

**UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION**

_____)	
ANA RAMIREZ, ISMAEL RAMIREZ and)	
JORGE SALAZAR, on behalf of themselves and)	
all others similarly situated,)	Case No. 3:08-cv-00369-TEH
)	
Plaintiffs,)	CLASS CERTIFICATION REPORT
)	OF HOWELL E. JACKSON
v.)	
)	
GREENPOINT MORTGAGE FUNDING, INC.)	
)	
Defendant.)	
_____)	

CONFIDENTIAL—SUBJECT TO PROTECTIVE ORDER

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I. I NTRODUCTION

1. I have been asked by counsel for Ana Ramirez, Ismael Ramierz, Jorge Salazar, and similarly situated individuals (“Plaintiffs”) to analyze whether (1) disparate impact of the mortgage loan pricing policies of Greenpoint Mortgage Funding (“Greenpoint” or “Defendant”) on Class members can be proven with common evidence and methods, (2) the claims made by the named Plaintiffs are typical of the Class, and (3) the calculation of individual and aggregate monetary relief is manageable and may be reliably performed on an aggregate or class-wide basis. I have read the Amended Complaint (“Complaint”), filed March 13, 2008, in this matter. This and other materials that I relied upon in forming my opinions are listed in Appendix 1.¹

2. Plaintiffs allege, among other things, that the lending practices of the Defendant have imposed a disparate impact on protected classes of minorities.² For example, Plaintiffs allege that Greenpoint engaged in a “Discretionary Pricing Policy” under which its executive officers, staff, and brokers could impose subjective, discretionary charges and interest rate mark-ups in the loans that the company originated in the wholesale market.³ These subjective charges are added to the objective, risk-based rates that Greenpoint establishes for its borrowers. Plaintiffs allege that Greenpoint’s policies for wholesale access to its loan products subject African American and Hispanic (collectively, “minority”) customers to a significantly higher likelihood of exposure to discretionary points, fees, and interest rate mark-ups.⁴ These

1. Consultants from Empiris, LLC provided assistance in the preparation of this report.
2. First Amended Complaint, Case No. 3:08-cv-00369-TEH, ¶ 2 [hereinafter *Complaint*].
3. *Id.*, ¶79.
4. *Id.*, ¶3.

allegations have been brought pursuant to the Equal Credit Opportunity Act (ECOA) and the Fair Housing Act (FHA).⁵

3. Plaintiffs have brought an action on behalf of themselves and a proposed class of borrowers defined as “all minority consumers (the “Class”) who obtained a Greenpoint home mortgage loan in the United States between January 1, 200[4] and the date of judgment in this action (the “Class Period”) and who were subject to Greenpoint’s Discretionary Pricing Policy pursuant to which they paid discretionary points, fees or interest rate mark-ups in connection with their loan. For the purposes of this Complaint, the term “minority” is intended to include black and Hispanic consumers.”⁶

II. Q UALIFICATIONS

4. I am the James S. Reid, Jr., Professor of Law at Harvard Law School. My research interests include financial regulation, international finance, the securitization of financial assets, consumer protection, federal budget policy, and entitlement reform. I have served as a consultant to the United States Treasury Department, the United Nations Development Program, and the World Bank/International Monetary Fund. I am a member of the National Academy on Social Insurance, a trustee of the College Retirement Equities Fund (CREF) and its affiliated TIAA-CREF investment companies, a member of the panel of outside scholars for the NBER Retirement Research Center, and a senior editor for Cambridge University Press Series on International Corporate Law and Financial Regulation. I frequently testify before Congress and consult with government agencies on issues of financial regulation. I am co-editor of *Fiscal Challenges: An Inter-Disciplinary Approach to Budget Policy* (Cambridge

5. *Id.*, ¶77.

6. *Id.*, ¶77. I understand that the class period originally began in 2001, but has been amended to begin in 2004.

University Press 2008), co-author of *Analytical Methods for Lawyers* (Foundation Press 2003) and *Regulation of Financial Institutions* (West 1999), and author of numerous scholarly articles. Before joining the Harvard Law School faculty in 1989, I was a law clerk for Associate Justice Thurgood Marshall and practiced law in Washington, D.C., from 1984 to 1989. I received J.D. and M.B.A. degrees from Harvard University in 1982 and a B.A. from Brown University in 1976.

5. I have previously consulted with government agencies and private litigants in litigation involving allegations of abusive and discriminatory practices in the origination of residential mortgages. In one of those cases, I submitted expert reports that are now subject to a confidentiality agreement. Partially on the basis of that work, I have written several scholarly articles and testified before the Senate Banking Committee.⁷ I have also served as an expert witness on behalf of the Internal Revenue Service in a case involving international banking transactions and on behalf of corporate defendants in suits arising under the Employee Retirement Income Security Act of 1974. I have not testified as an expert witness at deposition or trial in the last four years (Appendix 2).

6. I have attached (as Appendix 3) a list of documents that I have considered for my work on this case and to which I may refer during deposition or at trial.

7. I file this report in my individual capacity and have no financial stake in the outcome of this case. My hourly rate in this matter is \$750. My compensation is not contingent

7. See Howell E. Jackson & Laurie Burlingame, *Kickbacks or Compensation: The Case of Yield Spread Premiums*, 12 STANFORD J. L. BUS. & FIN. 289 (2007); Howell E. Jackson, *The Trilateral Dilemma in Financial Regulation*, in IMPROVING THE EFFECTIVENESS OF FINANCIAL EDUCATION & SAVINGS PROGRAMS (Anna Maria Lusardi, ed.) (University of Chicago Press 2008); *Predatory Mortgage Lending Practices: Abusive Uses of Yield Spread Premiums: Hearing Before the S. Comm. on Banking, Housing & Urban Affairs*, 107th Cong. (2002) (statement of Howell E. Jackson, Finn M.W. Caspersen and Household International Professor of Law and Associate Dean for Research and Special Programs, Harvard Law School), available at http://banking.senate.gov/02_01hr/010802/jackson.htm.

on any action or event resulting from the analyses, opinions or conclusions in, or the use of, this report.

III. SUMMARY OF CONCLUSIONS

8. The disparate impact imposed on the proposed Class may be proven here through evidence and methods that are common to the Class. As a disparate impact case under ECOA and FHA, Plaintiffs' claims cannot be proven by looking only to the circumstances of their individual loans. Rather, the only way to prove Plaintiffs' case is on a class-wide basis—that is, to look at how Defendant's policies affect minorities versus whites, in general. For the reasons detailed in this report, I conclude that Greenpoint maintains sufficient data concerning its borrowers to permit just the kind of class-wide examination of Greenpoint's policies as required by a disparate impact case. In addition, my analysis of the data provided to Plaintiffs shows that minorities paid more for Greenpoint wholesale mortgage loans than whites with similar risk-characteristics. Table 1 shows the difference in loan costs (represented by the annual percentage rate, or "APR") paid by white and minority borrowers for Greenpoint wholesale loans originated from 2004 to 2007.⁸

TABLE 1: SUMMARY OF DISPARATE IMPACT & MONETARY RELIEF

	African Americans	Hispanics	Total
<i>Wholesale Loans (2004-2007)</i>			
Mean APR for Given Minority	7.297%	7.166%	
Mean APR for Whites	6.602%	6.602%	
Difference	0.695%	0.565%	
Difference after Controlling for Relevant Risk Factors with Regressions	0.094%	0.076%	
Undiscounted Monetary Relief over Five Years (\$ Millions)	\$33.0	\$69.6	\$102.5
Number of Borrowers	30,175	64,611	94,786
Undiscounted Monetary Relief over Five Years per Borrower	\$1,093	\$1,076	\$1,082

8. My analysis of wholesale loans includes loans for which the business channel (wholesale, retail, or correspondent) could not be definitively identified in Greenpoint's data provided to Plaintiffs. As discussed below, the vast majority of these unclassified loans are likely wholesale loans.

As Table 1 shows, the mean APR of a Greenpoint wholesale loan to white borrowers was 6.602 percent, whereas the mean APR to African American and Hispanic borrowers was 7.297 percent and 7.166 percent, respectively. Even when controlling with regression analysis the risk-based factors used by lenders to price mortgage loans, the APRs for African Americans and Hispanics were 9.4 and 7.6 basis points higher than the APRs for whites.⁹ (A basis point is equal to 1/100th of a percentage point). Using assumptions and methodologies (discussed below) that can be further refined once merits discovery is complete, I calculate aggregate undiscounted monetary relief to African Americans and Hispanics of \$102.5 million over the five years following loan origination—an average of \$1,082 per minority borrower. Monetary relief can also be calculated for other periods as the court deems appropriate.

9. My report is organized as follows. In Section IV, I give an overview of the mortgage lending industry and the appropriate methodology for statistical analysis in disparate impact cases. I explain that the evidence and analysis required to show disparate impact is common to the class. In Section V, I show that Greenpoint's pricing policies imposed a disparate impact on minorities through higher priced loans by using Greenpoint's internal data on mortgage applications and originations. This evidence and analysis, discussed in more detail below, is common to the Class, in that none of it depends on an individualized inquiry of Class members. If this case were to proceed as individual trials, each plaintiff would rely on the common evidence presented here.

9. These estimates are based on my preferred regression model; comparable estimates using alternative model specifications are discussed below and in the appendices to this report.

10. In Section VI, I examine the named Plaintiffs in this case and show that their situations are typical of other Class members in that they suffered disparate impact resulting from Greenpoint's pricing policies.

11. In Section VII, I explain that monetary relief to the class may be reliably estimated on an aggregate basis to the Class as a whole. I propose a model that could be used to estimate the harm resulting from Defendant's challenged conduct. This model would estimate the finance charges Class members would have paid but-for Defendant's alleged practices. Computing aggregate overpayment would incorporate Defendant's own data on its mortgage originations. Accordingly, I conclude that aggregate and individual monetary relief to the Class may be reliably estimated on an aggregate basis to the Class as a whole. This analysis does not create any problems of manageability.

12. My review of materials and data is continuing, and I reserve the right to modify my opinions as new materials emerge.

IV. DISPARATE IMPACT CAN BE PROVEN THROUGH COMMON EVIDENCE AND METHODS

13. Common evidence and methods are available to show that Greenpoint's policies had a disparate impact on minorities such that minorities paid more for wholesale home mortgage loans than whites with similar risk characteristics. Using statistical tests such as regression analysis of legitimate mortgage underwriting factors that are common to the Class, my analysis of Greenpoint's internal data shows that Greenpoint's pricing policies and practices had a disparate impact on minority members of the Class.

A. Mortgage Industry Overview

1. Overview

14. In recent years, the capital markets have played an increasingly important role in financing residential mortgages in the United States. For many decades, under a variety of

programs overseen by government sponsored enterprises such as the Federal National Mortgage Association (Fannie Mae) and Federal Home Loan Mortgage Corporation (Freddie Mac), conforming loans (or prime loans) have been repackaged into mortgage backed securities in a process known as securitization and funded through the capital markets. Since the mid 1990's, non-conforming residential mortgages (subprime, Alt-A and jumbo) have had access to capital market funding, initially through securitization transactions sponsored by private firms but later with support from expanded programs of the government sponsored enterprises.¹⁰ Access to capital market funding sparked a dramatic increase in the origination of subprime and Alt-A residential mortgages, with annual originations ballooning from an estimated \$190 billion and \$60 billion in 2001 to \$600 billion and \$400 billion in 2006.¹¹ Over the same period, the percentage of subprime and Alt-A loans sold into the capital markets also expanded dramatically. By the mid 2000's, an estimated 75 percent of all new subprime and 91 percent of new Alt-A loans were sold into the capital markets.¹²

15. The emergence of capital market funding for the full spectrum of residential mortgages transformed the business model of many residential mortgage lenders in the United States. Traditionally, mortgage lenders made loans and then held them on their balance sheet. Under the capital market funding model upon which securitization depends, loan originators hold loans only for a brief period of time before selling the loans to mortgage pool assemblers who

10. Adam B. Ashcraft & Til Schuermann, *Understanding the Securitization of Subprime Mortgage Credit*, Federal Reserve Bank of New York Staff Report No. 318 (Mar. 2008).

11. *Id.* at 2. According to the data provided to Plaintiffs, only 10 percent of Greenpoint's loans originated from 2004 to 2007 were classified as "Conforming A" loans, with the rest classified as Alt-A, Jumbo A, Closed-End Second, Commercial, Government, HELOC, or A-Minus during the Class period. GPM-E-01-000001 - GPM-E-01-000006; GPM-E-02-000001; GPM-E-01-000003 B; GPM-E-01-000006 B.

12. Ashcraft & Til Schuermann, *supra* note 10, at 2.

then resell large pools of mortgages to capital market investors in securitization transactions.¹³ With this “originate to distribute” model, many major mortgage originators, like Greenpoint, sell substantially all of their mortgage loans shortly after origination.¹⁴ When these loan originators make an individual mortgage loan, they have quite accurate estimates of the price at which that loan can be sold into the secondary market, based on a relatively limited number of factors concerning the type of loan (e.g., loan amount, fixed or adjustable rate terms, maturity, and loan purpose – home purchase or refinance), characteristics of the borrower (credit score, income-to-debt service ratios, loan-to-value ratio of the loan), geographic location (e.g., state and metropolitan statistical area (MSA)), and a limited number of loan features (e.g., prepayment penalties and repricing formulas for adjustable rate mortgages).¹⁵ Through the period at issue in this litigation, major mortgage originators constantly monitor the secondary mortgage market to ascertain changes that may affect the value of the loans that the firms are about to originate and used that information to update the pricing of their new mortgage originations. Under this originate-to-distribute business model, originator profits depend largely on the difference between the secondary market value of a loan at the time of origination and the originator’s cost of making the loan, including most significantly the principal amount of the loan extended to the borrower and the credit risk factors associated with the loan.

16. According to depositions of Greenpoint witnesses in this litigation, Greenpoint relied almost exclusively on this originate-to-distribute model of funding through the capital

13. Kathleen C. Engel & Patricia A. McCoy, *Turning a Blind Eye: Wall Street Finance of Predatory Lending*, 75 *FORDHAM L. REV.* 102 (2007).

14. According to witnesses in this case, Greenpoint held less than 2 percent of the loans that it originated. See Deposition of Steve Abreu at 25-28 (Sep. 10, 2008).

15. See Robert B. Avery et al., *Credit Risk, Credit Scoring, and the Performance of Home Mortgages*, *FED. RES. BULL.*, July 1996, at 621; Alan M. White, *Risk-Based Mortgage Pricing: Present & Future Research*, 15 *HOUSING POL’Y DEBATE* 503 (2004).

markets. While the firms sold loans to several hundred different investors, its two largest sources of funding were Bear Stearns and Lehman Brothers.¹⁶ The Greenpoint executives charged with these secondary market sales of mortgages were in daily contact with potential investors, supplying those investors with extensive loan-level data on the kinds of mortgage loans that the firm was originating.¹⁷ Investors used this loan level information to determine the prices that these investors would pay Greenpoint for its mortgages.¹⁸ Based on its expectation of the prices that loans would earn in the secondary market, Greenpoint then would adjust on a daily basis the rates that the firm would set on its own mortgages.¹⁹ All but a small fraction of Greenpoint's loan originations were sold into the secondary market during the class period. Even when investors returned loans for failure to comply with underwriting standards or some other reason, the firm had a practice of repackaging the returned loans and reselling them into the market.²⁰ Accordingly, Greenpoint operated on a funding model that was entirely dependent on secondary market pricing, and all of the information necessary for the market to value Greenpoint mortgages, including their credit risk, was communicated to potential investors in the form of loan-level data. Greenpoint used the same loan-level data to set the prices for its mortgage originations.

17. Mortgage originators such as Greenpoint had several different ways to originate residential mortgages.²¹ Most commonly, Greenpoint employed mortgage brokers to identify buyers and facilitate the loan origination process. This market is often called the wholesale

16. See Deposition of Kevin Hughes at 42-45 (Dec. 3. 2008).

17. *Id.* at 52-55.

18. *Id.* at 36-50.

19. *Id.* at 60-73.

20. *Id.* at 71-79.

21. Jackson & Burlingame, *supra* note 7; Alan M. White, *Borrowing While Black: Applying Fair Lending Laws to Risk-Based Mortgage Pricing*, 60 S. CAROLINA L. REV. 677 (2009); Michael LaCour-Little, *The Pricing of Mortgages by Brokers: An Agency Problem?*, 31 J. REAL EST. RES. 235 (2009).

market for loan originations and Greenpoint was one of the largest participants in the wholesale originations market.²² Up to 93 percent of Greenpoint loans originated from 2004 to 2007, including all of the named Plaintiffs' loans, were originated through wholesale brokers.²³ To apprise mortgage brokers of current prices, loan originators would typically provide elaborate "rate sheets" indicating the loan terms available for a variety of loans programs (including a spectrum of fixed- and adjustable-rate mortgages) and reflecting a range of loan characteristics, based on the factors described above that affect the price at which individual loans could be sold into the secondary market.²⁴ For each loan program, the rate sheet would typically also offer a range of different prices. The "par value" rate would be the interest rate at which the originator would offer to fund the loan at precisely the face amount of the loan – that is \$100,000 for a mortgage with a \$100,000 face amount. Adjustments to the "par value" rate could be made according to terms on the rate sheet based on objective credit characteristics, resulting in a post-adjustment "rate sheet price". An "above par" loan would bear a higher interest rate and would carry a higher price than the rate sheet price – that is, the originator would offer to pay a

22. See Deposition of Steve Abreu at 18 (Sept. 10, 2008). The prominence of Greenpoint in wholesale originations is confirmed in contemporaneous trade accounts. See Tom MaMalfa, *Who's Who in Wholesale 2005*, Mortgage Banking, August 2006, available at http://findarticles.com/p/articles/mi_hb5246/is_11_66/ai_n29289151/pg_5/?tag=content;coll ("GreenPoint ranked seventh for the second straight year, with volume of \$40.9 billion. Approximately 90 percent of its production came from brokers. The company is best known for its reduced-doc programs.").

23. Based on Greenpoint's loan-level data and the business channel classification scheme provided to Plaintiffs, 77.5 percent of the 401,110 Greenpoint loans originated from 2004 to 2007 were identified as broker-originated wholesale loans. GPM-E-01-000001 – GPM-E-01-000006; GPM-E-02-000001; GPM-E-01-000003 B; GPM-E-01-000006 B; Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009). The origination channel for another 15.3 percent of loans were not classifiable based on information in the data, but most are likely to be wholesale originations. See Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009). For example, 12 percent of all loans originated from 2004 to 2007 are not definitively classified as wholesale loans in the data but are identified as "Greenpoint Express" originations. Most of these unclassified Greenpoint Express loans were likely broker-originated loans. See Deposition of J. Steven Gilcrest at 9-10 (Sep. 11, 2008). Greenpoint Express loans were agency loans originated directly for Fannie Mae or Freddie Mac using their underwriting systems. See Deposition of Kevin Hughes at 185-186 (Dec. 3, 2008).

24. See Jackson & Burlingame, *supra* note 7.

premium to fund the loan of as much as several percent of the loan amount.²⁵ These premiums, known in the industry as yield spread premiums, reflect the higher price the “above par” loans fetch when resold through securitization transactions, and might generate on a \$100,000 mortgage loan an additional payment to the mortgage broker of several thousand dollars. Between the mid-1990’s and the mid-2000’s, yield spread premiums became an increasingly important source of compensation for mortgage brokers, and were often more significant than the other principal source of mortgage broker compensation, origination fees and direct charges. With yield spread premiums, the cost of mortgage broker compensation is imposed on borrowers in the form of higher interest payments over the life of the mortgage.

18. The second major channel of mortgage originations by lenders such as Greenpoint would be direct lending operations, sometimes referred to as retail loans. All of Greenpoint’s retail loans were refinancings of loans that it already serviced.²⁶ These loans were originated through a single telemarketing processing center rather than through physical branch offices.²⁷ This channel is comparable to wholesale lending in that the originator’s retail office is provided pricing information similar to the rate sheets provided to mortgage brokers. The retail pricing information is based on a variety of loan programs, and the pricing reflects current conditions in the secondary mortgage market. Retail origination offices, like mortgage brokers, also receive a portion of their compensation through origination fees and direct charges. One difference with retail loans is that there is typically no explicit yield spread premium paid for loans with “above

25. Rate sheets also typically include a variety of “below par” loans with lower interest rates for each loan program. With below par loans, originators fund less than the face amount of a loan (perhaps \$98,000 on a \$100,000) and the borrower pays additional “discount points” to cover the shortfall (perhaps \$2,000 or two points). In exchange for these additional upfront payments, the borrower pays lower interest payments over the life of the loan than would have been true with a par loan or above par loan.

26. Deposition of Steve Abreu at 76, 106-107 (Sep. 10, 2008); Deposition of J. Steven Gilcrest at 71-74 (Sep. 11, 2008).

27. *Id.*

par” rates as the mortgage lenders fund the loans directly. Retail loans with higher interests do, however, also command higher prices when sold into loan securitization transactions and so mortgage lenders do generate more profits when their retail offices steer borrowers into above par loans. Moreover, borrowers incur additional costs through higher interest payments on above par retail mortgages, just as they do with above par wholesale loans. Based on Greenpoint’s loan-level data provided to Plaintiffs, 3.2 percent (12,852) of Greenpoint loans originated from 2004 to 2007 were retail originations.²⁸ Per instructions from Plaintiffs’ counsel, I exclude these 12,852 retail loans from my analysis.

19. A third and less common channel for mortgage originations is through correspondent banking arrangements under which a correspondent bank identifies the borrower and facilitates the transaction. Economically, correspondent mortgage originations are similar to the wholesale market via mortgage brokers, though originators may devise separate loan programs and rate sheets for their correspondent relationships. Greenpoint’s loan-level data provided to Plaintiffs identifies 15,992 loans originated from 2004 to 2007 as correspondent originations.²⁹ Again, per instructions from Plaintiffs’ counsel, I exclude these loans from my analysis because these were loans that Greenpoint acquired.³⁰

20. A system of Federal regulations governed the disclosure of information to borrowers in residential mortgage originations during the Class Period. Under the Real Estate Settlement Procedures Act, originators were required to disclose both direct compensation and

28. GPM-E-01-000001 – GPM-E-01-000006; GPM-E-02-000001; GPM-E-01-000003 B; GPM-E-01-000006 B; Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009).

29. *Id.*

30. See Deposition of Kevin Hughes at 91, 94 (Dec. 3, 2008).

yield spread premiums paid to mortgage brokers for loan originations.³¹ Retail originators were required to report direct compensation. Under regulations promulgated by the Federal Reserve Board under the Truth in Lending Act, borrowers were also required to be informed of the annual percentage rate (APR) of mortgage loans, an estimate of interest rates reflecting both the direct costs of origination (including origination fees and other direct charges) as well as projected interest rates over the life of the loans.³² The APR reflects the cost of yield spread premiums on wholesale loans and of analogous above par rates on retail loans and is generally regarded as a more accurate measure of the costs of borrowing than the stated interest rate on a loan.³³ Under the Home Mortgage Disclosure Act and implementing Federal Reserve Board regulations, mortgage originators are required to maintain and report a range of information about loan originations, including information on the racial characteristics of borrowers.³⁴ Finally, under the Equal Credit Opportunity Act³⁵ and Fair Housing Act,³⁶ mortgage originators such as Greenpoint are prohibited from engaging in discriminatory lending practices.

2. Discretionary Pricing Policies Have Resulted in Minorities Paying Higher Prices than Whites with Similar Risk Characteristics

21. Over the past two decades, a large number of academic studies have explored the relationship between borrower race and the availability or the cost of obtaining residential

31. Jackson & Burlingame, *supra* note 7.

32. The Truth in Lending Act, 15 U.S.C. §1606(a) (2006), and the Federal Reserve Board's Regulation Z (Truth in Lending), 12 C.F.R. §226.22(a)(1) (2008), define APR. The APR for mortgages is typically higher than the interest rate because it treats all prepaid finance charges (lender points and broker fees) as reductions in the loan principal. See *id.* §226.18(b).

33. The Truth in Lending Act, 15 U.S.C. § 1606 et seq. (2006); Federal Reserve Board's Regulation Z (Truth in Lending), 12 C.F.R. §226.22(a)(1) (2008). For a recent Federal Reserve Board discussion of APRs, see Federal Reserve System, Truth in Lending, 74 Fed. Reg. 43,232, 43,241-44 (proposed Aug. 26, 2009) (to be codified at 12 C.F.R. pt. 226).

34. See Robert B. Avery et al., *New Information Reported Under HMDA and Its Application in Fair Lending Enforcement*, FED. RES. BULL., Summer 2005, at 244.

35. Regulation B (Equal Credit Opportunity), 12 C.F.R. § 202 et seq. (2009).

36. Fair Housing Act, 42 U.S.C. § 3601 et seq.

mortgage loans in the United States. Two recent literature reviews can be found in White (2009)³⁷ and Courchane (2007).³⁸ As explained in greater detail in these reviews, early academic studies focused on the relationship between mortgage denials and the racial composition of neighborhoods.³⁹ Early studies also included audit tests of lenders. For example, a 1999 study by the Urban Institute found that minorities were offered mortgages at higher rates than whites in similar circumstances.⁴⁰ The Urban Institute findings were based in part on paired audit testing conducted by the National Fair Housing Alliance that was carried out by people of different racial and ethnic backgrounds in a sample of seven cities. Each group of testers - including one white and one or more minorities - told lenders they had similar credit histories, incomes and financial histories, and had the same type of mortgage needs. The testing found that minorities were less likely to receive information about loan products, and received less time and information from loan officers. Most importantly for our purposes, this audit study found that minorities “were quoted higher interest rates in most of the cities where tests were conducted.”⁴¹

37. See Alan M. White, *Borrowing While Black: Applying Fair Lending Laws to Risk-Based Mortgage Pricing*, 60 S. C L. REV. 677 (2009).

38. See Marsha J. Courchane, *The Pricing of Home Mortgage Loans to Minority Borrowers: How Much of the APR Differential Can We Explain?*, 29 J. REAL EST. RES. 399 (2007). In her own analysis of loan costs, Dr. Courchane finds statistically significant disparities between loan costs for minority borrowers when compared to white borrowers. While this aspect of Ms. Courchane’s analysis is consistent with my own work, I have reservations concerning certain aspects of her methodology.

39. See, e.g., Alicia H. Munnell et al., *Mortgage Lending in Boston: Interpreting HMDA Data*, 86 AM. ECON. REV. 25 (1996).

40. Margery Austin Turner & Felicity Skidmore, the Urban Institute, *MORTGAGE LENDING DISCRIMINATION: A REVIEW OF EXISTING EVIDENCE* (1999).

41. *Id.* at 8. See also *id.* at 36-37 (interest rate offered African-Americans statistically greater than those offered whites only in Atlanta tests). The report also found:

“One early analytic study found discrimination against blacks and Hispanics in interest rates and loan fees but not in loan maturities. Another also found discrimination against blacks in the setting of interest rates. Both studies used extensive statistical controls to isolate the effect of race and ethnicity from the effects of other factors. Two more recent studies examine discrimination in overages, defined as the excess of the final contractual interest rate over the lender’s official rate when it first commits to a loan. Both of these studies find cases in which the overages charged to black and Hispanic borrowers are higher than those charged white customers by a small but statistically significant amount.” *Id.* at 19.

22. These earlier studies were suggestive of significant racial effects, but suffered from an absence of controls for credit risk and other underwriting considerations when examining substantially large samples of actual loan originations as opposed to more limited audit tests. Over time, as government reporting requirements improved and litigation and various investigations offered more complete data sets, researchers were able to include a number of these controls in their studies and developed more complete empirical models of the residential mortgage origination process. Some focused on the impact of race on credit spreads and found statistically significant racial disparities.⁴² Later studies expanded this analysis by controlling for loan channels, and found reduced, but still statistically significant racial effect on the APR of mortgage loans.⁴³ Yet other studies, including my own published work, found statistically and economically significant racial disparities in the amount of compensation earned by mortgage brokers on residential mortgage originals and in FHA closing costs charged to borrowers.⁴⁴

23. The notion that minority borrowers may pay more for home loans than similarly situated white borrowers due to discretionary pricing policies is not altogether surprising. A wide body of literature has shown that individuals can be influenced (even subconsciously) by race. The theory that the racial disparities in borrowing costs are the by-product (at least in part) of

42. See Avery et al., *supra* note 34; Debbie Gruenstein Bocian, Keith S. Ernst, & Wei Li, Center for Responsible Lending, *Unfair Lending: The Effect of Race & Ethnicity on the Price of Subprime Mortgages* 3 (May 31, 2008), available at http://www.responsiblelending.org/mortgage-lending/research-analysis/rr011-Unfair_Lending-0506.pdf. See also Allen J. Fishbein & Patrick Woodall, Consumer Federation of America, *Subprime Cities: Patterns of Geographic Disparity in Subprime Lending* (Sept. 2005), available at <http://www.consumerfed.org/pdfs/Subprimecities090805.pdf>; and Allen J. Fishbein & Patrick Woodall, Consumer Federation of America, *Subprime Locations: Patterns of Geographic Disparity* (Sept. 2006), available at <http://www.consumerfed.org/pdfs/SubprimeLocationsStudy090506.pdf> (finding correlations between race and participation in subprime loan markets).

43. See Courchane, *supra* note 38; but see White, *supra* note 21, at 685-686 (questioning the appropriateness of controlling for loan channels). See also LaCour-Little, *supra* note 21 (finding racial effects on note rates in some but not all models based on a sample of loans within conforming loan size parameters).

44. See Jackson & Burlingame, *supra* note 7; Susan E. Woodward, U.S. Department of Housing & Urban Development, *A Study of Closing Costs for FHA Mortgages* (2008), available at http://www.huduser.org/Publications/pdf/FHA_closing_cost.pdf.

racially influenced credit pricing decisions in no way implies that loan officers and brokers must harbor animus toward minorities or that they are engaging in intentional discrimination. There are, for example, a number of studies that have found that economic decisionmakers are influenced by racially conscious or unconscious stereotypes.⁴⁵ For example, the Implicit Attitudes Tests (which can be completed in less than 5 minutes on the Internet)⁴⁶ suggest that many people of professed goodwill find it impossible not to treat African-American pictures differently than white pictures when asked to perform a simple sorting exercise. These tests are part of a growing literature documenting unconscious bias against African-Americans and other minorities.⁴⁷ These studies are relevant to this litigation because, to the extent that economic decisionmakers often harbor unconscious, but biased racial stereotypes, it becomes more plausible that the subjective pricing process that Greenpoint established for setting loan terms (in which a loan officer or broker can often plausibly deny that its treatment of a individual consumer was based on some attribute other than race) might mask what are in fact racially influenced decisions. In *Watson v. Fort Worth Bank & Trust*, the Supreme Court's recognition of the existence of subconscious stereotypes was cited as one of the reasons for approving the use of a disparate impact analysis to evaluate subjective decisionmaking processes at issue in that case. ("Furthermore, even if one assumed that any such discrimination can be adequately policed

45. See, e.g., Joleen Kirschenman & Kathryn M. Neckerman, *We'd Love to Hire Them But ... ! The Meaning of Race to Employers*, in THE URBAN UNDERCLASS, eds. Christopher Jencks & Paul E. Peterson (The Brookings Institution 1991).

46. *Project Implicit*, at <https://implicit.harvard.edu/implicit/>.

47. See, e.g., Eric J. Vanman et al., *The Modern Face of Prejudice and Structural Features That Moderate the Effect of Cooperation on Affect*, 73 J. PERSONALITY & SOC. PSYCHOL. 941, 944-45 (1997); Yolanda F. Niemann et al., *Intergroup Stereotypes of Working Class Blacks and Whites: Implications for Stereotype Threat*, 22 WESTERN J. BLACK STUD. 103 (1988); John F. Dovidio et al., *Racial Stereotypes: The Contents of Their Cognitive Representations*, 22 J. EXPERIMENTAL SOC. PSYCHOL. 22 (1986); Mark Chen & John A. Bargh, *Nonconscious Behavioral Confirmation Processes: The Self-Fulfilling Consequences of Automatic Stereotype Activation*, 33 J. EXPERIMENTAL SOC. PSYCHOL. 541 (1997).

through disparate treatment analysis, the problem of subconscious stereotypes and prejudices would remain.”)⁴⁸

24. There is a substantial body of empirical evidence finding that, even after controlling for differences in credit quality and other legitimate cost differentials, financial firms often charge minority borrowers more for credit than they charge similarly situated non-minority borrowers. Outside of the mortgage field summarized earlier, this evidence extends to automobile financing,⁴⁹ commercial lending,⁵⁰ and even foreign lending markets.⁵¹

25. Greenpoint’s Discretionary Pricing Policy was, in my view, susceptible to discrimination.⁵² As explained in the deposition of one Greenpoint witness, the firm engaged a larger number of mortgage brokers as an alternative to expanding its own retail operations.⁵³ While Greenpoint’s wholesale mortgage pricing was nominally based on objective criteria tied to credit quality and loan characteristics, its mortgage brokers were given discretion to place

48. *Watson v. Fort Worth Bank & Trust*, 487 U.S. 977, 990 (1988).

49. Mark A. Cohen, *Imperfect Competition in Auto Lending: Subjective Markup, Racial Disparity, and Class Action Litigation* at 36 (2008), available at http://works.bepress.com/mark_cohen/1/. Additional evidence of discriminatory treatment has been found in the pricing of automobiles themselves. See IAN AYRES, *PERVASIVE PREJUDICE?: NON-TRADITIONAL EVIDENCE OF RACE & GENDER DISCRIMINATION* ch. 3 (University of Chicago Press 2002); Ian Ayres, *Further Evidence of Discrimination in New Car Negotiations and Estimates of Its Cause*, 94 MICHIGAN LAW REV. 109 (1995).

50. David G. Blanchflower, Phillip B. Levine, & David J. Zimmerman, *Discrimination in the Small Business Credit Market*, 85 REV. ECON. & STAT. 930, 936 (Nov. 2003). See also Ken S. Cavalluzzo, Linda C. Cavalluzzo, & John D. Wolken, *Competition, Small Business Financing, and Discrimination: Evidence from a New Survey*, 75 J. BUS. 641 (2002).

51. Geraldo Cerqueiro, Hans Degryse, & Steven Ongena, *Rules versus Discretion in Loan Rate Setting* (Feb. 2008), available at <http://www.ifw-kiel.de/konfer/staff-seminar/paper/folder.2008-02-22.4077567561/degryse.pdf>.

52. That Greenpoint’s mortgage brokers might engage in discriminatory lending practices that could implicate Greenpoint’s legal obligations is confirmed by a contractual provision in Greenpoint’s agreements with mortgage brokers, under which Greenpoint required its mortgage brokers to represent that they were acting in compliance with federal fair lending laws. See Greenpoint Mortgage Funding, Inc., Broker Agreement ¶ 11.f, Deposition of J. Steven Gilcrest Exhibit 19 (Sept. 11, 2008). See also Deposition of Burnett K. Jarvis at 201 (Dec. 9, 2008) (brokers “had fair lending duties and responsibilities that they certified to become a [Greenpoint] broker”). Similarly, Greenpoint Mortgage’s Internal Policies and Procedures required that its Fair Lending Committee monitor exceptions to broker compensation limits. See Deposition of Steve Abreu Exhibit 8, ¶ 5 (Sept. 10, 2008).

53. See Deposition of Burnett K. Jarvis at 212 (Dec. 9, 2008) (“I would say that wholesale [use of mortgage brokers] was an efficient way to, you know, get business versus building your own retail network. . . . In essence, you’re outsourcing a function of your origination to someone else on a variable cost basis.”).

borrowers into higher cost above par loans to finance yield spread premiums and also to impose differential fees and charges,⁵⁴ both of which actions could – and based on my analysis of the data did – raise the APRs of minority borrowers. An additional dimension of discretion relates to Greenpoint’s practice of granting a very large number of pricing waivers at the request of mortgage brokers.⁵⁵ That is, while mortgage brokers were initially required to price wholesale mortgages from objective rate sheets, Greenpoint had a liberal practice of granting exceptions, which created another source of discretion in the pricing of wholesale mortgage. According to some contemporaneous trade press sources, Greenpoint had a reputation of being accommodating of mortgage brokers and that practice was thought to be a source of its rapid growth in wholesale lending markets during the class period.⁵⁶ Again, this latitude that Greenpoint afforded its mortgage brokers increased the likelihood of discriminatory pricing with respect to vulnerable minority borrowers.

B. Introduction to Disparate Impact Testing

26. A simple calculation of the average cost of a loan for borrowers of each race can show whether minorities pay more, on average, than white borrowers. In addition, one can break down the set of Greenpoint wholesale loans into subsets to determine whether minority borrowers with given characteristics paid more for loans than white borrowers with the same characteristics. *Regression analysis* can control for any legitimate underwriting characteristics

54. See *id.* at 213-215.

55. See Deposition of Kevin Hughes at 104-112 (Dec. 3, 2008) (noting that pricing exceptions were made on “30 to 35 percent of loans originated and/or acquired by GreenPoint”).

56. See Anthony Garritano & Scott Kersnar, *25 Tech-Savvy Lenders*, Mortgage Technology (Aug. 1, 2007) available at <http://www.mortgage-technology.com/plus/archive/?id=156640> (“GreenPoint’s claim to fame has been its use of technology to offer a broad array of mortgage products and to make the process easier for its brokers.”). See also Tom LaMalfa, *Who’s Who in Wholesale 2005*, MORTGAGE BANKING, Aug. 2006, at 80 (“GreenPoint ranked seventh for the second straight year, with volume of \$40.9 billion. Approximately 90 percent of its production came from brokers. The company is best known for its reduced-doc programs.”).

that affect the cost of a loan to a consumer and show whether minorities pay more for their loans than whites with similar risk characteristics.

27. Regression analysis is a statistical method for determining the relationship that exists in a set of data between a variable to be explained—called the “dependent variable”—and one or more “explanatory variables.” The type of regression analysis I use to evaluate disparate impact is known as “ordinary least squares” (OLS). In this case, the dependent variable is the cost of the loan to the consumer. This cost is reflected in the form of the APR of the loan, which is the measure that the staff of the Federal Reserve Board devised to communicate accurately the total cost of a loan to a consumer.⁵⁷ The explanatory variables include the race and ethnicity of the borrower and other non-race characteristics of the borrower and property that affect the cost of the loan to the lender. The regression model will show whether minority borrowers paid disproportionately higher APRs than non-minority borrowers even after controlling for plausible non-race “legitimate business need” characteristics.

1. Prima Facie Evidence of Discrimination

28. The appropriate test for assessing whether there is a *prima facie* disparate racial impact is both simple and straightforward. One must simply compare the average finance charges incurred by minority and white borrowers. To the extent one finds that the average finance charge paid by minority Greenpoint borrowers is statistically larger than that paid by white Greenpoint borrowers, this evidence is consistent with an inference that the Defendant’s Discretionary Pricing Policy has a disparate racial impact.

57. See, e.g., Regulation C (Home Mortgage Disclosure), 12 C.F.R. § 203 et seq. (2009); Regulation Z (Truth in Lending), 12 C.F.R. § 226 et seq. (2009).

29. In Section V.C of this report, I present statistics that show *prima facie* disparate racial impact. African-American borrowers on average paid \$1,093 more in finance charges than whites over five years. See Table 9. Hispanic borrowers on average paid \$1,076 more in finance charges than whites over five years. These differences are highly statistically significant.

2. Testing for Disparate Impact with Controls for Legitimate Explanatory Factors

30. It is also possible with the aggregate data made available from Greenpoint to use regression analysis to statistically analyze whether disparate racial impact persists after controlling for decision factors that “meet a legitimate business need.”⁵⁸ Thus, beyond assessing whether there is persuasive *prima facie* evidence of a disparate impact, it is possible with aggregate data to use regression analysis to assess whether there is persuasive evidence of whether a disparate impact was justified by a legitimate business need. My analysis therefore includes in a regression those variables that would reflect a legitimate business need for differential pricing practice among borrowers. If, after including these “legitimate business need” variables in the regression, the racial disparity remains and is statistically significant, then the data establishes a strong inference of racial discrimination against the affected class.

31. The kind of regressions that would be appropriate to use in this litigation – what economists call “ordinary least squares” (OLS) regressions with a limited number of right-hand side variables – are a standard and generally accepted statistical technique. In my experience, this is the form of statistical analysis that government agencies and academic experts generally

58. The quoted language comes from commentaries on ECOA regulation: “The act and regulation may prohibit a creditor practice that is discriminatory in effect because it has a disproportionately negative impact on a prohibited basis, even though the creditor has no intent to discriminate and the practice appears neutral on its face, unless the creditor practice meets a legitimate business need that cannot reasonably be achieved as well by means that are less disparate in their impact.” *Official Staff Interpretations*, Regulation B (Equal Credit Opportunity), 12 C.F.R. § 202.6(a)-2 (2009).

employ to detect discriminatory lending practices in financial institutions. And, particularly since the HMDA amendments went into effect in 2004, borrower APRs as defined under the Truth-in-Lending Act is the most common measure of the cost of borrowing in these analyses.⁵⁹

32. A regression testing for unjustified disparate impacts should control for only those variables that would provide a plausible valid business justification. It is my opinion that only attributes related to a decisionmaker's expected marginal cost⁶⁰ provide a valid business justification – and hence only such attributes should be included in the business justification regression. This standard resonates with the standard approach in the literature. For example, John Yinger succinctly describes (i) the problem of “included variable bias” (what he calls “diverting variable bias”); (ii) the need to purposefully exclude certain non-legitimate controls from a regression; and (iii) what constitutes “legitimate” controls:

Diverting variable bias arises when a variable that is not a legitimate control variable, but that is correlated with race or ethnicity, is included in the regression. The key issue, of course, is how to define what variables are “legitimate.” Under most circumstances, economists are taught to err on the side of including too many variables. In this case, however, illegitimate controls may pick up some of the effect of race or ethnicity and lead one to conclude that there is no discrimination when in fact there is. According to the definition of discrimination used here, legitimate controls are those associated with a person's qualifications to rent or buy a house, buy a car or so on-or to use a legal term business necessity.⁶¹

Notice that the legitimate controls turn on a person's ability to perform their part of the bargain – in the case of fair lending claims, that is primarily the capacity of the borrower to repay the loan

59. For recent presentations by a Federal Reserve Board economist identifying APRs as an appropriate dependent variable and outlining a methodology comparable to the one employed in this report, see Lynn Gottschalk, *Fair Lending Modeling of Pricing Decisions* (Sept. 10, 2008), available at <http://www.occ.treas.gov/flc/2008/Lynn%20Gottschalk.pdf>.

60. “Marginal” cost refers to the cost of a seller supplying one additional item (or service). A “marginal” cost contrasts with a seller's “fixed” or “overhead” costs which are invariant to the number of items (or services) supplied. The concept of “cost” includes earning a reasonable profit as a return on capital invested.

61. John Yinger, *Evidence on Discrimination in Consumer Markets*, 12 J. ECON. PERSPECTIVES 23, 27 (1998).

according to its terms. In the credit context, other scholars have similarly applied a performance standard for determining what characteristics are relevant:

Discrimination occurs whenever the terms of a transaction are affected by personal characteristics of the participants that are not relevant to the transaction. In credit markets, discrimination on the basis of race and/or gender exist if loan approval rates or interest rates charged differ across groups with equal ability to repay.⁶²

Again, it is legitimate to control for factors that relate to a person's probable performance of her contractual commitment – which in the credit context is chiefly whether or not the loan will be repaid:

Discrimination may be apparent if banks approve loans to equally credit-worthy minority and white-owned firms, but charge the minority-owned firms a higher rate of interest.⁶³

Focusing on creditworthiness or the likelihood of repayment is also consistent with a standard that focuses on a decisionmaker's costs. Borrowers who fail to pay off their loans can impose substantial costs on a lender. It would be appropriate in analyzing a lender's decisions about a borrower's cost of borrowing to control for factors that affect the likely costs of default.⁶⁴

33. Greenpoint's centralized electronic databases include abundant and comprehensive evidence of the basis on which Greenpoint evaluated individual borrowers'

62. Blanchflower, et al., *supra* note 50, at 930.

63. *Id.* at 940.

64. See *A.B. & S. Auto Service, Inc. v. South Shore Bank of Chicago*, 962 F. Supp. 1056 (N.D. Ill. 1997) (“[In a disparate impact claim under the ECOA], once the plaintiff has made the prima facie case, the defendant-lender must demonstrate that any policy, procedure, or practice has a manifest relationship to the creditworthiness of the applicant....In other words, the onus is on the defendant to show that the particular practice make's defendant's credit evaluation system more predictive than it would be otherwise.”). See also *Lewis v. ACB Business Services, Inc.*, 135 F.3d 389, 406 (6th Cir. 1998) (“The Act was only intended to prohibit credit determinations based on ‘characteristics unrelated to creditworthiness.’”). Attributes related solely to the potential for supra-competitive revenues that a lender or broker might extract from different classes of consumers do not constitute a valid business justification. Extracting supra-competitive revenues from a class of consumers – not because they impose higher costs on a seller but merely because the seller has the power to do so – is not consistent with business necessity (and thus would constitute an unjustified disparate impact). Sellers are justified in charging higher prices to cover their expected costs of serving particular types of consumers. Such pricing is consistent with business necessity. But sellers are not justified in charging higher prices to a disproportionately African-American and Hispanic class of consumers simply to make supra-competitive profits.

creditworthiness. Greenpoint's electronic data would allow them to statistically evaluate factors related to the borrower's credit history, the loan collateral, the borrower's "capacity" to borrow and the borrower's stability.

34. The credit industry is in many ways unique in amassing centralized and aggregate data on the creditworthiness of individual borrowers. The use of statistical "credit scoring" systems to determine whether to grant a loan and at what rate is well established and has largely replaced more subjective determinations. As one reviewer of the credit scoring approach noted:

The arrival of credit cards in the late 1960s made the banks and other credit card issuers realize the usefulness of credit scoring. The number of people applying for credit cards each day made it impossible both in economic and manpower terms to do anything but automate the lending decision. When these organizations used credit scoring, they found that it also was a much better predictor than any judgmental scheme and default rates would drop by 50% or more ...

The event that ensured the complete acceptance of credit scoring was the passing of the Equal Credit Opportunity Acts (ECOA 1975, ECOA 1976) in the US in 1975 and 1976.⁶⁵

Regulation B of ECOA comprehensively regulates the workings of "credit scoring systems" to assess creditworthiness:

To qualify as an *empirically derived, demonstrably and statistically sound, credit scoring system*, the system must be: (i) Based on data that are derived from an empirical comparison of sample groups of the population of creditworthy and noncreditworthy applicants who applied for credit within a reasonable preceding period of time; (ii) Developed for the purpose of evaluating the creditworthiness of applicants with respect to the legitimate business interests of the creditor utilizing the system (including, but not limited to, minimizing bad debt losses and operating expenses in accordance with the creditor's business judgment); (iii) Developed and validated using accepted statistical principles and methodology; and (iv) Periodically revalidated by the use of appropriate statistical principles and methodology and adjusted as necessary to maintain predictive ability.⁶⁶

65. Lyn C. Thomas, *A Survey of Credit and Behavioral Scoring: Forecasting Financial Risk of Lending to Consumers*, 16 INT'L J. FORECASTING 149 (2000).

66. Regulation B (Equal Credit Opportunity), 12 C.F.R. § 202.2 (p) (2009).

35. Through Greenpoint's data, I can reliably control for any creditworthiness variables that could influence the cost of the mortgage to the borrower, so long as those variables fulfill a legitimate business need. This is an industry where, except for discretionary pricing:

- lending decisions are made en masse by automated systems; and
- lending decisions are based on the formulaic application of objective, statistically-validated criteria, which also determine the price at which loans are sold into the secondary market.

The whole purpose of this centralized credit pricing process is to base credit determinations on arms-length, objective criteria whose validity can be periodically assessed with aggregate statistical analysis. Another chief purpose of the objective underwriting process is to avoid bias against certain classes of consumers.⁶⁷ Any argument that disparate impact cannot be proven on a class wide basis because the creditworthiness of a borrower requires an individualized inquiry is unjustified.

V. A STATISTICAL ANALYSIS OF DEFENDANT'S DATA SHOWS DISPARATE IMPACT

36. In this section, I describe Defendant's mortgage loan data provided to Plaintiffs, which is common evidence that I use to show the disparate impact of Defendant's Discretionary Pricing Policy to minority borrowers. Unless otherwise indicated, my analysis only considers Defendant's wholesale loans.⁶⁸

67. Deposition of J. Steven Gilcrest at 83 (Sep. 11, 2008). "Q. Is the reason why the underwriting process used an objective criteria, at least in part, to avoid biases to specific borrowers? A. Yes."

68. I include as wholesale loans all the loans for which the business channel could not be definitively classified, but most of which were wholesale loans, as discussed above in n.23. In Appendix 5, I perform several robustness checks with alternative formulations that control for loan classifications, including two – Models (17) and (18) – which control for the unknown business channel. In these models, the key results of my analysis are not materially changed.

A. Overview of Defendant's Data

37. Plaintiffs have been provided with a database of loans originated by Greenpoint from 1999 through 2007⁶⁹ along with files explaining the data contained in that database.⁷⁰ This data constitutes common evidence of disparate impact to the Class. Defendant's loan database includes data about the applicants and the applicants' properties that Greenpoint used in its underwriting process. The database also includes details about the characteristics of the loans, including loan interest rates. Finally, the database includes demographic information of the applicants collected by Greenpoint pursuant to HMDA regulations, including race and ethnicity.

38. As of the date of this report, the version of Greenpoint's database provided to Plaintiffs is incomplete in that data for many variables are missing for several years. For example, data on the APR and broker compensation for those loans is only available for loans originated from 2004 to 2007. Therefore, my analysis of the cost of Greenpoint's loans in this report is limited to those 2004-2007 loans.⁷¹

39. Defendant's loan database includes information on the race and ethnicity of the borrower and co-borrower. These race classifications appear to follow the conventions set forth through HMDA data filing requirements. Beginning in 2004, HMDA records ethnicity and race in separate variables. The two ethnicity options consisted of Hispanic or Latino, or not Hispanic or Latino. Therefore, an applicant can be identified with both a race and an ethnicity beginning in 2004. For example, an applicant can be identified as being both African American and Hispanic.

69. GPM-E-01-000001 - GPM-E-01-000006; GPM-E-02-000001; GPM-E-01-000003 B; GPM-E-01-000006 B.

70. Greenpoint Mortgage Funding, Inc., *Data Dictionary for Data Produced on August 28, 2008*; Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009), Exhibit A.

71. As I discussed earlier, I exclude from my analysis the approximately 29,000 loans identified as retail or correspondent loans in Defendant's loan database. Further discussion of various technical refinements to the data set is presented in the note to Appendix 4.

The HMDA standards also allow for applicants and co-applicants to be assigned to multiple race classifications beginning in 2004.

40. For all loans, the race and ethnicity can be recorded by the lender as not provided if the application was not taken in-person and the applicant failed to give a response to the race or ethnicity questions on the loan application. If the applicant was “not a natural person” (such as a business), then the race and ethnicity was recorded as “Not applicable”.⁷²

41. For purposes of my basic analysis,⁷³ I assign each loan to a single race based on the race and ethnicity of the borrower or co-borrower in Defendant’s loan database in a sequential order. First, I classify the race of a loan as “African American” if any of the races given for either the borrower or co-borrower is African American. Next, I classify the race of a loan as “Hispanic” if (1) the ethnicity of the borrower or co-borrower is “Hispanic or Latino”, and (2) I do not classify the loan as “African American”. I classify the race of a loan as “Asian” if (1) any of the races given for either the borrower or co-borrower is Asian, and (2) I do not classify the loan as “African American” or “Hispanic”. I classify the race of a loan as “American Indian” if (1) any of the races given for either the borrower or co-borrower is American Indian or Alaskan Native, and (2) I do not classify the loan as “African American”, “Hispanic”, or “Asian”. I classify the race of a loan as “Hawaiian” if (1) any of the races given for either the borrower or co-borrower is Native Hawaiian or Other Pacific Islander, and (2) I do not classify the loan as “African American”, “Hispanic”, “Asian”, or “American Indian”. I classify the race

72. See, e.g., Federal Financial Institutions Examination Council, *A Guide to HMDA Reporting: Getting It Right!* (2006 ed.), at A-5 – A-7, available at <http://www.ffiec.gov/Hmda/pdf/2006guide.pdf>. Applicants could also be classified according to HMDA standards as “Not applicable” under other circumstances if the loan application was taken in 2003 but final action on the loan did not occur until 2004 or later. See *SUPPLEMENT I TO PART 203—Staff Commentary*, Regulation C (Home Mortgage Disclosure), 12 C.F.R. § 203.4(a)(iv)(B)(3) (2009).

73. In Appendix 7, I analyze alternative racial/ethnic classifications of loans, which do not affect the substance of the findings of disparate impact in my basic analysis.

of a loan as “White” if (1) the first race listed for the borrower is White, (2) any other race listed for the borrower is unknown or missing, (3) the co-borrower’s race is White or unknown, and (4) I do not classify the loan as “African American”, “Hispanic”, “Asian”, or “American Indian”. I classify the race of all other loans as “Missing”. Table 2 shows the breakdown of the wholesale loans in Defendant’s loan database by year of origination based on this racial classification.

TABLE 2: RACIAL COMPOSITION OF BORROWERS IN DEFENDANT’S LOAN DATABASE

Year	American Indian	Asian	African American	Hawaiian	Hispanic	Missing	White	Total
2004	329	8,243	7,319	729	13,901	9,622	72,804	112,947
2005	382	11,053	8,161	1,068	17,333	7,705	64,974	110,676
2006	496	8,944	10,478	1,049	24,269	8,915	51,655	105,806
2007	313	3,232	4,223	353	9,119	4,701	20,851	42,792
Total 1	,520	31,472	30,181	3,199	64,622	30,943	210,284	372,221
% of Total	0.4%	8.5%	8.1%	0.9%	17.4%	8.3%	56.5%	100.0%

As Table 2 shows, 8.1 percent of the loans in Defendant’s loan database were made to African American borrowers, and another 17.4 percent were made to Hispanic borrowers. At least 94,000 Greenpoint loans were made to African American and Hispanic borrowers from 2004 to 2007.

42. Defendant’s loan database contains several variables related to the cost of the loan to borrowers that can be divided into two categories: interest rates and fees. Two of the interest rate variables in Defendant’s loan database are the note rate and the APR. The note rate of a mortgage loan is the interest rate upon which mortgage payments are calculated. For a fixed-rate mortgage, the interest rate of the loan is always equal to the initial note rate. For adjustable rate mortgages (ARMs), the interest rate for the loan can change after a specified period of time. The note rate as given in Defendant’s loan database does not consider any projected future changes in the loan’s interest rate for adjustable-rate loans, as the APR does. Examining only the initial interest rate for disparities would not account for disparities caused by anticipated future interest rate changes for adjustable-rate loans, especially if the initial interest rate is a low “teaser” rate in

effect for a brief period. In addition, unlike the APR, the note rate does not incorporate any upfront fees paid by the borrower. For example, the loan for the named plaintiffs Ramirez's loan has an APR (6.191 percent) that is more than four percentage points higher than the initial interest rate of the loan (2 percent). Because the APR takes into account forecasted changes in the loan interest rate and upfront fees, it is a better representation of the cost of the loan than the initial interest rate. Therefore, the APR is a more appropriate interest rate to use to measure disparate impact than the initial interest rate of the loan as represented by the note rate.

43. In addition to the interest rate, Defendant's loan database includes numerous variables related to the characteristics of the borrower, home, and loan. Home characteristics include the type of property (such as one-to-four family or manufactured housing) and whether the property will be owner-occupied. Borrower characteristics (besides race and ethnicity) include debt-to-income ratio ("total debt ratio"), FICO credit score, and the level of documentation given for the loan (such as "Full Documentation", "Stated Income", and "NIV - No income verif (Limited EZ Doc)").

44. Loan characteristics in the database include the loan amount, the purpose of the loan (such as purchase or refinance), the term length of the loan (10-year, 15-year, 30-year, etc.), the length of any prepayment penalty (for some years), and the lien status of the loan (first lien or subordinate lien). The database also categorizes each loan from 2004 to 2007 by one of 538 unique loan program codes. The descriptions of these loan program codes include "ALT A AP_30 YEAR FIXED", "CONFORMING A GX_30 YEAR FIXED AU", "ALT A AP_PIG_3YR/6MO LIBOR ARM I.O.", and "JUMBO A AQ_PIG_3YR/6MO I.O. LIBOR ARM". General descriptions of the meaning and structure for many of the loan program codes

are also provided in documentation provided to Plaintiffs.⁷⁴ Using this information, I categorized the 538 unique loan program codes into 59 categories of loans based on their term structure, such as 30-year fixed, 15-year fixed, 2yr/1yr ARM, 3yr/6mo ARM, and 30/15 balloon.

45. Appendix 4 includes summary statistics of the loan cost variables and the other borrower, home, and loan characteristics contained in Defendant's loan database. Should Greenpoint produce additional variables to Plaintiffs that would be appropriate to incorporate in a disparate impact analysis, I will update my analysis accordingly.

B. Mean Comparisons Show that Minorities Paid More for Greenpoint Loans than White Borrowers with Similar Risk Characteristics

46. As I discussed above, regression analysis is the primary tool I use to estimate disparity in the cost to minorities for Greenpoint mortgages because regression analysis can control for the loans' risk-based characteristics with valid business justification. Before performing the regression analysis, I first examine the simple mean costs of Greenpoint mortgages for minorities and for whites. Table 3 shows the mean APR for wholesale loans made to whites and minorities in Defendant's loan database.

TABLE 3: MEAN APR BY RACE, 2004-2007

Year	Mean for White Borrowers	Mean for African American Borrowers	<i>Difference between African American & White Borrowers</i>	Mean APR for Hispanic Borrowers	<i>Difference between Hispanic & White Borrowers</i>
<i>APR (%)</i>					
2004	5.251	5.848	0.597	5.534	0.283
2005	6.482	6.752	0.271	6.509	0.027
2006	8.102	8.364	0.262	8.207	0.106
2007	7.976	8.214	0.237	8.135	0.159
Total	6.602	7.297	0.695	7.166	0.565

74. Greenpoint Mortgage Funding, Inc., *Data Dictionary for Data Produced on August 28, 2008*; Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009) (Exhibits A & B).

Table 3 shows that the mean APR for African American borrowers is consistently higher than the mean APR for white borrowers in every year. The mean APR for Hispanic borrowers is always higher than the mean APR for white borrowers. Across all years, the average African American APR is 69.5 basis points higher and the average Hispanic APR is 56.5 basis points higher than the average white APR. These averages by themselves provide evidence of disparate racial impact. However, these raw differences in APRs are not as informative as the regression analysis I perform below because the risk-based characteristics of the loan are not taken into account in Table 3. It is possible that the differences shown in Table 3 may be explained by the risk characteristics of the borrower and loan with valid business justification. The regression analysis will control for these risk-based characteristics.

47. Before moving on to the regression analysis, I examine loan costs for borrowers with similar risk profiles by comparing the mean APR for borrowers of a given race and risk profile to the mean APR for borrowers of another race and the same risk profile. My measure of borrower risk profile in this illustrative comparison is the borrower credit score. Table 4 shows the mean APR for loans made to minorities and whites in Defendant's loan database broken down by credit score ranges.

TABLE 4: MEAN APR BY RACE AND CREDIT SCORE, 2004-2007

	African American		Hispanic		Whites		Difference between Mean Af. Amer. APR & Mean White APR	Difference between Mean Hisp. APR & Mean White APR
	Loans	Mean APR	Loans	Mean APR	Loans	Mean APR		
Missing score	58	7.785	123	7.550	341	7.314	0.471	0.236
300-599	30	8.261	38	7.711	110	7.385	0.876	0.326
600-619	50	7.936	69	7.167	195	7.383	0.553	-0.216
620-639	1,079	7.344	1,442	7.162	4,174	6.976	0.367	0.186
640-659	3,028	7.527	4,475	7.416	12,744	6.989	0.538	0.427
660-679	5,364	7.572	9,586	7.567	25,173	6.946	0.627	0.621
680-699	5,797	7.257	11,604	7.212	33,940	6.634	0.623	0.578
700-719	5,228	7.263	12,050	7.089	35,002	6.627	0.636	0.462
720-739	3,641	7.151	9,219	7.060	29,045	6.525	0.626	0.535
≥ 740	5,906	7.064	16,016	6.940	69,560	6.380	0.684	0.560
All Credit Scores	30,181	7.297	64,622	7.166	210,284	6.602	0.695	0.565

As Table 4 shows, the mean APR for Greenpoint African American borrowers is always higher than the mean APR for its white borrowers, regardless of the range of credit scores used. The mean APR for Hispanic borrowers is always higher than the mean APR for white borrowers for all credit scores except in one instance in which the data sample is extremely small.

C. Regression Models Show Disparate Impact on Minorities

48. As discussed above, regression analysis is the method by which I measure disparate impact because regression analysis can control for the risk-based attributes that lenders use in a race-neutral underwriting process. As I discussed above, a regression model is a mathematical equation that measures the relationship between a “dependent variable” (the APR, in this case) and numerous “explanatory” variables. In the regression model I employ here, I use the racial identity of the borrowers and objective risk-based characteristics of the borrowers to explain loan prices in terms of the APR.⁷⁵

49. Defendant’s own data, rate sheets,⁷⁶ and the existing academic literature inform my choices of the characteristics to use as explanatory variables in the regressions. Major explanatory variables considered in the literature and rate sheets include the applicant’s credit history, the type of the property, the applicant’s total debt ratio, the amount of the loan, the loan-to-value ratio, the combined loan-to-value ratio, the loan term, the lien position of the loan, the level of documentation provided by the applicant, the presence of any prepayment penalties, and

75. The regression model that I use to show disparate impact to the Class takes a form similar to Equation 1:

$$[1] \quad APR_i = \beta_0 + \beta_1 AfAm_i + \beta_2 Hispanic_i + \sum_r \beta_r x_{r,i} + \sum_k \beta_k x_{k,i} + \varepsilon_i,$$

where APR_i is the APR of customer i ’s loan, $AfAm_i$ is an indicator (or “dummy”) variable equal to one when borrower i is an African American, $Hispanic_i$ is an indicator variable equal to one when borrower i is an Hispanic, $x_{r,i}$ represents all the other potential races (excluding whites) for borrowers, $x_{k,i}$ represents all other observable characteristics that could explain the price of the loan, and ε_i represents the error term. In this report, I estimate all regression models with robust standard errors to account for any potential heteroscedasticity in the error term.

76. See Deposition of Steve Abreu Exhibit 10 (Sep. 10, 2008); Deposition of Kevin Hughes Exhibit 3 (Dec. 3, 2008).

the purpose of the loan.⁷⁷ Greenpoint included many of these risk-based variables in their marketing materials to purchasers in the secondary market, lending credence to the conjecture that these variables are risk-based metrics that meet a business necessity.⁷⁸ The explanatory variables in the regression model could also include the time at which the interest rate was locked on the loan and the location of the property in terms of broad geographic boundaries such as states or metropolitan areas.

50. Estimating the regression model on Defendant's data determines the marginal effect of each explanatory characteristic (including the applicant's race) on the APR of the loan. The model that I use is estimated over hundreds of thousands of observations, making this type of analysis appropriate for class-wide treatment. As long as the marginal effects of the racial identity of minority borrowers are greater than zero and statistically significant, then the model will show that Defendant's policies had a disparate impact on minorities.

51. Appendix 5 includes complete results from various regressions estimated on Defendant's loan database. Table 5 shows the marginal effect of a borrower's minority race (relative to white borrowers) as measured by estimating regressions using different sets of explanatory variables over all the loans with available data in Defendant's loan database. Each number (or "coefficient") measuring the marginal effect of race in Table 5 can be interpreted as the marginal increment by which the APR for minority borrowers exceeded the APR for white borrowers with the same non-race characteristics being controlled for in the regressions.

77. See, e.g., *id.*; Bocian, et al., *supra* note 42; Courchane, *supra* note 38; Jackson & Burlingame, *supra* note 7; Elaine Fortowsky & Michael LaCour-Little, *Credit Scoring and Disparate Impact*, Working Paper, Wells Fargo Home Mortgage, available at <http://fic.wharton.upenn.edu/fic/lacour.pdf>.

78. Deposition of Kevin Hughes at 35-40 (Dec. 3, 2008).

TABLE 5: EFFECT OF RACE ON APR (BASIS POINTS) USING REGRESSIONS ESTIMATED ON ALL LOANS

Race	Model (1)	Model (2)	Model (3)	Model (4)
African American	69.53*** (1.11)	27.08*** (0.58)	22.40*** (0.58)	9.44*** (0.44)
Hispanic	56.49*** (0.79)	8.35*** (0.39)	6.52*** (0.38)	7.64*** (0.32)
American Indian	18.34*** (3.91)	-17.65*** (2.33)	-36.12*** (2.66)	-5.83*** (2.02)
Asian	8.98*** (1.01)	-3.33*** (0.49)	-1.95*** (0.49)	2.61*** (0.39)
Hawaiian	27.67*** (3.06)	-1.09 (1.33)	-1.90 (1.32)	4.36*** (1.08)
Missing	26.39*** (1.12)	9.25*** (0.62)	7.62*** (0.61)	4.08*** (0.42)
Observations	372,186	372,186	372,186	372,038
R-squared	0.02055	0.73689	0.74322	0.87352
Adjusted R-squared	0.02053	0.73685	0.74317	0.87330

Note: Standard errors in parentheses.

*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%.

Coefficients and standard errors for other explanatory variables are shown in Appendix 5.

Explanatory variables for each model consist of:

Model (1): Race dummy variables only.

Model (2): Race dummy variables, interest rate lock month dummy variables, and subordinate lien dummy variable.

Model (3): Same as Model (2), but add FICO score bin dummy variables.

Model (4): Same as Model (3), but add loan amount bin dummy variables, LTV bin dummy variables (for first lien loans), CLTV bin dummy variables (for subordinate lien loans), self-employed borrower/co-borrower dummy variable, total debt ratio bin dummy variables, HELOC dummy variable, FHA/VA dummy variable, co-applicant dummy variable, documentation type dummy variables, loan purpose dummy variables, loan term dummy variables (e.g., 15-year, 20-year, 30-year), loan payment type and term dummy variables (e.g., 30-year fixed, 3/1 ARM, 40/30 balloon), dummy variables for residence type interacted with property type, state dummy variables, and metropolitan area (MSA) dummy variables.

Alternative model specifications estimated on the entire sample of loans can be found in Appendix 5.

Model (1) is the most basic regression model in Table 5; it controls for the race of the borrowers but no other characteristics of the loans. This model implies that African Americans pay 69.5 basis points more in APR than whites, and Hispanics pay 56.5 basis points more in APR than whites. These differences are statistically significant ($p < 1\%$). Model (2) controls for race as well as the month at which the loan's interest rate was locked. This addition helps control for interest rate movements over time. Model (2) also controls for whether a loan was a subordinate lien loan.

52. Because Model (2) does not control for any credit-related characteristics of the borrower, Model (3) adds controls for the borrower's credit score. Model (3) shows that, after adding basic controls for borrower's credit worthiness, African Americans' APRs are 22.4 basis points greater than whites' APRs, and Hispanics' APRs are 6.5 basis points greater than whites' APRs. Finally, Model (4) controls for a host of other potential risk-based characteristics, in addition to credit scores, widely considered in the literature to be useful in predicting loan performance. Some of these additional characteristics include loan-to-value ratios, debt ratios, the structure of the loan (in terms of whether it has a fixed or adjustable rate, the fixed-period before rate adjustment, etc.), and the term of the loan (10-year, 20-year, 30-year, etc.). Model (4) shows that even when a comprehensive list of risk-based characteristics are controlled for, African Americans' APRs are 9.4 basis points greater than whites' APRs, and Hispanics' APRs are 7.6 basis points greater than whites' APRs. These disparities are statistically significant at the 1 percent confidence level. These regression results show that Defendant's minority borrowers pay more in finance charges (reflected by the APR) than white borrowers with similar risk characteristics.⁷⁹ Model (4) is my preferred model for estimating the discriminatory impact of Defendant's Discretionary Pricing Policy as the model incorporates all of the important risk-based controls used to price mortgages in the secondary market and it produces a good fit with the dependent variable, generating an adjusted R-squared of 0.8733, meaning that the model explains over 87 percent of the variation in loan pricing.

79. I do not include in Model (4) a set of variables representing seven Greenpoint program categories (A Minus, Alt-A, Closed-End Second, Commercial, Conforming A, Jumbo A, or unknown). Controlling for all these categories is, in my view, potentially misleading because I already control for other risk-based characteristics that would correlate with these categories. To the extent that borrowers were steered by Defendant or its brokers into more expensive A Minus or Alt-A loans when they could have qualified for Conforming loans, controlling for these categories in a regression would understate the true disparity in loan costs for minorities compared to whites. Nevertheless, I include a regression (Model (16)) in Appendix 5 that controls for all these loan categories. The statistically significant disparate impact on minority APRs persists when controlling for these program categories.

53. In addition to estimating several regression models over all loans in Defendant's loan database, I also estimate separate regressions for different samples of loans within the database to check the robustness of my results. Table 6 shows the coefficients for African Americans and Hispanics when estimating regressions using the same explanatory variables as Model (4) over subsets of the database rather than all loans in the database. The results in Table 6 reflect Model (4) estimated separately for first lien loans, subordinate lien loans, loans originated in 2004, loans originated in 2005, loans originated in 2006, and loans originated in 2007.

TABLE 6: EFFECT OF RACE ON APR (BASIS POINTS) USING SEPARATE REGRESSIONS BY YEAR, LIEN STATUS, & BUSINESS CHANNEL

	African American	Hispanic	Observations	Adj. R-sq.
<i>Model (4) Estimated for All Loans</i>	9.44*** (0.44)	7.64*** (0.32)	372,038	0.87330
<i>Model (4) Estimated Separately by Lien Status</i>				
Model (4-L1): First Lien	8.98*** (0.43)	8.66*** (0.31)	340,512	0.81189
Model (4-L2): Subordinate Lien	5.42*** (1.50)	-2.01* (1.15)	31,526	0.77111
<i>Model (4) Estimated Separately by Year of Origination¹</i>				
Model (4-2004)	10.60*** (0.67)	7.21*** (0.49)	112,946	0.88526
Model (4-2005)	7.29*** (0.59)	3.79*** (0.39)	110,582	0.83258
Model (4-2006)	5.63*** (0.64)	1.66*** (0.46)	105,787	0.88072
Model (4-2007)	7.15*** (0.98)	2.07*** (0.72)	42,723	0.87890

Note: Standard errors in parentheses.

*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%.

Coefficients and standard errors for other explanatory variables are shown in Appendix 6.

¹The models estimated separately on individual years include additional variables not included in the models estimated over multiple years at once because some variables are only provided in the database for certain years:

2004: Length of rate lock; presence of a prepayment penalty.

2005: Length of rate lock; type of refinance (cash-out or rate and term); lender-paid mortgage insurance presence; waiver of escrow for taxes and insurance; presence & length of prepayment penalty.

2006: Length of rate lock; type of refinance (cash-out or rate and term); lender-paid mortgage insurance presence; waiver of escrow for taxes and insurance; presence & length of prepayment penalty.

2007: Type of refinance (cash-out or rate and term).

As Table 6 shows, every subset of the data examined shows a statistically significant, positive disparity between minority and white APRs, with the exception of subordinate-lien loans for Hispanic borrowers, which represent only 6,831 loans (less than 2 percent of the 372,000 wholesale loans in the data). These results indicate that the disparities between whites and

minorities persist across the spectrum of Greenpoint loans, and are not isolated to a specific time period or loan type, besides the limited number of subordinate-lien Hispanic loans.⁸⁰

54. To further illustrate the persistence of disparities between minorities and whites regardless of borrower credit characteristics, I construct an alternative regression specification to Model (4) called Model (4-RF) in which I interact the race dummy variables with the FICO score dummy variables. All other explanatory variables in Model (4-RF) are the same as Model (4). By using interactive terms in Model (4-RF), I can measure the effect of minority status on APR for borrowers within a given range of FICO scores. Using the interactive terms in the regression analysis is analogous to Table 4, with the addition that the regression controls for the other risk-based characteristics of the borrower and loan, such as lien status, rate lock month, loan-to-value ratio, and loan program characteristics, that the mean comparisons in Table 4 do not incorporate. Table 7 shows the coefficients for the interactive terms of minority and FICO scores.⁸¹

80. During the Class period, lenders often appear to have originated a subordinate lien loan simultaneously with a first lien loan. For example, when 100 percent of a home's value was financed, borrowers would often take a first-lien loan for 80 percent of the home value and a subordinate lien loan for the other 20 percent of the home value. In calculating APRs, many of the upfront closing costs, including broker fees, would be allocated to the first-lien loan in such combinations. For Greenpoint's wholesale loans with broker fee data, the mean broker fee for first-lien loans was \$5,621, whereas the mean broker fee for subordinate-lien loans was \$404. To the extent that any of the disparate impact in the APR for Greenpoint loans comes from broker fees allocated to the first-lien loans, an analysis of first-lien loan APRs would show greater disparate impact than an analysis of subordinate lien loan. To the extent that appropriate data is available in the Defendant's database, I may undertake additional analysis of the relationship between subordinated and first-lien loans.

81. As another robustness check, I construct two other models shown only in Appendix 7 (along with the model using the interaction of race and FICO scores). These models use alternative classifications of loans by race to the classification described at the beginning of Section V. These alternative classifications are explained in Appendix 7. The results in Appendix 7 show that disparate impact for minority borrowers persists under these alternative classifications.

TABLE 7: RACE EFFECTS ON APR USING INTERACTIONS OF RACE & FICO SCORE

Model (4-RF)	African American	Hispanic
FICO missing	33.61** (14.62)	37.38*** (9.82)
FICO < 600	64.98*** (23.15)	22.60 (26.29)
600 ≤ FICO < 620	35.53** (17.95)	-28.33** (13.88)
620 ≤ FICO < 640	4.57* (2.58)	6.49*** (2.39)
640 ≤ FICO < 660	11.59*** (1.51)	11.63*** (1.18)
660 ≤ FICO < 680	12.69*** (1.04)	12.24*** (0.78)
680 ≤ FICO < 700	10.83*** (0.94)	10.21*** (0.67)
700 ≤ FICO < 720	9.15*** (0.95)	7.11*** (0.66)
720 ≤ FICO < 740	8.12*** (1.15)	6.47*** (0.77)
FICO ≥ 740	6.66*** (0.93)	3.54*** (0.56)
Observations	372,038	
Adj. R-sq.	0.87353	

Note: Standard errors in parentheses.

*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%.

Coefficients and standard errors for other explanatory variables are shown in Appendix 7.

The coefficients in Table 7 show the disparity in APR between minorities with the given range of FICO scores and whites with the given range of FICO scores, when controlling for all the other risk-based characteristics included in Model (4). For example, the APR for a Greenpoint loan made to an African American with a FICO score less than 600 is an average of 65.0 basis points greater than the APR for a loan made to a white borrower with the same FICO score, after controlling for the other variables included in Model (4). As credit scores increase, the disparities in APRs between minority and white borrowers persist, but tend to decrease. For example, the APR for a Greenpoint loan made to an African American with a credit score of at least 740 is an average of 6.7 basis points greater than the APR for a white borrower with a similar credit score. The coefficient for Hispanic borrowers with credit scores between 600 and 620 (representing

only 69 loans, as shown in Table 4) is the only negative coefficient in Table 7. The results for all other subsets in Table 7 are further confirmation that disparities in loan costs between minorities and whites cannot be explained by differences in credit quality.

55. The analysis of Defendant's data using regression analysis shows that Defendant's policies had a disparate impact on the Class as alleged by Plaintiffs. Defendant's data shows that African Americans and Hispanics paid more for loans than whites with similar risk characteristics. As elaborated in Appendices 5-7, these findings are robust to numerous alternative formulations of my basic model. This data analysis is common to all Class members, using data that is common to all Class members, and shows disparate impact which is common to the Class.

VI. ANALYSIS OF THE TYPICALITY OF THE NAMED PLAINTIFFS' CLAIMS

56. Using information provided in the Complaint and plaintiff HUD-1 statements,⁸² I have identified each of the individual named plaintiffs' loans in the data produced by Greenpoint to Plaintiffs. Each of the named Plaintiffs' loans includes the interest rate (in terms of the original note rate and the APR) and data on the risk-based characteristics controlled for in the regressions in Section V.

57. Ana Ramirez and Ismael Ramierz, Hispanic borrowers, received a broker-originated \$469,000 refinance loan from Greenpoint in August 2005 for their primary residence in Massachusetts. The credit score listed for the Ramirez loan in Defendant's loan database is [REDACTED] and they received an Alt-A 30-year ARM with a fixed-rate of 2 percent for the first month, resetting every 12 months thereafter. The APR for the Ramirez's loan was 6.191 percent.

82. HUD-1 Settlement Statement for Ricky Norris [REDACTED] (Aug. 9, 2007).

58. Jorge Salazar, a Hispanic borrower, received a broker-originated \$475,000 refinance loan from Greenpoint in August 2006 for his primary residence in California. Mr. Salazar's credit score was [REDACTED], and he received a 30-year loan with a fixed-rate of 6.875 percent. The APR for Mr. Salazar's loan was 7.182 percent.

59. Ricky Norris,⁸³ an African-American borrower, received a broker-originated \$137,000 purchase loan from Greenpoint in August 2007 for a single-family investment property in Maryland. Mr. Norris's credit score was [REDACTED], and he received an Alt-A negative amortization interest-only 30-year ARM with a fixed-rate for the first 5 years, resetting every 6 months thereafter. The APR for Mr. Norris's loan was 9.649 percent.

60. Using coefficients from the regression models estimated in Section V, I calculate the APR for each loan of the named Plaintiffs after removing the marginal effect the Plaintiffs' race on the APR. That is, I calculate the Plaintiffs' APRs *but-for* the disparate impact of Defendant's policies. This but-for APR represents the estimated race-neutral cost of the loan to the named Plaintiff.

61. Table 8 shows the named Plaintiffs' actual APRs, less the marginal effect that their minority status had on the actual APR. This is calculated by subtracting the race coefficient corresponding to the Plaintiff's race from the Plaintiff's actual APR. The race coefficients and estimated race-neutral APRs are calculated using (1) Model (4) as it was estimated on the entire sample of loans in Defendant's loan database (shown in Table 5), (2) Model (4-L1) as it was estimated separately on the first-lien loans (shown in Table 6) (all named Plaintiff loans were first-lien loans), (3) Model (4-2005), (4-2006), and (4-2007) as they were estimated separately by

83. While preparing this report, I was notified by Plaintiffs' counsel that Mr. Norris had died.

the year of the loan origination (shown in Table 6), and (4) Model (4-RF) using the interaction of race indicator variables and FICO range indicator variables (shown in Table 7).

TABLE 8: ACTUAL AND ESTIMATED RACE-NEUTRAL APRS (%) OF NAMED PLAINTIFFS

	Norris	Ramirez	Salazar
Actual APR	9.649	6.191	7.182
<i>Model (4) Estimated Race-Neutral APRs for All Wholesale Loans</i>			
Actual APR less Marginal Effect of Minority Status	9.555	6.115	7.106
Difference from Actual	0.094	0.076	0.076
<i>Model (4-L1) Estimated Race-Neutral APRs for First Lien Wholesale Loans</i>			
Actual APR less Marginal Effect of Minority Status	9.559	6.104	7.095
Difference from Actual	0.090	0.087	0.087
<i>Model (4) Estimated Race-Neutral APRs Separated by Year</i>			
Actual APR less Marginal Effect of Minority Status	9.577	6.153	7.165
Difference from Actual	0.072	0.038	0.017
<i>Model (4-RF) Estimated Race-Neutral APRs for All Wholesale Loans (Race & FICO interactions)</i>			
Actual APR less Marginal Effect of Minority Status	9.582	6.126	7.117
Difference from Actual	0.067	0.065	0.065

62. Because the regression coefficients for the African American and Hispanic indicator variables are positive and statistically significant (as shown in Section V), the members of the proposed Class pay, on average, more for their mortgage loans than white borrowers with similar risk characteristics. Table 8 shows that when the coefficients from the regressions are subtracted from the named Plaintiffs' actual APRs (thus removing the average disparate impact to the Class), their APRs decrease for each of these model specifications. For example, Salazar's actual APR is 7.182 percent. When the disparate impact to Hispanics (as calculated using Model (4)) is removed from his APR, his APR decreases to 7.106 percent.

63. Each regression model shows a statistically significant disparate impact against minorities. Because each named Plaintiff was subject to the same Discretionary Pricing Policy that disproportionately affected minority borrowers, the named Plaintiffs have claims that are typical of the Class.

VII. C COMPUTATION OF AGGREGATE MONETARY RELIEF TO THE CLASS AS A WHOLE IS MANAGEABLE AND CAN BE COMPLETED USING COMMON EVIDENCE AND METHODS

64. Monetary relief in this case can be calculated using available, objective information that is already contained in Defendant's own centralized databases. To calculate relief for a particular class member, I calculate the difference between (1) the actual finance charges that the member paid (as measured by the APR), and (2) the finance charges the class member paid after removing the disparate impact to that member's race, as predicted using my regression models. These charges are a function of the same inputs used in the regression models used above to prove disparate impact. This is a calculation that with the help of computers can be done mechanically and can produce individualized as well as an aggregate monetary relief amount on the basis of readily available data.

65. If Defendant was able to show that it had a business justification to charge a higher (or lower) average finance charge to a certain subgroup of its borrowers, then it would be appropriate to calculate the average finance charge paid by whites in this subclass and compare it to the finance charges actually paid by class members in the subgroup. But this subgroup analysis can still be made on the basis of objective information that is currently available in Defendant's own databases. For example, calculations for relief could easily control for the loan product or business channel used to originate the loan. These central loan provisions are accessible in Defendant's own databases and readily amenable to computer manipulation. However, I have seen no basis in the academic literature or in materials provided by Defendant that indicate brokers' costs vary by borrower race and it would be highly implausible, in my view, that such cost differentials could justify disparities in APRs of the magnitude present in Defendant's database.

66. It would, however, be inappropriate in calculating monetary relief to control for revenue-based factors (such as buyers' negotiation skills, preferences and self-assessment of creditworthiness), since, as discussed above, it was not business justified for Greenpoint to charge minorities a higher price for credit based on such factors. More particularly, it would not be appropriate to calculate what monetary relief would be for the subclass of borrowers with strong (or weak) negotiation skills, because doing so would, in effect, suggest that such differences provide a justification to limit defendant's liability.

67. Thus, individualized evidentiary hearings on monetary damages are not necessary or appropriate. Calculation of monetary relief is amenable to mechanistic computation based on readily available and objective data.

68. To estimate monetary relief, I first determine the APR for each individual Class member after removing the marginal effect on APR of the member's minority status as estimated in my regression model.⁸⁴ For any given Class member's loan, this "but-for" APR is calculated by subtracting from the member's actual APR the marginal effect of the member's race on APR, as measured by the Model (4) regression estimated over the large set of Greenpoint wholesale loans.

69. The time period over which monetary relief is calculated can be determined using a number of assumptions. For example, further discovery could yield more information about payment of Greenpoint loans, including prepayments and defaults. In addition, a variety of prepayment prediction models exist in the literature that could be used to estimate the expected

84. This "but-for" APR is calculated using Equation [2].

[2] $APR_{w,i} = APR_i - \beta_r$

For any given Class member's loan, the but-for APR ($APR_{w,i}$) is calculated using the marginal effect (the β coefficient) corresponding to the member's race obtained from estimating Equation [1] over the large set of Greenpoint wholesale loans.

life of each loan.⁸⁵ The likelihood of prepayment for any given loan depends on various factors, including the underwriting factors of the loan, the interest rate of the loan relative to current and forecasted market rates, and home prices. If I were to use a prepayment model in my calculations of monetary relief, this model would use inputs that are common to the Class.

70. To show that monetary relief for the Class is in fact estimable, I calculate monetary relief for each Class member under three alternative assumptions: (1) every loan remains current (i.e., does not prepay or become delinquent) for the full term of the loan, (2) every loan remains current for a period of 10 years from the date it was originated, and (3) every loan remains current for a period of five years. Under each scenario, I assume that interest is paid at a constant interest rate equal to the APR, and that payments are made on an estimated full-amortization schedule over the given loan term.

71. Additional information on the actual payment history of the loan, currently unavailable to me, could yield a more accurate estimate of monetary relief than any of the three scenarios discussed above. For example, if a borrower prepaid his loan three years after origination, then I would calculate monetary relief for that borrower over a 3-year period. If a loan was still current as of the date of my calculation, I could calculate monetary relief based on the expected remaining life of the loan, given the characteristics of that loan and a prepayment prediction model (discussed above). For purposes of this report, however, I use the full-term, 10-year, and 5-year scenarios to calculate monetary relief for illustrative purposes, given the lack of

85. See, e.g., Geetesh Bhardwaj & Rajdeep Sengupta, *Did Prepayments Sustain the Subprime Market?*, Federal Reserve Bank of St. Louis Working Paper 2008-039B (May 2009), available at <http://research.stlouisfed.org/wp/2008/2008-039.pdf>; Charles A Calhoun & Yongheng Dung, *A Dynamic Analysis of Fixed- and Adjustable-Rate Mortgage Terminations*, 24 J. REAL ESTATE FIN. & ECON. 9 (2002); Roberto G. Quercia, Michael A. Stegman, & Walter R. Davis, *The Impact of Predatory Loan Terms on Subprime Foreclosures: The Special Case of Prepayment Penalties and Balloon Payments*, 18 HOUSING POL'Y DEBATE 311 (2007).

data on actual loan payment histories. Any refinement of the period over which to calculate monetary relief for a given Class member would use common methods and data that is common to the Class.

72. The assumption of a shorter calculation period of five years may be closest to the actual experience of Greenpoint loans, based on the recent history of mortgage longevity before prepayment. In a 2008 position paper, the Mortgage Bankers Association noted that issuers of securities backed by ARM mortgages assumed a Constant Prepayment Rate (CPR) within a range of 18 to 30 percent, with 25 percent being the most commonly used CPR.⁸⁶ The CPR is the annualized prepayment speed of a pool of mortgages. A CPR range of 18 to 30 percent translates to an average life of 2.8 to 5.1 years for a pool of 30-year mortgages.⁸⁷ A 25 percent CPR translates to an average life of 3.5 years for a pool of 30-year mortgages. In his statement before a Senate hearing on mortgage abuse, the chairman of the Mortgage Bankers Association noted that the average life of a subprime mortgage was 2.5 years, whereas the average life of a prime mortgage was slightly longer than four years.⁸⁸

73. Although the examples of the length an average mortgage life are shorter than five years, that longer average life may be more appropriate because I use the APR as my

86. Mortgage Bankers Association, *Position Paper: Identifying Prepayment Speeds Used to Price Ginnie Mae Securities Backed by Pools of Certain Types of Loans*, Mar. 20, 2008, available at [http://www.mbaa.org/files/Advocacy/2008/MBAPositionPaperWidelyHeldFixedInvestmentTrusts\(WHFITs\).pdf](http://www.mbaa.org/files/Advocacy/2008/MBAPositionPaperWidelyHeldFixedInvestmentTrusts(WHFITs).pdf).

87. To calculate the average life of a 30-year mortgage pool under a given CPR, I first convert the CPR into the Single Monthly Mortality (SMM) rate using the formula:

$$1 - \text{CPR} = (1 - \text{SMM})^{12}$$

where SMM is the monthly prepayment rate. I then calculate the number of mortgages that prepay in a given pool every month under that SMM and calculate the average life of the mortgages within the pool. A summary of the arithmetic of mortgage pricing, payments, and prepayments can be found in Ararat Yesayan, *Mortgage Pricing* (June 4, 2009), available at <http://ssrn.com/abstract=1414351>.

88. *Ending Mortgage Abuse: Safeguarding Homebuyers: Hearing Before the Subcomm. on Housing, Transportation & Community Development of the S. Comm. on Banking, Housing, & Urban Affairs*, 110th Cong. 10-11 (2007) (statement of John M. Robbins, CMB, Chairman of Mortgage Bankers Association), available at <http://www.mbaa.org/files/Advocacy/2007/MBATestimony6262007EndingMortgageAbuseSafeguardingHomebuyers.pdf>.

measure of finance charges, and the APR is calculated based on spreading out upfront fees over the life of the loan. Simply using the actual average life of a loan would understate the degree to which minorities were overcharged if minorities paid more in upfront fees than white borrowers with similar risk characteristics.

74. In addition to considerations of prepayments, the choice of a term over which to estimate finance charge disparity using the APR also depends on the degree to which disparity in the APR results from disparity in upfront fees as opposed to disparities in note rates or yield spread premia. Upfront fees are included in the calculation of an APR by spreading out the effect of those fees over the loan term, even though those fees are typically paid immediately at origination.⁸⁹ To the extent that disparate impact in the APR is due to disparate impact in upfront fees, calculating finance charge differentials over a longer period closer to the original loan term is appropriate, so that the full effect of the upfront fee disparity can be captured. Yield spread premia for Greenpoint loans, on the other hand, raise borrower finance costs through a higher interest rate for the entire term of the loan (for fixed-rate loans), or at least over the initial fixed-rate term (for ARMs).⁹⁰ To the extent that disparate impact in the APR is due to disparate impact in yield spread premium, calculating finance charge differentials over a shorter period closer to the actual life of the loan is appropriate.

75. For purposes of illustrating monetary relief for this report, however, I do not attempt to make any of these refinements related to upfront fees, yield spread premium, or

89. In mortgage lending, upfront closing fees are sometimes added to the loan principal rather than paid upfront at loan closing. However, a Greenpoint witness testified that he did not think that Greenpoint ever added origination fees (and presumably other closing costs) to the loan principal. See Deposition of Burnett K. Jarvis at 114 (Dec. 9, 2008).

90. *Id.* at 96-97, 114-115.

prepayments.⁹¹ Instead, I present monetary relief under the three scenarios (estimating finance charge disparities using the APR over the full-term, 10 years, and 5 years) outlined above. Aggregate monetary relief to the Class is merely equal to the sum of the monetary relief for all Class members. Table 9 shows the aggregate results of my calculations of monetary relief, based on regression Model (4) estimated on all wholesale loans in Defendant's loan database. Again, with additional data, I could develop a more nuanced estimate of damages based on the structure of APRs for individual borrowers. And, again, any such refinement to calculate monetary relief for a given Class member would use common methods and data that is common to the Class.

91. I reserve the right for an expert report on merits to adjust my calculations to account for these refinements.

TABLE 9: MONETARY RELIEF TO GREENPOINT MINORITY BORROWERS USING THE APRS
PREDICTED BY MODEL (4)

	African Americans	Hispanics	Total
Over entire loan term			
Undiscounted (\$Millions)	\$159.0	\$336.5	\$495.5
Present Value of Relief (\$Millions)	\$114.9	\$242.3	\$357.2
Over 10 years			
Undiscounted (\$Millions)	\$65.5	\$138.0	\$203.5
Present Value of Relief (\$Millions)	\$63.9	\$134.5	\$198.4
Over 5 years			
Undiscounted (\$Millions)	\$33.0	\$69.6	\$102.5
<i>Number of Loans*</i>	<i>30,175</i>	<i>64,611</i>	<i>94,786</i>
<i>Avg undiscounted relief per loan over 5 years (\$)</i>	<i>\$1,093</i>	<i>\$1,076</i>	<i>\$1,082</i>
Present Value of Relief (\$Millions)	\$35.8	\$75.3	\$111.1
<i>Number of Loans*</i>	<i>30,175</i>	<i>64,611</i>	<i>94,786</i>
<i>Avg. present value of relief per loan over 5 years (\$)</i>	<i>\$1,185</i>	<i>\$1,166</i>	<i>\$1,172</i>

Note: For purposes of these illustrations, the present value (as of March 2010) of the undiscounted relief is calculated using the 20-year Treasury rate (as of Mar. 5, 2010) of 4.49 percent as the discount rate. Federal Reserve Statistical Release H.15, 20-year Treasury constant maturities (nominal), available at http://www.federalreserve.gov/releases/h15/data/Business_day/H15_TCMNOM_Y20.txt. For the 10-year and 30-year scenarios, in which most of the harm comes in the form of disparities in future interest payments, the present value is smaller than the undiscounted value. For the 5-year scenario, in which most of the harm comes in the form of disparities in past interest payments, the present value is higher than the undiscounted value. I use a 20-year Treasury rate as the discount rate illustratively here. With additional analysis, more precise discount rates could be utilized to estimate class-wide monetary damages. For example, I could use the 7-year Treasury rate as of the date of origination to estimate the present value of relief for a plaintiff whose loan was originated 7-years prior to the date that relief is paid.

76. As Table 9 shows, minorities suffered \$495.5 million in harm over the full term of their loans. The present value of this \$495.5 million harm is \$357.2 million. When measured over five years, minorities suffered \$102.5 million in (undiscounted) harm. African American borrowers who are assigned monetary relief based on my methodology suffered an average of \$1,093 per loan (undiscounted) over five years, and Hispanic borrowers suffered an average of \$1,076 per loan (undiscounted).

77. The monetary relief for each individual Class member is easily ascertainable. My methodology estimates the monetary relief for each individual Class member based on his or her loan characteristics. For example, the undiscounted monetary relief under the 5-year scenario for

named Plaintiff Salazar is \$1,843. This relief of \$1,834 is equal to the difference in Mr. Salazar's interest payments over the first five years of his loan, based on his loan amount (\$475,000) and fixed-rate amortization schedules using his actual APR (7.182 percent) and his but-for APR when removing the effect of the disparate impact (7.106 percent—7.6 basis points lower than his actual APR). The aggregate monetary relief shown in Table 9 is merely the sum of the effect of the disparate impact on each Class member's loan terms.

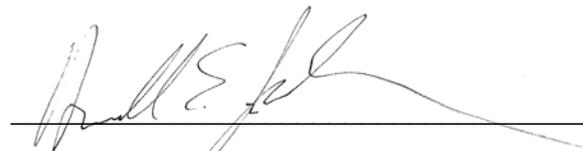
VIII. C ONCLUSION

78. In summary, Greenpoint maintains sufficient data concerning its loan applicants to allow a statistical analysis to determine the effect of Defendant's policies on borrowers by race. By using these statistical methods, one can reliably estimate whether Greenpoint's policies had a disparate impact on minorities through higher cost loans than white borrowers with similar risk characteristics as alleged in Plaintiffs' Complaint. Finally, the statistical tests relevant to estimating disparate impact and calculating aggregate and individual monetary relief can be resolved on a class-wide basis common to the borrowers in the class. My analysis of Defendant's data shows that Greenpoint's minority borrowers paid hundreds of millions of dollars more in finance charges than its white borrowers with similar risk characteristics.

* * *

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on March 15, 2010.

A handwritten signature in black ink, appearing to read 'Howell E. Jackson', is written over a solid horizontal line.

Howell E. Jackson

APPENDIX 1: MATERIALS RELIED UPON*Pleadings:*

- First Amended Complaint, Case No. 3:08-cv-00369-TEH.

Deposition Testimony:

- Deposition of Steve Abreu (Sep. 10, 2008).
- Deposition of J. Steven Gilcrest (Sep. 11, 2008).
- Deposition of Kevin Hughes (Dec. 3, 2008).
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- Truth in Lending Act, 15 U.S.C. §1606 et seq. (2006).
- Fair Housing Act, 42 U.S.C. § 3601 et seq.
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- Anthony Garritano & Scott Kersnar, *25 Tech-Savvy Lenders*, Mortgage Technology (Aug. 1, 2007) available at <http://www.mortgage-technology.com/plus/archive/?id=156640>.
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Web sites:

- *Project Implicit*, at <https://implicit.harvard.edu/implicit/>.

APPENDIX 2: CURRICULUM VITAE OF HOWELL JACKSON

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EMPLOYMENT

1989-present HARVARD LAW SCHOOL CAMBRIDGE, MA
 Acting Dean, 2009
 Vice Dean for Budget, 2003 to 2006
 Associate Dean for Research and Research Programs, 2001-2003
 James S. Reid Jr. Professor of Law, 2004 to present
 Finn. M.W. Caspersen and Household International
 Professor of Law, 1999 to 2004.
 Professor of Law, 1994-1999.
 Assistant Professor of Law, 1989-1994.
 Research interests include financial institutions, consumer protection, federal budget policy, government accounting, social security and entitlement programs, securities regulation, international finance.

1987-1989 ARNOLD & PORTER WASHINGTON, DC
 Associate: Financial Institutions Practice Group.

1984-1986 CAPLIN & DRYSDALE, CHARTERED WASHINGTON, DC
 Associate: Corporate/Banking/Securities Group.

1983-1984 UNITED STATES SUPREME COURT WASHINGTON, DC
 Law Clerk to Associate Justice Thurgood Marshall.

1982-1983 UNITED STATES COURT OF APPEALS HARTFORD, CT
FOR THE SECOND CIRCUIT
 Law Clerk to Judge Jon O. Newman.

1976-1978 NATIONAL COUNCIL FOR US-CHINA TRADE WASHINGTON, DC
 Escort Officer and Associate Editor *China Business Review*.

ACADEMIC

1978-1982 HARVARD UNIVERSITY CAMBRIDGE, MA
 MBA & JD, *magna cum laude*.

1972-1976 BROWN UNIVERSITY PROVIDENCE, RI
 B.A., *magna cum laude*:

PROFESSIONAL ACTIVITIES

Harvard University Financial Management Committee
 Trustee, CREF and Affiliated TIAA-CREF Mutual Funds.
 Senior Editor, Cambridge University Press Series on Int'l Corporate Law and Financial Regulation
 Past Chair, AALS Sections on Securities Regulation and Financial Institutions.

Member, Social Security Academic Advisory Board for NBER Retirement Research Program; National Academy of Social Insurance; and Bar of the District of Columbia.
Miscellaneous consulting projects for World Bank, International Monetary Fund, U.S. Treasury Department, and various other foreign and domestic regulatory agencies.

SELECTED PUBLICATIONS

Howell E. Jackson & Avery T. Day, Current Issues in Federal Budgeting: Harvard Law School Briefing Papers on Federal Budget Policy (draft of Feb. 22, 2010) (briefing papers available at <http://www.law.harvard.edu/faculty/hjackson/budget.php>).

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**APPENDIX 3: CASES IN WHICH HOWELL JACKSON HAS TESTIFIED AT DEPOSITION OR TRIAL
IN THE LAST FOUR YEARS**

None.

APPENDIX 4: SUMMARY STATISTICS OF VARIABLES IN GREENPOINT'S LOAN DATABASE, 2004-2007

Variable	Obs	Mean	Std. Dev.	Min	Max
APR	372,186	6.7886	1.8038	2.3820	19.0790
Note rate	355,278	5.7241	2.5376	1.0000	18.0000
Total broker compensation (\$)	304,673	\$5,142	\$4,312	-\$885	\$101,574
Total broker compensation (points)	304,673	1.9823	1.1542	-0.1362	15.6818
Race					
American Indian	372,221	0.4%	6.4%	0%	100%
Asian	372,221	8.5%	27.8%	0%	100%
Black	372,221	8.1%	27.3%	0%	100%
Hawaiian	372,221	0.9%	9.2%	0%	100%
Hispanic	372,221	17.4%	37.9%	0%	100%
Missing	372,221	8.3%	27.6%	0%	100%
White	372,221	56.5%	49.6%	0%	100%
Credit score	371,447	715.59	43.05	443	830
Missing credit score	372,221	0.2%	4.6%	0%	100%
Credit score < 600	372,221	0.1%	3.1%	0%	100%
600 ≤ Credit score < 620	372,221	0.1%	3.6%	0%	100%
620 ≤ Credit score < 640	372,221	2.2%	14.6%	0%	100%
640 ≤ Credit score < 660	372,221	6.5%	24.6%	0%	100%
660 ≤ Credit score < 680	372,221	13.0%	33.6%	0%	100%
680 ≤ Credit score < 700	372,221	16.7%	37.3%	0%	100%
700 ≤ Credit score < 720	372,221	17.1%	37.7%	0%	100%
720 ≤ Credit score < 740	372,221	13.8%	34.4%	0%	100%
Credit score ≥ 740	372,221	30.4%	46.0%	0%	100%
Loan amount (\$000)	372,221	272.5	203.7	7.0	4,950.0
Loan amount < \$40K	372,221	5.4%	22.5%	0%	100%
\$40K ≤ Loan amount < \$50K	372,221	1.6%	12.6%	0%	100%
\$50K ≤ Loan amount < \$75K	372,221	4.7%	21.3%	0%	100%
\$75K ≤ Loan amount < \$150K	372,221	18.3%	38.7%	0%	100%
\$150K ≤ Loan amount < \$200K	372,221	12.4%	32.9%	0%	100%
\$200K ≤ Loan amount < \$300K	372,221	21.3%	41.0%	0%	100%
\$300K ≤ Loan amount < \$500K	372,221	24.6%	43.0%	0%	100%
Loan amount ≥ \$500K	372,221	11.7%	32.1%	0%	100%
Lien Status					
First lien	372,221	91.5%	27.8%	0%	100%
Subordinate lien	372,221	8.5%	27.8%	0%	100%
Total debt ratio (%)	353,123	34.9	8.0	0.23	291.79
No total debt ratio	372,221	5.1%	22.1%	0%	100%
Total debt ratio ≤ 40%	372,221	74.2%	43.8%	0%	100%
40% < total debt ratio ≤ 45%	372,221	14.9%	35.6%	0%	100%
Total debt ratio > 45%	372,221	5.8%	23.3%	0%	100%
Total debt ratio > 36%	372,221	47.4%	49.9%	0%	100%
Housing debt ratio (%)	351,055	24.0	9.5	0.00	295.62
No housing debt ratio	372,221	5.7%	23.2%	0%	100%
Housing debt ratio ≤ 28%	372,221	61.2%	48.7%	0%	100%
28% < housing debt ratio ≤ 33%	372,221	16.0%	36.6%	0%	100%
33% < housing debt ratio ≤ 40%	372,221	13.4%	34.0%	0%	100%

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Variable	Obs	Mean	Std. Dev.	Min	Max
Housing debt ratio > 40%	372,221	3.8%	19.0%	0%	100%
Loan-to-value (LTV) (%)	371,700	70.21	20.18	1.35	240.67
LTV missing	372,221	0.1%	3.7%	0%	100%
LTV ≤ 60%	372,221	17.3%	37.8%	0%	100%
60% < LTV ≤ 70%	372,221	9.1%	28.8%	0%	100%
70% < LTV ≤ 80%	372,221	67.9%	46.7%	0%	100%
LTV > 80%	372,221	5.6%	22.9%	0%	100%
Combined loan-to-value (CLTV) (%)	372,091	83.79	14.75	3.85	240.67
CLTV missing	372,221	0.0%	1.9%	0%	100%
CLTV ≤ 60%	372,221	7.9%	27.0%	0%	100%
60% < CLTV ≤ 70%	372,221	6.9%	25.3%	0%	100%
70% < CLTV ≤ 80%	372,221	24.7%	43.1%	0%	100%
80% < CLTV ≤ 90%	372,221	32.9%	47.0%	0%	100%
CLTV > 90%	372,221	27.6%	44.7%	0%	100%
Residence type					
Primary residence	372,090	70.4%	45.7%	0%	100%
Investment property	372,090	27.2%	44.5%	0%	100%
Second home	372,090	2.4%	15.3%	0%	100%
Property type detail					
Commercial - Mixed use w/ residential	372,221	0.4%	6.3%	0%	100%
Commercial - Mixed use w/o residential	372,221	0.1%	2.4%	0%	100%
Commercial - Multi-family > 4	372,221	0.6%	7.6%	0%	100%
Commercial - Other	372,221	0.0%	0.4%	0%	100%
Condo - High Rise	372,221	1.2%	11.0%	0%	100%
Condo - Low Rise	372,221	8.7%	28.2%	0%	100%
Condo - Mid Rise	372,221	0.5%	6.8%	0%	100%
Condo - Site	372,221	0.2%	4.5%	0%	100%
Condotel	372,221	0.0%	0.4%	0%	100%
Coop	372,221	0.4%	6.6%	0%	100%
Duplex	372,221	5.2%	22.1%	0%	100%
Fourplex	372,221	1.9%	13.6%	0%	100%
Manufactured Home	372,221	0.0%	1.8%	0%	100%
PUD-1 unit attached	372,221	3.4%	18.1%	0%	100%
PUD-1 unit detached	372,221	13.2%	33.9%	0%	100%
PUD-2 Units	372,221	0.0%	1.7%	0%	100%
PUD-3 Units	372,221	0.0%	0.7%	0%	100%
PUD-4 Units	372,221	0.1%	2.5%	0%	100%
Single Family Attached	372,221	2.5%	15.6%	0%	100%
Single Family Detached	372,221	57.5%	49.4%	0%	100%
Triplex	372,221	1.5%	12.1%	0%	100%
Unknown property type	372,221	2.5%	15.7%	0%	100%
Loan purpose					
Purchase	372,221	49.0%	50.0%	0%	100%
Home improvement	372,221	1.0%	10.1%	0%	100%
Refinancing	372,221	50.0%	50.0%	0%	100%
Loan purpose detail					
Purchase	259,183	48.0%	50.0%	0%	100%
Rate term refinance	259,183	17.6%	38.0%	0%	100%
Cash out refinance	259,183	34.4%	47.5%	0%	100%

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Variable	Obs	Mean	Std. Dev.	Min	Max
Presence of prepayment penalty	329,402	32.1%	46.7%	0%	100%
Length of prepayment penalty					
1 year	216,455	8.7%	28.2%	0%	100%
More than 1 year	216,455	28.0%	44.9%	0%	100%
Lender paid mortgage insurance	216,455	0.3%	5.3%	0%	100%
Co-applicant	372,200	32.2%	46.7%	0%	100%
Self-employed borrower or co-borrower	372,221	3.5%	18.3%	0%	100%
Rate lock >= 30 days	329,402	9.0%	28.7%	0%	100%
Escrow waiver indicator = "Y" or "Yes Impounds"	216,455	35.0%	47.7%	0%	100%
Channel					
Wholesale	372,221	83.5%	37.1%	0%	100%
Unknown	372,221	16.5%	37.1%	0%	100%
Documentation type					
Alternative Doc	372,221	0.0%	0.2%	0%	100%
Full Doc	372,221	29.4%	45.6%	0%	100%
Low Doc	372,221	0.0%	0.8%	0%	100%
NED	372,221	0.0%	0.2%	0%	100%
NID	372,221	1.0%	10.1%	0%	100%
NID/NAD	372,221	0.1%	3.6%	0%	100%
NID/NAV	372,221	0.1%	2.7%	0%	100%
NID/NED	372,221	0.3%	5.5%	0%	100%
NID/NED/NAD	372,221	3.4%	18.2%	0%	100%
NIV/NAV	372,221	4.0%	19.6%	0%	100%
Stated Income	372,221	61.5%	48.7%	0%	100%
Streamlined Refi	372,221	0.0%	0.5%	0%	100%
Unknown	372,221	0.1%	3.0%	0%	100%
Payment type					
Fixed rate	372,221	35.5%	47.8%	0%	100%
Adjustable rate (ARM)	372,221	60.2%	48.9%	0%	100%
Balloon	372,221	4.1%	19.9%	0%	100%
HELOC	372,221	0.1%	3.4%	0%	100%
Unknown	372,221	0.0%	2.1%	0%	100%
Loan term					
5-year term	372,129	0.0%	1.0%	0%	100%
7-year term	372,129	0.0%	0.8%	0%	100%
10-year term	372,129	0.2%	4.8%	0%	100%
15-year term	372,129	7.3%	26.0%	0%	100%
20-year term	372,129	0.3%	5.7%	0%	100%
25-year term	372,129	0.2%	4.6%	0%	100%
30-year term	372,129	87.2%	33.4%	0%	100%
40-year term	372,129	4.7%	21.2%	0%	100%
Loan program categories					
A Minus	372,221	0.1%	2.5%	0%	100%
Alt A	372,221	48.7%	50.0%	0%	100%
Closed-End Second	372,221	8.5%	27.8%	0%	100%
Commercial	372,221	1.1%	10.5%	0%	100%
Conforming A	372,221	9.9%	29.9%	0%	100%
FHA/VA	372,221	0.2%	4.5%	0%	100%
HELOC First	372,221	0.1%	3.4%	0%	100%

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Variable	Obs	Mean	Std. Dev.	Min	Max
Jumbo A	372,221	31.3%	46.4%	0%	100%
Unknown	372,221	0.1%	3.7%	0%	100%
Loan terms					
ARM (unknown term)	372,221	0.1%	3.9%	0%	100%
ARM 10YR/1YR	372,221	0.0%	1.0%	0%	100%
ARM 10YR/6MO	372,221	0.5%	7.0%	0%	100%
ARM 1MO/1MO	372,221	1.3%	11.2%	0%	100%
ARM 1MO/1YR	372,221	16.1%	36.8%	0%	100%
ARM 1MO/2YR	372,221	0.2%	4.1%	0%	100%
ARM 1MO/3YR	372,221	0.3%	5.6%	0%	100%
ARM 1MO/5YR	372,221	0.4%	6.2%	0%	100%
ARM 1YR/10YR	372,221	0.0%	0.2%	0%	100%
ARM 1YR/1MO	372,221	0.0%	2.1%	0%	100%
ARM 1YR/1YR	372,221	0.8%	8.9%	0%	100%
ARM 1YR/25YR	372,221	0.0%	0.2%	0%	100%
ARM 1YR/30YR	372,221	0.0%	1.4%	0%	100%
ARM 2YR/1MO	372,221	0.0%	0.2%	0%	100%
ARM 2YR/6MO	372,221	1.0%	9.7%	0%	100%
ARM 3MO/1YR	372,221	1.2%	10.7%	0%	100%
ARM 3MO/2YR	372,221	0.0%	1.1%	0%	100%
ARM 3MO/3YR	372,221	0.0%	1.0%	0%	100%
ARM 3MO/5YR	372,221	0.0%	0.9%	0%	100%
ARM 3YR/10YR	372,221	0.0%	0.2%	0%	100%
ARM 3YR/15YR	372,221	0.0%	0.8%	0%	100%
ARM 3YR/1MO	372,221	0.0%	0.2%	0%	100%
ARM 3YR/1YR	372,221	0.2%	4.6%	0%	100%
ARM 3YR/20YR	372,221	0.0%	1.0%	0%	100%
ARM 3YR/25YR	372,221	0.1%	3.3%	0%	100%
ARM 3YR/30YR	372,221	0.1%	3.5%	0%	100%
ARM 3YR/6MO	372,221	17.0%	37.5%	0%	100%
ARM 4YR/1YR	372,221	0.0%	1.5%	0%	100%
ARM 5YR/10YR	372,221	0.0%	0.4%	0%	100%
ARM 5YR/15YR	372,221	0.0%	0.9%	0%	100%
ARM 5YR/1MO	372,221	0.0%	0.3%	0%	100%
ARM 5YR/1YR	372,221	0.7%	8.2%	0%	100%
ARM 5YR/20YR	372,221	0.0%	1.1%	0%	100%
ARM 5YR/25YR	372,221	0.1%	2.9%	0%	100%
ARM 5YR/30YR	372,221	0.2%	4.8%	0%	100%
ARM 5YR/6MO	372,221	12.9%	33.6%	0%	100%
ARM 6MO/6MO	372,221	6.1%	23.9%	0%	100%
ARM 6YR/1YR	372,221	0.0%	1.1%	0%	100%
ARM 7YR/1YR	372,221	0.2%	4.3%	0%	100%
ARM 7YR/6MO	372,221	0.7%	8.2%	0%	100%
Balloon (unknown term)	372,221	0.0%	0.2%	0%	100%
20/10 Balloon	372,221	0.0%	0.3%	0%	100%
25/10 Balloon	372,221	0.0%	0.5%	0%	100%
25/15 Balloon	372,221	0.0%	0.3%	0%	100%
30/10 Balloon	372,221	0.2%	4.2%	0%	100%
30/15 Balloon	372,221	3.7%	18.8%	0%	100%

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Variable	Obs	Mean	Std. Dev.	Min	Max
40/10 Balloon	372,221	0.0%	0.6%	0%	100%
40/15 Balloon	372,221	0.0%	1.4%	0%	100%
40/30 Balloon	372,221	0.3%	5.0%	0%	100%
5/25 Balloon	372,221	0.0%	1.0%	0%	100%
7/23 Balloon	372,221	0.0%	0.8%	0%	100%
5-year fixed	372,221	0.0%	0.2%	0%	100%
10-year fixed	372,221	0.0%	2.2%	0%	100%
15-year fixed	372,221	3.5%	18.3%	0%	100%
20-year fixed	372,221	0.3%	5.5%	0%	100%
30-year fixed	372,221	31.6%	46.5%	0%	100%
40-year fixed	372,221	0.1%	3.1%	0%	100%
HELOC	372,221	0.1%	3.4%	0%	100%
Unknown	372,221	0.0%	2.1%	0%	100%
Alternate race classification 1					
American Indian, non-Hispanic	372,221	0.4%	6.4%	0%	100%
American Indian, Hispanic	372,221	0.5%	7.3%	0%	100%
Asian, non-Hispanic	372,221	8.5%	27.8%	0%	100%
Asian, Hispanic	372,221	0.2%	4.3%	0%	100%
Black, non-Hispanic	372,221	7.9%	27.0%	0%	100%
Black, Hispanic	372,221	0.2%	4.7%	0%	100%
Hawaiian, non-Hispanic	372,221	0.9%	9.2%	0%	100%
Hawaiian, Hispanic	372,221	0.2%	4.2%	0%	100%
Missing, non-Hispanic	372,221	8.3%	27.6%	0%	100%
Missing, Hispanic	372,221	1.0%	9.8%	0%	100%
White, non-Hispanic	372,221	56.5%	49.6%	0%	100%
White, Hispanic	372,221	15.5%	36.2%	0%	100%
Alternate race classification: allow single loan to take multiple dummies					
American Indian	372,221	1.0%	9.9%	0%	100%
Asian	372,221	8.7%	28.2%	0%	100%
Black	372,221	8.1%	27.3%	0%	100%
Hawaiian	372,221	1.1%	10.4%	0%	100%
Hispanic	372,221	17.6%	38.1%	0%	100%
Missing	372,221	8.3%	27.6%	0%	100%
White	372,221	72.8%	44.5%	0%	100%

Note: I make the following assumptions and changes to the original data provided to Plaintiffs:

- I exclude the 28,844 loans in the data identified as retail or correspondent loans. The origination channel (wholesale, retail, correspondent, or unknown) is determined based on the Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009).
- 45 unique loan application numbers have two observations in the database, each in a different year. All other unique loan application numbers have one observation in the database. In cases with multiple loan application numbers, I use the loan data from the record for the later year.
- For loans originated before 2005 with no data on the rate lock date, or loans originated in 2005 or later with no data for the action date or rate lock date (113,921 loans), I assume that the rate lock date is equal to the application date plus the mean difference between the application date and the rate lock date for those loans with data for both dates. For the loans originated in 2005 or later with no data for the rate lock date (1,021 loans), I use the action (origination) date as the rate lock date because those loans did not have a rate lock until closing, per the Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009).

- I replace the note rates for 23 loans with values less than 1% with missing values.
- For the 22 loans with no lien status, I assume that the loans are first-lien loans. None of these 22 loans has APR data present, so they are excluded from my regression and monetary relief calculations.
- I assume a missing credit score for the 359 loans in the database with credit scores equal to zero or otherwise outside the typical FICO credit score range of 300 to 850.
- I set the values of the housing debt ratio (1,253 loans), and total debt ratio (391 loans) to missing if the values in the database are less than or equal to zero or if they are greater than 300%.
- Program codes are categorized into broader variables of loan term structure based on the program code description field, the code definitions set forth in the Letter from Anand S. Raman, Skadden, Arps, Slate, Meagher & Flom LLP, to Gary Klein, Roddy Klein & Ryan (June 23, 2009), the “Fixed or adjustable rate” field, the “Length of fixed rate period (ARMs)” field, and the “Length of reset period (ARMs)” field.
- Total broker compensation is calculated only for wholesale loans, and is equal to the sum of:
 - “801 origination fee to broker”
 - the absolute value of “802 discount/yield spread premium” *if* that field is negative (if the field is negative, it represents yield spread premium; if it is positive, it represents discount points paid by the borrower to Greenpoint to lower the rate, and is excluded from total broker compensation)
 - “807 recovery fees”
 - “808 other broker fees”
 - “814 process/admin fee to broker”
 - “821 broker points”

The modifications to values in the original data described in this list of assumptions (besides the exclusion of correspondent loans, retail loans, or multiple observations for single loan application numbers) affect a total of 114,968 loans in the 2004-2007 data sample. Most of these changes are due to missing rate lock dates.

Appendix 5: Results of APR Regressions Estimated Over Entire Sample

Dependent variable: APR (basis points)	Race Coefficients Are Also Shown in Table 6				Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
	Model (1)	Model (2)	Model (3)	Model (4)														
	Race dummies only	Race, rate lock month & subordinate lien dummies	Same as (2), add FICO bin dummies	Same as (3), add risk-based characteristics	Same as (2), use rate lock week dummies in place of rate lock month dummies	Add various explanatory variables	Interact residence type & property type	Interact LTV x 1st lien, CLTV x sub. lien	Add HELOC dummy	Omit HELOC loans from sample	Add documentation type	Add MSA	Same as Model (4), substitute broader loan program types for loan programs	Same as Model (4), add housing debt ratio dummies	Same as Model (4), substitute total debt ratio > 36% dummy	Same as Model (4), add program category dummies	Same as Model (4), add unknown business channel dummy	Same as Model (4), add program category & unknown business channel dummies
Race: African American	69.53*** (1.11)	27.08*** (0.58)	22.40*** (0.58)	9.44*** (0.44)	27.09*** (0.58)	9.82*** (0.51)	9.67*** (0.51)	10.45*** (0.51)	10.47*** (0.51)	10.47*** (0.51)	11.81*** (0.49)	11.71*** (0.50)	12.10*** (0.48)	9.20*** (0.44)	9.41*** (0.44)	8.53*** (0.43)	8.23*** (0.43)	8.03*** (0.43)
Race: Hispanic	56.49*** (0.79)	8.35*** (0.39)	6.52*** (0.38)	7.64*** (0.32)	8.34*** (0.39)	11.87*** (0.35)	11.64*** (0.35)	12.05*** (0.35)	12.09*** (0.35)	12.10*** (0.35)	7.59*** (0.34)	7.27*** (0.35)	8.66*** (0.32)	6.90*** (0.32)	7.29*** (0.31)	6.97*** (0.31)	6.97*** (0.31)	6.97*** (0.31)
Race: American Indian	18.34*** (3.91)	-17.65*** (2.33)	-36.12*** (2.66)	-5.83*** (2.02)	-17.59*** (2.32)	-5.04** (2.49)	-5.21** (2.48)	-5.03** (2.45)	-4.98** (2.45)	-4.91** (2.45)	-3.03 (2.27)	-2.95 (2.27)	-5.27** (2.01)	-5.75*** (2.01)	-5.48*** (2.02)	-4.13** (1.96)	-5.65*** (1.96)	-4.70** (1.92)
Race: Asian	8.98*** (1.01)	-3.33*** (0.49)	-1.95*** (0.49)	2.61*** (0.39)	-3.32*** (0.49)	6.61*** (0.44)	6.54*** (0.44)	6.13*** (0.44)	6.21*** (0.44)	6.24*** (0.44)	2.99*** (0.42)	3.67*** (0.44)	3.05*** (0.42)	2.31*** (0.39)	2.51*** (0.39)	2.86*** (0.38)	3.18*** (0.38)	3.07*** (0.38)
Race: Hawaiian	27.67*** (3.06)	-1.09 (1.33)	-1.90 (1.32)	4.36*** (1.08)	-1.09 (1.33)	5.71*** (1.19)	5.60*** (1.19)	6.11*** (1.18)	6.17*** (1.18)	6.18*** (1.18)	3.76*** (1.14)	4.82*** (1.15)	6.46*** (1.15)	4.12*** (1.08)	4.29*** (1.08)	4.47*** (1.05)	3.95*** (1.06)	4.24*** (1.05)
Race: Missing	26.39*** (1.12)	9.25*** (0.62)	7.62*** (0.61)	4.08*** (0.42)	9.15*** (0.62)	1.82*** (0.51)	1.52*** (0.51)	1.79*** (0.51)	1.87*** (0.51)	1.78*** (0.51)	1.62*** (0.49)	1.65*** (0.47)	3.21*** (0.42)	3.89*** (0.42)	4.01*** (0.41)	4.04*** (0.41)	3.95*** (0.41)	3.96*** (0.40)
Subordinate lien		353.91*** (0.71)	353.21*** (0.70)	235.06*** (1.23)	353.77*** (0.71)	313.12*** (1.15)	313.50*** (1.14)	230.20*** (1.33)	230.53*** (1.33)	230.56*** (1.33)	230.17*** (1.27)	232.98*** (1.29)	219.65*** (1.27)	234.73*** (1.23)	235.27*** (1.23)	223.28*** (1.21)	223.28*** (1.21)	223.28*** (1.21)
Missing FICO																		
300 <= FICO < 600																		
600 <= FICO < 620																		
620 <= FICO < 640																		
640 <= FICO < 660																		
660 <= FICO < 680																		
680 <= FICO < 700																		
700 <= FICO < 720																		
720 <= FICO < 740																		
0K <= Loan Amount < 40K																		
40K <= Loan Amount < 50K																		
50K <= Loan Amount < 75K																		
75K <= Loan Amount < 150K																		
150K <= Loan Amount < 200K																		
200K <= Loan Amount < 300K																		
300K <= Loan Amount < 500K																		
40% < total debt ratio <= 45%																		
Total debt ratio > 45%																		
No total debt ratio																		
Total debt ratio > 36%																		
28% < housing debt ratio <= 33%																		
33% < housing debt ratio <= 40%																		
Housing debt ratio > 40%																		
No housing debt ratio																		
LTV missing																		
0% < LTV <= 60%																		
60% < LTV <= 70%																		
70% < LTV <= 80%																		
CLTV missing																		
0% < CLTV <= 80%																		
80% < CLTV <= 90%																		
(First lien) x (LTV missing)																		
(First lien) x (0% < LTV <= 60%)																		

Race Coefficients Are Also Shown in Table 6				Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
Model (1)	Model (2)	Model (3)	Model (4)	Same as (2), use rate lock week dummies in place of rate lock month dummies	Add various explanatory variables	Interact residence type & property type	Interact LTV x sub. lien, CLTV	Add HELOC dummy	Omit HELOC loans from sample	Add documentation type	Add MSA	Same as Model (4), substitute broader loan amortization types for loan programs	Same as Model (4), add housing debt ratio dummies	Same as Model (4), substitute total debt ratio > 36% dummy	Same as Model (4), add program category dummies	Same as Model (4), add unknown business channel dummy	Same as Model (4), add program category & unknown business channel dummies
Dependent variable: APR (basis points)	Race dummies only	Race, rate lock month & subordinate lien dummies	Same as (2), add FICO bin dummies	Same as (3), add risk-based characteristics													
(First lien) x (60% < LTV <= 70%)				-.9572*** (0.69)													
(First lien) x (70% < LTV <= 80%)				-.8474*** (0.60)													
(Subordinate lien) x (CLTV missing)				-.4426 (27.49)													
(Subordinate lien) x (0% < CLTV <= 80%)				-103.67*** (2.81)													
(Subordinate lien) x (80% < CLTV <= 90%)				-34.99*** (1.24)													
Unknown business origination channel																	
Program Category																	
A Minus																	
Alt-A																	
Closed-End Second																	
Commercial																	
Jumbo A																	
Unknown program category																	
HELOC																	
HA/VA																	
Coapplicant present																	
Self-employed borrower or co-borrower																	
Documentation type																	
Alternative Doc																	
Low Doc																	
NED																	
NID																	
NID/NAD																	
NID/NAV																	
NID/NED																	
NID/NED/NAD																	
NIV/NAV																	
Stated Income																	
Streamlined Refi																	
Unknown doc type																	
Loan purpose: Home improvement																	
Loan purpose: Refinance																	
Loan term																	
5-year term																	
7-year term																	
10-year term																	
15-year term																	
20-year term																	
25-year term																	
40-year term																	
Loan amortization																	
ARM																	
Balloon																	
Unknown																	

Race Coefficients Are Also Shown in Table 6				Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
Model (1)	Model (2)	Model (3)	Model (4)	Same as (2), use rate lock week dummies in place of rate lock month dummies	Add various explanatory variables	Interact residence type & property type	Interact LTV x 1st lien, CLTV x sub. lien	Add HELOC dummy	Omit HELOC loans from sample	Add documentation type	Add MSA	Same as Model (4), substitute broader loan amortization types for loan programs	Same as Model (4), add housing debt ratio dummies	Same as Model (4), substitute total debt ratio > 36% dummy	Same as Model (4), add program category dummies	Same as Model (4), add unknown business channel dummy	Same as Model (4), add program category & unknown business channel dummies
Dependent variable: APR (basis points)				Same as (3), add risk-based characteristics													
Loan payment terms																	
ARM (unknown term)			-190.04*** (2.30)										-189.59*** (2.31)	-189.16*** (2.29)	-196.96*** (2.27)	-207.19*** (2.34)	-197.51*** (2.24)
ARM 10YR/1YR			5.75 (4.57)										6.36 (4.60)	5.80 (4.31)	23.43*** (4.10)	27.32*** (4.19)	26.54*** (4.06)
ARM 10YR/6MO			6.88*** (1.03)										6.93*** (1.03)	7.63*** (1.04)	0.85 (0.96)	-4.63*** (1.02)	-4.73 (0.94)
ARM 1MO/1MO			-167.38*** (1.01)										-167.19*** (1.01)	-166.29*** (1.01)	-182.71*** (0.95)	-182.84*** (1.05)	-184.50*** (0.94)
ARM 1MO/1YR			-34.27*** (0.39)										-34.26*** (0.39)	-33.51*** (0.38)	-56.24*** (0.42)	-46.05*** (0.40)	-58.77*** (0.42)
ARM 1MO/2YR			9.68*** (2.08)										9.09*** (2.08)	10.46*** (2.08)	-12.03*** (2.04)	-2.71 (2.04)	-14.57*** (2.04)
ARM 1MO/3YR			21.23*** (1.57)										20.69*** (1.57)	22.22*** (1.57)	-0.05 (1.55)	8.57*** (1.55)	-2.60* (1.55)
ARM 1MO/5YR			22.03*** (1.41)										21.42*** (1.41)	23.01*** (1.41)	-0.85 (1.37)	8.37*** (1.39)	-3.61*** (1.36)
ARM 1YR/10YR			-199.42*** (43.15)										-199.00*** (43.19)	-199.85*** (43.28)	-203.49*** (43.26)	-197.04*** (43.33)	-205.92*** (43.15)
ARM 1YR/1MO			-105.26*** (9.44)										-104.89*** (9.43)	-104.62*** (9.43)	-110.67*** (9.32)	-117.20*** (9.35)	-112.04*** (9.35)
ARM 1YR/1YR			-21.15*** (1.11)										-21.13*** (1.11)	-20.47*** (1.11)	-27.26*** (1.03)	-32.59*** (1.09)	-28.79*** (1.01)
ARM 1YR/25YR			-219.72*** (23.53)										-219.41*** (23.43)	-218.43*** (23.53)	-256.87*** (19.86)	-239.81*** (22.28)	-256.99*** (19.19)
ARM 1YR/30YR			-143.86*** (5.10)										-143.55*** (5.09)	-143.50*** (5.09)	-145.94*** (5.29)	-144.49*** (5.12)	-146.65*** (5.32)
ARM 2YR/1MO			-160.85*** (10.49)										-157.42*** (10.43)	-160.13*** (10.49)	-156.85*** (10.57)	-174.22*** (11.03)	-160.04*** (10.55)
ARM 2YR/6MO			-0.72 (0.69)										-0.95 (0.69)	-0.19 (0.68)	-13.94*** (0.65)	-12.79*** (0.66)	-16.03*** (0.64)
ARM 3MO/1YR			-63.69*** (0.79)										-63.44*** (0.79)	-62.75*** (0.79)	-84.04*** (0.80)	-77.09*** (0.77)	-86.74*** (0.79)
ARM 3MO/2YR			-18.45*** (6.48)										-18.59*** (6.46)	-17.40*** (6.39)	-39.49*** (6.11)	-28.54*** (6.09)	-41.30*** (6.06)
ARM 3MO/3YR			-9.68 (6.69)										-9.74 (6.81)	-7.87 (6.71)	-31.87*** (6.61)	-20.02** (6.65)	-34.24*** (6.62)
ARM 3MO/5YR			-0.99 (8.88)										-1.74 (8.98)	0.83 (9.05)	-21.66** (8.73)	-14.28* (8.45)	-25.49*** (8.37)
ARM 3YR/10YR			-105.82** (43.27)										-105.61** (43.28)	-106.16** (43.40)	-115.40*** (43.40)	-111.03** (43.47)	-118.61*** (43.29)
ARM 3YR/15YR			-140.81*** (16.12)										-141.18*** (16.15)	-140.42*** (16.13)	-138.78*** (16.66)	-143.19*** (16.22)	-137.03*** (16.50)
ARM 3YR/1MO			-119.77*** (9.77)										-120.12*** (9.80)	-119.45*** (9.76)	-111.37*** (9.71)	-130.45*** (10.29)	-115.59*** (9.71)
ARM 3YR/1YR			-55.02*** (2.11)										-54.79*** (2.13)	-55.20*** (2.10)	-48.86*** (2.21)	-50.56*** (2.25)	-48.02*** (2.24)
ARM 3YR/20YR			-39.95** (15.69)										-40.17** (15.69)	-40.00** (15.68)	-32.81** (14.22)	-38.29** (15.40)	-32.15** (14.20)
ARM 3YR/25YR			-47.40*** (12.82)										-48.72*** (12.84)	-46.65*** (12.83)	-76.15*** (13.00)	-62.14*** (12.97)	-75.94*** (12.74)
ARM 3YR/30YR			-44.04*** (4.29)										-44.18*** (4.28)	-43.88*** (4.29)	-42.99*** (4.43)	-43.78*** (4.30)	-43.45*** (4.43)
ARM 3YR/6MO			-68.82*** (0.40)										-68.70*** (0.40)	-68.14*** (0.40)	-79.48*** (0.40)	-80.46*** (0.41)	-81.20*** (0.40)
ARM 4YR/1YR			5.60 (3.82)										6.27* (3.78)	7.27* (3.76)	-2.09 (3.50)	-10.62*** (3.53)	-4.03 (3.46)
ARM 5YR/10YR			-14.46 (56.41)										-15.86 (56.39)	-15.48 (56.53)	-15.87 (56.87)	-14.62 (56.13)	-18.47 (56.98)
ARM 5YR/15YR			-74.10*** (15.86)										-74.40*** (15.86)	-73.67*** (15.85)	-78.48*** (15.98)	-78.15*** (15.93)	-76.71*** (15.80)
ARM 5YR/1MO			-121.23*** (16.63)										-120.17*** (16.82)	-120.91*** (16.46)	-118.77*** (14.74)	-133.07*** (17.71)	-120.94*** (15.58)
ARM 5YR/1YR			-37.74*** (1.05)										-37.28*** (1.05)	-36.71*** (1.05)	-41.71*** (0.97)	-47.33*** (0.97)	-42.72*** (0.96)
ARM 5YR/25YR			-21.81* (12.95)										-22.87* (12.96)	-21.05 (12.95)	-49.28*** (13.25)	-36.79*** (13.10)	-49.30*** (12.99)
ARM 5YR/30YR			-91.21*** (2.98)										-91.07*** (2.97)	-91.06*** (2.98)	-91.76*** (3.13)	-91.50*** (2.97)	-92.32*** (3.12)
ARM 5YR/6MO			-28.28*** (0.37)										-28.12*** (0.37)	-27.40*** (0.36)	-39.66*** (0.37)	-40.69*** (0.38)	-41.03*** (0.37)
ARM 6MO/6MO			-168.23*** (0.58)										-167.94*** (0.58)	-167.14*** (0.58)	-177.20*** (0.59)	-185.58*** (0.61)	-178.56*** (0.58)
ARM 6YR/1YR			-14.26*** (3.50)										-12.15*** (3.55)	-11.57*** (3.57)	-25.35*** (2.72)	-32.84*** (2.95)	-27.62*** (2.66)
ARM 7YR/1YR			-21.83*** (1.19)										-21.43*** (1.20)	-20.25*** (1.20)	-29.34*** (1.07)	-37.03*** (1.14)	-31.08*** (1.07)
ARM 7YR/6MO			-21.00*** (0.76)										-20.98*** (0.76)	-20.26*** (0.76)	-25.75*** (0.72)	-33.59*** (0.74)	-27.00*** (0.71)
Balloon (unknown term)			152.33*** (10.80)										149.01*** (10.80)	149.75*** (10.82)	145.11*** (10.68)	111.86*** (11.04)	108.11*** (10.37)
20/10 Balloon			-80.75 (60.95)										-81.68 (60.92)	-81.32 (61.01)	-81.00 (62.71)	-82.12 (60.12)	-83.13 (62.90)

	<i>Race Coefficients Are Also Shown in Table 6</i>				Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
	Model (1)	Model (2)	Model (3)	Model (4)	Same as (2), use rate lock week dummies in place of rate lock month dummies	Add various explanatory variables	Interact residence type & property type	Interact LTV x 1st lien, CLTV x sub. lien	Add HELOC dummy	Omit HELOC loans from sample	Add documentation type	Add MSA	Same as Model (4), substitute broader loan amortization types for loan programs	Same as Model (4), add housing debt ratio dummies	Same as Model (4), substitute total debt ratio > 36% dummy	Same as Model (4), add program category dummies	Same as Model (4), add unknown business channel dummy	Same as Model (4), add program category & unknown business channel dummies
Dependent variable: APR (basis points)	Race dummies only	Race, rate lock month & subordinate lien dummies	Same as (2), add FICO bin dummies	Same as (3), add risk-based characteristics														
25/10 Balloon				-132.63*** (47.48)										-133.07*** (47.49)	-133.16*** (47.59)	-135.55*** (47.62)	-132.69*** (47.46)	-138.01*** (47.52)
25/15 Balloon				-142.34*** (44.29)										-143.09*** (44.37)	-141.99*** (44.32)	-147.65*** (40.39)	-148.57*** (39.88)	-145.19*** (39.29)
30/10 Balloon				-157.50*** (45.22)										-157.64*** (43.27)	-158.02*** (43.35)	-161.33*** (43.33)	-158.23*** (43.41)	-163.47*** (45.22)
30/15 Balloon				-83.89*** (10.73)										-83.46*** (10.73)	-83.17*** (10.75)	-91.38*** (10.61)	-89.46*** (10.96)	-88.49*** (10.28)
40/10 Balloon				-141.23*** (44.99)										-141.37*** (45.00)	-141.73*** (45.11)	-141.43*** (44.55)	-141.24*** (45.11)	-142.89*** (44.44)
40/15 Balloon				-109.47*** (12.00)										-109.13*** (11.98)	-108.74*** (12.02)	-114.84*** (11.89)	-114.62*** (12.21)	-111.94*** (11.63)
40/30 Balloon				-29.49*** (1.38)										-29.88*** (1.37)	-29.06*** (1.37)	-38.65*** (1.31)	-43.61*** (1.36)	-41.20*** (1.30)
5/25 Balloon				-90.07*** (7.29)										-90.56*** (7.26)	-91.13*** (7.09)	-89.94*** (7.25)	-68.49*** (7.50)	-77.16*** (7.46)
10-year fixed				-83.19*** (43.27)										-83.36*** (43.31)	-84.03*** (43.40)	-84.67*** (43.43)	-81.98*** (43.48)	-85.19*** (43.31)
15-year fixed				-88.81*** (10.73)										-88.32*** (10.73)	-88.21*** (10.75)	-93.94*** (10.61)	-90.92*** (10.96)	-90.32*** (10.28)
20-year fixed				-0.93 (8.06)										-0.13 (8.04)	-1.60 (8.06)	9.73 (8.59)	9.64 (7.96)	11.91 (8.62)
40-year fixed				-51.43*** (2.20)										-51.13*** (2.18)	-53.67*** (2.16)	-42.63*** (2.20)	-44.41*** (2.20)	-41.78*** (2.29)
Unknown term				-90.94*** (11.05)										-90.57*** (10.98)	-90.31*** (11.06)	-100.32*** (10.92)	-103.61*** (11.58)	-100.09*** (10.82)
<i>Property type</i>																		
Commercial - Mixed use w/ residential																		
Commercial - Mixed use w/o residential																		
Commercial - Multi-family > 4																		
Commercial - Other																		
Condo - High Rise																		
Condo - Low Rise																		
Condo - Mid Rise																		
Condo - Site																		
Condotel																		
Coop																		
Duplex																		
Fourplex																		
Manufactured Home																		
PUD-1 unit attached																		
PUD-1 unit detached																		
PUD-2 Units																		
PUD-3 Units																		
PUD-4 Units																		
Single Family Attached																		
Triplex																		
Unknown property type																		
<i>Residence type</i>																		
Investment property																		
Second home																		
<i>Property & residence type</i>																		
Investment, unknown type				79.06*** (2.38)			104.93*** (3.21)	100.88*** (3.20)	101.22*** (3.20)	100.84*** (3.20)	100.69*** (3.11)	100.07*** (3.10)	99.49*** (2.65)	80.51*** (2.38)	79.26*** (2.32)	59.78*** (2.32)	122.16*** (2.31)	111.15*** (2.43)
Investment, Commercial - Mixed use w/ residential				66.00*** (2.73)			40.43*** (2.63)	37.78*** (2.62)	39.24*** (2.64)	37.03*** (2.65)	27.74*** (2.65)	27.57*** (2.66)	47.95*** (2.55)	67.25*** (2.72)	66.24*** (2.73)	52.63*** (2.73)	113.92*** (2.74)	104.58*** (6.48)
Investment, Commercial - Mixed use w/o residential				56.48*** (3.77)			36.06*** (4.26)	35.13*** (4.28)	35.65*** (4.27)	35.16*** (4.27)	21.14*** (4.24)	20.89*** (4.24)	39.07*** (4.30)	57.89*** (3.76)	56.66*** (3.76)	46.00*** (3.76)	106.17*** (3.91)	98.72*** (7.77)
Investment, Commercial - Multi-family > 4				41.46*** (2.31)			22.36*** (2.08)	20.18*** (2.08)	21.30*** (2.09)	19.86*** (2.08)	9.28*** (2.14)	7.25*** (2.15)	22.89*** (2.07)	42.71*** (2.31)	41.76*** (2.31)	27.61*** (6.65)	89.19*** (2.37)	79.75*** (6.69)

Race Coefficients Are Also Shown in Table 6				Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
				Same as (2), use rate lock week dummies in place of race month & subordinate lien dummies	Add various explanatory variables	Interact residence type & property type	Interact LTV x sub. lien	Omit HELOC dummy	Add HELOC loans from sample	Add documentation type	Add MSA	Same as Model (4), substitute broader loan amortization types for loan programs	Same as Model (4), add housing debt ratio dummies	Same as Model (4), substitute total debt ratio > 36% dummy	Same as Model (4), add program category dummies	Same as Model (4), add unknown business channel dummy	Same as Model (4), add program category & unknown business channel dummies
Dependent variable: APR (basis points)	Race dummies only	Race, rate lock month & subordinate lien dummies	Same as (2), add FICO bin dummies	Same as (3), add risk-based characteristics													
Investment, Commercial - Other	77.34*** (11.59)	86.91*** (12.69)	86.91*** (12.69)	90.40*** (11.59)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)	86.91*** (12.69)
Investment, Condo - High Rise	45.93*** (1.66)	47.84*** (1.72)	47.84*** (1.72)	51.28*** (0.78)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)	47.84*** (1.72)
Investment, Condo - Low Rise	51.28*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	55.96*** (3.15)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)	51.13*** (0.78)
Investment, Condo - Mid Rise	58.74*** (3.15)	61.68*** (3.37)	61.68*** (3.37)	65.23*** (3.15)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)	61.68*** (3.37)
Investment, Condo - Site	50.39*** (5.06)	49.73*** (4.74)	49.73*** (4.74)	50.39*** (5.06)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)	49.73*** (4.74)
Investment, Condolet	32.49** (13.14)	56.77*** (16.65)	56.77*** (16.65)	32.49** (13.14)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)	56.77*** (16.65)
Investment, Coop	1.60 (1.28)	-55.83*** (1.53)	-55.83*** (1.53)	1.60 (1.28)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)	-55.83*** (1.53)
Investment, Duplex	58.79*** (0.73)	72.05*** (0.84)	72.05*** (0.84)	58.79*** (0.73)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)	72.05*** (0.84)
Investment, Fourplex	69.21*** (0.94)	85.31*** (1.06)	85.31*** (1.06)	69.21*** (0.94)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)	85.31*** (1.06)
Investment, PUD-1 unit attached	46.70*** (1.08)	51.57*** (1.17)	51.57*** (1.17)	46.70*** (1.08)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)	51.57*** (1.17)
Investment, PUD-1 unit detached	49.76*** (0.66)	56.82*** (0.70)	56.82*** (0.70)	49.76*** (0.66)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)	56.82*** (0.70)
Investment, PUD-2 units	44.76*** (6.20)	62.33*** (7.62)	62.33*** (7.62)	44.76*** (6.20)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)	62.33*** (7.62)
Investment, PUD-3 units	75.72*** (24.90)	101.87*** (29.68)	101.87*** (29.68)	75.72*** (24.90)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)	101.87*** (29.68)
Investment, PUD-4 units	53.88*** (4.32)	68.74*** (4.65)	68.74*** (4.65)	53.88*** (4.32)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)	68.74*** (4.65)
Investment, Single Family Attached	52.25*** (1.26)	57.18*** (1.45)	57.18*** (1.45)	52.25*** (1.26)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)	57.18*** (1.45)
Investment, Single Family Detached	49.38*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	49.38*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)	59.07*** (0.46)
Investment, Triplex	74.07*** (1.27)	90.83*** (1.48)	90.83*** (1.48)	74.07*** (1.27)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)	90.83*** (1.48)
Primary, unknown type	2.24 (1.89)	-6.80** (2.89)	-6.80** (2.89)	2.24 (1.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)	-6.80** (2.89)
Primary, Commercial - Mixed use w/ residential	119.06*** (18.25)	108.22*** (21.39)	108.22*** (21.39)	119.06*** (18.25)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)	108.22*** (21.39)
Primary, Commercial - Multi-family > 4	150.66*** (33.94)	141.94*** (44.12)	141.94*** (44.12)	150.66*** (33.94)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)	141.94*** (44.12)
Primary, Condo - High Rise	9.13*** (1.20)	2.77** (1.32)	2.77** (1.32)	9.13*** (1.20)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)	2.77** (1.32)
Primary, Condo - Low Rise	5.32*** (0.48)	1.24** (0.53)	1.24** (0.53)	5.32*** (0.48)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)	1.24** (0.53)
Primary, Condo - Mid Rise	9.73*** (1.86)	5.47** (2.17)	5.47** (2.17)	9.73*** (1.86)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)	5.47** (2.17)
Primary, Condo - Site	2.09 (2.38)	1.81 (2.62)	1.81 (2.62)	2.09 (2.38)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)	1.81 (2.62)
Primary, Coop	6.50*** (1.65)	-17.84*** (1.63)	-17.84*** (1.63)	6.50*** (1.65)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)	-17.84*** (1.63)
Primary, Duplex	11.28*** (0.73)	20.24*** (0.85)	20.24*** (0.85)	11.28*** (0.73)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)	20.24*** (0.85)
Primary, Fourplex	31.04*** (2.05)	42.69*** (2.45)	42.69*** (2.45)	31.04*** (2.05)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)	42.69*** (2.45)
Primary, Manufactured Home	13.57 (7.89)	10.37 (9.31)	10.37 (9.31)	13.57 (7.89)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)	10.37 (9.31)
Primary, PUD-1 unit attached	-0.47 (0.69)	-4.42*** (0.76)	-4.42*** (0.76)	-0.47 (0.69)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)	-4.42*** (0.76)
Primary, PUD-1 unit detached	-2.91*** (0.39)	-3.65*** (0.46)	-3.65*** (0.46)	-2.91*** (0.39)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)	-3.65*** (0.46)
Primary, PUD-2 units	5.44 (12.84)	20.37 (12.88)	20.37 (12.88)	5.44 (12.84)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)	20.37 (12.88)
Primary, PUD-3 units	61.30*** (0.86)	56.94*** (0.84)	56.94*** (0.84)	61.30*** (0.86)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)	56.94*** (0.84)
Primary, PUD-4 units	28.77 (16.31)	27.72 (19.48)	27.72 (19.48)	28													

Dependent variable: APR (basis points)	Race Coefficients Are Also Shown in Table 6				Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
	Model (1)	Model (2)	Model (3)	Model (4)	Same as (2), use rate lock week dummies in place of rate lock month dummies	Add various explanatory variables	Interact residence type & property type	Interact LTV x 1st lien, CLTV x sub. lien	Add HELOC dummy	Omit HELOC loans from sample	Add documentation type	Add MSA	Same as Model (4), substitute broader loan amortization types for loan programs	Same as Model (4), add housing debt ratio dummies	Same as Model (4), substitute total debt ratio > 36% dummy	Same as Model (4), add program category dummies	Same as Model (4), add unknown business channel dummy	Same as Model (4), add program category & unknown business channel dummies
Second home, PUD-1 unit detached				18.07*** (1.45)		21.64*** (1.63)	18.19*** (1.63)	18.10*** (1.63)	17.71*** (1.62)	17.08*** (1.57)	16.17*** (1.58)	20.39*** (1.62)	20.86*** (1.46)	17.77*** (1.45)	10.45*** (1.41)	18.47*** (1.43)	9.70*** (1.41)	
Second home, Single Family Attached				12.48* (6.88)		13.09 (8.62)	10.49 (8.91)	10.57 (8.92)	10.54 (8.92)	11.59 (8.38)	11.73 (8.44)	15.66* (8.00)	14.90** (6.88)	11.46* (6.77)	7.22 (6.56)	13.74** (6.70)	6.31 (6.53)	
Second home, Single Family Detached				17.35*** (1.04)		17.02*** (1.28)	13.42*** (1.28)	13.42*** (1.28)	13.23*** (1.28)	14.31*** (1.24)	13.59*** (1.25)	18.04*** (1.22)	20.09*** (1.04)	17.04*** (1.04)	11.93*** (1.00)	17.62*** (1.01)	10.73*** (0.99)	
Constant	660.15*** (0.39)	500.61*** (67.99)	489.18*** (64.02)	562.02*** (34.83)	473.40*** (0.01)	519.00*** (44.32)	518.89*** (42.57)	514.29*** (42.14)	514.28*** (42.15)	513.88*** (42.11)	472.75*** (38.37)	470.34*** (39.00)	524.59*** (34.94)	557.51*** (35.06)	559.69*** (34.64)	533.76*** (34.58)	588.73*** (33.54)	593.94*** (33.94)
Observations	372186	372186	372186	372038	372186	372038	372038	372038	372038	371609	372038	372038	372038	372038	372038	372038	372038	372038
R-squared	0.02055	0.73689	0.74322	0.87352	0.73765	0.81732	0.81786	0.81835	0.81846	0.81866	0.83015	0.83145	0.84466	0.87387	0.87340	0.87995	0.87789	0.88208
Adjusted R-squared	0.02053	0.73685	0.74317	0.87330	0.73748	0.81723	0.81777	0.81826	0.81837	0.81856	0.83005	0.83118	0.84442	0.87365	0.87318	0.87974	0.87768	0.88187

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Coefficients and standard errors for rate lock month, rate lock week, state, and MSA dummy variables excluded from this table for brevity.

Appendix 6: Results of APR Regressions Estimated Over Subsets of Data

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)
Dependent variable: APR (basis points)			Subordinate lien				
	First lien loans only	loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only	
Race: African American	9.44*** (0.44)	8.98*** (0.43)	5.42*** (1.50)	10.60*** (0.67)	7.29*** (0.59)	5.63*** (0.64)	7.15*** (0.98)
Race: Hispanic	7.64*** (0.32)	8.66*** (0.31)	-2.01* (1.15)	7.21*** (0.49)	3.79*** (0.39)	1.66*** (0.46)	2.07*** (0.72)
Race: American Indian	-5.83*** (2.02)	-8.40*** (1.96)	15.94** (7.82)	-7.23** (2.96)	-3.02 (2.41)	0.28 (3.02)	-0.40 (4.09)
Race: Asian	2.61*** (0.39)	2.70*** (0.37)	-0.98 (1.63)	-0.61 (0.59)	1.25*** (0.44)	0.92 (0.60)	0.49 (0.98)
Race: Hawaiian	4.36*** (1.08)	4.90*** (1.05)	-1.27 (4.14)	4.75** (1.90)	2.68** (1.22)	1.01 (1.49)	-2.25 (2.50)
Race: Missing	4.08*** (0.42)	3.78*** (0.40)	2.73* (1.57)	4.09*** (0.59)	2.83*** (0.54)	3.74*** (0.65)	2.30*** (0.85)
Subordinate lien	235.06*** (1.23)			194.51*** (3.48)	212.50*** (3.97)	290.73*** (1.98)	324.78*** (2.75)
Missing FICO	64.49*** (4.37)	61.12*** (4.36)	132.09*** (34.23)	58.17*** (4.92)	69.37*** (7.30)	49.21*** (6.32)	12.43** (6.02)
300 <= FICO < 600	113.47*** (6.93)	107.85*** (6.81)	93.89*** (5.17)	133.75*** (7.98)	87.24*** (11.35)	46.88*** (6.11)	28.01*** (5.51)
600 <= FICO < 620	87.81*** (4.90)	83.77*** (4.94)	135.76*** (29.46)	91.71*** (6.38)	76.36*** (7.97)	52.01*** (5.51)	31.41*** (9.08)
620 <= FICO < 640	40.29*** (0.91)	29.59*** (0.86)	178.61*** (4.27)	40.74*** (1.19)	28.38*** (1.29)	55.73*** (1.47)	47.18*** (1.89)
640 <= FICO < 660	38.08*** (0.51)	29.06*** (0.48)	144.73*** (2.14)	31.34*** (0.68)	30.26*** (0.71)	51.76*** (0.78)	44.91*** (1.24)
660 <= FICO < 680	24.88*** (0.37)	16.49*** (0.35)	103.17*** (1.24)	16.18*** (0.52)	19.26*** (0.49)	35.12*** (0.54)	33.73*** (0.86)
680 <= FICO < 700	13.31*** (0.32)	7.75*** (0.31)	74.05*** (1.22)	8.81*** (0.45)	9.16*** (0.40)	22.40*** (0.50)	22.62*** (0.77)
700 <= FICO < 720	4.08*** (0.31)	3.39*** (0.30)	14.21*** (1.16)	5.40*** (0.45)	3.58*** (0.37)	5.19*** (0.49)	6.42*** (0.72)
720 <= FICO < 740	1.79*** (0.34)	1.85*** (0.33)	2.75** (1.31)	2.60*** (0.49)	1.80*** (0.40)	2.12*** (0.55)	2.82*** (0.80)
0K <= Loan Amount < 40K	47.99*** (1.31)	99.11*** (1.89)	-61.69*** (20.75)	63.90*** (2.37)	47.60*** (2.40)	27.65*** (1.91)	37.36*** (3.81)
40K <= Loan Amount < 50K	35.05*** (1.35)	64.72*** (1.52)	-61.73*** (20.76)	51.44*** (1.90)	49.98*** (2.23)	10.55*** (2.02)	12.64*** (3.83)
50K <= Loan Amount < 75K	31.70*** (0.80)	41.98*** (0.80)	-54.28*** (20.76)	38.30*** (1.07)	44.05*** (1.12)	15.49*** (1.32)	13.34*** (2.08)
75K <= Loan Amount < 150K	13.03*** (0.49)	15.97*** (0.48)	-45.86** (20.78)	18.94*** (0.68)	19.14*** (0.62)	11.00*** (0.78)	5.19*** (1.17)
150K <= Loan Amount < 200K	2.50*** (0.47)	4.88*** (0.46)	-17.96 (20.98)	8.36*** (0.66)	6.97*** (0.57)	3.02*** (0.70)	-1.00 (1.02)

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)	
			Subordinate lien					
Dependent variable: APR (basis points)		First lien loans only	loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only	
200K <= Loan Amount < 300K	-1.74*** (0.39)	-0.03 (0.38)	-8.00 (21.48)	2.49*** (0.59)	2.25*** (0.46)	-0.89 (0.54)	-4.76*** (0.81)	
300K <= Loan Amount < 500K	-5.40*** (0.34)	-4.56*** (0.34)	33.70 (25.86)	-1.61*** (0.55)	-1.41*** (0.38)	-2.98*** (0.44)	-5.09*** (0.67)	
40% < total debt ratio <= 45%	7.96*** (0.31)	8.09*** (0.29)	7.21*** (1.04)	2.52*** (0.50)	3.12*** (0.41)	5.17*** (0.45)	3.35*** (0.65)	
Total debt ratio > 45%	-7.13*** (0.52)	-10.51*** (0.49)	18.00*** (1.81)	-5.27*** (0.75)	-5.69*** (0.68)	-2.92*** (0.91)	-6.36*** (0.96)	
No total debt ratio	14.33*** (5.42)	10.68* (5.58)	33.65*** (11.37)	16.63*** (6.44)	3.06 (9.51)	3.51 (6.83)	-4.18 (17.46)	
(First lien) x (LTV missing)	-15.57 (11.63)	-9.39 (11.92)			-26.87 (21.86)	-101.25*** (19.46)		
(First lien) x (0% < LTV <= 60%)	-100.67*** (0.71)	-102.17*** (0.71)		-91.55*** (0.95)	-90.67*** (1.16)	-101.44*** (1.49)	-107.58*** (1.06)	
(First lien) x (60% < LTV <= 70%)	-95.72*** (0.69)	-95.36*** (0.69)		-84.84*** (0.94)	-85.37*** (1.13)	-97.50*** (1.47)	-107.67*** (0.99)	
(First lien) x (70% < LTV <= 80%)	-84.74*** (0.60)	-83.69*** (0.61)		-73.07*** (0.83)	-77.43*** (1.05)	-83.12*** (1.38)	-90.94*** (0.73)	
(Subordinate lien) x (CLTV missing)	-44.26 (27.49)		-72.04* (37.95)		-153.95*** (25.26)	-52.12 (32.26)		
(Subordinate lien) x (0% < CLTV <= 80%)	-103.67*** (2.81)		-166.12*** (2.23)	-100.95*** (5.88)	-118.91*** (4.98)	-102.74*** (3.88)	-98.56*** (10.69)	
(Subordinate lien) x (80% < CLTV <= 90%)	-34.99*** (1.24)		-85.95*** (1.10)	-22.62*** (3.46)	-43.49*** (2.39)	-34.40*** (1.59)	-39.09*** (3.76)	
HELOC	-46.16*** (11.34)	-21.64 (14.31)		-175.82*** (16.08)	-11.81 (15.37)			
FHA/VA	-123.17*** (3.98)	-123.36*** (3.94)		-100.45*** (7.73)	-94.46*** (6.43)	-86.96*** (5.16)	-91.53*** (5.06)	
Coapplicant present	-2.75*** (0.24)	-2.39*** (0.23)	-2.35** (0.92)	-2.85*** (0.33)	-1.97*** (0.29)	-2.27*** (0.38)	-5.34*** (0.56)	
Self-employed borrower or co-borrower	15.31*** (0.77)	16.09*** (0.73)	3.81* (2.27)				-2.21*** (0.60)	
<i>Documentation type</i>								
Alternative Doc	-18.09*** (4.90)	-33.71*** (4.93)		52.70*** (3.50)				
Low Doc	48.84*** (13.75)	47.77*** (13.99)		6.00 (20.09)	54.64** (27.70)	51.02*** (8.95)	14.85 (18.04)	
NED	-44.66*** (5.91)	-49.26*** (6.23)				0.88 (7.68)		
NID	59.10*** (5.50)	54.22*** (5.64)	115.48*** (11.73)	46.45*** (6.68)	60.84*** (9.65)	78.74*** (6.95)	68.66*** (17.46)	
NID/NAD	104.47*** (6.62)	104.14*** (6.78)		77.54*** (7.23)	75.11*** (10.81)	105.55*** (9.15)	94.00*** (19.51)	
NID/NAV	134.98*** (7.10)	134.77*** (7.19)		89.57*** (7.73)	139.51*** (15.59)	91.57*** (8.53)	72.19*** (20.16)	

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)
			Subordinate lien				
Dependent variable: APR (basis points)		First lien loans only	loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only
NID/NED	84.00*** (5.72)	82.55*** (5.88)		66.42*** (6.64)	79.59*** (9.78)	101.67*** (7.49)	90.94*** (18.20)
NID/NED/NAD	95.37*** (5.48)	95.54*** (5.64)	-68.13*** (24.10)	81.79*** (6.49)	95.77*** (6.97)	108.25*** (6.97)	81.92*** (17.48)
NIV/NAV	44.72*** (0.60)	38.47*** (0.57)	127.10*** (2.76)	19.92*** (0.79)	30.30*** (0.76)	61.89*** (0.99)	52.97*** (1.10)
Stated Income	43.87*** (0.29)	37.31*** (0.28)	109.68*** (1.11)	31.19*** (0.37)	34.23*** (0.37)	53.78*** (0.57)	48.18*** (0.81)
Streamlined Refi	10.74 (36.28)	7.52 (35.50)		-33.16 (29.43)	48.51 (44.38)		
Unknown doc type	-21.24** (10.14)	-30.03*** (10.29)	20.95 (45.40)		-29.72** (12.46)	12.69 (9.42)	
Lender paid mortgage insurance					8.43 (7.51)	14.91*** (3.36)	
Escrow/impound waiver indicator = 'Y' or 'Yes Impounds'					-2.29*** (0.30)	-3.66*** (0.34)	
Loan purpose: Home improvement	7.15*** (1.03)	6.50*** (0.99)	30.50*** (6.01)	0.95 (1.79)			
Loan purpose: Refinance	1.70*** (0.25)	1.50*** (0.23)	24.04*** (0.95)	-5.20*** (0.36)			
Cash-out refinance					0.92*** (0.35)	15.95*** (0.43)	7.36*** (0.65)
Rate & term refinance					-5.69*** (0.39)	-0.65 (0.46)	-4.89*** (0.67)
Rate lock >= 30 days				-1.11** (0.55)	0.72 (0.48)	1.12 (0.72)	
No prepayment penalty				2.64*** (0.41)			
1-yr prepayment penalty					1.57** (0.65)	3.25*** (0.48)	
Prepayment penalty > 1 year					6.01*** (0.32)	0.08 (0.42)	
<i>Loan term</i>							
5-year term	88.48*** (3.24)	-1.91 (6.61)	404.20*** (20.87)	-80.18*** (6.29)		102.57*** (4.57)	
7-year term	13.89* (8.04)	14.27* (7.79)		-67.03*** (7.84)	0.52 (1.28)	7.39*** (1.90)	
10-year term	99.86** (43.16)	9.17 (31.73)	60.18* (32.58)	151.65*** (15.89)	-6.63 (48.40)	73.41** (34.95)	282.48*** (6.43)
15-year term	79.11*** (10.72)	54.77*** (14.11)	19.61 (13.01)	99.31*** (15.39)	113.18*** (13.59)	-24.24 (45.21)	-6.67 (54.19)
20-year term	-7.19 (7.73)	-40.80*** (13.58)		-139.03*** (14.63)	-41.19*** (13.72)	-17.34*** (2.35)	-7.73*** (2.81)
25-year term	42.54*** (12.21)	20.16 (14.12)		67.45*** (16.87)	75.35*** (18.90)	-140.24*** (6.53)	-8.63 (12.76)

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)
			Subordinate lien				
Dependent variable: APR (basis points)	First lien loans only		loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only
40-year term	21.48*** (0.45)	20.74*** (0.45)			18.26*** (0.48)	13.16*** (0.59)	10.79*** (1.48)
<i>Loan payment terms</i>							
ARM (unknown term)	-190.04*** (2.30)	-189.89*** (2.27)		-284.40*** (1.88)		22.47*** (7.34)	
ARM 10YR/1YR	5.75 (4.57)	3.41 (4.43)		-83.07*** (4.68)	4.70 (5.04)	51.82*** (3.25)	24.92 (18.74)
ARM 10YR/6MO	6.88*** (1.03)	12.53*** (1.03)		-88.96*** (1.56)	20.84*** (2.21)	57.84*** (1.92)	57.18*** (2.33)
ARM 1MO/1MO	-167.38*** (1.01)	-167.21*** (1.02)	-47.91 (30.25)	-273.70*** (0.92)	-91.94*** (1.74)	21.17 (13.07)	
ARM 1MO/1YR	-34.27*** (0.39)	-31.09*** (0.38)		-223.71*** (1.38)	-59.12*** (0.46)	30.50*** (0.54)	118.34*** (1.00)
ARM 1MO/2YR	9.68*** (2.08)	12.20*** (2.12)			-26.23*** (3.25)	58.86*** (2.42)	127.24*** (5.47)
ARM 1MO/3YR	21.23*** (1.57)	24.32*** (1.58)			-19.37*** (2.49)	65.19*** (1.83)	128.13*** (3.16)
ARM 1MO/5YR	22.03*** (1.41)	24.13*** (1.41)			-18.92*** (2.27)	67.56*** (1.64)	129.08*** (3.13)
ARM 1YR/10YR	-199.42*** (43.15)	-110.42*** (31.71)				-97.49*** (35.05)	
ARM 1YR/1MO	-105.26*** (9.44)	-102.05*** (9.48)			-39.56*** (11.47)	6.07 (7.52)	
ARM 1YR/1YR	-21.15*** (1.11)	-20.55*** (1.07)		-183.54*** (1.34)	4.61*** (0.74)	67.17*** (4.95)	
ARM 1YR/25YR	-219.72*** (23.53)	-197.27*** (21.98)			-272.58*** (20.76)		
ARM 1YR/30YR	-143.86*** (5.10)	-142.41*** (5.16)			-198.16*** (11.67)	-69.81*** (8.11)	9.38** (4.17)
ARM 2YR/1MO	-160.85*** (10.49)	-154.64*** (10.67)				-27.48*** (8.96)	
ARM 2YR/6MO	-0.72 (0.69)	-0.09 (0.67)		4.22 (7.21)	-10.81*** (0.75)	64.87*** (1.12)	82.76*** (2.86)
ARM 3MO/1YR	-63.69*** (0.79)	-63.43*** (0.75)		-196.71*** (1.56)	-57.39*** (0.77)	34.09* (17.80)	
ARM 3MO/2YR	-18.45*** (6.48)	-18.71*** (6.36)			-25.86*** (5.98)		
ARM 3MO/3YR	-9.68 (6.69)	-10.25 (6.59)			-16.17** (6.60)		
ARM 3MO/5YR	-0.99 (8.88)	-3.51 (8.43)			-9.49 (8.92)		
ARM 3YR/10YR	-105.82** (43.27)	-14.30 (31.77)		-284.65*** (16.81)			
ARM 3YR/15YR	-140.81*** (16.12)	-111.30*** (18.36)		-238.10*** (18.74)	-201.61*** (23.70)		-25.17 (54.39)

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)
	Subordinate lien						
Dependent variable: APR (basis points)	First lien loans only		loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only
ARM 3YR/1MO	-119.77*** (9.77)	-114.30*** (9.86)				-7.97 (9.26)	
ARM 3YR/1YR	-55.02*** (2.11)	-54.66*** (2.05)		-177.12*** (2.72)	-38.24*** (3.51)	26.23*** (2.79)	69.95*** (7.55)
ARM 3YR/20YR	-39.95** (15.69)				-6.82 (31.92)		
ARM 3YR/25YR	-47.40*** (12.82)	-18.56 (14.62)		-166.37*** (17.41)	-104.08*** (24.24)	157.88*** (32.13)	
ARM 3YR/30YR	-44.04*** (4.29)	-42.11*** (4.33)		-117.37*** (9.40)	-53.26*** (9.43)	-48.44*** (7.70)	-20.99*** (7.92)
ARM 3YR/6MO	-68.82*** (0.40)	-65.43*** (0.40)	-746.16*** (21.45)	-191.58*** (0.50)	-36.58*** (0.45)	44.93*** (0.52)	63.97*** (1.18)
ARM 4YR/1YR	5.60 (3.82)	2.93 (3.56)				56.02*** (4.56)	68.48*** (3.15)
ARM 5YR/10YR	-14.46 (56.41)	82.24* (49.45)		-131.40*** (28.95)		14.42 (35.43)	
ARM 5YR/15YR	-74.10*** (15.86)	-43.58** (18.15)		-169.17*** (19.86)	-137.43*** (29.32)	30.26 (46.05)	44.73 (54.28)
ARM 5YR/1MO	-121.23*** (16.63)	-113.85*** (15.82)				-1.04 (10.03)	
ARM 5YR/1YR	-37.74*** (1.05)	-38.80*** (1.01)		-160.23*** (1.70)	-31.01*** (1.45)	33.16*** (1.40)	64.55*** (4.41)
ARM 5YR/20YR		36.78** (15.49)		55.73*** (17.02)		-12.48 (12.24)	
ARM 5YR/25YR	-21.81* (12.95)	5.79 (14.76)		-115.99*** (17.42)	-127.35*** (22.51)	91.06*** (9.85)	23.66 (21.67)
ARM 5YR/30YR	-91.21*** (2.98)	-89.48*** (3.01)		-71.11*** (12.26)	-61.95*** (9.32)	-53.79*** (6.37)	-16.23*** (3.00)
ARM 5YR/6MO	-28.28*** (0.37)	-24.48*** (0.36)		-161.71*** (0.48)	-16.29*** (0.47)	36.72*** (0.49)	64.24*** (0.59)
ARM 6MO/6MO	-168.23*** (0.58)	-168.94*** (0.58)	-62.00*** (20.73)	-257.13*** (0.60)	-114.69*** (1.35)	73.80*** (22.71)	
ARM 6YR/1YR	-14.26*** (3.50)	-16.28*** (3.23)				52.04*** (4.71)	71.54*** (10.27)
ARM 7YR/1YR	-21.83*** (1.19)	-26.08*** (1.13)		-107.07*** (4.70)	-29.90*** (1.47)	30.52*** (1.91)	39.99* (23.83)
ARM 7YR/6MO	-21.00*** (0.76)	-18.02*** (0.74)		-129.22*** (1.37)	-11.38*** (1.35)	30.33*** (1.11)	45.51*** (1.37)
Balloon (unknown term)	152.33*** (10.80)	181.92*** (14.17)		70.15*** (15.45)			
20/10 Balloon	-80.75 (60.95)	15.10 (55.61)		-181.11*** (16.70)	-74.79 (54.39)		
25/10 Balloon	-132.63*** (47.48)	-38.30 (37.14)		-264.17*** (16.65)	4.81 (51.05)	-76.46* (40.05)	

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)
			Subordinate lien				
Dependent variable: APR (basis points)		First lien loans only	loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only
25/15 Balloon	-142.34*** (44.29)	-112.86*** (41.28)					21.99 (61.07)
30/10 Balloon	-157.50*** (43.22)	-63.80** (31.81)		-245.33*** (17.82)	-64.08 (49.42)	-101.52*** (35.20)	-261.74*** (7.29)
30/15 Balloon	-83.89*** (10.73)	-49.20*** (14.15)	-3.55 (13.06)	-116.23*** (15.38)	-127.69*** (13.40)	46.80 (45.18)	35.03 (54.20)
40/10 Balloon	-141.23*** (44.99)	-46.52 (33.81)					-254.82*** (10.78)
40/15 Balloon	-109.47*** (12.00)	-79.24*** (15.02)					33.40 (54.36)
40/30 Balloon	-29.49*** (1.38)	-26.04*** (1.34)			-12.29*** (2.22)	10.48*** (1.69)	19.54*** (3.46)
5/25 Balloon	-90.07*** (7.29)						
10-year fixed	-83.19* (43.27)	3.38 (33.79)	-49.92 (32.67)	-191.06*** (21.50)	-28.82 (52.59)	-51.55 (34.74)	-246.69*** (16.27)
15-year fixed	-88.81*** (10.73)	-65.82*** (14.13)	-21.30 (13.10)	-142.66*** (15.38)	-141.97*** (13.56)	9.71 (45.23)	-6.77 (54.23)
20-year fixed	-0.93 (8.06)	30.30** (13.77)		126.61*** (14.84)	23.75* (14.00)		
40-year fixed	-51.43*** (2.20)	-48.89*** (2.20)				-150.11*** (2.47)	-6.31** (2.50)
Unknown term	-90.94*** (11.05)	-85.36*** (10.55)	-34.50 (46.16)		-31.39** (12.95)		
<i>Property & residence type</i>							
Invesment, unknown type	79.06*** (2.38)	69.42*** (2.41)	169.94*** (7.81)	70.27*** (1.53)	39.89*** (14.59)	96.54*** (20.51)	
Invesment, Commercial - Mixed use w/ residential	66.00*** (2.73)	62.55*** (2.76)		97.24*** (4.78)	96.12*** (8.84)	47.92*** (6.61)	62.32*** (3.01)
Invesment, Commercial - Mixed use w/o residential	56.48*** (3.77)	55.21*** (3.80)		141.93*** (19.62)		42.01*** (9.36)	84.41*** (3.34)
Invesment, Commercial - Multi-family > 4	41.46*** (2.31)	38.67*** (2.35)		87.94*** (4.99)	70.81*** (8.80)	28.72*** (6.36)	55.96*** (2.29)
Invesment, Commercial - Other	77.34*** (11.59)	70.88*** (12.27)		86.86*** (14.37)			
Invesment, Condo - High Rise	45.93*** (1.66)	39.04*** (1.54)	176.50*** (10.50)	47.97*** (2.63)	35.83*** (1.54)	55.16*** (3.13)	67.87*** (4.62)
Invesment, Condo - Low Rise	51.28*** (0.72)	38.81*** (0.67)	208.29*** (3.15)	44.79*** (1.14)	40.38*** (0.84)	65.91*** (1.20)	65.10*** (1.86)
Invesment, Condo - Mid Rise	58.74*** (3.15)	46.20*** (2.89)	209.44*** (13.38)	60.20*** (6.39)	36.52*** (2.86)	62.57*** (4.90)	63.47*** (5.88)
Invesment, Condo - Site	50.39*** (5.06)	42.93*** (4.99)	170.57*** (23.64)	48.72*** (5.53)	51.41*** (7.72)	47.99*** (5.59)	53.48** (21.47)
Invesment, Condotel	32.49** (13.14)	32.74*** (12.14)				31.60** (13.83)	29.73*** (8.84)

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)
	Subordinate lien						
Dependent variable: APR (basis points)	First lien loans only		loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only
Invesment, Coop	1.60 (1.28)	-1.37 (1.27)		47.61*** (1.41)			
Invesment, Duplex	58.79*** (0.73)	49.14*** (0.72)	177.32*** (2.15)	57.91*** (1.01)	53.17*** (0.95)	62.35*** (1.12)	68.10*** (1.77)
Invesment, Fourplex	69.21*** (0.94)	56.90*** (0.90)	225.32*** (2.73)	71.83*** (1.14)	60.56*** (1.24)	76.43*** (1.52)	80.04*** (2.79)
Invesment, PUD-1 unit attached	46.70*** (1.08)	36.59*** (1.02)	174.51*** (4.37)	45.81*** (1.69)	35.25*** (1.17)	58.28*** (1.81)	57.81*** (3.16)
Invesment, PUD-1 unit detached	49.76*** (0.66)	41.17*** (0.63)	158.79*** (2.15)	49.96*** (0.96)	41.92*** (0.78)	55.86*** (1.12)	58.64*** (1.82)
Invesment, PUD-2 units	44.76*** (6.20)	42.59*** (6.55)	112.77*** (26.40)	52.60*** (7.01)	54.18*** (7.17)	61.01*** (7.21)	74.83*** (15.89)
Invesment, PUD-3 units	75.72*** (24.90)	77.64*** (25.60)	198.39*** (4.46)	66.12*** (17.47)	80.17*** (19.61)	11.40*** (2.24)	
Invesment, PUD-4 units	53.88*** (4.32)	46.66*** (4.14)	201.87*** (14.47)	74.40*** (6.66)	45.49*** (5.26)	61.70*** (5.73)	73.07*** (11.20)
Invesment, Single Family Attached	52.25*** (1.26)	37.50*** (1.19)	173.05*** (4.89)	45.92*** (1.62)	48.52*** (1.58)	62.27*** (2.23)	62.53*** (3.08)
Invesment, Single Family Detached	49.38*** (0.40)	38.46*** (0.38)	169.57*** (1.46)	48.50*** (0.55)	42.57*** (0.50)	58.76*** (0.67)	59.13*** (0.97)
Invesment, Triplex	74.07*** (1.27)	63.14*** (1.23)	239.21*** (3.64)	76.54*** (1.50)	62.78*** (1.64)	79.80*** (2.06)	80.58*** (3.19)
Primary, unknown type	2.24 (1.97)	2.00 (2.00)	-9.45 (7.00)	5.15*** (1.31)	-39.51** (17.14)	37.34** (18.76)	
Primary, Commercial - Mixed use w/ residential	119.06*** (18.25)	116.12*** (18.33)		105.66*** (15.88)	140.09*** (28.39)	40.42*** (2.55)	
Primary, Commercial - Multi-family > 4	150.66*** (33.94)	146.84*** (34.27)		150.79*** (24.90)	140.74*** (32.52)	17.22** (6.87)	
Primary, Condo - High Rise	9.13*** (1.20)	5.79*** (1.16)	37.50*** (5.57)	7.29*** (2.66)	7.02*** (1.44)	9.83*** (1.60)	14.60*** (2.75)
Primary, Condo - Low Rise	5.32*** (0.48)	1.92*** (0.46)	43.05*** (1.85)	1.95*** (0.73)	1.88*** (0.58)	9.67*** (0.70)	7.80*** (1.10)
Primary, Condo - Mid Rise	9.73*** (1.86)	3.66** (1.75)	77.78*** (9.85)	1.77 (2.89)	5.67** (2.28)	18.29*** (2.93)	8.45*** (4.26)
Primary, Condo - Site	2.09 (2.38)	2.35 (2.20)	15.76** (7.80)	-1.51 (4.01)	2.62 (2.62)	0.07 (3.39)	-4.52 (7.75)
Primary, Coop	6.50*** (1.65)	1.02 (1.64)		7.60** (3.86)	11.06*** (1.95)	11.95*** (1.71)	0.41 (2.95)
Primary, Duplex	11.28*** (0.73)	8.97*** (0.72)	35.75*** (2.84)	15.50*** (1.17)	10.64*** (0.94)	13.28*** (0.98)	17.50*** (1.56)
Primary, Fourplex	31.04*** (2.05)	29.25*** (2.03)	67.71*** (8.54)	45.26*** (2.54)	29.15*** (2.39)	32.84*** (2.79)	27.54*** (4.90)
Primary, Manufactured Home	13.57* (7.89)	13.03* (7.76)		0.70 (24.04)	13.56 (11.43)	23.90*** (9.27)	-0.00 (8.32)

	Model (4)	Model (4-L1)	Model (4-L2)	Model (4-2004)	Model (4-2005)	Model (4-2006)	Model (4-2007)
			Subordinate lien				
Dependent variable: APR (basis points)		First lien loans only	loans only	2004 loans only	2005 loans only	2006 loans only	2007 loans only
Primary, PUD-1 unit attached	-0.47 (0.69)	0.85 (0.64)	-7.66*** (2.53)	0.47 (1.18)	0.37 (0.81)	-4.72*** (1.01)	-3.60** (1.80)
Primary, PUD-1 unit detached	-2.91*** (0.39)	-1.95*** (0.36)	-5.95*** (1.45)	-1.79*** (0.58)	-1.77*** (0.48)	-5.01*** (0.63)	-5.20*** (0.98)
Primary, PUD-2 units	5.44 (12.84)	0.94 (12.15)		5.23 (8.84)	47.30*** (16.68)	-28.75*** (1.57)	
Primary, PUD-3 units	61.30*** (0.86)	50.15*** (0.84)		86.79*** (1.04)			
Primary, PUD-4 units	28.77* (16.31)	13.09 (15.57)	39.46* (21.40)	-16.30** (7.56)	49.97** (22.81)	26.02 (28.06)	
Primary, Single Family Attached	-0.12 (0.88)	-1.06 (0.84)	5.30 (3.50)	-0.60 (1.33)	-0.44 (1.15)	3.31*** (1.27)	-1.37 (2.39)
Primary, Triplex	36.32*** (1.55)	34.94*** (1.56)	72.06*** (6.53)	44.94*** (2.18)	31.78*** (2.01)	34.62*** (1.98)	31.35*** (2.92)
Second home, unknown type	28.65*** (5.97)	21.74*** (5.71)	164.94*** (21.10)	26.50*** (4.40)	24.67*** (9.57)	66.49*** (23.54)	
Second home, Condo - High Rise	17.63*** (2.76)	12.26*** (2.66)	116.27*** (15.24)	31.05*** (5.29)	15.05*** (3.15)	26.74*** (3.78)	19.14*** (6.29)
Second home, Condo - Low Rise	24.66*** (1.54)	16.73*** (1.51)	126.46*** (6.42)	17.37*** (2.55)	16.40*** (1.86)	37.32*** (2.16)	29.94*** (3.33)
Second home, Condo - Mid Rise	17.03*** (5.25)	13.69** (5.33)	93.62*** (16.46)	27.56*** (7.18)	17.58*** (5.68)	20.42** (8.50)	5.10 (8.53)
Second home, Condo - Site	7.85 (17.68)	4.01 (17.89)	111.94** (45.51)	-35.21*** (5.37)	-17.80 (15.30)	30.51 (20.62)	77.99*** (4.27)
Second home, Coop	30.64*** (5.36)	24.56*** (4.97)		71.23*** (1.56)	17.11*** (6.01)	7.01 (8.93)	42.05*** (3.63)
Second home, PUD-1 unit attached	20.64*** (3.64)	13.66*** (3.24)	102.26*** (26.22)	11.02* (5.81)	18.91*** (4.25)	29.64*** (4.97)	21.70 (13.52)
Second home, PUD-1 unit detached	18.07*** (1.45)	15.86*** (1.37)	67.55*** (6.56)	20.82*** (3.08)	17.18*** (1.50)	21.89*** (2.46)	11.20*** (4.03)
Second home, Single Family Attached	12.48* (6.88)	5.46 (6.38)	86.70*** (30.55)	22.76** (10.82)	14.85** (6.44)	18.00 (13.94)	14.07 (17.25)
Second home, Single Family Detached	17.35*** (1.04)	12.95*** (0.99)	80.93*** (5.83)	15.51*** (1.56)	16.80*** (1.30)	25.01*** (1.86)	15.75*** (2.06)
Constant	562.02*** (34.83)	569.63*** (36.41)	887.73*** (52.26)	641.52*** (21.81)	703.80*** (59.08)	721.51 (.)	685.08*** (36.21)
Observations	372038	340512	31526	112946	110582	105787	42723
R-squared	0.87352	0.81224	0.77480	0.88581	0.83342	0.88136	0.88038
Adjusted R-squared	0.87330	0.81189	0.77111	0.88526	0.83258	0.88072	0.87890

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Coefficients and standard errors for rate lock month, rate lock week, state, and MSA dummy variables excluded from this table for brevity.

Appendix 7: Results of APR Regressions Estimated Using Alternative Race Classifications

Dependent variable: APR (basis points)	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
Race: African American	9.44*** (0.44)			
Race: Hispanic	7.64*** (0.32)			
Race: American Indian	-5.83*** (2.02)			
Race: Asian	2.61*** (0.39)			
Race: Hawaiian	4.36*** (1.08)			
Race: Missing	4.08*** (0.42)			
American Indian, non-Hispanic			-5.90*** (2.02)	
American Indian, Hispanic			3.82*** (1.39)	
Asian, non-Hispanic			2.60*** (0.39)	
Asian, Hispanic			8.11*** (2.22)	
African American, non-Hispanic			9.50*** (0.45)	
African American, Hispanic			6.90*** (2.46)	
Hawaiian, non-Hispanic			4.34*** (1.08)	
Hawaiian, Hispanic			10.77*** (2.39)	
Missing, non-Hispanic			4.08*** (0.42)	
Missing, Hispanic			11.49*** (1.26)	
White, Hispanic			7.46*** (0.33)	
Black				5.19*** (0.92)
Hispanic				7.29*** (0.32)
Asian				-1.38 (0.87)
American Indian				-7.80*** (1.30)
Hawaiian				0.66 (1.18)
White				-4.10*** (0.84)
Missing				-0.05 (0.93)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
Dependent variable: APR (basis points)				
(FICO missing) x African American		33.61** (14.62)		
(FICO < 600) x African American		64.98*** (23.15)		
(600 <= FICO < 620) x African American		35.53** (17.95)		
(620 <= FICO < 640) x African American		4.57* (2.58)		
(640 <= FICO < 660) x African American		11.59*** (1.51)		
(660 <= FICO < 680) x African American		12.69*** (1.04)		
(680 <= FICO < 700) x African American		10.83*** (0.94)		
(700 <= FICO < 720) x African American		9.15*** (0.95)		
(720 <= FICO < 740) x African American		8.12*** (1.15)		
(FICO >= 740) x African American		6.66*** (0.93)		
(FICO missing) x Hispanic		37.38*** (9.82)		
(FICO < 600) x Hispanic		22.60 (26.29)		
(600 <= FICO < 620) x Hispanic		-28.33** (13.88)		
(620 <= FICO < 640) x Hispanic		6.49*** (2.39)		
(640 <= FICO < 660) x Hispanic		11.63*** (1.18)		
(660 <= FICO < 680) x Hispanic		12.24*** (0.78)		
(680 <= FICO < 700) x Hispanic		10.21*** (0.67)		
(700 <= FICO < 720) x Hispanic		7.11*** (0.66)		
(720 <= FICO < 740) x Hispanic		6.47*** (0.77)		
(FICO >= 740) x Hispanic		3.54*** (0.56)		
(FICO missing) x American Indian		-33.44*** (10.07)		
(FICO < 600) x American Indian		-129.58*** (12.70)		
(600 <= FICO < 620) x American Indian		-104.06*** (11.04)		
(620 <= FICO < 640) x American Indian		0.11 (8.85)		
(640 <= FICO < 660) x American Indian		-6.72 (5.89)		
(660 <= FICO < 680) x American Indian		-7.59 (4.67)		

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
Dependent variable: APR (basis points)		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
(680 <= FICO < 700) x American Indian		13.04** (5.39)		
(700 <= FICO < 720) x American Indian		11.37** (4.65)		
(720 <= FICO < 740) x American Indian		-0.35 (4.27)		
(FICO >= 740) x American Indian		-4.06 (3.24)		
(FICO missing) x Asian		9.31 (10.61)		
(FICO < 600) x Asian		73.03** (32.52)		
(600 <= FICO < 620) x Asian		-41.30** (19.18)		
(620 <= FICO < 640) x Asian		8.39** (3.74)		
(640 <= FICO < 660) x Asian		5.15*** (1.92)		
(660 <= FICO < 680) x Asian		3.98*** (1.20)		
(680 <= FICO < 700) x Asian		2.70*** (0.93)		
(700 <= FICO < 720) x Asian		1.79** (0.86)		
(720 <= FICO < 740) x Asian		1.87** (0.94)		
(FICO >= 740) x Asian		2.14*** (0.62)		
(FICO missing) x Hawaiian		5.41 (18.89)		
(FICO < 600) x Hawaiian		-84.09* (48.99)		
(600 <= FICO < 620) x Hawaiian		-23.84 (46.64)		
(620 <= FICO < 640) x Hawaiian		1.48 (8.78)		
(640 <= FICO < 660) x Hawaiian		13.91*** (5.40)		
(660 <= FICO < 680) x Hawaiian		8.57*** (2.87)		
(680 <= FICO < 700) x Hawaiian		6.01** (2.56)		
(700 <= FICO < 720) x Hawaiian		5.12** (2.50)		
(720 <= FICO < 740) x Hawaiian		1.50 (2.86)		
(FICO >= 740) x Hawaiian		0.82 (1.92)		
(FICO missing) x Missing race		-40.96*** (10.62)		
(FICO < 600) x Missing race		-9.82 (26.47)		

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
Dependent variable: APR (basis points)				
(600 <= FICO < 620) x Missing race		-27.06** (13.73)		
(620 <= FICO < 640) x Missing race		1.41 (3.05)		
(640 <= FICO < 660) x Missing race		6.23*** (1.70)		
(660 <= FICO < 680) x Missing race		7.39*** (1.15)		
(680 <= FICO < 700) x Missing race		5.58*** (0.98)		
(700 <= FICO < 720) x Missing race		2.71*** (0.94)		
(720 <= FICO < 740) x Missing race		5.05*** (1.12)		
(FICO >= 740) x Missing race		2.51*** (0.71)		
Subordinate lien	235.06*** (1.23)	235.19*** (1.22)	235.09*** (1.23)	235.08*** (1.23)
Missing FICO	64.49*** (4.37)	63.91*** (5.88)	64.45*** (4.36)	64.37*** (4.36)
300 <= FICO < 600	113.47*** (6.93)	142.36*** (11.69)	113.44*** (6.92)	113.26*** (6.93)
600 <= FICO < 620	87.81*** (4.90)	104.94*** (7.54)	87.81*** (4.90)	87.83*** (4.90)
620 <= FICO < 640	40.29*** (0.91)	40.00*** (1.27)	40.30*** (0.91)	40.30*** (0.91)
640 <= FICO < 660	38.08*** (0.51)	35.68*** (0.69)	38.07*** (0.51)	38.07*** (0.51)
660 <= FICO < 680	24.88*** (0.37)	22.23*** (0.49)	24.88*** (0.37)	24.89*** (0.37)
680 <= FICO < 700	13.31*** (0.32)	11.55*** (0.43)	13.31*** (0.32)	13.31*** (0.32)
700 <= FICO < 720	4.08*** (0.31)	3.37*** (0.41)	4.09*** (0.31)	4.09*** (0.31)
720 <= FICO < 740	1.79*** (0.34)	1.15** (0.45)	1.79*** (0.34)	1.79*** (0.34)
0K <= Loan Amount < 40K	47.99*** (1.31)	47.81*** (1.31)	47.98*** (1.31)	48.01*** (1.31)
40K <= Loan Amount < 50K	35.05*** (1.35)	34.78*** (1.35)	35.05*** (1.35)	35.08*** (1.35)
50K <= Loan Amount < 75K	31.70*** (0.80)	31.54*** (0.80)	31.71*** (0.80)	31.73*** (0.80)
75K <= Loan Amount < 150K	13.03*** (0.49)	12.91*** (0.49)	13.04*** (0.49)	13.05*** (0.49)
150K <= Loan Amount < 200K	2.50*** (0.47)	2.39*** (0.47)	2.50*** (0.47)	2.52*** (0.47)
200K <= Loan Amount < 300K	-1.74*** (0.39)	-1.81*** (0.39)	-1.73*** (0.39)	-1.72*** (0.39)
300K <= Loan Amount < 500K	-5.40*** (0.34)	-5.43*** (0.34)	-5.40*** (0.34)	-5.39*** (0.34)
40% < total debt ratio <= 45%	7.96*** (0.31)	7.92*** (0.31)	7.96*** (0.31)	7.97*** (0.31)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
<i>Dependent variable: APR (basis points)</i>				
Total debt ratio > 45%	-7.13*** (0.52)	-7.27*** (0.52)	-7.13*** (0.52)	-7.13*** (0.52)
No total debt ratio	14.33*** (5.42)	15.19*** (5.50)	14.35*** (5.42)	14.30*** (5.42)
(First lien) x (LTV missing)	-15.57 (11.63)	-16.08 (11.72)	-15.44 (11.63)	-15.45 (11.63)
(First lien) x (0% < LTV <= 60%)	-100.67*** (0.71)	-100.74*** (0.71)	-100.66*** (0.71)	-100.67*** (0.71)
(First lien) x (60% < LTV <= 70%)	-95.72*** (0.69)	-95.74*** (0.69)	-95.71*** (0.69)	-95.72*** (0.69)
(First lien) x (70% < LTV <= 80%)	-84.74*** (0.60)	-84.70*** (0.60)	-84.73*** (0.60)	-84.73*** (0.60)
(Subordinate lien) x (CLTV missing)	-44.26 (27.49)	-51.08* (27.52)	-44.14 (27.49)	-43.69 (27.66)
(Subordinate lien) x (0% < CLTV <= 80%)	-103.67*** (2.81)	-103.70*** (2.81)	-103.68*** (2.81)	-103.69*** (2.81)
(Subordinate lien) x (80% < CLTV <= 90%)	-34.99*** (1.24)	-35.07*** (1.24)	-34.99*** (1.24)	-34.99*** (1.24)
HELOC	-46.16*** (11.34)	-46.34*** (11.32)	-46.13*** (11.35)	-46.18*** (11.36)
FHA/VA	-123.17*** (3.98)	-104.22*** (4.04)	-122.95*** (3.97)	-124.24*** (3.78)
Coapplicant present	-2.75*** (0.24)	-2.76*** (0.24)	-2.75*** (0.24)	-2.70*** (0.24)
Self-employed borrower or co-borrower	15.31*** (0.77)	15.18*** (0.77)	15.31*** (0.77)	15.31*** (0.77)
<i>Documentation type</i>				
Alternative Doc	-18.09*** (4.90)	-18.60*** (4.89)	-17.84*** (4.90)	-17.88*** (4.90)
Low Doc	48.84*** (13.75)	47.49*** (13.85)	48.85*** (13.75)	48.80*** (13.76)
NED	-44.66*** (5.91)	-46.43*** (5.98)	-44.68*** (5.91)	-44.64*** (5.91)
NID	59.10*** (5.50)	58.20*** (5.57)	59.05*** (5.50)	59.11*** (5.49)
NID/NAD	104.47*** (6.62)	103.96*** (6.68)	104.34*** (6.61)	104.38*** (6.61)
NID/NAV	134.98*** (7.10)	134.42*** (7.17)	134.88*** (7.10)	134.95*** (7.10)
NID/NED	84.00*** (5.72)	83.04*** (5.79)	83.99*** (5.72)	83.99*** (5.72)
NID/NED/NAD	95.37*** (5.48)	94.33*** (5.56)	95.32*** (5.48)	95.38*** (5.48)
NIV/NAV	44.72*** (0.60)	44.90*** (0.60)	44.73*** (0.60)	44.72*** (0.60)
Stated Income	43.87*** (0.29)	43.91*** (0.29)	43.87*** (0.29)	43.86*** (0.29)
Streamlined Refi	10.74 (36.28)	-31.26 (39.93)	7.88 (36.40)	9.35 (36.34)
Unknown doc type	-21.24** (10.14)	-28.37*** (10.61)	-21.11** (10.14)	-21.03** (10.14)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
<i>Dependent variable: APR (basis points)</i>				
Loan purpose: Home improvement	7.15*** (1.03)	7.21*** (1.03)	7.13*** (1.03)	7.13*** (1.03)
Loan purpose: Refinance	1.70*** (0.25)	1.73*** (0.25)	1.70*** (0.25)	1.70*** (0.25)
<i>Loan term</i>				
5-year term	88.48*** (3.24)	88.61*** (3.24)	88.47*** (3.24)	88.40*** (3.24)
7-year term	13.89* (8.04)	14.23* (7.98)	13.95* (8.04)	13.89* (8.03)
10-year term	99.86** (43.16)	100.73** (43.45)	99.87** (43.16)	99.87** (43.18)
15-year term	79.11*** (10.72)	79.24*** (10.70)	79.08*** (10.73)	79.10*** (10.73)
20-year term	-7.19 (7.73)	-8.01 (7.84)	-7.06 (7.74)	-7.03 (7.74)
25-year term	42.54*** (12.21)	43.39*** (12.10)	42.56*** (12.22)	42.62*** (12.22)
40-year term	21.48*** (0.45)	21.48*** (0.45)	21.47*** (0.45)	21.47*** (0.45)
<i>Loan payment terms</i>				
ARM (unknown term)	-190.04*** (2.30)	-190.51*** (2.29)	-189.94*** (2.30)	-189.94*** (2.30)
ARM 10YR/1YR	5.75 (4.57)	6.07 (4.51)	5.75 (4.57)	5.80 (4.56)
ARM 10YR/6MO	6.88*** (1.03)	6.88*** (1.03)	6.89*** (1.03)	6.89*** (1.04)
ARM 1MO/1MO	-167.38*** (1.01)	-167.51*** (1.01)	-167.38*** (1.01)	-167.38*** (1.01)
ARM 1MO/1YR	-34.27*** (0.39)	-34.38*** (0.39)	-34.26*** (0.39)	-34.26*** (0.39)
ARM 1MO/2YR	9.68*** (2.08)	9.57*** (2.08)	9.69*** (2.08)	9.68*** (2.08)
ARM 1MO/3YR	21.23*** (1.57)	21.17*** (1.57)	21.23*** (1.57)	21.22*** (1.57)
ARM 1MO/5YR	22.03*** (1.41)	21.98*** (1.41)	22.01*** (1.41)	22.02*** (1.41)
ARM 1YR/10YR	-199.42*** (43.15)	-200.05*** (43.43)	-199.36*** (43.14)	-199.29*** (43.16)
ARM 1YR/1MO	-105.26*** (9.44)	-104.67*** (9.57)	-105.21*** (9.44)	-105.23*** (9.44)
ARM 1YR/1YR	-21.15*** (1.11)	-21.18*** (1.11)	-21.14*** (1.11)	-21.14*** (1.11)
ARM 1YR/25YR	-219.72*** (23.53)	-221.88*** (23.25)	-218.39*** (22.79)	-223.31*** (25.70)
ARM 1YR/30YR	-143.86*** (5.10)	-144.23*** (5.08)	-143.76*** (5.10)	-143.72*** (5.10)
ARM 2YR/1MO	-160.85*** (10.49)	-161.71*** (10.53)	-160.91*** (10.49)	-160.92*** (10.49)
ARM 2YR/6MO	-0.72 (0.69)	-1.05 (0.68)	-0.71 (0.69)	-0.70 (0.69)
ARM 3MO/1YR	-63.69*** (0.79)	-63.82*** (0.79)	-63.69*** (0.79)	-63.70*** (0.79)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
Dependent variable: APR (basis points)				
ARM 3MO/2YR	-18.45*** (6.48)	-18.31*** (6.47)	-18.42*** (6.48)	-18.40*** (6.48)
ARM 3MO/3YR	-9.68 (6.69)	-9.69 (6.66)	-9.67 (6.69)	-9.67 (6.69)
ARM 3MO/5YR	-0.99 (8.88)	-0.75 (8.89)	-1.00 (8.88)	-0.99 (8.88)
ARM 3YR/10YR	-105.82** (43.27)	-106.13** (43.57)	-105.74** (43.26)	-105.76** (43.28)
ARM 3YR/15YR	-140.81*** (16.12)	-139.17*** (16.29)	-140.56*** (16.12)	-140.56*** (16.12)
ARM 3YR/1MO	-119.77*** (9.77)	-143.25*** (11.19)	-119.78*** (9.78)	-119.55*** (9.78)
ARM 3YR/1YR	-55.02*** (2.11)	-55.44*** (2.13)	-55.00*** (2.11)	-55.01*** (2.11)
ARM 3YR/20YR	-39.95** (15.69)	-41.11** (16.09)	-39.89** (15.69)	-39.89** (15.69)
ARM 3YR/25YR	-47.40*** (12.82)	-48.12*** (12.71)	-47.27*** (12.83)	-47.33*** (12.83)
ARM 3YR/30YR	-44.04*** (4.29)	-44.22*** (4.30)	-44.01*** (4.29)	-44.01*** (4.29)
ARM 3YR/6MO	-68.82*** (0.40)	-68.77*** (0.40)	-68.80*** (0.40)	-68.79*** (0.40)
ARM 4YR/1YR	5.60 (3.82)	5.51 (3.84)	5.61 (3.82)	5.69 (3.82)
ARM 5YR/10YR	-14.46 (56.41)	-14.59 (56.66)	-14.24 (56.39)	-14.21 (56.40)
ARM 5YR/15YR	-74.10*** (15.86)	-74.84*** (15.89)	-73.96*** (15.88)	-73.95*** (15.88)
ARM 5YR/1MO	-121.23*** (16.63)	-124.17*** (22.42)	-121.24*** (16.69)	-121.12*** (16.65)
ARM 5YR/1YR	-37.74*** (1.05)	-37.89*** (1.04)	-37.73*** (1.05)	-37.70*** (1.05)
ARM 5YR/25YR	-21.81* (12.95)	-22.36* (12.85)	-21.68* (12.96)	-21.72* (12.96)
ARM 5YR/30YR	-91.21*** (2.98)	-91.31*** (2.99)	-91.15*** (2.98)	-91.14*** (2.98)
ARM 5YR/6MO	-28.28*** (0.37)	-28.31*** (0.37)	-28.27*** (0.37)	-28.27*** (0.37)
ARM 6MO/6MO	-168.23*** (0.58)	-168.28*** (0.58)	-168.21*** (0.58)	-168.21*** (0.58)
ARM 6YR/1YR	-14.26*** (3.50)	-14.34*** (3.48)	-14.24*** (3.50)	-14.25*** (3.50)
ARM 7YR/1YR	-21.83*** (1.19)	-22.05*** (1.19)	-21.82*** (1.19)	-21.76*** (1.19)
ARM 7YR/6MO	-21.00*** (0.76)	-20.97*** (0.76)	-21.01*** (0.76)	-21.00*** (0.76)
Balloon (unknown term)	152.33*** (10.80)	153.06*** (10.79)	152.35*** (10.82)	152.29*** (10.82)
20/10 Balloon	-80.75 (60.95)	-81.00 (61.06)	-80.65 (60.95)	-80.63 (60.96)
25/10 Balloon	-132.63*** (47.48)	-134.04*** (47.73)	-132.54*** (47.47)	-132.53*** (47.49)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
Dependent variable: APR (basis points)				
25/15 Balloon	-142.34*** (44.29)	-127.68*** (33.51)	-142.20*** (44.28)	-142.22*** (44.24)
30/10 Balloon	-157.50*** (43.22)	-158.55*** (43.51)	-157.43*** (43.22)	-157.46*** (43.24)
30/15 Balloon	-83.89*** (10.73)	-83.98*** (10.72)	-83.86*** (10.75)	-83.88*** (10.75)
40/10 Balloon	-141.23*** (44.99)	-144.55*** (45.71)	-141.15*** (44.99)	-141.15*** (45.01)
40/15 Balloon	-109.47*** (12.00)	-110.78*** (12.05)	-109.49*** (12.01)	-109.44*** (12.01)
40/30 Balloon	-29.49*** (1.38)	-29.51*** (1.38)	-29.49*** (1.37)	-29.49*** (1.37)
5/25 Balloon	-90.07*** (7.29)	-88.60*** (7.19)	-89.94*** (7.31)	-89.82*** (7.30)
10-year fixed	-83.19* (43.27)	-84.47* (43.55)	-83.15* (43.27)	-83.16* (43.29)
15-year fixed	-88.81*** (10.73)	-88.93*** (10.72)	-88.78*** (10.75)	-88.81*** (10.75)
20-year fixed	-0.93 (8.06)	0.02 (8.17)	-1.03 (8.07)	-1.10 (8.07)
40-year fixed	-51.43*** (2.20)	-51.48*** (2.20)	-51.44*** (2.20)	-51.46*** (2.20)
Unknown term	-90.94*** (11.05)	-93.74*** (11.29)	-90.86*** (11.05)	-90.83*** (11.05)
Investment, unknown type	79.06*** (2.38)	79.28*** (2.38)	78.97*** (2.38)	79.00*** (2.38)
Investment, Commercial - Mixed use w/ residential	66.00*** (2.73)	66.49*** (2.73)	65.89*** (2.73)	65.90*** (2.73)
Investment, Commercial - Mixed use w/o residential	56.48*** (3.77)	56.89*** (3.80)	56.41*** (3.77)	56.41*** (3.77)
Investment, Commercial - Multi-family > 4	41.46*** (2.31)	42.00*** (2.31)	41.35*** (2.31)	41.36*** (2.31)
Investment, Commercial - Other	77.34*** (11.59)	77.53*** (11.38)	77.25*** (11.59)	77.25*** (11.59)
Investment, Condo - High Rise	45.93*** (1.66)	46.03*** (1.66)	45.91*** (1.66)	45.87*** (1.66)
Investment, Condo - Low Rise	51.28*** (0.72)	51.34*** (0.72)	51.26*** (0.72)	51.24*** (0.72)
Investment, Condo - Mid Rise	58.74*** (3.15)	58.83*** (3.15)	58.71*** (3.15)	58.69*** (3.15)
Investment, Condo - Site	50.39*** (5.06)	49.96*** (5.07)	50.37*** (5.06)	50.34*** (5.05)
Investment, Condotel	32.49** (13.14)	32.70** (12.96)	32.44** (13.13)	32.41** (13.15)
Investment, Coop	1.60 (1.28)	3.46*** (1.31)	1.63 (1.28)	1.63 (1.28)
Investment, Duplex	58.79*** (0.73)	58.83*** (0.73)	58.78*** (0.73)	58.79*** (0.73)
Investment, Fourplex	69.21*** (0.94)	69.29*** (0.94)	69.19*** (0.94)	69.22*** (0.94)
Investment, PUD-1 unit attached	46.70*** (1.08)	46.77*** (1.08)	46.69*** (1.08)	46.66*** (1.08)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
Dependent variable: APR (basis points)				
Invesment, PUD-1 unit detached	49.76*** (0.66)	49.73*** (0.66)	49.73*** (0.66)	49.73*** (0.66)
Invesment, PUD-2 units	44.76*** (6.20)	44.96*** (6.21)	44.77*** (6.20)	44.76*** (6.20)
Invesment, PUD-3 units	75.72*** (24.90)	75.51*** (25.35)	75.70*** (24.89)	75.71*** (24.88)
Invesment, PUD-4 units	53.88*** (4.32)	53.81*** (4.31)	53.85*** (4.32)	53.94*** (4.32)
Invesment, Single Family Attached	52.25*** (1.26)	52.37*** (1.26)	52.24*** (1.26)	52.23*** (1.26)
Invesment, Single Family Detached	49.38*** (0.40)	49.41*** (0.40)	49.37*** (0.40)	49.36*** (0.40)
Invesment, Triplex	74.07*** (1.27)	74.16*** (1.27)	74.05*** (1.27)	74.06*** (1.27)
Primary, unknown type	2.24 (1.97)	2.11 (1.97)	1.96 (1.97)	1.98 (1.97)
Primary, Commercial - Mixed use w/ residential	119.06*** (18.25)	119.41*** (18.16)	119.00*** (18.25)	119.03*** (18.26)
Primary, Commercial - Multi-family > 4	150.66*** (33.94)	150.68*** (33.79)	150.59*** (33.95)	150.61*** (33.95)
Primary, Condo - High Rise	9.13*** (1.20)	9.05*** (1.20)	9.12*** (1.20)	9.10*** (1.20)
Primary, Condo - Low Rise	5.32*** (0.48)	5.32*** (0.48)	5.31*** (0.48)	5.31*** (0.48)
Primary, Condo - Mid Rise	9.73*** (1.86)	9.61*** (1.86)	9.71*** (1.86)	9.72*** (1.86)
Primary, Condo - Site	2.09 (2.38)	2.15 (2.38)	2.06 (2.38)	2.12 (2.38)
Primary, Coop	6.50*** (1.65)	6.48*** (1.65)	6.48*** (1.65)	6.49*** (1.65)
Primary, Duplex	11.28*** (0.73)	11.25*** (0.73)	11.31*** (0.73)	11.31*** (0.73)
Primary, Fourplex	31.04*** (2.05)	30.89*** (2.05)	31.04*** (2.05)	31.06*** (2.05)
Primary, Manufactured Home	13.57* (7.89)	6.66 (6.87)	13.62* (7.88)	13.56* (7.93)
Primary, PUD-1 unit attached	-0.47 (0.69)	-0.48 (0.69)	-0.48 (0.69)	-0.49 (0.69)
Primary, PUD-1 unit detached	-2.91*** (0.39)	-2.93*** (0.39)	-2.93*** (0.39)	-2.94*** (0.39)
Primary, PUD-2 units	5.44 (12.84)	2.84 (12.45)	5.25 (12.87)	5.25 (12.87)
Primary, PUD-3 units	61.30*** (0.86)	60.36*** (0.87)	61.26*** (0.86)	61.23*** (0.86)
Primary, PUD-4 units	28.77* (16.31)	28.46* (16.32)	28.73* (16.30)	28.74* (16.31)
Primary, Single Family Attached	-0.12 (0.88)	-0.11 (0.87)	-0.12 (0.88)	-0.11 (0.88)
Primary, Triplex	36.32*** (1.55)	36.25*** (1.55)	36.34*** (1.55)	36.38*** (1.55)
Second home, unknown type	28.65*** (5.97)	28.68*** (5.98)	28.74*** (5.97)	28.77*** (5.97)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
		Interact Race & FICO	Interact Ethnicity & Race	Allow Multiple Race Classifications
Dependent variable: APR (basis points)				
Second home, Condo - High Rise	17.63*** (2.76)	17.72*** (2.76)	17.60*** (2.76)	17.60*** (2.76)
Second home, Condo - Low Rise	24.66*** (1.54)	24.64*** (1.54)	24.65*** (1.54)	24.63*** (1.54)
Second home, Condo - Mid Rise	17.03*** (5.25)	16.82*** (5.24)	17.01*** (5.25)	17.01*** (5.25)
Second home, Condo - Site	7.85 (17.68)	7.49 (17.62)	7.83 (17.68)	7.80 (17.67)
Second home, Coop	30.64*** (5.36)	30.56*** (5.34)	30.62*** (5.35)	30.59*** (5.36)
Second home, PUD-1 unit attached	20.64*** (3.64)	20.80*** (3.65)	20.53*** (3.64)	20.54*** (3.64)
Second home, PUD-1 unit detached	18.07*** (1.45)	18.03*** (1.45)	18.04*** (1.45)	18.02*** (1.45)
Second home, Single Family Attached	12.48* (6.88)	12.53* (6.88)	12.42* (6.87)	12.43* (6.88)
Second home, Single Family Detached	17.35*** (1.04)	17.28*** (1.04)	17.33*** (1.04)	17.33*** (1.04)
Constant	562.02*** (34.83)	563.56*** (34.72)	561.70*** (34.87)	565.81*** (34.87)
Observations	372038	372038	372038	372038
R-squared	0.87352	0.87377	0.87353	0.87353
Adjusted R-squared	0.87330	0.87353	0.87331	0.87331

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Coefficients and standard errors for rate lock month, rate lock week, state, and MSA dummy variables excluded from this table for brevity.

Notes : Model (4) assigns each loan to a single race as described in Section V.

Model (4-RF) interacts the race and FICO score dummy variables as described in Section V.

In estimating Model (4-X), each loan is assigned to a race and ethnicity separately based on the race and ethnicity of the borrower or coborrower in Defendants' loan database in a sequential order. Model (4-X) uses the interaction of the assigned race and ethnicity variables in place of the single race variable from Model (4). To assign each loan to an ethnicity for Model (4-X), I classify the ethnicity of a loan as "Hispanic" if the ethnicity of the borrower or co-borrower is "Hispanic or Latino". The loan ethnicity is classified as "non-Hispanic" if I do not classify the loan ethnicity as Hispanic. I classify the race of a loan as "African American" if any of the races given for either the borrower or co-borrower is African American. Next, I classify the race of a loan as "Asian" if (1) any of the races given for either the borrower or co-borrower is Asian, and (2) I do not classify the loan as "African American". I classify the race of a loan as "American Indian" if (1) any of the races given for either the borrower or co-borrower is American Indian or Alaskan Native, and (2) I do not classify the loan as "African American", or "Asian". I classify the race of a loan as "Hawaiian" if (1) any of the races given for either the borrower or co-borrower is Native Hawaiian or Other Pacific Islander, and (2) I do not classify the loan as "African American", "Asian", or "American Indian". I classify the race of a loan as "White" if (1) the first race listed for the borrower is White, (2) any other races listed for the borrower is unknown or missing, (3) the co-borrower's race is White or unknown, and (4) I do not classify the loan as "African American", "Asian", or "American Indian". I classify the race of all other loans as "Missing".

In estimating Model (4-Y), each loan is assigned to any race or ethnicity that appears in the data for that loan. For example, if the race of the borrower is African American and the ethnicity of the borrower is Hispanic, then the dummy variables for both "African American" and "Hispanic" are equal to 1 for that loan. If the race of the borrower is African American, the ethnicity of the borrower is non-Hispanic, the race of the co-borrower is White, and the ethnicity of the co-borrower is Hispanic, then the dummy variables for "African American", "Hispanic", and "White" are equal to 1 for that loan.