in which the property was located.

[43] I selected this date because the 2006 Presentation was dated October 2006. See 2006 Presentation at MS_CDIB_000485536.

[44] In the Model, I marked loans as defaulted when they were at least 90-days delinquent. For the collateral loss analysis, I used the 150-days delinquency status, as losses are recorded months or even years after the first time a loan becomes 90 days delinquent.

[45] 2006 Presentation at MS_CDIB_0004855480-MS_CDIB_000485549.

92. The 2006 Presentation notes that the graph presents data from 2000-2006, and also discusses expected cumulative loss after four years.[46] Based on this information, I dropped loans from the dataset with origination dates outside the date range beginning with January 1, 2000 and ending with September 30, 2002. This ensured that I considered loans from the time period mentioned in the 2006 Presentation and that I could follow the resulting set of loans for a full four years.

93. I also collected the annual house price index ("HPI") data from FHFA's website.[47] This data included comprehensive data on annual house prices (reported quarterly) for the United States at the zip code level from the first quarter of 1995 to the fourth quarter of 2015.[48]

94. For a given year quarter and zip code, I took the difference between the HPI at that year and quarter and the HPI at the same quarter at the previous year. I then divided this difference with the previous year HPI at that quarter to calculate HPA for each year and quarter.

95. I then used the HPA data to assign HPA values to each loan as follows:

    a. If a loan had not defaulted within four years of origination, the HPA value for the loan was the HPA value in its zip code four years after origination.

    b. If a loan had defaulted within four years of origination, the HPA value for the loan was the HPA value in its zip code when default occurred.

96. I then grouped the loans by HPA categories, with each category representing 1 percent intervals ranging from -5 percent to 2 percent. This gave me eight HPA categories in total: -5, -4, -3, -2, -1, 0, 1, 2. For example, if a loan had been assigned an HPA of 1.5%, then it would belong to HPA category 1. If a loan had been assigned an HPA value of 2%, it would belong to HPA category 2.

97. For each HPA category, I calculated the percentage of loans that defaulted within four years from origination.

98. In order to obtain the collateral losses, I assumed 40 percent loss severity for the loans that defaulted.[49]

99. I present the results in **Figure 4**: *Relationship Between Collateral Losses and HPA in the 2006 Presentation, Seru's Re-Drawing, and Historical Data*.

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[46] 2006 Presentation at MS_CDIB_000485570.

[47] "House Price Index Data: Three Digit Zip-Code Level." *Federal Housing Finance Agency*. <https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx> (accessed Sept. 13, 2016).

[48] As noted elsewhere, although I collected information that included data relating to the period after March 2007, any information relating to the period after March 2007 was ultimately dropped and was not incorporated into my analysis.

[49] I used this figure as it is the loss severity projection used by the 2006 Presentation. *See* 2006 Presentation at MS_CDIB_000485573.

VI. BOND LOSS AND HPA

100. I also performed an analysis of historical data on RMBS bond losses and HPA for the years 2002-2006.

A. DETERMINING THE LIST OF RELEVANT BONDS AND THEIR MONTHLY CASHFLOW DATA

101. I first identified the list of RMBS securitizations issued between 2002-2006, extracting the securitization names from ABSNet.

102. I determined which securitizations were represented in the cumulative pay down dataset ("CPD Data") included in the Seru Report's supporting materials.[50] For securitizations that were not represented, I downloaded the list of tranches and their ratings from Bloomberg.[51]

103. I extracted monthly cashflow data from the CPD Data for Baa1, Baa2 and Baa3 rated tranches. I also downloaded monthly cashflow data for the RMBS tranches rated Baa1, Baa2 and Baa3 retrieved from Bloomberg.[52]

104. I then dropped any monthly cashflow data after October 31, 2006.[53]

105. This process gave me a comprehensive list of RMBS bonds issued between 2002-2006 rated Baa1, Baa2 and Baa3 and their corresponding monthly cashflow data ("Combined Cashflow Data").

B. DETERMINING BOND PRICES

106. I calculated average bond prices for bonds with Moody's ratings ranging from A2 to Baa3. To do so, I retrieved the NAIC data ("NAIC Data") from the Seru Report's supporting materials.[54] In the NAIC Data, each bond was identified by its CUSIP. I merged the NAIC Data with a file from the Seru Report supporting materials to add the certificate names and ratings for each CUSIP.[55]

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[50] Seru Report supporting materials at SERU_00001936.

[51] Bloomberg, L.P. (accessed Oct. 26, Nov. 22, 28-29, 2016).

[52] Bloomberg, L.P. (accessed Oct. 26, Nov. 22, 28-29, 2016).

[53] I selected this date because the 2006 Presentation was dated October 2006. *See* 2006 Presentation at MS_CDIB_000485536.

[54] Seru Report supporting materials at SERU_0000373, SERU_0000374.

[55] Seru Report supporting materials at SERU_0000370.

107. I calculated the price for bonds with initial Moody's ratings ranging from A2 to Baa3 in the same manner as Dr. Seru.[56] Each bond may have had multiple prices in a given year. Following the same manner as Dr. Seru, I determined the average price for each bond in each year.

108. I then calculated the average price for bonds with the same vintage in each year. For example, I determined the average price in 2005 for bonds issued in 2003 that were initially rated Baa1.

109. Again following Dr. Seru's methodology, if there were no prices for bonds with a given vintage and rating in a given year, I substituted the price with the first available next-higher-rated-bond price of the same vintage for the same year. For example, for 2002 vintage bonds initially rated Baa3, there was no price available in 2005. Therefore, I assigned the price to be the price of a Baa2 bond.

110. This process gave me a comprehensive list of average bond prices for each vintage in each year ("Average Bond Price Data").

C. CALCULATING BOND LOSSES

111. With the cash flow and price data collected as explained above, I determined the bond loss for each bond rated Baa1, Baa2 and Baa3.

112. To do so, I first calculated the cumulative principal paydown and principal losses for each bond. The Combined Cashflow Data contained monthly information regarding the principal paydown and principal losses for each bond.

113. I calculated the cumulative principal paydown for each bond by summing the principal paydown amounts beginning with the issuance of the bond and ending with the last date that data was available. I determined the dollar amount and the percentage of the original principal balance that had been paid down.

114. I calculated the cumulative principal loss for each bond by summing the principal loss amount beginning with the issuance of the bond and ending with the last date that data was available. I determined the dollar amount and the percentage of the original principal balance that was written down for each bond.

115. Following Dr. Seru's methodology, I proceeded to calculate monthly bond losses. To do so, I used the Average Bond Price Data, cumulative principal paydown percentage, and the percent of the bond principal that is still outstanding (the "factor"):

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[56] Dr. Seru reported the NAIC Data in two parts, titled part 1 and part 3. To determine bond price for data in part 1, Dr. Seru divided the value in the field "rate_used_to_obtain_fair_val" by 10,000. To determine bond price for data in part 3, Dr. Seru divided the value in the field "actual_cost" by the value in the field "par_val" and multiplied the result by 10,000. Any bonds with a price lower than 1 or higher than 120 were dropped. I followed the same steps.

$$bond\ loss\ (\%) = 1 - ((price\ /\ 100) * factor + cum\_principal\_paydown\_perc).$$

116. The resulting dataset ("Bond Loss Data") contained the monthly bond loss for each bond issued between 2002-2006.

D. Determining the Relationship Between HPA and Bond Loss

117. I collected data regarding the annual house price index ("HPI") from FHFA on October 7, 2016.[57] This data included comprehensive data on annual U.S. house prices (reported quarterly) at the national level from the first quarter of 1975 until the second quarter of 2016.[58] I calculated national HPA for each quarter by subtracting the HPI from the same quarter of the previous year. This gave me the national HPA growth rate for each quarter between 1975-2015.

118. I merged the national HPA growth rate data with the bond loss data. As a result, each bond had a monthly bond loss figure and an associated HPA value for the period of 2002-2006.

119. Finally, I calculated the average bond loss for all tranches at the 13th month after origination.

120. I then determined the average bond loss for tranches with an HPA value that was higher than 6% and for tranches with an HPA value below 6%.

121. I report the results in **Table 1**: *Baa3 Bond Losses by HPA.*

VII. Income Overstatement Analysis

122. I conducted an analysis to assess the validity of the assertions that underlie Dr. Seru's conclusions regarding alleged borrower income overstatement. Dr. Seru asserts that HMDA and BEA income growth rates were "largely similar" for the years 1996-2001. For the years 2001 to 2006, Seru calculates the number of loans in STACK located in counties where BEA income grew at least five percent faster than HMDA income.

123. For my analysis, I used the county level HMDA income and BEA income data, as well as zip code-to-county mapping and loan level information, from the supporting materials submitted by Dr. Seru.[59]

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[57] "House Price Index Data: National Level." *Federal Housing Finance Agency*. <https://www.fhfa.gov/DataTools/Downloads/Documents/HPI/HPI_AT_us_and_census.csv> (accessed Oct. 7, 2016).

[58] As noted elsewhere, although I downloaded information that included data relating to the period after March 2007, any information relating to the period after March 2007 was ultimately dropped and was not incorporated into my analysis.

[59] Seru Report supporting materials at SERU_0000406, SERU_0000408, SERU_0001674, SERU_0024600.

124. I first conducted an analysis to estimate the true relationship between the five-year HMDA income growth rate and five year BEA income growth rate from 1996 to 2001. To do so, I used the following model:

$$HMDA\ growth = \alpha + \beta \times BEA\ growth.$$

125. I performed a regression analysis using the above model to estimate the actual relationship between HMDA and BEA income growth rates from 1996 to 2001. From my regression analysis, I found that the constant term was positive and the slope was less than 1. Both these results were statistically significant at the level of 0.01.

126. The data show that, during 1996-2001, for each level of BEA income growth, there was a wide range of corresponding values for HMDA income growth. To account for this variation, I used the results from the regression analysis to calculate the 95 percent confidence interval. I then used the confidence interval and compared it to the 2001-2006 BEA income growth data.

127. I identified counties where the HMDA 2001-2006 growth rate was above the upper bound of the 95% confidence interval. To do this, I assigned an indicator variable to a county if the five year HMDA income growth rate was above the upper bound of the 95% confidence interval associated with the 5 year BEA income growth rate. I assigned a value of zero to the indicator otherwise.

128. I merged the list of counties with indicator variables with Dr. Seru's list of loans and their corresponding original balances.[60] This allowed me identify loans in the Seru Loan-Level Datasets that were secured by properties located in a county with an HMDA income growth rate that was higher than the upper bound of the confidence interval.

129. I then calculated the percentage of loans, weighted by original loan balance, that were secured by properties where HMDA income growth rate was above the upper bound of the 95% confidence interval.

130. I report the results in **Exhibit 10**: *Income Overstatement Analysis Results*.

[60] Seru Report supporting materials at SERU_0001674.

Appendix Cb

Technical Appendix

Credit Ratings Analysis

Technical Appendix – Credit Ratings Analysis

I. OVERVIEW

1. The Cornaggia Report submitted on behalf of Plaintiff claims that Morgan Stanley misrepresented STACK because it knew the credit ratings assigned to STACK collateral were not accurate.[1] The Cornaggia Report provides allegedly "[m]ore [a]ccurate [r]atings" for STACK.[2] To generate these ratings, the Cornaggia Report relies on a single slide in the 2006 Presentation,[3] and contends that the ratings for all the RMBS in the STACK portfolio should have been moved downward by eight notches.[4]

2. I conducted an analysis to test whether notching methodologies consistent with industry practice would have affected the ratings of STACK.

    a. I performed a rating analysis to test whether notching the tranches discussed in the 2006 Presentation (subprime tranches rated Baa3 or below), based on a stress test conducted by Moody's in March 2007 (the "Moody's Stress Test"), would have affected the ratings of STACK's Supersenior Swap.

    b. Second, I tested whether downgrading collateral placed on a negative watch list by S&P in July 2007 to a CCC rating would have affected the ratings of STACK's Supersenior Swap ("S&P Negative Watch List").

    c. Finally, I tested whether downgrading all the RMBS and CDO collateral in STACK according to an S&P notching schedule cited in the Cornaggia Report would have affected the ratings of STACK's Supersenior Swap ("S&P's Notching Schedule").

3. I describe my procedure in detail below.

II. PREPARING THE DATA

4. In order to conduct my analyses, I compiled and prepared certain data.

A. Merging the Portfolio Data

5. My analysis utilizes both Moody's and S&P industry categories. The Moody's classifications (prime, subprime, etc.) and S&P's industry categories relating to the STACK collateral, however, were not both reflected in any single dataset available to me. Therefore, I first merged the following datasets:

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[1] Cornaggia Report at 3.

[2] *Id.* at 25.

[3] *Id.* at 13.

[4] *Id.* at 18.

a. The STACK 2006-1 portfolio as of November 2, 2006 ("November 2 Portfolio") (reflected Moody's industry categories);[5] and

b. The STACK 2006-1 portfolio as of November 6, 2006 ("November 6 Portfolio").[6]

6. In order to facilitate the merge of the two portfolios, I renamed certain fields from the November 2 Portfolio[7] and the November 6 Portfolio.[8] I also made minor changes to the formatting of certain fields in the November 2 Portfolio and the November 6 Portfolio for consistency.

7. I merged the November 6 Portfolio with the November 2 Portfolio.

8. The resulting dataset had Moody's classifications for 121 of the 130 tranches of CMBS, RMBS and CDOs.[9] For the nine tranches missing this entry, I determined the Moody's category information as follows:

a. Four tranches that were missing Moody's category information were classified as CMBS, about which Plaintiff has made no allegations.

i. MLMT 2006-C2 G was classified as S&P industry category 53, "CMBS Diversified (Conduit and CTL)." I classified this as Moody's specified type 7.[10]

ii. BAYC 2006-3A B2, COMM 2006-FL12 FSH2, and GSMS 2006-FL8 AH were classified as S&P industry category 54, "CMBS (Large Loan, Single Borrower, and Single Property)." I classified these as Moody's specified type 9.[11]

b. The remaining five tranches were RMBS. The Offering Memorandum gives Moody's definitions for whether a tranche should be considered first and second lien prime, midprime, or subprime. If the underlying collateral had a weighted average FICO score

[5] STACK Portfolio (MS_CDIB_000373406), attached to email from Shalini Sriram, to Ewan Labrom, *RE: Investec: STACK 2006-1* (Nov. 2, 2006) (MS_CDIB_000373403).

[6] STACK Portfolio (MS_CDIB_000382057), attached to email from Graham Jones, to Ashish Khanna, *et al.*, *RE: Stack/basis* (Nov. 13, 2006) (MS_CDIB_000382055). I determined that the portfolio as of date was November 6 based on the Note Valuation Report that was also attached to this email (MS_CDIB_000382058).

[7] I renamed the field "MoodysIndustryCategory" as "MoodysIndCat," "SPInd" as "SPInd_Nov2," "SP" as "SPRating_Nov2," "Moodys" as "MoodysRating," and "Coupon" as "CouponNov."

[8] I renamed the field "S&PCategory2" as "SPInd_Nov6," "RatingS&P" as "SPRating," and "RatingMoody" as "MoodysRating."

[9] The following tranches are missing in the November 2 Portfolio: BAYC 2006-3A B2, COMM 2006-FL 12 FSH2, FFML 2006-FF15 M9, GSAA 2006-11B3, GSAA 2006-12B3, GSAA 2006-14B2, GSMS 2006-FL8A H, MLMT 2006-C2 G, MSM 2006-16AX B1.

[10] I did so because all other tranches in the portfolio with this S&P industry category were listed as Moody's specified type 7, "CMBS Conduit Securities."

[11] I did so because all other tranches in the portfolio with this S&P industry category were listed as Moody's specified type 9, "CMBS Large Loan Securities."

of 700 or above, it would be classified as first and second lien prime. If the weighted average FICO score was at least 625 but below 700, it would be classified as midprime. Finally, if the weighted average FICO score was below 625, it would be classified as subprime.[12]

i. I classified FFML 2006-FF15 M9 as midprime, because it was collateralized by loans with a weighted average credit score over 625 but below 700.[13]

ii. I classified GSAA 2006-11 B3, GSAA 2006-12 B3, GSAA 2006-14 B2, and MSM 2006-16AX B1 as first and second lien prime, because their weighted average FICO scores were over 700.[14]

9. Four tranches had a different value in the "SPInd" fields in the November 2 Portfolio and the November 6 Portfolio.[15] I used the value in the November 6 Portfolio, as this value was consistent with the portfolio emailed to CDIB and with the data used by Cornaggia.[16]

10. The resulting dataset ("Merged Data") contained Moody's and S&P categories.

B. Verifying the Merged Data with Cornaggia's Data

11. I next combined the Merged Data with Cornaggia's data ("Cornaggia Data").[17] The merge served two purposes:

a. It allowed me to verify that all S&P ratings in my data were identical to those used by Cornaggia.

[12] Offering Memorandum at CDIB_000532651.

[13] *See* FFML 2006-FF15 Prospectus Supplement (Oct. 25, 2006). <https://www.sec.gov/Archives/edgar/data/1378018/000114420406043891/v055697_424b5 htm> (accessed Jan. 5, 2017).

[14] *See* GSAA 2006-11 Prospectus Supplement (June 29, 2006). <https://www.sec.gov/Archives/edgar/data/1367042/000112528206003868/0001125282-06-003868.txt> (accessed Jan. 5, 2017); GSAA 2006-12 Prospectus Supplement (July 19, 2006). <https://www.sec.gov/Archives/edgar/data/807641/000090514806004943/efc6-2013_424b5.txt> (accessed Jan. 5, 2017); GSAA 2006-14 Prospectus Supplement (Aug. 15, 2006). <https://www.sec.gov/Archives/edgar/data/807641/000090514806005361/0000905148-06-005361.txt> (accessed Jan. 5, 2017); MSM 2006-16AX Prospectus Supplement (Oct. 26, 2006). <https://www.sec.gov/Archives/edgar/data/807641/000090514806005361/0000905148-06-005361.txt> (accessed Jan. 5, 2017).

[15] These four tranches were CWALT 2006-OC4 M7, IMM 2004-83 B, LXS 2006-7 M7, and LXS 2006-7 M8.

[16] STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Francis Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616); Cornaggia Report supporting materials at CORNAGGIA_0000005.

[17] Cornaggia Report supporting materials at CORNAGGIA_0000005. Cornaggia's data was constructed by merging the November 6 Data with the portfolio emailed to CDIB (MS_CDIB_000206617).

b. It allowed me to replicate Cornaggia's results because it enabled me to use the same values as Cornaggia for a number of fields required by the S&P CDO Evaluator.[18]

12. To facilitate my analysis, I first reformatted certain fields in the Merged Data and the Cornaggia Data.[19]

13. I then merged the Merged Data and the Cornaggia Data.

14. Two tranches were missing S&P ratings in the Merged Data. Following the notching schedule in the Offering Memorandum,[20] I assigned the S&P Rating "BBB-" to BSABS 2005 AQ1 M4 and JPMCC 2006-CB15 F.[21]

15. I then dropped all fields that were not used by CDO Evaluator.[22]

16. The combination of the Merged Data and Cornaggia Data resulted in the final dataset ("Rating Analysis Data"), which I used in the following analyses.

III. RATING ANALYSIS

17. I performed three analyses that allowed me to determine whether notching the collateral in STACK according to industry practice would have affected the rating of the Supersenior Swap.

18. In each analysis, I followed the same method as the Cornaggia Report, and capped the lowest S&P rating at CCC- because S&P's CDOE Evaluator does not accept lower ratings.[23]

19. Like Cornaggia, my analyses reflect the ratings that would have been assigned as of March 19, 2007.

[18] For example, I directly used the values Cornaggia used for weighted average maturity, current annualized coupon, and country code, to name a few.

[19] I created two new fields, "ABS_MBS_Issuer" and "SPRating," by removing white space from the "Obligor ID" and "SPCreditRating" fields, respectively.

[20] Both of these tranches were rated Baa1 by Moody's. I therefore notched each of them by two, following the Offering Memorandum. *See* Offering Memorandum at CDIB_000532650.

[21] The Cornaggia Data listed the S&P rating for both of these tranches as BBB. However, the Cornaggia Report at Appendix B correctly notes that they should have been notched to BBB-.

[22] The following fields remained in the dataset: "SPInd," "MoodysInd," "MoodySpecifiedType," "MoodysSpecifiedType2," "SPRating," "Obligor ID," "Asset Type," "S&P Credit Rating," "Weighted Average Maturity," "Current Balance," "Current Coupon (annualized)," "Assumed Recovery (%)," "Current Market Price\n (Per 100 Face)," "Country Code," "Sovereign Foreign Currency Rating," "Country Name," "Region Code," "Industry Local Regional Global," "Description," "CDO ID," "MoodysRating," and "Synthetic."

[23] *See* Cornaggia Report at 18.

A. Moody's Stress Test

20. For the Moody's Stress Test, I tested whether downgrading subprime collateral in STACK would have affected the rating of the Supersenior Swap. This was consistent with a stress test proposed by Moody's.[24]

21. I applied a five notch downgrade to the S&P rating for every tranche in the Rating Analysis Data classified as subprime (Moody's industry number 41) in the "MoodysInd" field and rated Baa3 or below in the "MoodysRating" field.

22. I applied a four notch downgrade to the S&P rating for every tranche in the Rating Analysis Data classified as subprime (Moody's industry number 41) in the "MoodysInd" field and rated Baa1 or Baa2 in the "MoodysRating" field. I did this because the 2006 Presentation, which forms the basis for Cornaggia's analysis, specifically addresses potential losses for Baa3 tranches, and does not address Baa1 or Baa2 tranches,[25] and the Cornaggia Report claims that these tranches had different loss projections.[26] The Seru Report also forecasts lower losses for Baa1 and Baa2 tranches.[27] It stands to reason that higher-rated tranches are less likely to experience losses, as they benefit from additional credit support. Furthermore, Moody's expected loss levels for tranches with these ratings are lower.[28]

23. I then imported the data with the notching applied into the "Assets" tab of CDOevaluator2.4.3 ("CDO Evaluator").[29] I changed the "As Of Date" to March 19, 2007, the date used in the Cornaggia Report.[30] For this, and the analyses that follow, I selected the "Standard" number of simulations and "Standard and Poor's" for correlation assumptions and asset default tables.[31]

24. I then ran CDO Evaluator. To do so, I selected "Add-Ins." I then selected the tab "Scenario Loss Rates." In this tab, I selected "Run SDR/SLR." CDO Evaluator uses a Monte Carlo estimation to generate the Scenario Default Rate ("SDR") for the different tranches of the portfolio.[32]

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[24] Park, John. "The Impact of Subprime Residential Mortgage-Backed Securities on Moody's-Rated Structured Finance CDOs: A Preliminary Review." *Moody's Investors Service* (Mar. 23, 2007): 1-8.

[25] 2006 Presentation at MS_CDIB_000485570.

[26] Cornaggia Report at 17.

[27] Seru Report at Figure A.7.

[28] *See* "Moody's Idealised Cumulative Expected Default and Loss Rates." *Moody's Investors Service* (2016). <https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBS_SF434522> (accessed Jan. 5, 2017).

[29] CDOevaluator2.4.3.

[30] Cornaggia Report at 41 (Appendix B).

[31] *Id.* at 42 (Appendix B).

[32] "Global Cash Flow and Synthetic CDO Criteria." *Standard & Poor's Structured Finance* (Mar. 21, 2002): 1-167 at 40.

25. I compared the SDR to the Breakeven Default Rate ("BDR") from the Cornaggia Report.[33] If the SDR was below the BDR (which, for an AAA rating, was 41.05%), the Supersenior Swap could have been assigned a rating of AAA.[34]

B. S&P Negative Watch List

26. I next tested whether downgrading the ratings of collateral placed on a negative watch list by S&P during July 2007 would have affected the rating of the STACK Supersenior Swap.

27. To do so, I reviewed the list of RMBS tranches placed on Negative Watch by S&P in July 2007.[35] I found 16 tranches in the Rating Analysis Data that had been placed on WatchNeg status.[36]

28. For these tranches, I assigned an S&P rating of CCC in the Rating Analysis Data. I did so because this was the most extreme rating action listed by S&P.[37]

29. I imported the data into the "Assets" tab of CDO Evaluator and used the "As Of Date" of March 19, 2007. I then ran CDO Evaluator which generated a portfolio SDR.

30. I compared the SDR with the BDR to determine whether the Supersenior Swap would continue to be eligible for an AAA rating.

C. S&P's Notching Schedule

31. The Cornaggia Report cites a document by S&P published in July 2007 as an example of how the rating agencies applied notching.[38] I tested whether downgrading the ratings of the collateral in STACK using the most punitive notching proposed by S&P would have affected the rating of STACK's Supersenior Swap.

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[33] Cornaggia Report at Appendix B, Table B.2.

[34] *See* Ghetti, Belinda, David C. Tesher, Henry C. Albulescu, Katrien Van Acoleyen. "CDO Spotlight: Generalized Cash Flow Analytics for CDO Securitizations." *Standard & Poor's Credit Research* (Aug. 25, 2004): 1-27 at 5.

[35] "S&PCORRECT: 612 U.S. Subprime RMBS Classes Put On Watch Neg; Methodology Revisions Announced." *Standard & Poor's RatingsDirect* (July 11, 2007): 1-24.

[36] The RMBS in STACK affected by this ratings action were: ACE 2006-HE2, ARSI 2006-W1, ARSI 2006-W2, ARSI 2006-W5, CMLTI 2005-HE4, FFML 2006-FF10, IXIS 2006-HE1, IXIS 2006-HE2, LXS 2006-7 (tranches M7 and M8), NCHET 2006-1, RAMP 2006-NC2, RAMP 2006-NC3, SABR 2005-FR5, SABR 2006-NC1, and SAIL 2005-9.

[37] "S&PCORRECT: 612 U.S. Subprime RMBS Classes Put On Watch Neg; Methodology Revisions Announced." *Standard & Poor's RatingsDirect* (July 11, 2007): 1-24 at 5.

[38] Cornaggia Report at 17 n. 62. *See also* "ARCHIVE: S&P Comments On Process For Rating New CDOs With U.S. RMBS Exposure." *S&P Global Ratings' Credit Research* (July 18, 2007).

32. I reviewed the notching schedule published by S&P in July 2007, which was cited in the Cornaggia Report.[39] The notching proposed by S&P is shown in **Table 2**: *S&P Notching Schedule, July 2007.*

Table 2: S&P Notching Schedule, July 2007

Rating Category	Notch Downgrade
AAA to AA-	0
AAA/Watch Neg to AA-/Watch Neg	1
A+ to BBB-	1
BB+ and lower	2

33. This notching would have applied to certain RMBS and CDO collateral in a new CDO transaction in July 2007.[40]

34. To be conservative, I selected the most punitive notching proposed by S&P, two notches. I applied this notch downgrade to the S&P rating of any tranche with S&P category 56 (RMBS A), category 57 (RMBS B/C, HELs, HELOCs and Tax Liens) and category 50 (CDO).

35. I imported the data into the "Assets" tab of CDO Evaluator and used the "As Of Date" of March 19, 2007. I then ran CDO Evaluator which generated a portfolio SDR.

36. Finally, I compared the SDR generated when notching all RMBS & CDO collateral in STACK with the BDR to determine whether the Supersenior Swap of STACK would continue to be eligible for an AAA rating.

D. Results

37. I present the results of these analyses in **Exhibit 12**: *Rating Analysis Results.*

[39] "ARCHIVE: S&P Comments On Process For Rating New CDOs With U.S. RMBS Exposure." *S&P Global Ratings' Credit Research* (July 18, 2007).

[40] *Id.*

Appendix D

Statements Regarding the Housing Bubble by Morgan Stanley Economists, 2004-2006

Statements Regarding the Housing Bubble by Morgan Stanley Economists, 2004-2006

1. In 2004, Morgan Stanley Chief Economist, Stephen Roach, confirmed the existence of a housing bubble.

   > The debate over a US housing bubble is now over. The recent US house prices report for the third quarter was a shocker - an 18.5 per cent annualised surge from the second quarter and a 13 per cent increase from year-earlier levels, according to the Office of Federal Housing Enterprise Oversight (OFHEO). That represents a stunning acceleration from the 9.8 percent year-on-year increase of the second quarter, and pushes nationwide house price appreciation to a 25-year high.[1]

2. In 2005, Chief U.S. Economist for Morgan Stanley, Richard Berner, said that home prices would stagnate in the coming years.

   > On a national level, home prices aren't going to plunge -- they just won't rise very much. "Home prices will rust, not bust, for the next few years," says Richard Berner, chief U.S. economist for Morgan Stanley[.][2]

3. In August 2006, Stephen Roach claimed that the housing bubble was already bursting.

   > Today, America's housing bubble is finally bursting. […] Demand for homes is falling like a stone and inventories of unsold dwellings are ballooning – up 40% for existing homes and 22% for new homes in the 12 months ending July. These are the classic quantity adjustments that set the stage for price destruction – the endgame of any asset bubble. So far, home values just seem to be leveling off at still lofty price points. As the bid-offer gap widens in an excess inventory and rising interest rate climate, price declines will come as they always do. This bubble is not different.[3]

4. In September 2006, Stephen Roach wrote that the global economy was at risk due to the effects of the bursting U.S. housing bubble.

   > It's hard to imagine that a US-centric global economy wouldn't be at risk in the aftermath of a bursting of the US housing bubble. Lacking in internal support from private consumption, the non-US world remains heavily reliant on selling exports to wealth-dependent American consumers. As the United States now comes to grips with the aftershocks of another post-bubble shakeout, so, too, must the rest of the world.[4]

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[1] Roach, Stephen. "America's Ominous Housing Bubble." *The Financial Times Ltd*. (Dec. 9, 2004).

[2] Madigan, Kathleen, Christopher Palmieri, Ann Therese Palmer, and Dean Foust. "After the Housing Boom." *Bloomberg Businessweek* (Apr. 10, 2005).

[3] Roach, Stephen. "Where Next as the US Housing Bubble Bursts?" *MoneyWeek* (Aug. 31, 2006).

[4] Roach, Stephen. "What the Burst US Property Bubble Means for the World." *MoneyWeek* (Sept. 4, 2006).

Appendix E

Statements Regarding the Housing Market by the Federal Reserve, 2006-2007

Statements Regarding the Housing Market by the Federal Reserve, 2006-2007

1. The Cornaggia Report points to a slowdown in housing prices as a risk factor.[1] This risk was known in the market.

   > The number of single-family and multifamily housing starts has fallen nearly 25 percent since the beginning of the year; sales of both new and existing homes have dropped sharply since their peak of last summer, and the inventory of unsold homes has soared. At the same time, homes are appreciating more slowly and in some markets prices are even declining.[2]

2. The Cornaggia Report points to worsening housing affordability as a risk factor.[3] This risk was known in the market.

   > [T]he sustained rise in prices, together with some increase in mortgage interest rates, sowed the seeds of the correction by making housing progressively less affordable. Declining affordability ultimately served to limit the demand for housing, leading to a deceleration in house prices and slowing home purchases.[4]

3. The Cornaggia Report points to risky and credit impaired subprime borrowers as a risk factor.[5] This risk was known in the market.

   > More recently, nontraditional mortgages have been offered to a wider spectrum of consumers, including subprime borrowers, who may be less suited for these types of mortgages and may not fully recognize their embedded risks. These borrowers are more likely to experience an unmanageable payment shock during the life of the loan, meaning that they may be more likely to default on the loan.[6]

4. The Cornaggia Report points to payment shocks resulting from interest rate resets on alternative mortgage products, as a risk factor.[7] This risk was known in the market.

   > More recently, nontraditional mortgages have been offered to a wider spectrum of consumers, including consumers who may be less able to afford the jump in monthly payments common in these types of mortgages and may not fully recognize their embedded risks. Subprime

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[1] Cornaggia, Kimberly. Expert Report of Kimberly J. Cornaggia. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) ("Cornaggia Report") at 11.

[2] Bies, Susan S. "The Economic Outlook." *Board of Governors of the Federal Reserve System* (Nov. 2, 2006) at 1.

[3] Cornaggia Report at 11.

[4] Bernanke, Ben S. "The Economic Outlook." *Board of Governors of the Federal Reserve System* (Nov. 28, 2006) at 2.

[5] Cornaggia Report at 11.

[6] Bies, Susan S. "A Supervisor's Perspective on Mortgage Markets and Mortgage Lending Practices." *Board of Governors of the Federal Reserve System* (June 14, 2006) at 3.

[7] Cornaggia Report at 11.

borrowers are more likely to experience an unmanageable payment shock during the life of the loan, meaning that they may be more likely to default on the loan.[8]

5. The Cornaggia Report points to worsening loan characteristics as a risk factor.[9] This risk was known in the market.

> Supervisors have also observed that lenders are increasingly combining nontraditional mortgage loans with "risk layering" practices--such as by not evaluating the borrower's ability to meet increasing monthly payments when amortization begins or when interest rates on adjustable rate mortgages rise due to indexing or at the end of a "teaser" rate period. We are also seeing more frequent use of limited or no documentation in evaluating an applicant's income and assets. Although some lenders may have used elements of nontraditional mortgage products successfully in the past, the recent easing of traditional underwriting controls and the sale of some types of nontraditional products to subprime borrowers may generate losses on these products greater than has been observed in the past. Additionally, information from other sources seems to indicate that more borrowers are purchasing real estate with no equity down payment by using simultaneous second liens.[10]

[8] Bies, Susan S. "Enterprise Risk Management and Mortgage Lending." *Board of Governors of the Federal Reserve System* (Jan. 11, 2007) at 4.

[9] Cornaggia Report at 11.

[10] Bies, Susan S. "Enterprise Risk Management and Mortgage Lending." *Board of Governors of the Federal Reserve System* (Jan. 11, 2007) at 4.

Appendix F

Statements Regarding Structural Risk in the Offering Memorandum

Statements Regarding Structural Risk in the Offering Memorandum

1. The Cornaggia Report points to increased leverage as a risk factor.[1] This risk was indicated in the Offering Memorandum.

   > The Notes represent leveraged investments in the Collateral Assets and other underlying Collateral. Therefore, changes in the value of the Notes of the respective Classes would be anticipated to be greater than the change in the value or payment performance of the underlying Collateral Assets, which themselves are subject to credit, liquidity and interest rate risks. Utilization of leverage is a speculative investment technique and involves certain risks to investors in the Notes, including the risk that they may not be paid in full. The use of leverage generally magnifies an investor's opportunities for gain and risk of loss. In addition, the Notes represent a leveraged investment because the Collateral Principal Balance, which includes the notional balance of the CDS Assets, will be substantially greater than the principal amount of the Notes and any Draw made under the Supersenior Swap will reduce the likelihood of repayment of the principal of the Notes and may reduce the returns on the Notes. As a result, the Notes will be exposed to credit risk on assets with a Principal Balance substantially greater than the principal amount of the Notes.[2]

2. The Cornaggia Report points to the structural risk and lack of credit support posed by lower RMBS tranches as a risk factor.[3] This risk was indicated in the Offering Memorandum.

   > A significant portion of the Collateral Assets will consist of Structured Finance Securities, or Synthetic Assets referencing Structured Finance Securities, that are subordinate in right of payment and rank junior to other securities that are secured by or represent an ownership interest in the same pool of assets. In addition, many of the related transactions have structural features that divert payments of interest and/or principal to more senior classes when the delinquency or loss experience of the pool exceeds certain levels. As a result, such securities have a higher risk of loss as a result of delinquencies or losses on the underlying assets. In certain circumstances, payments of interest may be reduced or eliminated for one or more payment dates.[4]

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[1] Cornaggia, Kimberly. Expert Report of Kimberly J. Cornaggia. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) ("Cornaggia Report") at 11.

[2] STACK 2006-1 Ltd., STACK 2006-1 Corp. *Final Offering Memorandum* (July 20, 2006) (CDIB_000532408 at CDIB_000532446) ("Offering Memorandum").

[3] Cornaggia Report at 11.

[4] Offering Memorandum at CDIB_000532452.

Appendix G

Statements regarding the Housing Market by Moody's, 2005-2007

Statements Regarding the Housing Market by Moody's, 2005-2007

1. The Cornaggia Report points to increased leverage as a risk factor.[1] This risk was known in the market.

   > A longer-term risk to the outlook is related to the increasing leverage of homeowners and the rising investor share of buyers, both of which are high in the most overpriced, and thus most vulnerable, markets. Not only are homebuyers highly leveraged, but they are resorting to nontraditional mortgage products that leave them open to risks associated with interest rate fluctuations.[2]

2. The Cornaggia Report points to worsening housing affordability as a risk factor.[3] This risk was known in the market.

   > Affordability stands out at as the major constraint on housing's outlook. Housing affordability is eroding rapidly, due largely to the equally rapid rise in house prices. […] While housing still remains affordable, with the index standing at 120 according to the NAR, affordability has eroded by 16% from its peak in mid-2003 and is at its lowest point since 1991.[4]

3. The Cornaggia Report points to a slowdown in housing prices as a risk factor.[5] This risk was known in the market.

   > Acceleration in the existing house price is softening. […] Price appreciation for new homes has been softening for the last year, going from a 14% gain last year to an average of only 5% currently[.][6]

4. The Cornaggia Report points to risky and credit impaired subprime borrowers as a risk factor.[7] This risk was known in the market.

   > Not only is the share of outstandings that is subject to interest rate risks larger compared to three years ago, but the borrowers themselves are likely riskier: the gain in the ARM share results in part from an increase in subprime borrowers— those most likely to run into difficulties—as subprime loans typically have a much higher ARM share than prime loans.[8]

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[1] Cornaggia, Kimberly. Expert Report of Kimberly J. Cornaggia. *China Development Industrial Bank v. Morgan Stanley, et al.* (N.Y. Sup. No. 650957/10) (Aug. 1, 2016) ("Cornaggia Report") at 11.

[2] "The Single-Family Housing Market Monitor." *Moody's Economy.com* 5.4 (Oct. 2005): 1-32 at 8.

[3] Cornaggia Report at 11.

[4] "The Single-Family Housing Market Monitor." *Moody's Economy.com* 5.4 (Oct. 2005): 1-32 at 5.

[5] Cornaggia Report at 11.

[6] "The Single-Family Housing Market Monitor." *Moody's Economy.com* 5.4 (Oct. 2005): 1-32 at 5.

[7] Cornaggia Report at 11.

[8] "The Single-Family Housing Market Monitor." *Moody's Economy.com* 5.4 (Oct. 2005): 1-32 at 7.

5. The Cornaggia Report points to payment shocks resulting from interest rate resets on alternative mortgage products, as a risk factor.[9] This risk was known in the market.

> While nontraditional mortgage products can get a family into a house, the risks are more substantial: higher mortgage interest rates would further burden already highly leveraged households. When the loan resets, the homeowner can be left with hefty mortgage principal and interest payments.[10]

6. The Cornaggia Report points to the structural risk and lack of credit support posed by lower RMBS tranches as a risk factor.[11] This risk was known in the market.

> If losses on 2006 loan pools end up being somewhat higher than initial expectations, then Ba–rated bonds will come under downgrade pressure and some may incur losses, while Baa–rated bonds could come under downgrade pressure. However, for Baa–rated bonds to incur losses, loan performance would have to continue to decline materially. Higher-rated bonds (Aaa, Aa or A) have more credit protection and will be able to withstand higher loan losses than lower-rated bonds and will be less likely to experience downgrade pressure.[12]

7. The Cornaggia Report points to worsening loan characteristics as a risk factor.[13] This risk was known in the market.

> Through 2005 and 2006, in an effort to maintain or increase loan volume, lenders introduced alternative mortgage loans that made it easier for borrowers to obtain a loan.[14]

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[9] Cornaggia Report at 11.

[10] "The Single-Family Housing Market Monitor." *Moody's Economy.com* 5.4 (Oct. 2005): 1-32 at 8.

[11] Cornaggia Report at 11.

[12] Chatterjee, Debash. "Challenging Times for the US Subprime Mortgage Market." *Moody's Investor Services* (Mar. 7, 2007): 1-8 at 6.

[13] Cornaggia Report at 11.

[14] Chatterjee, Debash. "Challenging Times for the US Subprime Mortgage Market." *Moody's Investor Services* (Mar. 7, 2007): 1-8 at 3.

Appendix H

Trusts Excluded from ABSNet Calibration Set

Trusts Excluded from ABSNet Calibration Set[1]

ABSHE 2006-HE4
ACABS 2006-1A
ACE 2005-HE1
ACE 2005-HE3
ACE 2006-ASP2
ACE 2006-ASP3
ACE 2006-HE2
ACE 2006-OP1
ALEXP 2004-1A
AMSI 2005-R10
AMSI 2005-R2
AMSI 2005-R3
AMSI 2005-R5
ARSI 2005-W5
ARSI 2006-W1
ARSI 2006-W2
ARSI 2006-W4
ARSI 2006-W5
BALTA 2006-2
BALTA 2006-3
BALTA 2006-4
BSABS 2005-AQ1
BSABS 2005-HE11
BSABS 2005-HE12
BSABS 2005-HE5
CARR 2005-NC1
CARR 2006-RFC1
CMLTI 2005-HE4
CMLTI 2005-OPT3
CSMC 2006-C2
CSMC 2006-TFLA
CWALT 2006-OC3
CWALT 2006-OC4
CWALT 2006-OC5
CWHL 2005-HYB7
CWL 2005-11
CWL 2005-13
CWL 2005-14
CWL 2005-3
CWL 2006-3
CWL 2006-5
CWL 2006-7
CWL 2006-ABC1
CWL 2006-BC2
DBALT 2006-AR2
FFML 2006-FF10
FFML 2006-FF7
FFML 2006-FF8
FHLT 2005-1
FHLT 2005-D
FHLT 2005-E
GLCR 2004-1A
GLCR 2005-3A
GSAA 2006-10
GSAA 2006-9
GSAMP 2005-HE4
HEAT 2005-5
HEAT 2005-7
HEAT 2005-9
HEAT 2006-1
HEAT 2006-2
IMM 2004-8
IMSA 2006-2
INDE6 6A
IXIS 2005-HE4
IXIS 2006-HE1
IXIS 2006-HE2
JPMAC 2006-CW1
JPMCC 2005-LDP1
JPMCC 2006-CB14
JPMCC 2006-CB15
JPMCC 2006-LDP7
LBUBS 2006-C4
LXS 2006-5
LXS 2006-7
LXS 2006-8
MABS 2005-HE1
MLCFC 2006-2
MSAC 2005-HE7
MSAC 2006-NC1
MSAC 2006-NC4
MSM 2006-6AR
MSM 2006-8AR
NCHET 2005-1
NCHET 2005-3
NCHET 2005-4
NCHET 2005-C
NCHET 2006-1
NEPTN 2006-3A
OOMLT 2005-3
OOMLT 2006-1
PPSI 2005-WHQ3
RALI 2006-QA4
RAMP 2005-EFC4
RAMP 2005-EFC5
RAMP 2006-NC2
RAMP 2006-NC3
RASC 2005-KS5
RASC 2005-KS8
RASC 2006-KS4
SABR 2005-FR1
SABR 2005-FR2
SABR 2005-FR5
SABR 2006-NC1
SAIL 2005-7
SAIL 2005-9
SAST 2006-2
VERT 2006-1A
VERT 2006-2A
WFHET 2006-1
BAYC 2006-3A
COMM 2006-FL12
FFML 2006-FF15
GSAA 2006-11
GSAA 2006-12
GSAA 2006-14
GSMS 2006-FL8A
MLMT 2006-C2
MSM 2006-16AX

[1] STACK Portfolio (MS_CDIB_000206617), attached to email from Helena Chen, to Frances Liu, *STACK2006 Portfolio February (CDIB) – vintagae* [sic] *distribution* (Mar. 19, 2007) (MS_CDIB_000206616).