EXHIBIT 5

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

CECIL BARRETT, JR., CYNTHIA BARRETT, JEAN BLANCO GUERRIER, JACQUELINE GRISSETT, CRAIG GRISSETT, STEVEN PARHAM, BETTY HOFFMAN, EDWARD HOFFMAN, DORIS MURRAY, JOSLYN DAY and KEISHA CHAVERS on behalf of themselves and all others similarly situated,	)))))))))))	C.A. No. 08-10157
Plaintiffs,	))	**CLASS CERTIFICATION REPORT OF IAN AYRES**
v.	))	
OPTION ONE MORTGAGE CORPORATION and H&R BLOCK MORTGAGE CORP. N/K/A OPTION ONE MORTGAGE SERVICES, INC.	)))))	
Defendants.	))	

CONFIDENTIAL—SUBJECT TO PROTECTIVE ORDER

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I. INTRODUCTION

1.   I have been asked by counsel for Cecil Barrett Jr. and similarly situated individuals ("Plaintiffs") to analyze whether (1) disparate impact of the mortgage loan pricing policies of Option One Mortgage Corp. ("OOMC") and H&R Block Mortgage Corp. ("HRBMC") (collectively "Option One" or "Defendants") 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 Second Amended Complaint ("Complaint"), filed July 9, 2009, in this matter. This and other materials that I relied upon in forming my opinions are listed in Appendix 1.

2.   Plaintiffs allege, among other things, that the lending practices of Defendants have imposed a disparate impact on protected classes of minorities.[1] For example, Plaintiffs allege that Defendants engaged in a "Discretionary Pricing Policy" under which its loan officers, brokers, and correspondent lenders could impose subjective, discretionary charges and interest rate mark-ups in the loans that they originated.[2] These subjective charges are added to the objective, risk-based rates already established by Defendants. Plaintiffs allege that Defendants' policies for retail and wholesale access to its loan products subject African American customers to a significantly higher likelihood of exposure to discretionary points, fees, and interest rate mark-ups.[3] These allegations have been brought pursuant to the Equal Credit Opportunity Act (ECOA) and the Fair Housing Act (FHA).[4]

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1.   Second Amended Class Action Complaint, C.A. No. 08-10157, ¶9 [hereinafter *Complaint*].
2.   *Id.* ¶2.
3.   *Id.* ¶10.
4.   *Id.* ¶¶1-2, 184.

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3.   Plaintiffs have brought an action on behalf of themselves and a proposed class of borrowers defined as all African American "consumers (the "Class") who obtained an Option One home mortgage loan in the United States between January 1, 2001 and the date of judgment in this action (the "Class Period") and who were subject to the Defendants' Discretionary Pricing Policy pursuant to which they paid discretionary points, fees or interest rate mark-ups in connection with their loan."[5]

II. QUALIFICATIONS

4.   I am the William K. Townsend Professor at Yale Law School, and a Professor at Yale's School of Management. I have been ranked as one of the most prolific and most-cited law professors of my generation. I am a columnist for Forbes magazine and write for the New York Times' Freakonomics Blog. I have been a commentator on public radio's Marketplace. My research has been featured on Primetime Live, Oprah, and Good Morning America and in Time and Vogue magazines. I was the editor of the Journal of Law, Economics and Organization for 7 years. I clerked for the Honorable James K. Logan of the Tenth Circuit Court of Appeals. I have previously taught at Harvard, Illinois, Northwestern, Stanford, and Virginia law schools and have been a research fellow of the American Bar Foundation. In 2006, I was elected to the American Academy of Arts and Sciences. I regularly teach Quantitative Corporate Finance.

5.   In the Spring of 2010, together with Barry Nalebuff, I will publish a book with Basic Books on retirement investments entitled *Lifecycle Investing: A New, Safe, and Audacious Way to Improve the Performance of Your Retirement Portofilio*. My book with

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5. *Id.* ¶184. The Complaint included both African Americans and Hispanic borrowers in the Class, but I understand that only African American borrowers' claims are being pursued in this case as of the date of this report.

Gregory Klass, *Insincere Promises: The Law of Misrepresented Intent*, won the 2006 Scribes book award "for the best work of legal scholarship published during the previous year." I have published 9 books and over 100 articles on a wide range of topics. In 2007, I published *Super Crunchers: Why Thinking-By-Numbers is the New Way to be Smart*. In the spring 2005, I published *Optional Law: The Structure of Legal Entitlements* (University of Chicago Press 2005); and *Insincere Promises: The Law of Misrepresented Intent* (Yale University Press 2005) (with Gregory Klass). I also am the author of *Why Not?: How to Use Everyday Ingenuity to Solve Problems Big and Small* (2003) (with Barry Nalebuff); *Voting with Dollars: A New Paradigm for Campaign Finance* (2002) (with Bruce Ackerman); and *Pervasive Prejudice?: Non-Traditional Evidence of Race and Gender Discrimination* (2001). My two most cited articles are *Fair Driving: Gender and Race Discrimination in Retail Car Negotiations*, 104 Harvard Law Review 817 (1991), and *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 Yale Law Journal 87 (1989) (with Robert Gertner).

6.   I am the author of several empirical studies: *Does Affirmative Action Reduce the Number of Black Lawyers?*, 57 Stanford Law Review 1807 (2005) (with Richard Brooks); *To Insure Prejudice: Racial Disparities in Taxicab Tipping*, 114 Yale Law Journal 1613 (2005) (with Fred Vars and Nasser Zakariya); *Measuring the Positive Externalities from Unobservable Victim Precaution: An Empirical Analysis of Lojack*, 113 Quarterly Journal of Economics 43 (1998) (with Steven D. Levitt); *Pursuing Deficit Reduction Through Diversity: How Affirmative Action at the FCC Increased Auction Competition*, 48 Stanford Law Review 761 (1996) (with Peter Cramton); and *Racial Equity in Renal Transplantation: The Disparate Impact of HLA-Based Allocation*, 270 Journal of American Medical Association 1352 (1993) (with Robert Gaston, Laura Dooley, and Arnold Diethelm). I received my B.A. in Russian studies and

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economics and J.D. from Yale University and my Ph.D. in economics from M.I.T.

7.   I have attached (as Appendix 1) 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.

8.   My curriculum vitae is included as Appendix 2. I have previously testified as an expert witness in a variety of antitrust, contract, and civil rights cases – including several concerning discretionary markups of auto loans.[6] I have attached a list of cases on which I have given sworn testimony (Appendix 3).

9.   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 $600. My compensation is not contingent on any action or event resulting from the analyses, opinions or conclusions in, or the use of, this report.

III. SUMMARY OF CONCLUSIONS

10.   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 Defendants' policies affect African Americans versus whites, in general. For the reasons detailed in this report, I conclude that Defendants maintain sufficient data concerning its borrowers to permit just the kind of class-wide examination of Defendants' policies as required by a disparate impact case. In addition, my analysis of the data provided to Plaintiffs shows that African Americans paid more for Option One mortgage loans than whites with similar risk-

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6. See Ian Ayres, *Market Power and Inequality: A Competitive Conduct Standard for Assessing When Disparate Impacts are Justified*, 95 CAL. L. REV. 669 (2007) (available at http://islandia.law.yale.edu/ayres/Market%20Failure%20and%20Inequality.doc).

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characteristics. Table 1 shows the difference in loan costs (represented by the annual percentage

rate, or "APR") paid by white and African American borrowers for Option One nonprime loans

originated from 2001 to 2007.[7]

TABLE 1: SUMMARY OF DISPARATE IMPACT & MONETARY RELIEF

All Nonprime Loans (2001-2007)	
Mean APR for African Americans	9.876%
Mean APR for Whites	9.415%
Difference	0.461%
Difference after Controlling for Risk Factors with Regressions	0.086%
Undiscounted Monetary Relief over Five Years ($ Millions)	$86.3
Number of Loans	129,171
Undiscounted Monetary Relief over Five Years per Borrower	$668

As Table 1 shows, the mean APR of an Option One nonprime loan to white borrowers was 9.415

percent, whereas the mean APR to African American borrowers was 9.876 percent. Even when

controlling with regression analysis the risk-based factors used by lenders to price mortgage

loans, the APRs for African Americans were 8.6 basis points higher than the APRs for whites.[8]

(A basis point is equal to $1/100^{th}$ 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 of $86.3 million over the five

years following loan origination—an average of $668 per African American borrower. Monetary

relief can also be calculated for other periods as the court deems appropriate.

11.   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

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7.   I restrict my analysis to nonprime loans because of data limitations discussed below.
8.   These estimates are based on my preferred regression model. I discuss comparable estimates using alternative model specifications later in this report.

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common to the class. In Section V, I show that Defendants' pricing policies imposed a disparate impact on African Americans through higher priced loans by using Defendants' 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.

12.   In Section VI, I examine the named Plaintiffs in this case and show that their situations are typical of other Class members in that similarly situated Class members suffered disparate impact resulting from Defendants' pricing policies. Using several models, I show that each of the named Plaintiffs paid more for at least one of their loans than whites with similar risk characteristics.

13.   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 Defendants' challenged conduct. This model would estimate the finance charges Class members would have paid but-for Defendants' alleged practices. Computing aggregate overpayment would incorporate Defendants' 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.

14.   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

15.   Common evidence and methods are available to show that Defendants' policies had a disparate impact on African Americans such that African Americans paid more for home

mortgage loans than whites with similar risk characteristics. Using statistical tests such as regression analysis that are common to the Class, my analysis of Defendants' internal mortgage application data shows that Defendants' pricing policies had a disparate impact on the Class.

A.   **Mortgage Industry Overview**

1.   **Overview**

16.   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.[9] 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.[10] 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

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

10. *Id.* at 2. Based on Defendants' loan-level data produced to Plaintiffs in this case, 97 percent of loans originated by Option One during the Class period were nonprime (Alt-A and subprime) loans. Bates No. DEF6000001; DEF6000003; DEF6000004.

loans were sold into the capital markets.[11] During much of the class period, Option One was among the top ten originators of sub-prime and Alt-A residential loans.[12] Substantially all of its nonprime originations were sold into the capital markets through a variety of whole loan or securitization transactions.[13]

17.   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 then resell large pools of mortgages to capital market investors in securitization transactions.[14] With this "originate to distribute" model, many major mortgage originators, like Option One, sell substantially all of their mortgage loans shortly after origination. 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 a limited number of loan features (e.g., prepayment penalties and repricing formulas for adjustable rate

11. Ashcraft & Til Schuermann, *supra* note 9, at 2.
12. *Id.* at 4; Souphala Chomsisengphet and Anthony Pennington-Cross, *The Evolution of the Subprime Mortgage Market*, FED. RES. BANK OF ST. LOUIS REV., Jan./Feb. 2006, at 31, 39.
13. See H&R Block, Inc., SEC Form 10-K for Year Ended Apr. 30, 2006, filed June 30, 2006, at 38. Defendants' prime loans were typically sold as whole loans to Countrywide Home Loans, Inc. *Id.* at 8; Deposition of Vivian Olsen at 233-235 (Oct. 14, 2009).
14. Kathleen C. Engel & Patricia A. McCoy, *Turning a Blind Eye: Wall Street Finance of Predatory Lending*, 75 FORDHAM L. REV. 102 (2007).

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mortgages).[15] 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. Originators update the pricing of new mortgage loans using this market information. 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.

18.   Option One relied almost exclusively on this originate-to-distribute model of funding through the capital markets. Option One's underwriting department communicated with potential investors about these secondary market sales of mortgages, supplying those investors with extensive loan-level data on the kinds of mortgage loans that the firm was originating.[16] All but a small fraction of Option One's loan originations were sold into the secondary market during the class period.[17] Accordingly, Option One operated on a funding model that was entirely dependent on secondary market pricing, and all of the information necessary for the market to value Option One mortgages, including their credit risk, was communicated to potential investors in the form of loan-level data. Option One used the same loan-level data to set the prices for its mortgage originations.

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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).

16. Deposition of Vivian Olson at 24, 242 (Oct. 14, 2009).

17. H&R Block, Inc., SEC Form 10-K for Year Ended Apr. 30, 2006, filed June 30, 2006, at 38. Defendants' prime loans, representing only 3 percent of loan originations from 2001 to 2007, were typically sold as whole loans to Countrywide Home Loans, Inc. *Id.* at 8; Deposition of Vivian Olsen at 233-235 (Oct. 14, 2009).

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19.   During the class period, mortgage originators such as Option One had several

different ways to originate residential mortgages.[18] Most commonly, Option One employed

independent mortgage brokers to identify buyers and facilitate the loan origination process. This

market is often called the wholesale market for loan originations. Defendants originated their

wholesale loans through the OOMC unit. Based on the Defendants' loan-level data provided to

Plaintiffs, 71 percent of Defendants' loans originated from 2001 to 2007 were wholesale OOMC

originations.[19] All loans originated by OOMC during the class period were nonprime loans.[20]

20.   To apprise mortgage brokers in the wholesale market 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 that individual loans could be sold into the secondary market.[21] 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. An "above par" loan

would bear a higher interest rate and would carry a higher price – that is, the originator would

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18. Howell E. Jackson & Laurie Burlingame, *Kickbacks or Compensation: The Case of Yield Spread Premiums*, 12 STANFORD J. L. BUS. & FIN. 289 (2007); 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).

19. Bates No. DEF6000001; DEF6000003; DEF6000004. This figure includes the 0.5 percent of loans in the loan level data classified as "concurrent" transactions within OOMC, but does not include correspondent transactions, which I discuss below. According to Option One's internal documents, concurrent transactions are similar to other wholesale transactions in that the broker originates the loan and Option One funds the loan. Differences between concurrent transactions and other wholesale transactions include the fact that loan documents are generated in the broker's name rather than Option One's name and yield-spread premia is not allowed. *See* Deposition of Vivian Olson Exhibit 25 at 23-28 (Oct. 14, 2009).

20. Bates No. DEF6000001; DEF6000003; DEF6000004.

21. See Jackson & Burlingame, *supra* note 18.

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offer to pay a premium to fund the loan of as much as several percent of the loan amount.[22]

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.

21.   The second major channel of mortgage originations by lenders such as Option

One would be direct lending operations, sometimes referred to as retail loans. 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

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

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22. 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 borrowers 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.

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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. Option One's retail loans were originated through HRBMC.[23] Based on the Defendants' loan-level data provided to Plaintiffs, 13 percent of Option One's loans originated from 2001 to 2007 were retail originations through its HRBMC unit.[24] HRBMC originated both nonprime and prime loans during the class period.[25]

22.   A third 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. Although the loan would close in the correspondent lender's name, Option One would underwrite the loan for the correspondent lender and was responsible for the pricing of the loan.[26] Option One would purchase the loan from the correspondent lender immediately after closing.[27] Based on Defendant's loan-level data, 16 percent of the loans originated by Option One from 2001 to 2007 were correspondent

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23. See Deposition of Vivian Olson at 54-55 (Oct. 14, 2009); H&R Block, Inc., SEC Form 10-K for Year Ended Apr. 30, 2006, filed June 30, 2006, at 7-8.

24. Bates No. DEF6000001; DEF6000003; DEF6000004. Over 99 percent of these HRBMC loans are classified as "wholesale" transactions, whereas the remaining < 1 percent are classified as concurrent or correspondent transactions. Based on the deposition testimony and public filings cited above, I assume that all these loans are originated through retail channels.

25. *Id.*

26. Deposition of Vivian Olson at 60-61.

27. Deposition of Vivian Olson Exhibit 25 at 13-22, 28 (Oct. 14, 2009).

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originations.[28] Unless otherwise specified, I include loans labeled as correspondent transactions within OOMC as OOMC wholesale loans.[29]

23.   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 yield spread premiums paid to mortgage brokers for loan originations.[30] 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 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.[31] 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.[32] 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.[33] Finally, under the Equal Credit

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28. Bates No. DEF6000001; DEF6000003; DEF6000004.

29. I consider the 88 HRBMC loans labeled as correspondent transactions to be HRBMC retail loans in my analysis unless otherwise noted.

30. Jackson & Burlingame, *supra* note 18.

31. 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).

32. 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).

33. See Robert B. Avery et al., *New Information Reported Under HMDA and Its Application in Fair Lending Enforcement*, FED. RES. BULL., Summer 2005, at 344.

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Opportunity Act[34] and Fair Housing Act,[35] mortgage originators such as Option One are

prohibited from engaging in discriminatory lending practices.

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

24.   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

mortgage loans in the United States. Two recent literature reviews can be found in White

(2009)[36] and Courchane (2007).[37] As explained in greater detail in these reviews, early academic

studies focused on the relationship between mortgage denials and the racial composition of

neighborhoods.[38] 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.[39] 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

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

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

36. White, *supra* note 18.

37. 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. Although this aspect of Dr. Courchane's analysis is consistent with other studies of mortgage loan cost disparities, I have reservations concerning certain aspects of her methodology.

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

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

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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."[40]

25. 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.[41] Later studies expanded this analysis by controlling for

loan channels, and found a reduced, but still statistically significant racial effect on the APR of

mortgage loans.[42] Yet other studies found statistically and economically significant racial

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40. *Id.* at 2. See also *id.* at 30-31 (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 13.

41. See Avery et al., *supra* note 33; 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 in Subprime Lending* (Sept. 2006), *available at* http://www.consumerfed.org/pdfs/SubprimeLocationsStudy090506.pdf (finding correlations between race and participation in subprime loan markets).

42. See Courchane, *supra* note 37; but see White, *supra* note 18, at 685-686 (questioning the appropriateness of controlling for loan channels). See also LaCour-Little, *supra* note 18 (finding racial effects on note rates in some but not all models based on a sample of loans within conforming loan size parameters).

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disparities in the amount of compensation earned by mortgage brokers on residential mortgage

originals and in FHA closing costs charged to borrowers.[43]

26.   The notion that African American 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 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.[44] For

example, the Implicit Attitudes Tests (which can be completed in less than 5 minutes on the

Internet)[45] 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.[46] These studies are relevant to this litigation because, to the extent that

economic decisionmakers often harbor biased or unconscious racial stereotypes, it becomes more

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43. See Jackson & Burlingame, *supra* note 18; 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.

44. *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).

45. *Project Implicit*, at https://implicit.harvard.edu/implicit/.

46. *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 Sterotypes 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).

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plausible that the subjective pricing process that Defendants 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 through disparate treatment analysis, the problem of subconscious stereotypes and prejudices would remain.")[47]

27.   Option One's Discretionary Pricing Policy was, in my view, susceptible to discrimination. While Option One's mortgage pricing was nominally based on objective criteria tied to credit quality and loan characteristics, its mortgage brokers were given discretion to place borrowers into higher cost above par loans to finance yield spread premiums and also to impose differential fees and charges,[48] both of which actions could – and based on my analysis of the data did – raise the APRs of minority borrowers. In addition, Option One did not begin automated underwriting until 2005.[49] Manual underwriting before that time could have led to discretion in the underwriting process itself, rather than in the sales process between broker/lender and borrower. Finally, Option One did not restrict total broker compensation on its wholesale loans, with the exception of certain high-cost "Section 32 loans" governed by specific federal regulations.[50]

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47. *Watson v. Fort Worth Bank & Trust*, 487 U.S. 977, 990 (1988).
48. See Deposition of Vivian Olson at 103-108 (Oct. 14, 2009).
49. *Id.* at 30-31.
50. *Id.* at 104-105; Regulation Z (Truth in Lending), 12 C.F.R. § 226.32 (2009).

28.   Researchers have published 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,[51] other consumer markets,[52] commercial lending,[53] and even foreign lending markets.[54]

29.   My own research on automobile transactions, in which a buyer typically negotiates the sales price for a vehicle with the seller, has shown persistent patterns of discrimination against minorities. For example, I conducted audit tests of more than 200 dealerships in the Chicago area and described these tests in a series of publications.[55] These studies found strong and pervasive evidence that dealerships engaged in racially influenced decisionmaking in the prices they offered consumers.

30.   I have also written extensively about what may have caused this pricing disparity—the cause of the cause, if you will, of racially disparate pricing. The evidence, while more tentative, points to a number of partial explanations: (1) the "consequential" animus of

51. 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) [hereinafter PERVASIVE PREJUDICE?]; Ian Ayres, *Further Evidence of Discrimination in New Car Negotiations and Estimates of Its Cause*, 94 MICHIGAN LAW REV. 109 (1995).

52. Two leading review articles are by Peter Siegelman, *Race Discrimination in "Everyday" Commercial Transactions: What Do We Know, What Do We Need to Know, and How Can We Find Out*, in A NATIONAL REPORT CARD ON DISCRIMINATION IN AMERICA: THE ROLE OF TESTING (Michael Fix & Margery Austin Turner, eds. 1999); John Yinger, *Evidence of Discrimination in Consumer Markets*, 12 J. ECON PERSPECTIVES 23 (1998).

53. 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).

54. 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.

55. See PERVASIVE PREJUDICE?, *supra* note 51; Ayres, *supra* note 51.

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dealers – dealers behave as if they gain more utility from extracting an extra dollar from African-Americans than from white customers; (2) dealer perception that African-Americans are more likely to consent to "home run" profits; and (3) dealership perception that African-Americans have higher costs of bargaining.[56]

31.   My book *Pervasive Prejudice?* also includes a meta analysis of four different studies of racial disparities in vehicle pricing – including two studies of consummated transactions.[57] The racial disparities produced by the four different studies consistently point in the same direction—African-American men and women are asked to pay hundreds of dollars more than their white male and female counterparts and that these differentials, in aggregate and for all but one of the individual studies, are statistically significant. Further collaboration of this evidence by other researchers has been published since my studies.[58]

32.   The same perceptions that lead dealerships to charge African Americans more for the price of the vehicle also lead them to charge African Americans more in finance charge markups under discretionary pricing policies. A series of ECOA class action lawsuits, in which I served as an expert witness for plaintiffs, were brought beginning in 1998 against multiple institutions involved in automobile financing.[59] The plaintiffs in these lawsuits alleged that the

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56. See Chapter 3 of PERVASIVE PREJUDICE?, *supra* note 51; Ayres, *supra* note 51, at 124-128.

57. PERVASIVE PREJUDICE?, *supra* note 51, at 88-124. In the audit tests, the testers solicited offers from dealerships, but did not actually purchase cars. In contrast, the studies of consummated transactions tested for racially disparate pricing in actual sales.

58. See Fiona Scott Morton, Florian Zettlemeyer & Jorge Silva-Risso, *Consumer Information & Discrimination: Does the Internet Affect the Pricing of New Cars to Women and Minorities?*, 1 QUANTITATIVE MARKETING & ECONOMICS 65 (2003); Ian Ayres, *Discrimination in Consummated Car Purchases*, in LAURA BETH NIELSEN & ROBERT L. NELSON (ED.) HANDBOOK ON EMPLOYMENT DISCRIMINATION RESEARCH: RIGHTS AND REALITIES 137 (Springer 2005) (available at http://islandia.law.yale.edu/ayres/abf%20conference.pdf).

59. These institutions included General Motors Acceptance Corp. (GMAC), Nissan Motor Acceptance Corp., Toyota Motor Credit Company, Ford Motor Credit Company, DaimlerChrysler Financial Company, Bank One, Bank of America, Primus Automotive Financial Services, American Honda Finance Company, WFS Financial, U.S. Bank, and AmSouth Bank Corp. Mark A. Cohen, *Imperfect Competition in Auto Lending: Subjective Markup,*

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practice of allowing markups had a disparate impact against minority borrowers. Vanderbilt University Professor Mark Cohen, an economic expert witness testifying on behalf of plaintiffs in these cases, found that African Americans were more likely to pay mark-ups in finance charges, and that mark-ups for African American borrowers were greater than mark-ups for white borrowers.[60] In addition to the analysis performed through the course of the automobile financing litigation, I have analyzed the financing practices of dealers and have found that their discretionary pricing policies have a disparate impact on African American borrowers.[61]

33.   My research of vehicle price negotiations suggests that it is particularly likely that decisionmakers offered high finance charge markups to buyers whom they perceived were willing to pay supra-competitive prices. If decisionmakers perceive that consumers with less education are more likely on average to pay a supra-competitive markup, it might be rational to offer higher finance charge markups to all consumers who are perceived by decisionmakers to be less educated. Indeed, this foregoing concentration of finance profits from a few borrowers means that decisionmakers have an incentive to offer higher markups to uneducated borrowers even if the average uneducated borrower has a lower willingness to pay a high markup. When profits are concentrated, decisionmakers will tend to focus not on the average willingness of consumers to pay, but on the probability that a subset of particular consumer types will allow the dealer to hit a markup home-run.

34.   The lure of receiving a virtually immediate cash reward for arranging and processing a low marginal cost transaction gives decisionmakers a strong incentive to troll for

Racial Disparity, and Class Action Litigation (2008), available at http://works.bepress.com/mark_cohen/1, at 7-8, 13-14, 36, 49. See also Ayres, *supra* note 6, at 692-717.
    60.   Cohen, *supra* note 59, at 1.
    61.   PERVASIVE PREJUDICE?, *supra* note 51, at 100-119.

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high markup borrowers. This trolling for high-markup buyers is likely to disproportionately burden African-American borrowers. Not only did the automobile audit studies indicate that dealerships are likely to infer that African-Americans are more willing to pay higher markups, but dealer perceptions about non-race attributes (such as access to competitive offers) might lead dealerships to impose higher markups on a class of consumers that are disproportionately African-American.[62] Dealership profit maximization inclines the decisionmaking toward revenue-based inferences (as opposed to cost-based inferences) in setting the markup charge and it is my opinion that such inferences likely play a contributory role to the overall racial disparity in finance charge markups.

35.   These studies of different markets are relevant to the case at hand in showing that (i) market competition does not necessarily drive out discrimination from consumer markets and (ii) racially influenced decisionmaking is particularly likely to arise in situations where sellers have unchecked authority and where a consumer has difficulty comparing the prices that others are charged.

B.   Introduction to Disparate Impact Testing

36.   A simple calculation of the average cost of a loan for borrowers of each race can show whether African Americans pay more, on average, than white borrowers. In addition, one can break down the set of Option One loans into subsets to determine whether African American borrowers with given characteristics paid more for loans than white borrowers with the same characteristics. *Regression analysis* can control for any legitimate underwriting characteristics that affect the cost of a loan to a consumer and show whether African Americans pay more for their loans than whites with similar risk characteristics.

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62. *See* Ayres, *supra* note 51, at 138-141.

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37.   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 can take the form of the APR of the loan, which is the measure used by the Federal Reserve Board to evaluate the cost of a loan to a consumer.[63] The explanatory variables include the race and ethnicity of the borrower and other non-race characteristics of the borrower and property that could affect the cost of the loan to the lender. The regression model will show whether African American borrowers paid disproportionately higher APRs than non-African American borrowers even after controlling for plausible non-race "legitimate business need" characteristics.

38.   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 African American and white borrowers. To the extent one finds that the average finance charge paid by African American Option One borrowers is statistically larger than that paid by white Option One borrowers, one can conclude that the Defendants' Discretionary Pricing Policy has a disparate racial impact. Accordingly, the standard test for *prima facie* case presents a "common question of fact" that can be answered with a single aggregate estimation.

39.   In Section V.C of this report, I present statistics that show strong evidence of *prima facie* disparate racial impact. African-American borrowers on average paid $668 more in

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63. *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).

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finance charges than whites over five years. See Table 10. These differences are highly significant in a statistical sense.

C.   Tests for Disparate Impact Are Amenable to Aggregate Statistical Analysis

40.   It is also possible with aggregate data to use regression analysis to statistically analyze whether disparate racial impact persists after controlling for decision factors that "meet a legitimate business need."[64] 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 the differential pricing practice among borrowers. If, after including these "legitimate business need" variables in the regression, the racial disparity is eliminated (or becomes statistically insignificant), then the regression indicates that the *prima facie* disparate impact is at least partially justified.[65]

41.   This type of regression analysis is not experimental or on the fringe of statistics. It does not push the social science envelope of empiricism. If anything, more esoteric techniques are routinely accepted by courts in antitrust and patent litigation – which often need to control for

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64. 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).

65. Note that the coefficients on the business-related variables must also correspond to the magnitude of the alleged business justification. For example, in this case, imagine that it was reasonable for lenders to charge a $100 higher finance charge to a particular class of customers who on average expose the lenders to $100 higher costs. In that case, it would be appropriate to include in the regression a control for this cost-related attribute. However, if the regression revealed that the lenders were charging customers with this attribute $300 higher, then this supra-competitive charge of $200 might still produce an unjustified disparate racial impact.

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selection effects and endogeneity that are not at issue here.[66] 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 employ to identify discriminatory lending

practices in financial institutions. And, particularly since the HMDA amendments went into

effect in 2004, the borrower APR as defined under the Truth-in-Lending Act is the most common

measure of the cost of borrowing in these analyses.[67]

42.   A regression testing for unjustified disparate impacts should only include those

variables that would provide a plausible valid business justification. It is my opinion that only

attributes related to a decisionmaker's expected marginal cost[68] 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

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66. See, e.g., David H. Kaye & David A. Freedman, *Reference Guide on Statistics*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 83-178 (2nd ed. 2000); Daniel L. Rubinfeld, *Reference Guide on Multiple Regression*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 179-227 (2nd ed. 2000); Daniel L. Rubinfeld & Peter O. Steiner, *Quantitative Methods in Antitrust Litigation*, 46 LAW & CONTEMPORARY PROBLEMS 69 (1983); Daniel L. Rubinfeld, *Econometrics in the Courtroom*, 85 COLUMBIA LAW REV. 1048 (1985).

67. For a recent presentation 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.

68. "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.

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> 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.[69]

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

according to its terms. In the credit context, other scholars have similarly applied a performance

standard for determining what characteristics are irrelevant:

> 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.[70]

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.[71]

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.[72]

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69. Yinger, *supra* note 52, at 27.
70. Blanchflower, et al., *supra* note 53, at 930.
71. *Id.* at 940.
72. My economic opinion is consonant with judicial analysis as well. 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

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43.   It is my opinion, however, that 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.[73] 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 class of consumers in order to make supra-competitive profits.

44.   This cost/revenue distinction is supported by the statutory language defining the scope of business justification defense. The Civil Rights Act of 1991 defines a defendant policy as unjustified if:

> the respondent fails to demonstrate that the challenged practice *is job related for the position in question and consistent with business necessity*...[74]

It is straightforward to see how the "business necessity" language supports the distinction. It is "consistent with business necessity" to allow sellers to take into account cost attributes of its consumers. Sellers need to cover their costs to survive, but it is not necessary for them to charge supra-competitive prices.

45.   This distinction between cost-based and revenue-based attributes is also supported by analysis of market competition. Competition between sellers tends to drive out revenue-based pricing distinctions. Rivals in a competitive market will tend to undercut above-cost pricing. But

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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.'").

73. Ayres, *supra* note 6.

74. Civil Rights Act of 1991, 42 U.S.C. § 2000e-2 (k) (1)(A)(i) (2006) (emphasis added).

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competition will tend to re-enforce cost-based pricing distinctions. Sellers cannot simply ignore the expected cost of supplying particular consumer classes. Pricing distinctions that are a by-product of market competition provide a valid business justification, while pricing distinctions that are the by-product of market failure—and indeed, can only persist in the absence of competition—are invalid justifications.

46.   This discussion of competition may seem incomplete. The free-wheeling market forces that bring buyers and sellers together in marketplace negotiations seem like competition in its purest form. The Defendants may argue that the competitive price is whatever the market can bear. But civil rights law has rejected this kind of "whatever the market will bear" standard. The law's focus on job relatedness and performance attributes implies that the defense must be related to a decisionmaker's costs of doing business. As an example, an employer who pays a caregiver less—not because she is less productive but because she is more necessitous—will not be able to justify the practice simply as "what the market would bear" or as simply the by-product of freewheeling negotiations. A "what the market will bear" defense would negate large parts of the civil rights laws mandating non-discriminatory "terms and conditions" in employment and housing because a defendant would simply use the plaintiffs' consent to the discriminatory terms as a justification for its actions.

47.   Defendants' centralized electronic databases include abundant and comprehensive evidence of the basis on which Defendants evaluated individual borrowers' creditworthiness. Defendants' 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.

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48.   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.[75]

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.[76]

49.   Through Defendants' 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

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75. Lyn C. Thomas, *A Survey of Credit and Behavioural Scoring: Forecasting Financial Risk of Lending to Consumers*, 16 INT'L J. FORECASTING 149, 151 (2000).
76. Regulation B (Equal Credit Opportunity), 12 C.F.R. § 202.2 (p) (2009).

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- lending decisions are based on the formulaic application of objective, statistically-validated criteria that determine the price at which the loans can be 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. The objective underwriting process is also meant to prevent bias against certain classes of consumers.[77] 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 DEFENDANTS' DATA SHOWS DISPARATE IMPACT

50.   In this section, I describe Defendants' mortgage loan data provided to Plaintiffs, which is common evidence that I use to show the disparate impact of Defendants' Discretionary Pricing Policy to African American borrowers.

A.   Overview of Defendants' Data

51.   Plaintiffs have been provided three discs containing six Microsoft Access database files of more than one million loans originated by Option One from 1999 through 2007 ("Defendants' loan database")[78] along with letters from Defendants' counsel explaining the data contained in those databases.[79] This data constitutes common evidence of disparate impact to the Class. Defendants' loan database includes data about the applicants and the applicants'

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77. Deposition of Vivian Olson at 98 (Oct. 14, 2009).

78. Bates No. DEF6000001; DEF6000003; DEF6000004.

79. Letter from Brian P. Brooks, O'Melveny & Myers LLP, to Gary Klein, Roddy Klein & Ryan (Oct. 8, 2009); Letter from Elizabeth Lemond McKeen, O'Melveny & Myers LLP, to Shennan Kavanagh, Roddy Klein & Ryan (Dec. 1, 2009); Letter from Elizabeth Lemond McKeen, O'Melveny & Myers LLP, to Gary Klein, Roddy Klein & Ryan (Jan. 5, 2010); E-Mail from Elizabeth Lemond McKeen, O'Melveny & Myers LLP, to Gary Klein, Roddy Klein & Ryan (Mar. 11, 2010, 16:12:10).

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properties that Defendants 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 Defendants pursuant to HMDA regulations, including race and ethnicity. If Defendants produce additional data to Plaintiffs during the course of litigation, I will be able to update my analysis as appropriate to show disparate impact to the Class.

52.   Each loan in Defendants' loan database is identified by a unique loan number. Loans in Defendants' loan database are categorized by business unit (OOMC or HRBMC).[80] Defendants also provided loan-level data on loans from its bulk acquisition channel, which specialized in the purchase of performing nonprime mortgage loan pools.[81] Per instructions from Plaintiffs' counsel, I exclude bulk acquisition loans from my analysis. Because the class period begins in 2001, I also exclude loans originated before 2001 from my analysis. Finally, I exclude prime loans (representing 3 percent of loans originated by Defendants during the class period) from my analysis due to limited data availability.[82] I reserve the right to modify my analysis should additional data become available.

53.   Defendants' 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

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80. Within each business unit, loans are also classified in the data by a "transaction type" of wholesale, correspondent, or concurrent. All three of these transaction types appear in both the HRBMC retail unit and the OOMC wholesale unit (although less than 1 percent of loans in the HRBMC unit are labeled as "correspondent" or "concurrent").

81. H&R Block, Inc., SEC Form 10-K for Year Ended Apr. 30, 2006, filed June 30, 2006, at 7.

82. Defendants have not produced data on loan amounts, loan-to-value ratios, or prepayment penalties for prime loans as of the date of this report. Although loan amounts can be calculated for nearly all prime loans using other variables in the data (such as the first mortgage payment, the term of the mortgage, and the type of amortization for the mortgage), loan-to-value ratios cannot be calculated because the denominator in the loan-to-value ratio (the sales price or appraisal value) is not given or calculable from the data provided. Loan-to-value ratios and prepayment penalties are risk-based characteristics used to price loans, as shown in Option One's rate sheets and in the academic literature. Because of the importance of these characteristics and their absence only for prime loans, I exclude prime loans from my analysis at this time.

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through HMDA data filing requirements. Before 2004, loan applicant race and ethnicity were identified in a single variable according to the HMDA standards.[83] The six HMDA race classifications for loans before 2004 were American Indian or Alaska Native, Asian or Pacific Islander, Black, Hispanic, White, or Other. 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. The HMDA standards also allow for applicants and co-applicants to be assigned to multiple race classifications beginning in 2004. Before 2004, that applicant could only be identified as either African American or Hispanic, but not both.

54.   For all loans (pre-2004 and post-2004), 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".[84]

55.   For purposes of my basic analysis,[85] I assign each loan to a single race based on the race and ethnicity of the borrower or co-borrower in Defendants' loan database in a sequential order. First, I classify the race of a loan as "African American" if either the borrower

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83. For a discussion of the changes in HMDA reporting standards for race and ethnicity, *see* Federal Reserve, *Frequently Asked Questions about the New HMDA Data* (Mar. 31, 2005), *available at* http://www.federalreserve.gov/boarddocs/press/bcreg/2005/20050331/attachment.pdf.
84. *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).
85. 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.

or co-borrower is African American. Next, I classify the race of a loan as "Hispanic" if (1) the

race or 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) the race of the

borrower or co-borrower is Asian, Hawaiian, or Pacific Islander, 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 "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", "Hispanic", "Asian", or

"American Indian". I classify the race of all other loans as "Missing".[86] Table 2 shows the

breakdown of the loans in Defendants' loan database by year of origination based on this racial

classification.

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86. Although all the named plaintiffs in this case are African American, their races and ethnicities are not always identified correctly in Defendants' loan database. The named plaintiffs Barretts are African Americans, but their races are identified in Defendants' loan database as Asian for their 2005 Option One loan, and their ethnicities are identified as Hispanic. Both the Barretts' races and ethnicities are identified as "Missing" for their 2006 Option One loan. The race and ethnicity in named plaintiff Murray's loan record is also identified as "Missing" in Defendants' loan database. In all my analyses, I adjust the races and ethnicities for named plaintiffs Murray and the Barretts to non-Hispanic African American. All other named plaintiffs are correctly identified as African American in Defendants' loan database.

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TABLE 2: RACIAL COMPOSITION OF NONPRIME LOAN BORROWERS IN
DEFENDANTS' LOAN DATABASE

Year	American Indian	Asian or Hawaiian	African American	Hispanic	Missing	White	Total
2001	303	1,403	9,714	6,070	18,112	35,419	71,021
2002	367	1,944	11,316	9,187	26,191	44,571	93,576
2003	538	2,878	16,508	14,963	27,465	68,693	131,045
2004	706	3,951	22,846	20,657	22,502	89,294	159,956
2005	983	6,516	34,563	32,849	26,805	125,838	227,554
2006	579	3,653	26,034	19,758	17,124	70,454	137,602
2007	170	1,451	8,191	6,335	6,143	22,019	44,309
Total	**3,646**	**21,796**	**129,172**	**109,819**	**144,342**	**456,288**	**865,063**
% of Total	**0.4%**	**2.5%**	**14.9%**	**12.7%**	**16.7%**	**52.7%**	**100.0%**

As Table 2 shows, 14.9 percent of the nonprime loans in Defendants' loan database were made to African American borrowers. At least 130,000 Option One loans were made to African American borrowers from 2001 to 2007.

56.   Defendants' 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 Defendants' loan database are the note rate[87] 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 Defendants' 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

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87. I assume that the note rate is represented as the "final_rate" in Defendants' loan database. The "final_rate" is defined in the documentation provided to Plaintiffs as the "rate based on additional discount points or rate exceptions made." See Letter from Brian P. Brooks, O'Melveny & Myers LLP, to Gary Klein, Esq., Roddy Klein & Ryan (Oct. 8, 2009), at 5. This variable is always equal to another variable in the database, "interest_rate", when both variables have non-missing values, and when neither has a value less than 0.0001 percent (which I assume are data errors and omit from my analysis).

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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 named plaintiffs Barretts' 2006 loan has an APR (10.536 percent) that is more than four percentage points higher than the initial interest rate of the loan (6.5 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.[88]

57.   In addition to the interest rate, Defendants' 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, credit score, and the level of documentation given for the loan (such as "Full Doc", "Stated Income", "No Income/No Asset", and "Easy Doc").

58.   Loan characteristics in the database include the loan amount, the purpose of the loan (such as purchase, cash-out refinance, or rate and term refinance), the term length of the loan (10-year, 15-year, 30-year, etc.), the length of any prepayment penalty, and the lien status of the loan (first lien or subordinate lien). The database also categorizes each loan by one of 182 unique loan program codes. The descriptions of these loan program codes include "JUMBO 30YR FIXED", "ADJ 2YR FIX/30 YEAR", and "OVER 80% - 2YR FIXED/30YR". Based on these descriptions, I group the 182 loan program codes into 29 categories of loan terms based on

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88. Defendants' loan database includes two other interest rate variables: "Par/Base Rate", "Rate post Loan Char Adj". Because neither of these variables represents the interest rates actually paid by the borrower, I do not consider them in my analysis.

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whether they are interest-only loans and their term structure, such as 30-year fixed, 15-year fixed, and 30-year ARM with initial rate fixed for 2 years.

59.   The database also includes Option One's "risk grade" for the loan. According to his 2005 testimony in a Congressional hearing, Option One Chief Operating Officer Steve Nadon stated that Option One categorizes prospective borrowers into risk grades based on factors such as credit score, mortgage or rental payment history, income documentation, loan-to-value ratio, and debt-to-income ratio.[89] According to an Option One deposition witness, Option One's underwriters had some discretion in assigning borrowers to risk grades.[90]

60.   Appendix 4 includes summary statistics of the loan cost variables and the other borrower, home, and loan characteristics contained in Defendants' loan database. Should Defendants 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 African Americans Paid More for Option One Loans than White Borrowers with Similar Risk Characteristics

61.   As I discussed above, regression analysis is the primary tool I use to estimate disparity in the cost to African Americans for Option One 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 Option One nonprime mortgages for African Americans and for whites. Table 3 shows the mean APR for nonprime loans made to whites and African Americans in Defendants' loan database.

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89. *Legislative Solutions to Abusive Mortgage Lending Practices: Joint Hearing Before the Subcomm. on Financial Institutions & Consumer Credit and the Subcomm. on Housing & Community Opportunity of the H. Comm. on Financial Services*, 109th Cong. 19 (2005) (statement of Steve Nadon, Chief Operating Officer, Option One Mortgage) (*available at* http://financialservices.house.gov/media/pdf/052405sn.pdf).

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TABLE 3: MEAN NONPRIME APR BY RACE, 2001-2007

Year	Mean for White Borrowers	Mean for African American Borrowers	Difference between African American & White Borrowers
APR (%)			
2001	10.550	11.057	0.508
2002	9.259	9.754	0.495
2003	8.254	8.695	0.441
2004	8.201	8.521	0.320
2005	9.499	9.816	0.317
2006	11.083	11.218	0.134
2007	10.637	10.790	0.153
Total	9.415	9.876	0.461

Table 3 shows that the mean APR for African American borrowers is consistently higher than the mean APR for white borrowers in every year.[91] Across all years, the average African American APR is 46.1 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 these differences 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.

62.   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. I use two measures of risk for this illustrative comparison: borrower credit scores and Option One's risk

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91. The mean disparity across all years (46.1 basis points) is greater than most of the individual annual means because African Americans constitute a higher share of the sample, relative to whites, at times when APRs for both African Americans and whites are higher.

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grades. Table 4 shows the mean APR for loans made to African Americans and whites in Defendants' loan database broken down by credit score ranges.

TABLE 4: MEAN NONPRIME APR BY RACE AND CREDIT SCORE, 2001-2007

	African American		Whites		Difference between Mean Af. Amer. APR & Mean White APR
	Loans	Mean APR	Loans	Mean APR	
Credit Score					
Missing Score	2,111	10.407	6,182	10.123	0.285
300-519	9,646	10.439	24,874	10.199	0.240
520-539	10,296	10.315	30,164	10.028	0.288
540-559	10,589	10.255	33,110	9.949	0.306
560-579	13,326	10.166	40,798	9.741	0.426
580-599	19,675	10.215	60,838	9.782	0.432
600-619	19,141	9.870	67,770	9.512	0.358
620-639	15,604	9.579	62,076	9.200	0.379
640-659	11,098	9.380	47,658	8.983	0.397
660-679	7,004	9.148	31,847	8.744	0.404
680-699	4,412	9.045	20,296	8.589	0.456
700-719	2,785	8.858	12,512	8.443	0.415
720-739	1,541	8.852	7,691	8.462	0.390
740-759	1,028	8.712	5,026	8.451	0.261
760-779	585	8.807	3,252	8.367	0.440
780-799	280	8.725	1,737	8.317	0.408
≥ 800	51	8.751	457	8.502	0.249
All Credit Scores	**129,172**	**9.876**	**456,288**	**9.415**	**0.461**

As Table 4 shows, the mean APR for Option One African American borrowers is always higher than the mean APR for its white borrowers, regardless of the range of credit scores used. In fact, African Americans with higher credit scores often appear to suffer more disparate impact than African Americans with the lower credit scores. For example, African Americans with credit scores less than 520 pay an average of 24 basis points more in APR than whites with similar credit scores, whereas African Americans with credit scores between 700 and 719 pay an average of 41.5 basis points more in APR than whites with similar credit scores.

63.   The mean APRs by risk grade tell a similar story. With the exception of the rarely used "AAA" risk grade, the disparity between African American and white borrowers' APRs in the less risky risk grades (AA+ and AA) are greater than the disparities between African

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American and white borrowers' APRs in the more risky risk grades (B, C, and CC), as shown in

Table 5.

TABLE 5: MEAN NONPRIME APR BY RACE AND RISK GRADE, 2001-2007

	African American		Whites		Difference between Mean Af. Amer. APR & Mean
	Loans	Mean APR	Loans	Mean APR	White APR
Credit Score					
AAA	1,720	10.058	3,675	9.865	0.194
AA+	58,903	10.025	205,905	9.585	0.440
AA	31,570	9.404	120,677	8.926	0.477
A	18,759	9.445	70,560	9.032	0.413
B	12,245	10.325	38,146	9.963	0.362
C	4,117	11.057	11,266	10.733	0.325
CC	1,853	11.781	6,056	11.694	0.088
Missing	5	8.998	3	8.763	0.235
All	**129,172**	**9.876**	**456,288**	**9.415**	**0.461**

64.   Various "Fair Lending Scorecards" prepared for Option One by ADI Compliance

Consulting during the class period confirm that African American loan prices were greater than

loan prices for white borrowers with similar risk characteristics.[92] These scorecards list mean

denial rates and price disparities, broken down by region of the country, loan purpose, and risk

grade. The scorecards show that loan prices for African American borrowers were greater than

loan prices for white borrowers across a wide spectrum of loan purposes, risk grades, and

geographic regions.

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92. Fair Lending Scorecard (2002 Q4 OOMC scorecard.xls) (Bates No. OOMCADI2.00231 – OOMCADI2.00303); 2003 Q1 & Q2 OOMC scorecard.xls (Bates No. OOMCADI2.00304 – OOMCADI2.00375); 2003 Q3 OOMC scorecard.xls (Bates No. OOMCADI2.00476 – OOMCADI2.00514); 2003 Q4 OOMC scorecard.xls (Bates No. OOMCADI2.00515 – OOMCADI2.00553); 2003 Q1 & Q2 HRBMC Non-prime scorecard.xls (Bates No. OOMCADI2.00554 – OOMCADI2.00556); 2003 Q3 & Q4 HRBMC Non-prime scorecard.xls (Bates No. OOMCADI2.00557 – OOMCADI2.00559); 2003 Q1 & Q2 HRBMC Prime scorecard.xls (Bates No. OOMCADI2.00560 – OOMCADI2.00563); 2003 Q3 & Q4 HRBMC Prime scorecard.xls (Bates No. OOMCADI2.00564 – OOMCADI2.00567); 2003 Q1 & Q2 OOMC scorecard.xls (Bates No. OOMCADI2.01033 – OOMCADI2.01109); 2003 Q3 OOMC scorecard.xls (Bates No. OOMCADI2.01110 – OOMCADI2.01148); 2003 Q4 OOMC scorecard.xls (Bates No. OOMCADI2.01110 – OOMCADI2.01187).

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C.   Regression Models Show Disparate Impact on African Americans

65.   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.[93]

66.   Defendants' own data, rate sheets,[94] 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 debt-to-income 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 the purpose of the loan.[95] 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.

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93. The regression model that I use to show disparate impact to the Class takes a form similar to Equation 1:
[1] $APR_i = \beta_0 + \beta_1 AfAm_i + \sum_r \beta_r x_{r,i} + \sum_k \beta_k x_{k,i} + \varepsilon_i,$
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, $x_{r,i}$ 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.
94. *See* Deposition of Vivian Olson Exhibits 6-13 (Oct. 14, 2009).
95. *See, e.g.*, Gruenstein Bocian, et al., *supra* note 41; Courchane, *supra* note 37; Jackson & Burlingame, *supra* note 18; 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.

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67.   Estimating the regression model on Defendants' 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 African American borrowers are greater than zero and statistically significant, then the model will show that Defendant's policies had a disparate impact on African Americans.

68.   Appendix 5 includes complete results from various regressions estimated on nonprime loans in Defendants' loan database. Table 6 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 nonprime loans with available data in Defendants' loan database. Each number (or "coefficient") measuring the marginal effect of race in Table 6 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.

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TABLE 6: EFFECT OF RACE ON APR (BASIS POINTS) USING REGRESSIONS ESTIMATED ON ALL NONPRIME LOANS

Race	Model (1)	Model (2)	Model (3)	Model (4)
African American	46.06***	31.28***	20.53***	8.63***
	(0.56)	(0.41)	(0.37)	(0.31)
Hispanic	-11.42***	-20.30***	-11.81***	1.25***
	(0.60)	(0.42)	(0.37)	(0.32)
American Indian	11.38***	10.59***	3.59*	7.57***
	(2.99)	(2.19)	(1.91)	(1.56)
Asian	-27.51***	-37.44***	-18.67***	4.15***
	(1.22)	(0.84)	(0.77)	(0.61)
Missing	-11.85***	-6.00***	-11.05***	0.33
	(0.54)	(0.41)	(0.36)	(0.29)
Observations	865,056	865,056	865,056	865,052
R-squared	0.01152	0.48180	0.59256	0.73608
Adjusted R-squared	0.01151	0.48175	0.59251	0.73601

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 credit score bin dummy variables.
Model (4): Same as Model (3), but add dummy variables for loan amount bins, debt-to-income ratio bins, LTV bins (for first lien loans), CLTV bins (for subordinate lien loans), property type interacted with occupancy type, borrower or co-borrower self-employed, lender-paid mortgage insurance, escrow waiver, presence of a co-applicant, loan purpose, prepayment penalty length, documentation type, loan term and program category, and state 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 6; it controls for the race of the borrowers but no other characteristics of the loans. This model implies that African Americans pay 46.1 basis points more in APR than whites. This difference is 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.

69.   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

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adding basic controls for borrower's credit worthiness, African Americans' APRs are 20.5 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-to-income ratios, the structure of the loan (in terms of whether it has a fixed or adjustable rate, had an interest-only period, 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 8.6 basis points greater than whites' APRs. These disparities are statistically significant at the 1 percent confidence level. These regression results show that Defendants' African American borrowers pay more in finance charges (reflected by the APR) than white borrowers with similar risk characteristics. Model (4) is my preferred model for estimating the discriminatory impact of Defendant's Discretionary Pricing Policy because the model incorporates all of the important risk-based controls used to price mortgages in the secondary market. Model (4) also produces a good fit with the dependent variable, generating an adjusted R-squared of 0.73601, meaning that the model explains over 73 percent of the variation in loan pricing.

70.   One factor not included as an explanatory variable in Model (4) is an indicator for whether the loan was originated through Option One's retail (HRBMC) or wholesale (OOMC) business channel. Option One has provided no credible evidence of a legitimate business need to justify any APR disparities between loans for borrowers with similar credit characteristics merely because the loans were originated through different business channels. According to an Option One deposition witness, HRBMC retail nonprime loans and OOMC wholesale nonprime

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loans had the same basic underwriting guidelines.[96] The business channel through which a loan is originated is not a risk-based characteristic. Model (4) already controls for a host of risk-based characteristics that would influence the price of a loan. Including a factor for the business channel in a regression would inappropriately allow the unjustified business channel effect possibly to soak up part of the true discriminatory impact. Such a regression would be subject to "included variable bias" and would not be able to measure the unjustified disparate impact due to African Americans' disproportionate representation in the more expensive wholesale loans. Although controlling for the business channel is inappropriate in a model for disparate impact, I nonetheless estimate a regression model identical to Model (4) with the addition of a dummy variable for whether the loan was a retail HRBMC loan. The results for this regression are included in Appendix 5 as Model (14). The coefficient for the retail HRBMC dummy is positive—holding all other characteristics constant, a retail loan has a greater APR than a wholesale loan. Despite the inclusion of the retail dummy variable for HRBMC-originated loans, Model (14) shows that the APRs for African American borrowers remain greater than the APRs for white borrowers.[97]

71.   In addition to estimating several regression models over all loans in Defendants' loan database, I also estimate separate regressions for different samples of loans within the database to check the robustness of my results. Table 7 shows the coefficients for African

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96. Deposition of Vivian Olson at 54 (Oct. 14, 2009).

97. In its database, Option One classifies its loans as Prime, Alt-A, or Subprime. I do not include in Model (4) any control for whether the loan was a prime, Alt-A, or subprime loan (I already omit prime loans from my analysis because of the data limitations described earlier). 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 Defendants or their brokers into more expensive nonprime loans when they could have qualified for prime loans, controlling for these categories in a regression would understate the true disparity in loan costs for African Americans compared to whites, even if data were available to include prime loans in my Model (4). Nevertheless, I include a regression (Model (17)) in Appendix 5 that controls for whether a loan was Alt-A or subprime, and the statistically significant disparate impact on African American APRs persists.

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Americans 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 7 reflect Model (4) estimated separately by business unit (OOMC or HRBMC), first lien loans, subordinate lien loans, loans originated in 2001, loans originated in 2002, loans originated in 2003, loans originated in 2004, loans originated in 2005, loans originated in 2006, and loans originated in 2007.[98]

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98. Appendix 6 includes these models, as well as models estimated separately by transaction type (wholesale, correspondent, or concurrent) within OOMC, and a model estimated only on prime loans using the limited data available on prime loans. The disparities between African American and white borrower APRs are persistent across all samples. All disparities are statistically significant, except for the disparity within prime loans (Model (4-Prime): 1.2 basis points), which represents only 1,746 African American borrowers. Again, due to the lack of data for all explanatory variables of prime loans, I exclude prime loans from all my analyses other than Model (4-Prime) in Appendix 6.

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TABLE 7: EFFECT OF RACE ON APR (BASIS POINTS) USING SEPARATE REGRESSIONS ON NONPRIME LOANS BY YEAR, LIEN STATUS, & BUSINESS CHANNEL

	African American	Observations	Adj. R-sq.
Model (4) Estimated for All Nonprime Loans	8.63*** (0.31)	865,052	0.73601
Model (4) Estimated Separately by Business Unit			
Model (4-OOMC): Option One Mortgage Co.	8.54*** (0.33)	778,553	0.74095
Model (4-HRBMC): H&R Block Mortgage Corp.	7.16*** (0.95)	86,499	0.76145
Model (4) Estimated Separately by Lien Status			
Model (4-L1): First Lien	8.96*** (0.31)	767,811	0.74367
Model (4-L2): Subordinate Lien	3.78*** (0.78)	97,241	0.71582
Model (4) Estimated Separately by Year of Origination			
Model (4-2001)	15.20*** (1.21)	71,019	0.59471
Model (4-2002)	11.83*** (1.02)	93,576	0.63310
Model (4-2003)	11.80*** (0.80)	131,044	0.61894
Model (4-2004)	9.39*** (0.67)	159,953	0.69325
Model (4-2005)	5.87*** (0.47)	227,550	0.76560
Model (4-2006)	4.05*** (0.62)	137,601	0.66171
Model (4-2007)	6.88*** (1.08)	44,309	0.72216

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.

As Table 7 shows, every subset of the data examined shows a positive disparity between African American and white APRs. The disparities are statistically significant in all subsets. These results indicate that the disparities between whites and African Americans persist across the

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spectrum of Option One loans, and are not isolated to a specific time period, lien status,[99] or origination channel.

72.   To further illustrate the persistence of disparities between African Americans 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 credit 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 credit 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 8 shows the coefficients for the interactive terms of African American and credit scores.[100]

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99. 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 Option One's OOMC loans, only 11 percent of subordinate-lien loans from 2001 to 2007 include fees paid to brokers, whereas 96 percent of first-lien OOMC loans included fees paid to brokers. To the extent that any of the disparate impact in the APR for Option One loans comes from discretionary 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.

100.As another robustness check, I construct two other models shown only in Appendix 7 (along with the model using the interaction of race and credit 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 African American borrowers persists under these alternative classifications.

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TABLE 8: RACE EFFECTS ON NONPRIME APR (BASIS POINTS) USING INTERACTIONS OF RACE & CREDIT SCORE

Model (4-RF)	African American	Model (4-RF) (cont)	African American
Score missing	19.92***	$640 \leq$ Score < 660	8.09***
	(3.22)		(0.87)
Score < 520	10.28***	$660 \leq$ Score < 680	8.23***
	(1.23)		(1.07)
$520 \leq$ Score < 540	11.39***	$680 \leq$ Score < 700	8.16***
	(1.19)		(1.39)
$540 \leq$ Score < 560	13.41***	$700 \leq$ Score < 720	6.23***
	(1.10)		(1.82)
$560 \leq$ Score < 580	8.08***	$720 \leq$ Score < 740	7.39***
	(1.03)		(2.34)
$580 \leq$ Score < 600	7.18***	$740 \leq$ Score < 760	7.39***
	(0.78)		(2.86)
$600 \leq$ Score < 620	6.83***	$760 \leq$ Score < 780	5.87
	(0.75)		(3.78)
$620 \leq$ Score < 640	6.39***	$780 \leq$ Score < 800	1.37
	(0.79)		(6.02)
Observations	865,052	Score ≥ 800	10.46
Adj. R-sq.	0.73617		(12.40)

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 8 show the disparity in APR between African Americans with the given range of credit scores and whites with the given range of credit scores, when controlling for all the other risk-based characteristics included in Model (4). For example, the APR for an Option One nonprime loan made to an African American with a credit score between 580 and 600 is an average of 7.2 basis points greater than the APR for a nonprime loan made to a white borrower with the same credit score, after controlling for the other variables included in Model (4). As credit scores increase, the disparities in APRs between African American and white borrowers tend to decrease, but remain statistically significant for all credit score ranges other than the range from 760 to 799 (representing only 865 African American nonprime loans, as shown in Table 4). The results in Table 8 are further confirmation that disparities in loan costs between African Americans and whites cannot be explained by differences in credit quality.

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73.   The analysis of Defendants' data using regression analysis shows that Defendants' policies had a disparate impact on the Class as alleged by Plaintiffs. Defendants' data shows that African Americans 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

74.   Using information provided in the Complaint,[101] I have identified each of the individual named plaintiffs' ten loans in the data produced by Defendants to Plaintiffs. All named plaintiffs are African American borrowers who obtained nonprime loans from Option One between 2005 and 2007. Nine of the ten loans are wholesale OOMC loans, and one loan is a retail HRBMC loan. Each named Plaintiff received at least one first-lien loan from Option One during the class period, and one of the named Plaintiffs also received a subordinate lien loan from Option One. 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.

75.   Using coefficients from the regression models estimated in Section V, I calculate the predicted APR for each loan of the named Plaintiffs *if the named Plaintiffs had been white instead of African American*. This "predicted APR if white" represents the predicted race-neutral cost of the loan to the named Plaintiff based on the risk-based characteristics of the loan.[102] If the

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101. *Complaint* ¶¶18-31.
102. The predicted APR if white for a borrower *i's* loan can be represented as $APR_{w,i}$ in Equation [2]:

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named Plaintiff's actual APR is greater than the predicted APR if white, then the Plaintiff's loan

was more expensive than what the Plaintiff's non-race, risk-based characteristics would have

implied. Table 9 compares the actual APRs of the named Plaintiffs with the predicted APRs if

the Plaintiffs had been white. Table 9 also shows the named Plaintiffs' actual APRs, less the

marginal effect that their status as African Americans 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 predicted APRs are calculated using Model (4) as it was

estimated on the entire sample of loans in Defendants' loan database (shown in Table 6).

TABLE 9: ACTUAL AND PREDICTED APRs (%) OF NAMED PLAINTIFFS

Plaintiff	Actual APR	Model (4) Estimated for All Loans			
		Predicted APR if White	Difference from Actual	Actual APR less Marginal Effect of Af. Am. Status	Difference from Actual
Barrett (2005)	8.653	8.412	0.241	8.567	0.086
Barrett (2006)	10.536	10.592	-0.056	10.450	0.086
Chavers	9.807	9.638	0.169	9.721	0.086
Day	11.759	9.680	2.079	11.673	0.086
Grissett (First lien)	10.878	10.330	0.548	10.792	0.086
Grissett (Sub. lien)	14.131	12.506	1.625	14.045	0.086
Guerrier	10.844	10.372	0.472	10.758	0.086
Hoffman	10.699	10.103	0.596	10.613	0.086
Murray	10.482	9.466	1.016	10.396	0.086
Parham	10.829	10.630	0.199	10.743	0.086

76.   As Table 9 shows, all of the named Plaintiffs have loans that are typical of most

members of the proposed Class in that their predicted APRs (had they been white) are lower than

their actual APRs when using Model (4). For example, Ms. Day's actual APR was 11.759

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[2] $APR_{w,i} = \beta_0 + \sum_k \beta_k x_{k,i}$,

where $x_{k,i}$ represents all the non-race, risk-based characteristics used in estimating the regression in Equation [1], and the β terms are the coefficients that are calculated from estimating Equation [1]. Note that Equation [2] is nearly identical to Equation [1], except the ε_i error term and the non-white race variables used as explanatory variables in Equation [1] are dropped. By dropping the non-white race variables from Equation [2], the marginal effects of being African American that are estimated in Equation [1] will have no effect on the predicted APR if white.

percent, whereas her predicted APR had she been white was 9.680 percent. I also estimate predicted APRs if white for the named Plaintiffs' loans under the regressions shown in Tables 7 and 8, and I find that *every* named Plaintiff's loan APR is greater than the predicted APR if the Plaintiffs had been white in at least one of these models.

77.   Because the regression coefficients for the African American indicator variable 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 9 also 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 model specification. For example, Ms. Murray's actual APR on her Option One mortgage is 10.482 percent. When the average disparate impact to African Americans (as calculated using Model (4)) is removed from her APR, her APR decreases to 10.396 percent. Because each named Plaintiff was subject to the same Discretionary Pricing Policy that disproportionately affected African American borrowers, the named Plaintiffs have claims that are typical of the Class.

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

78.   Monetary relief in this case can be calculated using available, objective information that is already contained in Defendants' 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

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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.

79.   If Defendants were able to show that they 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 Defendants' 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 Defendants' 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.

80.   Moreover, it would be particularly 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 Defendants to charge African Americans 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.

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81.   Once again, considering revenue-based factors in calculating the amount of monetary relief would likely require more individualized evidentiary hearings. However, for the reasons described above, it is inappropriate to consider such factors in calculating the amounts of monetary relief that were not business justified. Individualized evidentiary hearings on monetary relief are not necessary or appropriate. Calculation of monetary relief is amenable to mechanistic computation based on readily available and objective data.

82.   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 African American status as estimated in my regression model.[103] 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 Option One loans.

83.   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 Option One 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 life of each loan.[104] The likelihood of prepayment for any given loan depends on various factors,

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103. This "but-for" APR is calculated using Equation [3].

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

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 Option One loans.

104. *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).

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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.

84.   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.

85.   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, which I could calculate using the characteristics of that loan in 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 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.

86.   The assumption of a shorter calculation period of five years may be closest to the actual experience of Option One loans, based on the recent history of mortgage longevity before

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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.[105] 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.[106] 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.[107]

     87.   Although the examples of the length of an average mortgage life are shorter than

five years, that longer average life may be more appropriate because I use the APR as my

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 African Americans were overcharged if African Americans paid more in upfront fees than

white borrowers with similar risk characteristics.

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105. 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.

106. 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:

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

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.

107. *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).

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88.   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.[108] 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 Option One 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).[109] 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.

89.   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 prepayments.[110] 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 10 shows the aggregate results of my calculations of monetary relief, based on regression Model (4) estimated on all loans in Defendants' loan database. Again, with

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108.In mortgage lending, upfront closing fees are sometimes added to the loan principal rather than paid upfront at loan closing.
109.See Deposition of Vivian Olson at 89-90 (Oct. 14, 2009).
110.I reserve the right for an expert report on merits to adjust my calculations to account for these refinements.

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additional data, I could develop a more nuanced estimate of relief 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.

TABLE 10: MONETARY RELIEF TO OPTION ONE AFRICAN AMERICAN BORROWERS OF NONPRIME
LOANS USING THE APRs PREDICTED BY MODEL (4)

	African Americans
Over entire loan term	
Undiscounted ($Millions)	$438.2
Present Value of Relief ($Millions)	$326.8
Over 10 years	
Undiscounted ($Millions)	$173.5
Present Value of Relief ($Millions)	$175.6
Over 5 years	
Undiscounted ($Millions)	$86.3
*Number of Loans**	*129,171*
Avg undiscounted relief per loan over 5 years ($)	*$668*
Present Value of Relief ($Millions)	$97.2
*Number of Loans**	*129,171*
Avg. present value of relief per loan over 5 years ($)	*$752*

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. 15, 2010) of 4.48 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 30-year scenario, 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 10-year and 5-year scenarios, 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.

90.   As Table 10 shows, African Americans suffered $438.2 million in harm over the

full term of their nonprime loans. The present value of this $438.2 million harm is $326.8

million. When measured over five years, African Americans suffered $86.3 million in

(undiscounted) harm. African American borrowers who are assigned monetary relief based on

my methodology suffered an average of $668 per loan (undiscounted) over five years.

91.   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 terms. For example, the undiscounted monetary relief under the 5-year scenario for named Plaintiff Parham is $2,195. This relief of $2,195 is equal to the difference in Mr. Parham's interest payments over the first five years of his loan, based on his loan amount ($494,000) and fixed-rate amortization schedules using his actual APR (10.829 percent) and his but-for APR when removing the effect of the disparate impact (10.743 percent—8.6 basis points lower than his actual APR). The aggregate monetary relief shown in Table 10 is merely the sum of the effect of the disparate impact on each Class member's loan terms.

VIII. CONCLUSION
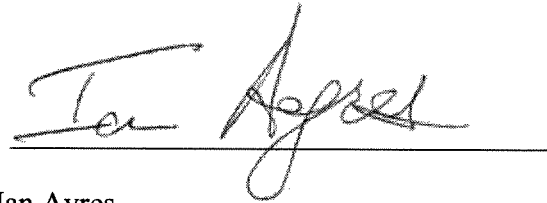
92.   In summary, Defendants maintain sufficient data concerning Option One loan applicants to allow a statistical analysis to determine the effect of Defendants' policies on borrowers by race. By using these statistical methods, one can reliably estimate whether Defendants' policies had a disparate impact on African Americans 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 Defendants' data shows that Option One's African American borrowers paid hundreds of millions of dollars more in finance charges than Option One's 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.

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Executed on March 22, 2010.

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Ian Ayres

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APPENDIX 1: MATERIALS RELIED UPON

Pleadings:

- Second Amended Class Action Complaint, C.A. No. 08-10157.

Deposition Testimony:

- Deposition of Vivian Olson (Oct. 14, 2009) and exhibits.
- Deposition of Jennifer Green (Oct. 14, 2009) and exhibits.
- Deposition of Diane Wang (Oct. 13, 2009) and exhibits.

Bates-Labeled Documents

- Fair Lending Scorecard (2002 Q4 OOMC scorecard.xls) (Bates No. OOMCADI2.00231 – OOMCADI2.00303).
- 2003 Q1 & Q2 OOMC scorecard.xls (Bates No. OOMCADI2.00304 – OOMCADI2.00375).
- 2003 Q3 OOMC scorecard.xls (Bates No. OOMCADI2.00476 – OOMCADI2.00514).
- 2003 Q4 OOMC scorecard.xls (Bates No. OOMCADI2.00515 – OOMCADI2.00553).
- 2003 Q1 & Q2 HRBMC Non-prime scorecard.xls (Bates No. OOMCADI2.00554 – OOMCADI2.00556).
- 2003 Q3 & Q4 HRBMC Non-prime scorecard.xls (Bates No. OOMCADI2.00557 – OOMCADI2.00559).
- 2003 Q1 & Q2 HRBMC Prime scorecard.xls (Bates No. OOMCADI2.00560 – OOMCADI2.00563).
- 2003 Q3 & Q4 HRBMC Prime scorecard.xls (Bates No. OOMCADI2.00564 – OOMCADI2.00567).
- 2003 Q1 & Q2 OOMC scorecard.xls (Bates No. OOMCADI2.01033 – OOMCADI2.01109).
- 2003 Q3 OOMC scorecard.xls (Bates No. OOMCADI2.01110 – OOMCADI2.01148).
- 2003 Q4 OOMC scorecard.xls (Bates No. OOMCADI2.01110 – OOMCADI2.01187).

Court Cases:

- *Watson v. Fort Worth Bank & Trust*, 487 U.S. 977 (1988).
- *A.B. & S. Auto Service, Inc. v. South Shore Bank of Chicago*, 962 F. Supp. 1056 (N.D. Ill. 1997)
- *Lewis v. ACB Business Services, Inc.*, 135 F.3d 389 (6th Cir. 1998).

Congressional Testimony:

- *Legislative Solutions to Abusive Mortgage Lending Practices: Joint Hearing Before the Subcomm. on Financial Institutions & Consumer Credit and the Subcomm. on Housing & Community Opportunity of the H. Comm. on Financial Services*, 109th Cong. 19 (2005) (statement of Steve Nadon, Chief Operating Officer, Option One Mortgage) (*available at* http://financialservices.house.gov/media/pdf/052405sn.pdf).
- *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/MBATestimony6262007EndingMortgageAbuseSafeguardingH omebuyers.pdf).

Data

- 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.
- Bates No. DEF6000001.
- Bates No. DEF6000003.
- Bates No. DEF6000004.

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Letters, E-Mails, and Other Correspondences

- Letter from Brian P. Brooks, O'Melveny & Myers LLP, to Gary Klein, Roddy Klein & Ryan (Oct. 8, 2009).
- Letter from Elizabeth Lemond McKeen, O'Melveny & Myers LLP, to Shennan Kavanagh, Roddy Klein & Ryan (Dec. 1, 2009).
- Letter from Elizabeth Lemond McKeen, O'Melveny & Myers LLP, to Gary Klein, Roddy Klein & Ryan (Jan. 5, 2010).
- E-Mail from Elizabeth Lemond McKeen, O'Melveny & Myers LLP, to Gary Klein, Roddy Klein & Ryan (Mar. 11, 2010, 16:12:10).

Laws, Regulations, and Other Government Publications:

- Regulation B (Equal Credit Opportunity), 12 C.F.R. § 202 et seq. (2009).
- 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).
- Truth in Lending Act, 15 U.S.C. §1606 et seq. (2006).
- Civil Rights Act of 1991, 42 U.S.C. § 2000e-2 (k) (1)(A)(i) (2006).
- Fair Housing Act, 42 U.S.C. § 3601 et seq.
- Federal Reserve, *Frequently Asked Questions about the New HMDA Data* (Mar. 31, 2005), *available at* http://www.federalreserve.gov/boarddocs/press/bcreg/2005/20050331/attachment.pdf.
- Federal Financial Institutions Examination Council, *A Guide to HMDA Reporting: Getting It Right!* (2006 ed.), *available at* http://www.ffiec.gov/Hmda/pdf/2006guide.pdf.
- Federal Reserve System, Truth in Lending, 74 Fed. Reg. 43,232 (proposed Aug. 26, 2009) (to be codified at 12 C.F.R. pt. 226).

SEC Filings:

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Web sites:

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

APPENDIX 2: CURRICULUM VITAE OF IAN AYRES

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IAN AYRES

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EDUCATION

Ph.D.   (Economics) Massachusetts Institute of Technology, 1988.
     Major Fields: Industrial Organization, Econometrics.
     Dissertation: Essays on Vertical Foreclosure, Cartel Stability and the
               Structural Determinants of Oligopolistic Behavior.

J.D.   Yale Law School, 1986.
     Articles Editor, Yale Law Journal.

B.A.   Yale University, 1981.
     Majors: Russian and East European Studies (Distinction).
                  Economics (Distinction).
     Summa Cum Laude, 1981.
     Phi Beta Kappa, 1980.

PROFESSIONAL APPOINTMENTS

William K. Townsend Professor, Yale Law School, 1994 - present.

Professor, Yale School of Management, 1994 - present.

Anne Urowsky Professorial Fellow, 2009 – present.

Research Associate, National Bureau of Economic Research, 2005 - present.

Editor, JOURNAL OF LAW, ECONOMICS AND ORGANIZATION, 2002 - 2009.

Adviser, The Center for Cost-Effective Consumerism, 2008 – present.

Robert B. and Candice J. Haas Visiting Professor, Harvard Law School, Winter Term 2008.

Visiting Professor, University of Illinois, School of Law, 1997-98.

Lecturer, University of Toronto, Faculty of Law, January 1995.

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Professor, Stanford Law School, 1992 - 1994.

Lecturer, University of Illinois, School of Law, Summers 1994 and 1995.

Board of Editors, SUPREME COURT ECONOMIC REVIEW, 1993 - .
Lecturer, University of Iowa, School of Law, January Term 1993.

Lecturer, Moscow State Institute of International Relations (MGIMO) -- Cardozo Law Institute, Summer 1992.

Visiting Professor, Yale Law School, Fall 1991.

Visiting Professor, University of Virginia, School of Law,
Fall 1990 - Spring 1991.

Guest Scholar, Brookings Institution, Summer 1990 - Spring 1991.

Associate Professor, Northwestern University, School of Law,
1990 - 1991; (Assistant Professor, 1987-1990).

Research Fellow, American Bar Foundation, 1987 - 1991.

Scholar in Residence, Sonnenschein Nath and Rosenthal - Summer 1990.

Associate Editor, *Law and Social Inquiry*, 1990.

Clerk to the Honorable James K. Logan, Tenth Circuit Court of Appeals, 1986-1987.

Olin Summer Research Fellow, Yale Law School Program in Law, Economics, and Public Policy, May to August 1986.

COURSES TAUGHT

Antitrust, Civil Rights, Commercial Law, Contracts, Corporations, Corporate Finance, Law and Economics, Property, Quantitative Methods.

PUBLIC INTEREST

Rothe Dev. Corp. v. United States, SA-98-CA-1011-EP, U.S. District Court Western District of Texas, testifying expert concerning narrowtailoring of affirmative action in government procurement, 1999.

Advisor, Justice and Commerce Departments on post-Adarand review of Affirmative Action, 1998.

- 68 -

Member, Board of Directors, Yale Law School Early Learning Center, 1996 - 1997.

Member, Board of Directors, East Palo Alto Community Law Project, 1993 - 1994.

In re Insurance Antitrust Litigation, consulting expert; regarding antitrust claims of 17 state Attorneys General against major commercial insurers, 1988 - 1991.

Counsel in Illinois post-conviction petition, *People v. Titone,* 83-C-127, 1988 to 1992 (Death sentence vacated September 7, 1990; argued cl aims concerning underlying conviction to Illinois Supreme Court, March 14, 1992).

New Haven Battered Women's Temporary Restraining Order Project,
September 1985 to April 1986.

Harvard Prison Legal Assistance Project, October 1983 to May 1984.

Legal Services of Western Missouri, June to August 1983.

Jerome Frank Legal Services Organization, January 1983 to October 1984.

PUBLICATIONS

Books

CARROTS AND STICKS: THE NEW SCIENCE OF HIGH-POWERED INCENTIVES (Bantam Books, forthcoming 2010).

LIFECYCLE INVESTING: A NEW, SAFE, AND AUDACIOUS WAY TO IMPROVE THE PERFORMANCE OF YOUR RETIREMENT PORTFOLIO (Basic Books, forthcoming 2010) (with Barry Nalebuff).

STUDIES IN CONTRACT LAW (7th edition, Foundation Press, 2008) (with Richard E. Speidel).

SUPER CRUNCHERS: WHY THINKING-BY-NUMBERS IS THE NEW WAY TO BE SMART (BANTAM BOOKS 2007).

Excerpt: How Computers Routed the Experts, Financial Times (August 31, 2007).

STRAIGHTFORWARD: HOW TO MOBILIZE HETEROSEXUAL SUPPORT FOR GAY RIGHTS (PRINCETON UNIVERSITY PRESS 2005) (with Jennifer Gerarda Brown).

INSINCERE PROMISES: THE LAW OF MISREPRESENTED INTENT (YALE UNIVERSITY PRESS, 2005) (with Gregory Klass).

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OPTIONAL LAW: THE STRUCTURE OF LEGAL ENTITLEMENTS (UNIVERSITY OF CHICAGO PRESS, 2005).

WHY NOT?: HOW TO USE EVERYDAY INGENUITY TO SOLVE PROBLEMS BIG AND SMALL (Harvard Business School Press, 2003) (with Barry Nalebuff) *also published in Portugese* as "Você Pode Tudo" (Negocio Editora), *in Spanish* as " ¿Y por que NO" (Empresa Activa), *in Korean* (Sejong), *in Japanese* (Hankyu), *in Chinese* (The Com mercial Press), *in Bulgarian* (Klasika and Still), *in Chinese* (China Times), *in Estonian* (Tanapaev), *in Italian* (Il Sole), *in Korean* (Sejong Books), *in Russian* (Williams Publishing), and *in Thai* (AR Business Press).

> *Book Excerpt: Ideas Waiting to Happen*, FORBES 127 (Oct. 27 2003) (with Barry Nalebuff).

> *Book Excerpt: A Role on the Board for the 'Loyal Opposition,'* DIRECTORS & BOARDS 32 (Fall 2003).

> *Book Excerpt: Problem Solving: What Would Croesus Do?,* DARWIN (Nov. 2003).

STUDIES IN CONTRACT LAW (6th edition, Foundation Press, 2003) (with Edward J. Murphy & Richard E. Speidel).

VOTING WITH DOLLARS: A NEW PARADIGM FOR CAMPAIGN FINANCE (with Bruce Ackerman) (Yale University Press) (2002).

PERVASIVE PREJUDICE?: UNCONVENTIONAL EVIDENCE OF RACE AND GENDER DISCRIMINATION (University of Chicago Press, 2002).

STUDIES IN CONTRACT LAW (5th edition, Foundation Press, 1997) (with Edward J. Murphy & Richard E. Speidel).

RESPONSIVE REGULATION: TRANSCENDING THE   DEREGULATION DEBATE (O XFORD UNIVERSITY PRESS 1992) (with John Braithwaite).

Scholarly Articles and Chapters

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Schwartz Lecture, Never Say No: The Law, Economics and Psychology of Counteroffers, Ohio State Law Review (forthcoming 2010).

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A Study of Racially Disparate Outcomes in the Los Angeles Police Department, prepared for the ACLU of Southern California, *available at* www.aclu-sc.org (October 2008) (with Jonathan Borowsky).

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When Does Private Discrimination Justify Public Affirmative Action? 1998 COLUMBIA LAW REVIEW 1577 (1998) (with Fredrick E. Vars).

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Three Proposals To Harness Private Information in Contract, 21 HARVARD JOURNAL OF LAW AND PUBLIC POLICY 135 (1997).

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Never Confuse Efficiency With A Liver Complaint, 1997 WISCONSIN LAW REVIEW 503 (1997).

Common Knowledge As A Barrier to Negotiation, 44 UCLA LAW REVIEW 1631 (1997) (with Barry Nalebuff).

Legal Entitlements as Auctions: Property Rules, Liability Rules, and Beyond, 106 YALE LAW JOURNAL 703 (1997) (with Jack Balkin).

Narrow Tailoring, 43 UCLA LAW REVIEW 1781 (1996).

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Comment on Painter, 65 FORDHAM LAW REVIEW 201 (1996).

The Q-Word As Red Herring: Why Disparate Impact Liability Does Not Induce Hiring Quotas, 74 TEXAS LAW REVIEW 1485 (1996) (with Peter Siegelman).

Review, *Overcoming Law*, by Richard A. Posner, 40 A   MERICAN JOURNAL OF LEGAL HISTORY 371 (1996).

Pursuing Deficit Reduction Through Diversity: How Affirmative Action at the FCC Increased Auction Competition, 48 S TANFORD LAW REVIEW 761 (1996) (with Peter Cramton).

Supply Side Inefficiencies and Competitive Federalism, in INTERNATIONAL REGULATORY COMPETITION AND COORDINATION: PERSPECTIVES ON ECONOMIC REGULATION IN EUROPE AND THE UNITED STATES (Oxford University Press, 1996) (McCahery, Baratton et al. eds.)

Distinguishing Between Consensual and Nonconsensual Advantages of Liability Rules, 105 YALE LAW JOURNAL 235 (1995) (with Eric Talley).

Further Evidence of Discrimination in New Car Negotiations and Estimates of Its Cause, 94 MICHIGAN LAW REVIEW 109 (1995).

Review, *The Limits of Freedom of Contract*, by Michael J. Trebilcock, 33 J OURNAL OF ECONOMIC LITERATURE. 865 (1995).

HLA Matching in Renal Transplantation, 332 THE NEW ENGLAND JOURNAL OF MEDICINE 752 (1995) (with Robert Gaston and Mark Deierhoi).

Solomonic Bargaining: Dividing A Legal Entitlement To Facilitate Coasean Trade, 104 YALE LAW JOURNAL 1027 (1995) (with Eric Talley).

Supply-Side Inefficiencies in Corporate Charter Competition: Lessons from Patents, Yachting and Bluebooks, 43 KANSAS LAW REVIEW 541 (1995).

Race and Gender Discrimination in Negotiation For the Purchase of a New Car, 84 AMERICAN ECONOMIC REVIEW 304 (1995) (with Peter Siegelman).

Alternative Grounds: Epstein's Discrimination Analysis in Other Market Settings, 31 UNIVERSITY OF SAN DIEGO LAW REVIEW 67 (1994).

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      A Donation Booth? (June 23, 2004)
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Race, Tips and Economics 136 (Nov. 1, 2004)
Throwaway Tickets 52 (August 18, 2004)
Dialing for Thieves 76 (April 19, 2004)
Don't Sell Us Short 57 (Feb. 2, 2004)
It Beats a CD 160 (Dec. 8, 2003)
Blackbox for Cars 83 (August 11, 2003)
An Educated Consumer 95 (June 09, 2003)
Make Car Insurance Fairer 154 (March 17, 2003)
The Virtues of a Virtual Strike 128 (Oct. 25, 2002)
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Colleges in Collusion, THE NEW REPUBLIC 19 (October 16, 1989).

NAMED LECTURES

The Schwartz Lecture on Dispute Resolution, "Never Say No: The Law, Economics and Psychology of Counteroffers," Ohio State University, Moritz College of Law, April 2, 2009.

The Biddle Lecture, "A New Test for   Race Discrimination," Harvard Law School, November 12, 2008.

The Hart Lecture, "The Secret Refund Booth," Georgetown University Law Center, March 22, 2006.

The Henry Schneider Lecture, "Mark(et)ing Nondiscrimination," Columbia Law School, March 8, 2005.

The Hazard Lecture, "Can Creativity be Taught?: Why Not!," Pembroke Hill High School, September 17, 2004.

The John M. Olin Lecture in Law and Economics, "Why Not?: Can Legal Creativity Be Taught?," Michigan Law School, September 11, 2003.

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The Monsanto Lecture in Tort Reform   and Jurisprudence,   "Using Tort Settlem ent To Cartelize," Valparaiso University, School of Law, March 26, 2000.

The John M. Olin Public Lecture in Law and Economics, "Coveting Thy Neighbor's Stock: Substitute Trading as Evasion and as Policy Tool," University of Toronto, September 24, 1999.

The Ladd Lecture, "Empire or Residue: Com peting Visions of the Contractual Canon, " Florida State College of Law, October 22, 1998.

The Monsanto Lecture in Tort Reform and Jurisprudence, "Protecting Property with Puts," Valparaiso University, School of Law, March 26, 1998.

Inaugural Lecture for W illiam K. Townsend Chair,   "Solomonic Bargaining, " Yale Law School, November 15, 1994.

The Mirikitani Lecture in Law and Econom ics, "Back to Basics, " University of Hawaii, March 9, 1990.

PROFESSIONAL MEMBERSHIP

James W. Cooper Fellow, Connecticut Bar Foundation, 2009 – present.

Fellow, American Academy of Arts & Sciences, 2006 - present.

Member, American Law Institute, 1997 - present.

Board of Directors, American Law and Economic Association, 1995-1999.

Admitted, Illinois Bar, 1987.

AWARDS

Scribes Book Award (I NSINCERE PROMISES) – "for the best work of legal scholarship published during the previous year," 2006

Research in the Public Interest, The Center for Public Representation, 1991.

ACTIVITIES

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1st Place, Law and Society Association -- 5 kilometer fun run, 1989, 2002 and 2003.

Completed 1984 Boston marathon in 3 hours, 12 minutes.

Whiffenpoofs, 1980-81.

Yale Russian Chorus, 1977-80.

Semester in Soviet Union, Moscow's Pushkin Institute, Spring 1979.

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APPENDIX 3: CASES IN WHICH IAN AYRES HAS TESTIFIED OR WRITTEN A DISCLOSED REPORT

1. In re First Franklin Financial Corp. Litigation (2010) No. C08-01515JW (HRL) (N.D. Ca.) (testifying expert; re: disparate impact of discretionary pricing policies).

2. In re Federated Mutual Funds Excessive Fee Litigation (2009) Consolidated No. 2:04-cv-352-DSC (W.D. Pa.) (testifying expert; re: competition in the mutual fund industry).

3. Connecticut Podiatric Medical Association v. Health Net of Connecticut (2008) No. X01-CV-05-005900-S (CT SUP. CT.) (analyzed business justifications for discriminatory pricing in reimbursement rates paid to podiatrists and medical doctors).

4. INEOS Fluor Americas LLC, v. Honeywell International Inc. (2006) Civil Action No.: 06-189-SLR (DC. Del.) (expert concerning competition in the market for hydrofluoric acid).

5. Techold Participações S.A. v. Telecom Italia International N.V. (2006) International Chamber of Commerce Arbitration Nos.: 13960/CCO, 14048/CCO, 14376/CCO and 14393/CCO (expert concerning breach of corporate fiduciary duties).

6. Regarding Cayuga Nation's Land in Trust Application (2006) (expert concerning economic impact of placing certain lands in trust).

7. Blanchard & Co. v. Barrick Gold Corp. (2005) NO.: 02-3721 c/w 04-2610 (E.D. Louisiana) (expert concerning derivative trading strategies).

8. Claybrooks v. Primus Automotive Financial Services, Inc. (2005) No. 3-02-0382(M.D. Tenn.) (Testifying expert concerning disparate impact of finance markups).

9. Owens v. Nationwide Mutual Insurance Co. (2005) No. 3-03CV1184-H (N.D. Texas) (expert concerning disparate impact of credit scoring mechanism).

10. Russell v. Bank One (2004), No. 3-02-0365 (M.D. Tenn.) (testifying expert concerning disparate impact of finance markups).

11. Fishback and Willis vs. AHFC (2004), No. 3-02-0490 (M.D.Tenn.) (Testifying expert concerning disparate impact of finance markups).

12. Smith v. CFC (2004) No. 00-6003 (D.N.J.) (expert concerning disparate impact of finance markups).

13. Jones v. FMCC (2004) No. 00 CIV 8330 (S.D.N.Y.) (testifying expert concerning disparate impact of finance markups).

14. Coleman v. GMAC (2003) No. 3-98-0211 (M.D. Tenn) (testifying expert concerning disparate impact of finance markups).

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15. Monsanto v. Scruggs (2002) Civil Action No. 3:00CV-161-P-A (N.D. Miss) (testifying expert concerning GM seed antitrust and patent abuse claims).

16. Rodriguez v. FMCC (2002) No. 01 C 8526 (N.D. Ill.) (submitted report concerning disparate impact of finance markups).

17. Cisco System, Inc (2001) (transfer pricing report prepared for IRS).

18. Cason v. Nissan Motor Acceptance Corp (2001) 3-98-0223 (M.D. Tenn.) (testifying expert concerning disparate impact of finance markups).

19. Star Scientific v. Steve Carter (2001) IP01-0838 C T/G (S. D. Indiana) (testifying expert concerning MSA qualifying statute).

20. Johnson v. City of Tulsa (2001) 94-C-39-H (N.D. Okla.) (submitted report concerning racial profiling by Tulsa Police Department).

21. Wisconsin v. Rent-a-Center (2000) (testifying expert concerning rent-to-own transaction).

22. Dynalantic Corp. v. United States Department of Defense (1999) (submitted report concerning narrow tailoring of affirmative action in government procurement).

23. Colon v. Rent-a-Center (1999) (wrote report concerning rent-to-own transaction).

24. Rothe Dev. Corp. v. United States, (1999) (testifying expert concerning narrow tailoring of affirmative action in government procurement).

25. Chiron Corp. v. Hoffman-La Roche (1999) (submitted report concerning interpretation of contract releasing certain claims concerning Hepatitis C patent).

26. Teledyne v. Boeing (1998) (testifying expert re: contractual and antitrust issues of Apache attack Helicopter fuselage procurement).

27. Connecticut Municipal Electric Energy Cooperative v. Connecticut Light & Power Co. (February 1998) (submitted report concerning interpretation of Life-of-Unit nuclear power output contract).

28. F. Buddie Contracting Ltd. v. Cuyahoga Community College District (March 1998) (submitted expert report re: narrow tailoring of procurement affirmative action plan).

29. Lufkin v. IDES and CMS (January 1998) (consulting expert; re: disparate impact and Equal Pay Act challenge to Illinois compensation plan).

30. DOJ's PCS Auction Investigation (June 1997) (non-testifying expert on competitive effects of auction bidding strategies).

31. Cassandra Burney et al. v. Rent-a-Center (1996-97) (testifying expert; re: excess interest charged in rent-to-own agreements).

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32. Mother Bertha Music, Ltd. v. Bourne Music Ltd. (May 1996) (consulting expert; re: interpretation of copyright assignment contract).

33. U.S. v. Christopher Barnes (March 1996) (testifying expert, re: statistical representation of minorities in federal criminal venires).

34. U.S. v. John M. Purdy, Jr. (February 1996) (testifying expert; re: statistical representation of minorities in federal criminal venires).

35. Johnson v. Apple (July 1994) (testifying expert; re: disparate treatment and damages).

36. Williams v. Du Pont (July 1993) (affidavit expert; re: appropriate prejudgement interest rate).

37. AT&T (September 1993) (consulting expert; re: appropriate preconditions for lifting interexchange restriction).

38. James E. Gilleran, et al. v. Deno Evangelista, et al. (October 1992) (testifying expert; re: fiduciary duties of officers and directors).

39. Neiman Marcus Group v. Federated Department Stores (January 1992) (consulting expert; re: covenant not to compete).

40. In re Fare Box Litigation (1989) (testifying expert; re: relevant market and merger to monopoly).

41. In re Insurance Antitrust Litigation (1988 - 1991) consulting expert; re: antitrust claims of 17 state Attorneys General against major commercial insurers.

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APPENDIX 4: SUMMARY STATISTICS OF VARIABLES IN DEFENDANTS' LOAN DATABASE
2001-2007 NONPRIME LOANS

Variable	Obs	Mean	Std. Dev.	Min	Max
APR	865,056	9.4433	1.7887	4.2210	16.2900
Note rate	865,059	8.5320	1.7027	3.3500	15.3500
Total broker compensation ($)	670,031	$4,458	$3,419	-$37,570	$83,926
Total broker compensation (points)	670,031	2.7854	1.3996	-20.0000	11.8506
Race					
American Indian	865,063	0.4%	6.5%	0%	100%
Asian, Hawaiian, or Pacific Islander	865,063	2.5%	15.7%	0%	100%
Black	865,063	14.9%	35.6%	0%	100%
Hispanic	865,063	12.7%	33.3%	0%	100%
Missing	865,063	16.7%	37.3%	0%	100%
White	865,063	52.7%	49.9%	0%	100%
Credit score	852,764	609.77	58.21	422	832
Missing credit score	865,063	1.4%	11.8%	0%	100%
Credit score < 520	865,063	5.9%	23.6%	0%	100%
520 ≤ Credit score < 540	865,063	6.9%	25.4%	0%	100%
540 ≤ Credit score < 560	865,063	7.5%	26.3%	0%	100%
560 ≤ Credit score < 580	865,063	9.1%	28.7%	0%	100%
580 ≤ Credit score < 600	865,063	13.3%	33.9%	0%	100%
600 ≤ Credit score < 620	865,063	14.4%	35.1%	0%	100%
620 ≤ Credit score < 640	865,063	13.1%	33.8%	0%	100%
640 ≤ Credit score < 660	865,063	10.1%	30.2%	0%	100%
660 ≤ Credit score < 680	865,063	6.9%	25.3%	0%	100%
680 ≤ Credit score < 700	865,063	4.5%	20.8%	0%	100%
700 ≤ Credit score < 720	865,063	2.8%	16.6%	0%	100%
720 ≤ Credit score < 740	865,063	1.7%	13.1%	0%	100%
740 ≤ Credit score < 760	865,063	1.2%	10.7%	0%	100%
760 ≤ Credit score < 780	865,063	0.7%	8.3%	0%	100%
780 ≤ Credit score < 800	865,063	0.4%	5.9%	0%	100%
Credit score ≥ 800	865,063	0.1%	2.9%	0%	100%
Loan amount ($000)	865,061	165.8	130.3	10.0	3,190.0
Loan amount < $40K	865,061	7.4%	26.2%	0%	100%
$40K ≤ Loan amount < $50K	865,061	2.4%	15.4%	0%	100%
$50K ≤ Loan amount < $75K	865,061	13.4%	34.1%	0%	100%
$75K ≤ Loan amount < $150K	865,061	34.0%	47.4%	0%	100%
$150K ≤ Loan amount < $200K	865,061	14.7%	35.4%	0%	100%
$200K ≤ Loan amount < $300K	865,061	15.5%	36.1%	0%	100%
$300K ≤ Loan amount < $500K	865,061	10.0%	30.1%	0%	100%
Loan amount ≥ $500K	865,063	2.6%	16.0%	0%	100%
Risk Grade					
AAA	865,052	1.0%	9.7%	0%	100%
AA+	865,052	44.6%	49.7%	0%	100%
AA	865,052	26.9%	44.4%	0%	100%
A	865,052	15.1%	35.8%	0%	100%
B	865,052	8.4%	27.8%	0%	100%
C	865,052	2.6%	15.9%	0%	100%
CC	865,052	1.3%	11.4%	0%	100%

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Variable	Obs	Mean	Std. Dev.	Min	Max
Lien Status					
First lien	865,063	88.8%	31.6%	0%	100%
Subordinate lien	865,063	11.2%	31.6%	0%	100%
Total debt ratio (%)	856,081	39.2	9.7	0.18	197.60
No total debt ratio	865,063	1.0%	10.1%	0%	100%
Total debt ratio ≤ 36%	865,063	33.6%	47.2%	0%	100%
36% < total debt ratio ≤ 50%	865,063	53.8%	49.9%	0%	100%
Total debt ratio > 50%	865,063	11.5%	31.9%	0%	100%
Loan-to-value (LTV) (%)	865,061	80.76	13.91	4.76	800.00
LTV missing	865,063	0.0%	0.2%	0%	100%
LTV ≤ 60%	865,063	8.0%	27.1%	0%	100%
60% < LTV ≤ 70%	865,063	11.2%	31.5%	0%	100%
70% < LTV ≤ 80%	865,063	39.2%	48.8%	0%	100%
80% < LTV ≤ 90%	865,063	20.5%	40.4%	0%	100%
90% < LTV ≤ 95%	865,063	9.0%	28.6%	0%	100%
LTV > 95%	865,063	12.1%	32.7%	0%	100%
Combined loan-to-value (CLTV) (%)	865,061	82.86	15.00	4.76	800.00
CLTV missing	865,063	0.0%	0.2%	0%	100%
CLTV ≤ 60%	865,063	7.9%	26.9%	0%	100%
60% < CLTV ≤ 70%	865,063	11.0%	31.4%	0%	100%
70% < CLTV ≤ 80%	865,063	29.0%	45.4%	0%	100%
80% < CLTV ≤ 90%	865,063	20.6%	40.4%	0%	100%
90% < CLTV ≤ 95%	865,063	9.8%	29.7%	0%	100%
CLTV > 95%	865,063	21.8%	41.3%	0%	100%
Occupancy status					
Owner-occupied	865,061	92.2%	26.8%	0%	100%
Non-owner occupied	865,061	6.5%	24.6%	0%	100%
Second home	865,061	1.3%	11.3%	0%	100%
Loan purpose					
Purchase	865,061	37.2%	48.3%	0%	100%
Cash-out refinance	865,061	54.5%	49.8%	0%	100%
Rate & term refinance	865,061	8.3%	27.6%	0%	100%
CNS	865,061	0.0%	0.2%	0%	100%
Prepayment penalty (months)	865,061	19	13	0	60
Prepayment penalty data missing	865,063	0.0%	0.2%	0%	100%
No prepayment penalty	865,063	28.9%	45.3%	0%	100%
1-to-12-month	865,063	5.2%	22.1%	0%	100%
13-to-24-month	865,063	48.4%	50.0%	0%	100%
25-to-36-month	865,063	17.5%	38.0%	0%	100%
37-to-60-month	865,063	0.0%	1.5%	0%	100%
Unit & transaction type					
H&R Block Mortgage Corp. (HRBMC)	865,063	10.0%	30.0%	0%	100%
Concurrent	865,063	0.1%	2.7%	0%	100%
Correspondent	865,063	0.0%	1.0%	0%	100%
Wholesale	865,063	9.9%	29.9%	0%	100%
Option One Mortgage Co. (OOMC)	865,063	90.0%	30.0%	0%	100%
Concurrent	865,063	0.5%	7.2%	0%	100%
Correspondent	865,063	16.8%	37.4%	0%	100%
Wholesale	865,063	72.7%	44.6%	0%	100%

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Variable	Obs	Mean	Std. Dev.	Min	Max
Alt-A	865,063	0.9%	9.5%	0%	100%
Subprime	865,063	99.1%	9.5%	0%	100%
Documentation type					
Full/Alt	865,061	0.0%	0.0%	0%	0%
Business Bank Statements	865,061	0.3%	5.8%	0%	100%
Easy Doc	865,061	0.0%	0.0%	0%	0%
Limited	865,061	30.4%	46.0%	0%	100%
Lite Doc	865,061	0.8%	9.1%	0%	100%
No Doc	865,061	0.9%	9.3%	0%	100%
No Income/No Asset	865,061	0.0%	0.0%	0%	0%
No Ratio	865,061	0.1%	3.0%	0%	100%
Reduced Doc	865,061	0.0%	0.0%	0%	0%
Stated Income	865,061	0.0%	1.3%	0%	100%
Income Stated Loan Plus	865,061	0.0%	0.1%	0%	100%
Super Streamline	865,061	0.0%	0.0%	0%	0%
Full Doc	865,061	67.0%	47.0%	0%	100%
Xpress Full Doc	865,061	0.3%	5.4%	0%	100%
Xpress Stated Income	865,061	0.1%	3.7%	0%	100%
Payment type					
Fixed rate	865,061	30.8%	46.2%	0%	100%
Adjustable rate (ARM)	865,061	69.2%	46.2%	0%	100%
Balloon (Fixed or ARM)	865,063	7.0%	25.5%	0%	100%
Interest-only	865,063	5.5%	22.9%	0%	100%
Loan term					
10-year term	865,061	0.1%	3.1%	0%	100%
15-year term	865,061	2.6%	16.0%	0%	100%
20-year term	865,061	1.3%	11.3%	0%	100%
25-year term	865,061	0.0%	0.1%	0%	100%
30-year term	865,061	96.0%	19.6%	0%	100%
Loan program categories					
10-year fixed	865,061	0.1%	3.1%	0%	100%
15-year ARM, initial rate fixed 6 months	865,061	0.0%	0.2%	0%	100%
15-year ARM, initial rate fixed 2 years	865,061	0.2%	4.2%	0%	100%
15-year ARM, initial rate fixed 3 years	865,061	0.0%	1.2%	0%	100%
15-year fixed	865,061	1.6%	12.6%	0%	100%
15-year fixed balloon	865,061	0.8%	9.1%	0%	100%
20-year fixed	865,061	1.3%	11.3%	0%	100%
25-year ARM	865,061	0.0%	0.1%	0%	100%
25-year fixed	865,061	0.0%	0.0%	0%	0%
30-year ARM, initial rate fixed 6 months	865,061	0.1%	2.6%	0%	100%
30-year ARM, initial rate fixed 2 years	865,061	53.6%	49.9%	0%	100%
30-year ARM, initial rate fixed 3 years	865,061	3.7%	18.9%	0%	100%
30-year ARM, initial rate fixed 5 years	865,061	0.8%	9.0%	0%	100%
30-year ARM, initial rate fixed 7 years	865,061	0.0%	0.0%	0%	0%
30-year ARM, initial rate fixed 10 years	865,061	0.0%	0.0%	0%	0%
30-year ARM, initial rate fixed 15 years	865,061	0.2%	4.7%	0%	100%
30-year interest-only ARM, initial rate fixed 2 years	865,061	4.6%	20.9%	0%	100%
30-year interest-only ARM, initial rate fixed 3 years	865,061	0.3%	5.4%	0%	100%

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Variable	Obs	Mean	Std. Dev.	Min	Max
30-year interest-only ARM, initial rate fixed 5 years	865,061	0.4%	6.6%	0%	100%
30-year interest-only ARM, initial rate fixed 7 years	865,061	0.0%	0.0%	0%	0%
30-year interest-only ARM, initial rate fixed 10 years	865,061	0.0%	0.0%	0%	0%
30-year interest-only ARM, initial rate fixed 15 years	865,061	0.0%	0.5%	0%	100%
30-year ARM balloon, initial rate fixed 6 months	865,061	0.0%	0.6%	0%	100%
30-year ARM balloon, initial rate fixed 2 years	865,061	4.6%	20.9%	0%	100%
30-year ARM balloon, initial rate fixed 3 years	865,061	0.3%	5.4%	0%	100%
30-year ARM balloon, initial rate fixed 5 years	865,061	0.4%	6.6%	0%	100%
30-year fixed	865,061	25.9%	43.8%	0%	100%
30-year interest-only fixed	865,061	0.2%	4.9%	0%	100%
30-year fixed balloon	865,061	0.8%	9.0%	0%	100%
Alternate race classification: Interact race & ethnicity (2004-2007 only)					
American Indian, non-Hispanic	560,542	0.4%	6.5%	0%	100%
American Indian, Hispanic	560,542	0.4%	6.5%	0%	100%
Asian, non-Hispanic	560,542	2.7%	16.3%	0%	100%
Asian, Hispanic	560,542	0.2%	5.0%	0%	100%
Black, non-Hispanic	560,542	15.7%	36.4%	0%	100%
Black, Hispanic	560,542	0.4%	6.4%	0%	100%
Missing, non-Hispanic	560,542	12.6%	33.2%	0%	100%
Missing, Hispanic	560,542	1.8%	13.4%	0%	100%
White, non-Hispanic	560,542	54.1%	49.8%	0%	100%
White, Hispanic	560,542	11.5%	31.9%	0%	100%
Alternate race classification: Allow multiple race classifications					
American Indian	865,063	0.7%	8.5%	0%	100%
Asian	865,063	2.7%	16.3%	0%	100%
Black	865,063	14.9%	35.6%	0%	100%
Hispanic	865,063	13.0%	33.6%	0%	100%
Missing	865,063	16.7%	37.3%	0%	100%
White	865,063	53.9%	49.8%	0%	100%

Note: I make the following assumptions and changes to the original 2001-2007 data on prime and nonprime loans provided to Plaintiffs:

- Defendants have produced three discs of data to Plaintiffs in this case, labeled Bates No. DEF6000001, DEF6000003, and DEF6000004. DEF6000003 included additional data not included in DEF6000001 for prime and nonprime loans, as well as corrections to data contained in DEF6000001. See Letter from Elizabeth Lemond McKeen, O'Melveny & Myers LLP, to Shennan Kavanagh, Roddy Klein & Ryan (Dec. 1, 2009). DEF6000004 contained data from another Option One database ("PFUND") for nonprime loans only. DEF6000004 included some variables included in the earlier discs, as well as variables that were not included in DEF6000001 or DEF6000003.
- When there is a discrepancy between the values for a given variable for a given loan in the data provided in DEF6000004 and data provided in the earlier discs (DEF6000001, DEF6000003), I use the data from DEF6000004 in all instances except for APR. The APRs for a large number of loans in DEF6000004 are missing. For those loans, I use the APRs from DEF6000001.

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- I adjust the races and ethnicities for named plaintiffs Murray (loan number 041068915) and the Barretts (loan numbers 161044209 and 161048049) to non-Hispanic African American to correct for missing or inaccurate race and ethnicity values.
- I calculate total broker compensation for a given loan to be equal to the sum of all fees paid to the broker (regardless of whether the lender or borrower pays the fees), with the exception of certain fees that appear to be pass-through fees to third parties such as appraisers, notaries, and credit report firms. The fees in Defendants' loan database that I exclude from total broker compensation have the following fee descriptions: "APPRAISAL {INDEPENDENT}", "CLOSING DOC FEE {INDEPENDENT}", "CREDIT REPORT {INDEPENDENT}", "NOTARY FEE {INDEPENDENT}", "[B/A] APPRAISAL FEE", "[B/A] CLOSING DOC FEE", "[B/A] CREDIT REPORT FEE", and "[B/A] NOTARY FEE".
- I correct the years for four loans with rate lock dates or application dates in 2009, 2022, 2055, or before 1995 to match the years for other date variables in the data, such as application date and funded date.
- I assume the date of loan closing is equal to the latest date among the action date, funded date, conditional approval date, application date, and rate lock date.
- I assume the rate lock date, if missing, is equal to the action date (if present), or the latest date among the funded date, conditional approval date, application date, and rate lock date.
- For year-by-year analyses, such as the regression models estimated on loans within a single year, I group the one loan with an action date in 2008 with 2007 loans.
- I use the "company_name_2" variable to classify the business unit for the seven loans with no value for the "Unit" variable (OOMC or HRBMC).
- For the 2 loans with no lien status, I assume that the loans are first-lien loans. Neither loan has APR data present, so they are excluded from my regression and monetary relief calculations.
- I replace the note rates for 2 loans with values less than 1% with missing values.
- I replace the APR for 3 loans with values less than 1.002% with missing values.
- I assume a missing credit score for the 34 loans in the database with credit scores outside the typical FICO credit score range of 300 to 850.
- I classify the terms of each loan program (such as fixed-rate vs. ARM, balloon loan indicator, initial fixed-rate period for ARM loans, interest-only indicator, length of loan term, etc.) based on the descriptions for those programs in the data.
- The loan amount is missing for 26,596 loans in Defendants' loan database. For those loans, I estimate the loan amount based on other variables with values present in the database: the first principal and interest payment ("first_pi"), the initial interest rate of the loan ("final rate"), and the description of the loan program (from which I infer the amortization term of the loan and whether the loan was an interest-only or fully-amortized loan).
- My primary race classifications are explained in ¶55 above. My alternate race classifications are explained in the note to Appendix 7.
- The debt-to-income ratio is equal to the ratio of liabilities to income in the data. I set the debt-to-income ratio as missing for the 739 loans with a debt-to-income ratio greater than 200 percent or liabilities less than $10.

Appendix 5: Results of APR Regressions Estimated Over Entire Sample

Race Coefficients Are Also Shown in Table 6

Dependent variable: APR (basis points)	Model (1) Race dummies only	Model (2) Race, rate lock month & subordinate lien dummies	Model (3) Same as (2), add credit score bin dummies	Model (4) Same as (3), add risk-based characteristics	Model (5) Same as (2), use rate lock week dummies in place of rate lock month dummies	Model (6) Add various explanatory variables	Model (7) Interact residence type & property type	Model (8) Interact LTV x 1st lien, CLTV x sub lien	Model (9) Add prepayment term	Model (10) Add documentation type	Model (11) Same as Model (4), add individual loan program dummies	Model (12) Same as Model (4), substitute program categories with separate attribute variables	Model (13) Same as Model (4), add risk grade dummies	Model (14) Same as Model (4), add HRBMC dummy	Model (15) Same as Model (4), add transaction type dummies	Model (16) Same as Model (4), add interaction of business unit & transaction type dummies	Model (17) Same as Model (4), add Alt-A dummy
Race: African American	46.06*** (0.56)	31.28*** (0.41)	20.53*** (0.37)	8.63*** (0.31)	31.18*** (0.41)	5.72*** (0.33)	5.74*** (0.33)	6.41*** (0.33)	7.27*** (0.33)	8.42*** (0.33)	8.76*** (0.31)	8.73*** (0.32)	7.69*** (0.29)	8.53*** (0.31)	8.45*** (0.31)	8.39*** (0.31)	8.82*** (0.31)
Race: Hispanic	-11.42*** (0.60)	-20.30*** (0.42)	-11.81*** (0.37)	1.25*** (0.32)	-20.24*** (0.42)	5.00*** (0.34)	5.03*** (0.35)	5.91*** (0.34)	5.69*** (0.34)	2.13*** (0.33)	1.69*** (0.32)	1.73*** (0.33)	1.31*** (0.30)	1.31*** (0.32)	0.60* (0.32)	0.76** (0.33)	1.63*** (0.32)
Race: American Indian	11.38*** (2.99)	10.59*** (2.19)	3.59* (1.91)	7.57*** (1.56)	10.59*** (2.19)	6.27*** (1.64)	6.28*** (1.64)	6.73*** (1.63)	7.36*** (1.61)	7.74*** (1.60)	7.57*** (1.55)	7.60*** (1.58)	6.00*** (1.41)	6.73*** (1.55)	7.52*** (1.55)	6.86*** (1.54)	7.62*** (1.55)
Race: Asian, Hawaiian, or Pacific Islander	-27.51*** (1.22)	-37.44*** (0.84)	-18.57*** (0.77)	4.15*** (0.61)	-37.47*** (0.84)	8.31*** (0.67)	8.35*** (0.67)	8.97*** (0.66)	8.52*** (0.65)	-4.84*** (0.64)	4.36*** (0.61)	4.66*** (0.63)	3.57*** (0.57)	4.09*** (0.61)	3.96*** (0.61)	3.98*** (0.61)	4.33*** (0.61)
Race: Missing	-11.85*** (0.54)	-9.00*** (0.41)	-11.05*** (0.39)	0.33 (0.29)	-5.91*** (0.41)	-1.58*** (0.31)	-1.57*** (0.31)	-1.28*** (0.31)	-0.47 (0.31)	-0.01 (0.30)	0.57* (0.29)	0.61** (0.30)	1.10*** (0.27)	-4.40*** (0.30)	0.01 (0.29)	-3.91*** (0.30)	0.38 (0.29)
Subordinate lien		171.95*** (0.46)	199.03*** (0.43)	31.62*** (0.29)	171.88*** (0.46)	67.08*** (0.82)	67.07*** (0.82)	-1.43 (0.88)	-7.53*** (0.87)	-13.43*** (0.86)	-78.58 (33,735.64)	30.18*** (0.93)	27.84*** (0.90)	35.06*** (0.93)	32.05*** (0.93)	35.01*** (0.93)	33.46*** (0.93)
Missing Credit Score			191.92*** (4.79)	177.14*** (1.57)		187.62*** (4.02)	187.58*** (4.01)	187.04*** (3.98)	180.28*** (3.87)	184.42*** (3.86)	179.22*** (3.50)	177.21*** (3.67)	151.41*** (3.40)	176.63*** (3.57)	181.31*** (3.55)	179.99*** (3.55)	179.30*** (3.53)
300 <= Credit Score < 520			218.58*** (4.66)	233.32*** (3.41)		243.13*** (3.88)	243.05*** (3.87)	243.52*** (3.80)	234.34*** (3.70)	240.98*** (3.61)	230.89*** (3.35)	231.79*** (3.67)	190.14*** (3.29)	223.18*** (3.41)	232.83*** (3.39)	231.42*** (3.39)	230.81*** (3.35)
520 <= Credit Score < 540			206.38*** (4.65)	220.28*** (3.40)		231.27*** (3.88)	231.20*** (3.87)	231.28*** (3.79)	222.43*** (3.69)	229.11*** (3.60)	218.95*** (3.35)	219.81*** (3.52)	182.20*** (3.29)	220.79*** (3.41)	221.53*** (3.39)	221.55*** (3.39)	218.82*** (3.35)
540 <= Credit Score < 560			187.61*** (4.65)	199.18*** (3.40)		210.88*** (3.87)	210.80*** (3.87)	210.33*** (3.79)	201.13*** (3.69)	208.58*** (3.60)	197.85*** (3.34)	199.36*** (3.51)	168.79*** (3.28)	199.92*** (3.40)	199.64*** (3.39)	200.11*** (3.38)	197.72*** (3.37)
560 <= Credit Score < 580			145.17*** (4.65)	155.10*** (3.40)		163.99*** (3.87)	163.92*** (3.87)	163.95*** (3.78)	157.09*** (3.68)	163.87*** (3.59)	153.74*** (3.34)	155.53*** (3.50)	137.85*** (3.28)	155.70*** (3.40)	155.44*** (3.38)	155.84*** (3.38)	153.55*** (3.37)
580 <= Credit Score < 600			117.08*** (4.68)	120.07*** (3.39)		125.58*** (3.87)	125.50*** (3.87)	126.58*** (3.78)	120.76*** (3.68)	128.08*** (3.59)	118.47*** (3.34)	120.84*** (3.49)	112.26*** (3.27)	120.59*** (3.39)	120.14*** (3.37)	120.73*** (3.38)	118.18*** (3.36)
600 <= Credit Score < 620			102.17*** (4.64)	98.07*** (3.39)		105.50*** (3.86)	105.43*** (3.86)	105.03*** (3.68)	99.79*** (3.68)	105.56*** (3.59)	96.40*** (3.33)	98.77*** (3.49)	91.27*** (3.27)	98.79*** (3.38)	98.54*** (3.37)	99.05*** (3.37)	96.22*** (3.36)
620 <= Credit Score < 640			75.87*** (4.64)	71.72*** (3.38)		78.16*** (3.86)	78.09*** (3.86)	78.34*** (3.77)	74.14*** (3.67)	78.08*** (3.58)	69.93*** (3.32)	72.33*** (3.48)	65.79*** (3.27)	71.96*** (3.38)	72.11*** (3.37)	72.22*** (3.37)	69.81*** (3.36)
640 <= Credit Score < 660			58.05*** (4.64)	53.83*** (3.38)		60.31*** (3.86)	60.25*** (3.86)	61.16*** (3.77)	57.58*** (3.67)	59.33*** (3.58)	52.35*** (3.32)	54.47*** (3.49)	48.55*** (3.27)	53.71*** (3.38)	54.16*** (3.37)	53.96*** (3.37)	52.19*** (3.36)
660 <= Credit Score < 680			36.21*** (4.65)	31.37*** (3.39)		34.60*** (3.86)	34.53*** (3.86)	35.33*** (3.78)	35.59*** (3.68)	35.56*** (3.59)	29.91*** (3.33)	32.20*** (3.49)	26.68*** (3.27)	31.16*** (3.38)	31.59*** (3.37)	31.33*** (3.37)	29.70*** (3.36)
680 <= Credit Score < 700			25.41*** (4.66)	14.67*** (3.39)		20.51*** (3.86)	20.46*** (3.86)	21.29*** (3.78)	20.55*** (3.68)	17.88*** (3.60)	13.90*** (3.33)	15.17*** (3.49)	10.65*** (3.27)	14.35*** (3.39)	14.94*** (3.37)	14.56*** (3.37)	13.87*** (3.36)
700 <= Credit Score < 720			17.43*** (4.68)	2.14 (3.39)		7.85** (3.87)	7.80** (3.87)	8.37*** (3.79)	8.29*** (3.69)	4.37 (3.60)	1.63 (3.33)	2.97 (3.50)	-1.55 (3.28)	1.62 (3.41)	2.13 (3.39)	1.80 (3.38)	1.44 (3.37)
720 <= Credit Score < 740			18.37*** (4.72)	-0.06 (3.43)		5.26 (3.89)	5.21 (3.89)	5.74 (3.80)	5.91 (3.70)	4.37 (3.61)	0.07 (3.35)	0.76 (3.52)	-2.88 (3.32)	-0.67 (3.43)	0.11 (3.39)	-0.51 (3.39)	-0.10 (3.38)
740 <= Credit Score < 760			13.62*** (4.76)	-3.31 (3.47)		1.01 (3.91)	1.00 (3.91)	1.74 (3.83)	2.02 (3.73)	-1.50 (3.64)	-3.18 (3.37)	-2.54 (3.54)	-5.62* (3.32)	-4.17 (3.43)	-3.14 (3.42)	-3.78 (3.42)	-3.31 (3.41)
760 <= Credit Score < 780			7.96 (4.86)	-5.44 (3.55)		-2.56 (3.95)	-2.62 (3.95)	-1.93 (3.87)	-1.27 (3.76)	-3.47 (3.67)	-4.96 (3.41)	-4.22 (3.58)	-7.34** (3.35)	-5.78 (3.47)	-5.07 (3.45)	-5.47 (3.45)	-5.25 (3.44)
780 <= Credit Score < 800			1.90 (5.09)	-5.57 (3.70)		-4.55 (4.21)	-4.59 (4.21)	-3.74 (4.12)	-2.98 (4.02)	-3.89 (3.93)	-6.35* (3.64)	-4.73 (3.81)	-8.24*** (3.58)	-6.42* (3.70)	-5.27 (3.69)	-6.12* (3.69)	-6.56* (3.67)
0K <= Loan Amount < 40K				163.02*** (1.00)		128.37*** (4.21)	128.43*** (4.21)	143.58*** (4.12)	147.36*** (4.02)	156.00*** (4.04)	164.51*** (3.94)	164.80*** (3.81)	156.31*** (3.58)	161.65*** (3.70)	163.09*** (3.69)	160.38*** (3.69)	164.20*** (3.67)
40K <= Loan Amount < 50K				174.00*** (1.09)		143.55*** (1.10)	143.60*** (1.18)	153.01*** (1.16)	157.00*** (1.06)	164.55*** (1.04)	174.39*** (0.99)	173.57*** (1.03)	164.59*** (0.94)	170.91*** (0.99)	172.64*** (0.99)	170.66*** (0.99)	174.13*** (0.99)
50K <= Loan Amount < 75K				125.50*** (0.66)		101.14*** (0.65)	103.20*** (0.66)	104.93*** (0.65)	106.37*** (0.74)	114.48*** (0.72)	125.33*** (0.66)	124.37*** (0.70)	119.52*** (0.66)	121.72*** (0.66)	123.68*** (0.66)	120.87*** (0.66)	125.19*** (0.66)
75K <= Loan Amount < 150K				66.13*** (0.58)		47.67*** (0.78)	47.71*** (0.77)	48.47*** (0.77)	51.17*** (0.67)	55.90*** (0.65)	66.66*** (0.58)	65.16*** (0.61)	64.06*** (0.58)	64.06*** (0.58)	65.11*** (0.58)	63.41*** (0.58)	66.47*** (0.58)
150K <= Loan Amount < 200K				30.23*** (0.59)		15.38*** (0.71)	15.41*** (0.71)	15.79*** (0.70)	18.34*** (0.67)	21.14*** (0.65)	30.65*** (0.58)	29.22*** (0.61)	29.15*** (0.58)	29.57*** (0.58)	29.57*** (0.58)	28.67*** (0.58)	30.78*** (0.58)
200K <= Loan Amount < 300K				15.12*** (0.56)		4.34*** (0.70)	4.36*** (0.72)	4.99*** (0.70)	6.62*** (0.66)	7.32*** (0.64)	15.89*** (0.58)	13.89*** (0.63)	13.24*** (0.56)	14.61*** (0.58)	14.27*** (0.58)	14.23*** (0.58)	15.65*** (0.58)
300K <= Loan Amount < 500K				0.28 (0.56)		-5.62*** (0.72)	-5.59*** (0.72)	-5.23*** (0.72)	-4.12*** (0.68)	-5.54*** (0.64)	0.64 (0.55)	-1.90*** (0.54)	-1.81*** (0.54)	0.13 (0.56)	0.07 (0.56)	-0.03 (0.56)	0.51 (0.56)
No debt-to-income ratio				1.46 (3.62)		20.60*** (2.16)	20.65*** (2.16)	21.49*** (1.17)	19.29*** (0.68)	-1.25 (3.64)	8.25*** (3.71)	0.78 (3.69)	13.97*** (3.47)	2.13 (3.61)	1.07 (3.63)	1.64 (3.62)	9.12*** (3.71)
Debt-to-income > 36%				1.48** (0.22)		0.05 (0.23)	0.07 (0.23)	-0.11 (0.23)	0.22 (0.23)	1.37*** (0.22)	1.27*** (0.22)	1.69*** (0.22)	1.65*** (0.20)	1.46*** (0.22)	1.59*** (0.22)	1.55*** (0.22)	1.35*** (0.22)
0% < LTV <= 60%						-91.61*** (0.81)	-91.64***										
60% < LTV <= 70%						-71.04*** (0.77)	-71.04***										
70% < LTV <= 80%						-56.77*** (0.65)	-56.77***										
80% < LTV <= 90%						-11.58*** (1.38)	-11.61***										
90% < LTV <= 95%						3.39** (1.39)	3.36**										
0% < CLTV <= 80%						-4.69*** (0.43)	-4.68***										
80% < CLTV <= 90%						-10.11*** (1.54)	-10.06***										
90% < CLTV <= 95%						4.94*** (1.24)	5.01***										
(First lien) x (0% < LTV <= 60%)			-138.58*** (0.68)					-141.07*** (0.75)	-136.04*** (0.72)	-147.53*** (0.72)	-133.51*** (0.73)	-140.90*** (0.70)	-160.03*** (0.64)	-137.25*** (0.68)	-138.10*** (0.68)	-137.00*** (0.67)	-137.78*** (0.68)
(First lien) x (60% < LTV <= 70%)			-120.28*** (0.64)					-120.36*** (0.71)	-117.02*** (0.68)	-128.20*** (0.68)	-114.79*** (0.69)	-123.35*** (0.66)	-150.95*** (0.61)	-119.88*** (0.64)	-120.37*** (0.64)	-119.53*** (0.63)	-119.88*** (0.64)

Race Coefficients Are Also Shown in Table 6

	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)
	Race dummies only	Race, rate lock month & subordinate lien dummies	Same as (2), add credit score 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 prepayment term	Add documentation type	Same as Model (4), add individual loan program dummies	Same as Model (4), substitute program categories with separate attribute variables	Same as Model (4), add risk grade dummies	Same as Model (4), add HRBMC dummy	Same as Model (4), add transaction type dummies	Same as Model (4), add interaction of business unit & transaction type dummies	Same as Model (4), add Alt-A dummy
Dependent variable: APR (basis points)																	
(First lien) x (70% < LTV <= 80%)				-109.92*** (0.52)				-106.48*** (0.59)	-105.25*** (0.56)	-114.86*** (0.50)	-103.41*** (0.58)	-112.17*** (0.54)	-15.66*** (0.53)	-108.85*** (0.52)	-109.46*** (0.52)	-108.66*** (0.53)	-108.65*** (0.52)
(First lien) x (80% < LTV <= 90%)				-69.17*** (0.53)				-67.02*** (0.61)	-65.91*** (0.58)	-72.92*** (0.57)	-69.21*** (0.54)	-71.40*** (0.55)	-69.39*** (0.54)	-68.36*** (0.53)	-68.89*** (0.53)	-68.72*** (0.52)	-68.55*** (0.53)
(First lien) x (90% < LTV <= 95%)				-33.75*** (0.56)				-35.82*** (0.63)	-35.64*** (0.60)	-36.61*** (0.59)	-34.01*** (0.56)	-35.83*** (0.57)	-30.24*** (0.56)	-34.21*** (0.55)	-33.76*** (0.55)	-34.15*** (0.55)	-33.29*** (0.53)
(Subordinate lien) x (0% < CLTV <= 80%)				30.83*** (1.33)				56.80*** (1.32)	70.41*** (1.35)	55.79*** (1.32)	41.99*** (1.61)	34.07*** (1.32)	31.17*** (1.29)	27.69*** (1.35)	30.27*** (1.32)	27.68*** (1.34)	30.68*** (1.33)
(Subordinate lien) x (80% < CLTV <= 90%)				60.36*** (2.13)				74.27*** (2.13)	86.01*** (2.23)	79.83*** (2.19)	54.53*** (2.11)	63.70*** (2.13)	68.18*** (2.00)	55.97*** (2.15)	58.80*** (2.13)	55.09*** (2.15)	64.97*** (2.03)
(Subordinate lien) x (90% < CLTV <= 95%)				-8.62*** (2.12)				1.30 (2.19)	2.14 (2.21)	-6.71*** (2.14)	-4.99** (2.12)	-8.26*** (2.12)	-0.80 (2.08)	-9.93*** (2.14)	-8.83*** (2.12)	-9.95*** (2.14)	-1.31 (2.12)
Risk Grade																	
AA+													79.92*** (1.44)				
AA													96.38*** (1.47)				
A													114.69*** (1.49)				
B													151.92*** (1.50)				
C													233.07*** (1.58)				
CC													359.05*** (1.73)				
HRBMC (retail)														32.14*** (0.36)			
Transaction type																	
Concurrent															-4.56*** (1.33)		
Correspondent															-23.04*** (0.27)		
Unit & transaction type																	
HRBMC Concurrent																-45.05*** (4.49)	
HRBMC Correspondent																-128.19*** (11.02)	
HRBMC Wholesale																28.77*** (0.36)	
OOMC Concurrent																3.39** (1.36)	
OOMC Correspondent																-19.66*** (0.27)	
Co-applicant				1.62*** (0.23)		0.89 (19.45)	0.82 (19.49)	-1.96 (20.17)	4.88 (11.96)	6.44 (14.91)	-12.10 (13.59)	8.73 (13.09)	-29.29*** (5.75)	-16.01 (10.39)	-19.07* (11.26)	-20.13* (10.83)	-13.74 (11.43)
Borrower or co-borrower self-employed				1.78*** (0.25)		-14.56*** (5.19)	-14.56***	-18.16***	-16.00***	-17.00***	-14.31***	-14.25***	-17.14***	-17.63***	-12.71***	-16.23***	-14.53***
Lender-paid mortgage insurance				-9.26*** (0.28)		-17.10*** (0.28)	-17.11*** (0.28)	-18.43*** (0.36)	-14.59*** (0.27)	-13.66*** (0.29)	-9.90*** (0.28)	-10.09*** (0.28)	-6.80*** (0.27)	-9.15*** (0.28)	-8.95*** (0.28)	-8.91*** (0.28)	-9.69*** (0.28)
Escrow waived				10.55*** (0.33)		14.22*** (0.21)	14.22*** (0.37)	13.70*** (0.36)	12.60*** (0.35)	11.44*** (0.43)	10.08*** (0.33)	10.68*** (0.34)	8.07*** (0.32)	11.76*** (0.33)	11.53*** (0.33)	12.44*** (0.32)	10.26*** (0.33)
Loan purpose																	
CNS				-13.90 (10.83)		0.89 (19.45)	9.82 (19.49)	-1.96 (20.17)	4.88 (11.96)	6.44 (14.91)	-12.10 (13.59)	8.73 (13.09)	-29.29*** (5.75)	-16.01 (10.39)	-19.07* (11.26)	-20.13* (10.83)	-13.74 (11.43)
Cash-out refinance				-13.80*** (0.24)		-14.56*** (5.19)	-14.56*** (5.19)	-18.16*** (20.17)	-16.00*** (0.25)	-17.00*** (8.20)	-14.31*** (5.44)	-14.25*** (5.25)	-17.14*** (5.17)	-17.63*** (5.16)	-12.71*** (5.20)	-16.23*** (5.18)	-14.53*** (5.46)
Rate & term refinance				-11.17*** (0.42)		-17.36*** (0.27)	-17.36*** (0.46)	-19.27*** (0.44)	-15.22*** (0.44)	-14.70*** (0.43)	-11.38*** (0.43)	-11.54*** (0.43)	-23.74*** (0.37)	-14.95*** (0.42)	-10.14*** (0.42)	-13.63*** (0.42)	-11.62*** (0.42)
Documentation type																	
Business Bank Statements				8.45*** (1.80)						9.19*** (2.01)	8.03*** (1.79)	10.47*** (1.88)	9.90*** (1.77)	8.14*** (1.78)	7.55*** (1.78)	7.41*** (1.77)	7.91*** (1.80)
Limited				40.52*** (0.25)						42.79*** (0.26)	40.77*** (0.25)	41.22*** (0.26)	46.82*** (0.24)	41.47*** (0.25)	40.60*** (0.25)	41.41*** (0.25)	40.59*** (0.25)
Lite Doc				29.79*** (1.29)						28.74*** (1.32)	51.74*** (1.29)	29.70*** (1.31)	52.93*** (1.13)	29.81*** (1.29)	28.30*** (1.30)	28.54*** (1.29)	52.27*** (1.30)
No Doc				48.96*** (3.79)						50.36*** (3.82)	69.91*** (3.85)	48.67*** (3.66)	74.08*** (3.61)	50.48*** (3.78)	47.81*** (3.80)	49.37*** (3.79)	68.56*** (3.87)
No Ratio				-15.56*** (5.19)						-23.07*** (5.22)	40.74*** (5.44)	-15.64*** (5.25)	49.90*** (5.17)	-14.59*** (5.16)	-19.74*** (5.20)	-18.01*** (5.18)	46.63*** (5.46)
Stated Income				-43.66*** (7.11)						48.81*** (8.20)	43.13*** (6.04)	34.65*** (8.00)	50.48*** (6.63)	43.12*** (7.00)	43.65*** (7.15)	43.19*** (7.05)	44.49*** (7.09)
Income Stated Loan Plus				-17.29*** (1.30)						5.44*** (1.23)	-15.47*** (1.15)	-29.00*** (1.27)	-11.15*** (1.18)	-13.26*** (1.29)	4.46*** (1.32)	4.91*** (1.31)	-16.19*** (1.30)
Xpress Full Doc				20.27*** (1.56)						25.73*** (1.38)	19.68*** (1.59)	15.90*** (1.66)	25.92*** (1.58)	-3.91*** (1.59)	14.99*** (1.56)	-6.01*** (1.59)	19.78*** (1.56)
Xpress Stated Income				65.07*** (2.00)						78.25*** (2.44)	64.40*** (1.98)	66.00*** (2.19)	72.61*** (2.07)	49.71*** (2.02)	59.56*** (2.00)	37.57*** (2.01)	64.77*** (1.99)
1-to-12-month prepayment penalty				13.12*** (0.60)		9.12*** (0.60)	12.58*** (0.55)	-8.43*** (0.65)	-8.49*** (11.01)?	-7.80*** (0.62)	10.93*** (0.60)	16.24*** (0.62)	12.58*** (0.55)	13.06*** (0.60)	11.99*** (0.60)	12.88*** (0.61)	10.57*** (0.60)
13-to-24-month prepayment penalty				-15.33*** (0.34)		-15.33*** (0.34)		-6.71*** (0.35)		-6.28*** (0.34)	-15.69*** (0.34)	-13.48*** (0.34)	-15.92*** (0.34)	-13.46*** (0.34)	-15.53*** (0.34)	-13.88*** (0.34)	-16.17*** (0.34)
25-to-36-month prepayment penalty				-12.62*** (0.54)		-12.62*** (0.50)		-46.94*** (0.44)		-44.33*** (0.43)	-14.38*** (0.46)	-22.26*** (0.46)	-14.17*** (0.47)	-10.96*** (0.50)	-12.63*** (0.49)	-11.18*** (0.49)	-14.45*** (0.50)
37-to-60-month prepayment penalty				-68.40*** (10.32)		-68.40*** (10.32)		-91.39*** (11.01)		-88.72*** (10.86)	-71.07*** (10.35)	-70.59*** (10.32)	-67.04*** (9.39)	-64.39*** (10.26)	-58.95*** (10.20)	-54.80*** (10.21)	-71.08*** (10.37)

Race Coefficients Are Also Shown in Table 6

Dependent variable: APR (basis points)	Model (1) Race dummies only	Model (2) Race, rate lock month & subordinate liens dummies	Model (3) Same as (2), add credit score ten dummies	Model (4) Same as (3), add risk-based characteristics	Model (15) Same as (3), use rate lock week dummies in place of rate lock month dummies	Model (6) Add various explanatory variables	Model (7) Interact residence type & property type	Model (8) Interact LTV x 1st lien, CLTV x sub. lien	Model (9) Add prepayment term	Model (10) Add documentation type	Model (11) Same as Model (4), add individual loan program dummies	Model (12) Same as Model (4), substitute program categories with separate attribute variables	Model (13) Same as Model (4), add risk grade dummies	Model (14) Same as Model (4), add HRBMC dummy	Model (15) Same as Model (4), add transaction type dummies	Model (16) Same as Model (4), add interaction of business unit & transaction type dummies	Model (17) Same as Model (4), add Alt-A dummy
Property type																	
ATH																	
Condo/hotel				2.22 (19.58)		56.15*** (1.58)											
1-4 story condo				74.91*** (1.52)		-21.66* (12.42)											
4+ story condo				87.17*** (4.80)		14.01*** (0.50)											
Condo conversion				96.44*** (8.90)		23.00*** (1.72)											
Co-op				109.00*** (11.25)		32.54*** (5.07)											
Manufactured housing				53.32*** (1.56)		-31.18 (23.93)											
Planned Urban Development				64.33*** (0.51)		39.44*** (0.85)											
						-3.79*** (0.41)											
2-4 units				85.60*** (0.67)		13.35*** (0.43)											
Occupancy type																	
Non-owner occupied				68.07*** (1.63)		69.58*** (0.44)											
Second home				-13.14 (24.58)		5.68*** (0.83)											
Occupancy type & property type																	
Non-owner occupied, condo/hotel				11.65*** (0.49)			-4.71 (24.32)	-2.19 (24.14)	3.31 (21.49)	1.84 (20.44)	4.68 (19.60)	12.46 (18.46)	1.30 (20.14)	3.63 (19.63)	-3.85 (19.78)	-1.73 (19.80)	0.97 (19.59)
Non-owner occupied, 1-4 story condo				20.28*** (0.53)			83.87*** (1.60)	81.91*** (1.59)	78.49*** (1.57)	75.12*** (1.53)	75.98*** (1.51)	74.88*** (1.53)	80.55*** (1.42)	76.50*** (1.52)	74.69*** (1.51)	76.17*** (1.51)	75.93*** (1.51)
Non-owner occupied, 4+ story condo				24.21*** (1.93)			97.71*** (4.81)	94.08*** (4.84)	90.05*** (4.82)	87.20*** (4.82)	87.40*** (4.78)	86.50*** (4.85)	90.63*** (4.51)	87.26*** (4.76)	85.82*** (4.81)	86.10*** (4.78)	87.11*** (4.75)
Non-owner occupied, condo conversion				-53.63*** (5.92)			108.48*** (10.17)	105.17*** (10.32)	96.01*** (10.02)	93.54*** (9.14)	95.23*** (8.96)	94.99*** (8.75)	97.38*** (8.83)	97.33*** (8.94)	94.00*** (8.59)	95.71*** (8.66)	95.80*** (8.93)
Non-owner occupied, manufactured housing				47.96*** (27.20)			112.43*** (11.56)	111.62*** (11.50)	107.55*** (11.60)	109.50*** (11.17)	108.73*** (11.23)	108.35*** (11.44)	132.39*** (11.08)	112.34*** (11.45)	109.29*** (11.31)	113.06*** (11.27)	108.17*** (11.32)
Non-owner occupied, Planned Urban Development				-4.13*** (0.86)			60.12*** (1.64)	58.43*** (1.64)	56.26*** (1.62)	53.25*** (1.58)	56.48*** (1.59)	53.86*** (1.58)	59.98*** (1.58)	55.07*** (1.56)	53.06*** (1.55)	54.62*** (1.55)	57.04*** (1.54)
Non-owner occupied, single-family home				13.33*** (0.40)			69.29*** (0.54)	68.20*** (0.54)	66.87*** (0.52)	64.98*** (0.51)	65.99*** (0.51)	64.16*** (0.52)	69.83*** (0.48)	76.34*** (0.51)	63.70*** (0.51)	65.55*** (0.51)	66.72*** (0.51)
Non-owner occupied, 2-4 units				0.46 (11.99)			84.13*** (0.69)	83.72*** (0.68)	84.18*** (0.68)	84.39*** (0.68)	86.21*** (0.68)	86.04*** (0.68)	90.74*** (0.64)	87.08*** (0.67)	85.19*** (0.67)	72.43*** (0.67)	86.49*** (0.67)
Owner occupied, ATH				-6.76 (11.99)			56.09*** (1.58)	57.27*** (1.57)	86.26*** (1.55)	88.52*** (1.53)	66.62*** (1.53)	61.17*** (1.53)	70.16*** (1.50)	76.34*** (1.63)	64.50*** (1.62)	13.81 (1.61)	67.21*** (1.62)
Owner occupied, condo/hotel				14.54*** (2.21)			-2.23 (30.94)	-0.10 (30.42)	2.92 (27.61)	-4.00 (25.80)	-13.16 (24.19)	-2.56 (23.60)	-1.44 (23.38)	-12.63 (24.14)	-14.43 (23.94)	-13.81 (23.66)	-13.20 (24.57)
Owner occupied, 1-4 story condo				36.36*** (5.26)			13.73*** (0.53)	13.38*** (0.52)	12.14*** (0.51)	12.83*** (0.50)	11.61*** (0.49)	11.62*** (0.50)	12.75*** (0.46)	11.84*** (0.49)	11.82*** (0.49)	11.95*** (0.49)	11.51*** (0.49)
Owner occupied, 4+ story condo				79.17*** (19.48)			21.60*** (1.91)	21.39*** (1.91)	20.86*** (1.88)	21.10*** (1.84)	20.27*** (1.79)	20.56*** (1.83)	21.82*** (1.68)	20.21*** (1.79)	20.07*** (1.79)	19.97*** (1.79)	20.03*** (1.79)
Owner occupied, condo conversion				33.04*** (6.37)			28.18*** (5.92)	29.19*** (5.77)	25.41*** (5.58)	27.06*** (5.50)	22.46*** (5.22)	26.47*** (5.29)	22.31*** (5.21)	25.02*** (5.21)	22.96*** (5.14)	23.91*** (5.14)	22.00*** (5.24)
Owner occupied, co-op				0.82 (2.01)			-31.22 (23.31)	-31.87 (23.96)	-36.74 (24.71)	-42.91* (24.91)	-52.40* (27.22)	-53.78** (27.37)	-44.76 (27.57)	-47.90* (26.91)	-48.54* (26.65)	-44.24* (26.54)	-52.47* (27.22)
Owner occupied, manufactured housing				-4.31*** (1.09)			39.57*** (0.85)	40.98*** (0.85)	42.37*** (0.84)	46.68*** (0.84)	48.25*** (0.83)	47.90*** (0.83)	52.32*** (0.82)	52.67*** (0.86)	47.07*** (0.86)	51.40*** (0.87)	48.30*** (0.86)
Owner occupied, Planned Urban Development				-1.37 (1.03)			-3.56*** (0.43)	-3.74*** (0.42)	-3.93*** (0.42)	-3.22*** (0.41)	-4.21*** (0.40)	-3.86*** (0.41)	-4.35*** (0.37)	-4.05*** (0.40)	-3.95*** (0.40)	-3.58*** (0.40)	-4.23*** (0.40)
Owner occupied, 2-4 units				29.13*** (5.91)			12.77*** (0.50)	13.13*** (0.49)	13.44*** (0.49)	12.95*** (0.48)	13.63*** (0.46)	13.20*** (0.47)	14.98*** (0.42)	13.86*** (0.45)	13.48*** (0.46)	13.91*** (0.45)	13.77*** (0.46)
Second home, condo/hotel							0.31 (15.34)	1.20 (15.23)	10.05 (13.84)	2.64 (13.29)	-7.46 (11.84)	1.13 (11.57)	-11.36 (12.34)	-6.12 (11.98)	-12.60 (11.94)	-11.17 (11.94)	-8.96 (12.02)
Second home, 1-4 story condo							24.61*** (2.34)	23.03*** (2.33)	21.49*** (2.32)	15.23*** (2.26)	14.60*** (2.21)	14.50*** (2.25)	16.61*** (2.10)	15.02*** (2.21)	14.58*** (2.21)	14.97*** (2.20)	14.58*** (2.22)
Second home, 4+ story condo							36.36*** (5.26)	35.16*** (5.24)	33.82*** (5.14)	30.62*** (5.06)	27.19*** (4.97)	28.77*** (5.08)	27.97*** (4.56)	27.58*** (5.06)	27.83*** (5.01)	27.61*** (5.06)	27.25*** (4.96)
Second home, condo conversion							79.17*** (19.48)	77.06*** (18.86)	69.06*** (18.19)	59.73*** (17.86)	42.32*** (15.22)	53.39*** (16.68)	41.23*** (14.43)	47.93*** (16.22)	46.94*** (17.05)	47.83*** (16.85)	41.86*** (15.60)
Second home, manufactured housing							33.04*** (6.37)	32.23*** (6.32)	32.44*** (6.57)	36.76*** (6.37)	36.30*** (6.47)	37.32*** (6.70)	44.08*** (6.13)	41.70*** (6.50)	36.44*** (17.05)	40.14*** (16.85)	36.84*** (6.51)
Second home, Planned Urban Development							0.82 (2.01)	-0.46 (2.00)	-1.60 (1.96)	-8.10*** (1.96)	-8.18*** (1.89)	-4.35*** (1.94)	-6.16*** (1.82)	-7.56*** (1.88)	-9.00*** (1.88)	-7.48*** (1.88)	-8.24*** (1.89)
Second home, single-family home							-4.31*** (1.09)	3.62** (1.08)	3.96*** (1.07)	-1.22 (1.05)	-0.71 (1.02)	-1.00 (1.04)	1.62* (0.97)	-1.15 (1.02)	-1.46 (1.02)	-1.28 (1.03)	-0.65 (1.03)
Second home, 2-4 units							30.21*** (6.44)	29.08*** (6.52)	29.11*** (6.39)	26.11*** (6.34)	29.24*** (5.98)	28.18*** (6.04)	29.59*** (6.59)	27.78*** (5.86)	28.67*** (5.87)	27.49*** (5.83)	28.57*** (5.98)
Loan term																	
10-year loan term				74.41*** (4.28)	74.40*** (4.28)	74.41*** (4.28)		60.11*** (4.03)	65.80*** (4.10)	68.98*** (4.06)	87.92*** (4.03)						
15-year loan term				48.58*** (0.80)	48.57*** (0.80)	48.57*** (0.80)		32.15*** (0.78)	43.01*** (0.79)	44.06*** (0.78)	51.34*** (0.80)						
20-year loan term				61.10*** (1.21)	61.09*** (1.21)	61.09*** (1.21)		40.00*** (1.12)	46.43*** (1.12)	48.39*** (1.10)	59.41*** (1.07)						
25-year loan term				-15.77*** (1.49)	-15.49*** (1.49)	-15.49*** (1.49)		-11.10*** (1.41)	17.70*** (1.12)	40.90*** (1.38)	20.51*** (1.36)						
Fixed-rate													-47.04*** (0.41)				

Race Coefficients Are Also Shown in Table 6

Dependent variable: APR (basis points)	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)
	Race dummies only	Race, rate lock month & subordinate lien dummies	Same as (2), add credit score 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 prepayment term	Add documentation type	Same as Model (4), add individual loan program dummies	Same as Model (4), add subprime program categories with separate attribute variables	Same as Model (4), add risk grade dummies	Same as Model (4), add HRBMC dummy	Same as Model (4), add transaction type dummies	Same as Model (4), add interaction of business unit & transaction type dummies	Same as Model (4), add Alt-A dummy
Balloon payment																	
Interest-only												20.44*** (0.46)					
Alt-A												6.09*** (0.40)					-79.58*** (1.54)
Loan program category																	
10-year fixed				81.23*** (4.03)									94.48*** (3.87)	65.76*** (4.00)	79.85*** (3.99)	67.79*** (3.97)	80.84*** (4.02)
15-year ARM, initial rate fixed 6 months				64.18 (80.00)									34.87 (78.99)	51.36 (72.96)	61.78 (79.50)	50.59 (73.23)	63.49 (80.69)
15-year ARM, initial rate fixed 2 years				67.07*** (2.50)									64.21*** (2.28)	54.11*** (2.43)	65.31*** (2.43)	54.31*** (2.42)	66.20*** (2.50)
15-year ARM, initial rate fixed 3 years				27.47*** (8.43)									25.60*** (7.86)	19.78** (8.32)	26.27*** (8.31)	21.55*** (8.17)	27.19*** (8.42)
15-year fixed				45.55*** (0.96)									51.23*** (0.92)	44.31*** (0.97)	45.58*** (0.96)	44.56*** (0.96)	45.73*** (0.96)
15-year fixed balloon				68.66*** (1.38)									65.93*** (1.25)	72.05*** (1.38)	69.94*** (1.38)	72.17*** (1.38)	67.86*** (1.38)
20-year fixed				54.30*** (1.07)									55.80*** (1.03)	52.24*** (1.09)	54.47*** (1.07)	52.93*** (1.09)	53.72*** (1.07)
25-year ARM				59.32*** (1.31)									52.54*** (1.25)	61.64*** (1.31)	75.30*** (1.32)	74.95*** (1.31)	56.21*** (1.30)
30-year ARM, initial rate fixed 6 months				61.57*** (4.14)									44.12*** (3.68)	53.68*** (3.97)	60.67*** (4.11)	53.83*** (3.97)	59.85*** (4.14)
30-year ARM, initial rate fixed 2 years				44.38*** (0.46)									30.59*** (0.43)	44.90*** (0.46)	44.68*** (0.45)	45.05*** (0.45)	42.94*** (0.46)
30-year ARM, initial rate fixed 3 years				22.33*** (0.58)									12.22*** (0.52)	23.77*** (0.57)	22.16*** (0.57)	23.43*** (0.57)	21.76*** (0.57)
30-year ARM, initial rate fixed 5 years				28.31*** (0.36)									26.06*** (0.80)	25.04*** (0.84)	26.52*** (0.84)	23.79*** (0.84)	29.91*** (0.83)
30-year ARM, initial rate fixed 15 years				47.56*** (2.26)									42.15*** (2.04)	51.20*** (2.26)	48.64*** (2.23)	51.86*** (2.27)	47.10*** (2.27)
30-year interest-only ARM, initial rate fixed 15 years				62.29*** (0.58)									56.58*** (0.56)	62.63*** (0.58)	63.06*** (0.58)	63.20*** (0.57)	61.66*** (0.58)
30-year interest-only ARM, initial rate fixed 2 years				30.02*** (1.38)									29.98*** (1.26)	31.47*** (1.37)	30.31*** (1.37)	31.49*** (1.36)	32.73*** (1.27)
30-year interest-only ARM, initial rate fixed 3 years				8.92*** (1.10)									13.19*** (0.99)	8.95*** (1.09)	8.77*** (1.09)	8.71*** (1.09)	16.33*** (0.99)
30-year interest-only ARM, initial rate fixed 5 years				-34.24** (15.67)									-31.43** (15.33)	-40.77*** (14.11)	-37.32** (14.96)	-40.13*** (13.63)	-34.33** (15.68)
30-year ARM balloon, initial rate fixed 15 years				119.35*** (15.99)									108.12*** (15.46)	101.06*** (15.72)	116.99*** (15.62)	100.37*** (15.53)	118.42*** (16.01)
30-year ARM balloon, initial rate fixed 6 months				94.17*** (0.59)									86.63*** (0.57)	94.05*** (0.59)	93.97*** (0.59)	93.85*** (0.59)	92.29*** (0.59)
30-year ARM balloon, initial rate fixed 2 years				75.43*** (1.23)									70.91*** (1.18)	75.10*** (1.21)	74.24*** (1.20)	74.07*** (1.20)	74.32*** (1.23)
30-year ARM balloon, initial rate fixed 3 years				48.12*** (0.97)									37.71*** (0.95)	35.87*** (0.96)	39.12*** (0.94)	35.36*** (0.94)	39.19*** (0.96)
30-year ARM balloon, initial rate fixed 5 years				-96.21*** (2.09)									-96.60*** (2.10)	-94.46*** (2.06)	-95.07*** (2.05)	-93.76*** (2.04)	-96.52*** (2.09)
30-year fixed				-153.13*** (1.19)									-153.44*** (1.16)	-151.60*** (1.18)	-152.03*** (1.16)	-150.92*** (1.16)	-153.98*** (1.18)
Constant	941.53*** (0.26)	1,176.20*** (1.97)	1,038.64*** (4.97)	968.07*** (3.87)	1,204.23*** (4.84)	975.16*** (4.29)	975.18*** (4.29)	1,015.36*** (4.21)	1,033.64*** (4.13)	1,018.35*** (4.03)	1,006.85*** (3.81)	1,016.52*** (3.95)	886.01*** (3.96)	966.37*** (3.88)	971.74*** (3.85)	977.16*** (3.85)	970.57*** (3.84)
Observations	865056	865056	865056	865052	865056	865052	865052	865052	865052	865052	865052	865052	865043	865052	865052	865052	865052
R-squared	0.00152	0.48180	0.59256	0.73960	0.48364	0.69867	0.69868	0.70487	0.71157	0.71996	0.73850	0.72611	0.77579	0.73845	0.73826	0.74019	0.73722
Adjusted R-squared	0.00151	0.48175	0.59251	0.73960	0.48342	0.69860	0.69861	0.70480	0.71150	0.71989	0.73841	0.72604	0.77573	0.73837	0.73819	0.74011	0.73714

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, individual program, and state dummy variables excluded from this table for brevity.

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

Dependent variable: APR (basis points)	Model (4)	Model (4-L1) First lien loans only	Model (4-L2) Subordinate lien loans only	Model (4-W) OOMC loans only	Model (4-R) HRBMC loans only	Model (4-2001) 2001 loans only	Model (4-2002) 2002 loans only	Model (4-2003) 2003 loans only	Model (4-2004) 2004 loans only	Model (4-2005) 2005 loans only	Model (4-2006) 2006 loans only	Model (4-2007) 2007 loans only	Model (4-OOMCwo) OOMC "Wholesale" loans only	Model (4-OOMCcn) OOMC "Correspondent" loans only	Model (4-OOMCco) OOMC "Concurrent" loans only	Model (4-Prime) HRBMC prime loans
Race: African American	8.63*** (0.31)	8.96*** (0.31)	3.78*** (0.78)	8.54*** (0.33)	7.16*** (0.95)	15.20*** (1.21)	11.83*** (1.02)	11.80*** (0.80)	9.39*** (0.67)	5.87*** (0.47)	4.05*** (0.62)	6.88*** (1.08)	7.62*** (0.36)	10.55*** (0.73)	10.01** (4.93)	1.24 (1.15)
Race: Hispanic	1.25*** (0.32)	0.64** (0.32)	3.99*** (0.76)	1.65*** (0.33)	-4.23*** (1.16)	2.14 (1.38)	6.03*** (1.02)	2.88*** (0.77)	1.03 (0.65)	-0.63 (0.47)	1.02 (0.66)	3.55*** (1.13)	1.11*** (0.37)	-0.39 (0.73)	-4.70 (4.40)	-0.04 (1.16)
Race: American Indian	7.57*** (1.56)	6.65*** (1.59)	4.91 (3.78)	7.62*** (1.65)	2.72 (4.17)	2.96 (5.83)	11.99*** (4.90)	12.08*** (3.92)	9.13*** (3.31)	2.06 (2.38)	7.98*** (3.12)	2.57 (5.29)	8.09*** (1.85)	7.04*** (3.49)	63.36*** (17.93)	-1.64 (4.15)
Race: Asian, Hawaiian, or Pacific Islander	4.15*** (0.61)	2.77*** (0.62)	4.67*** (1.37)	4.34*** (0.62)	3.47 (2.77)	4.29* (2.59)	4.65** (1.94)	6.01*** (1.52)	3.34*** (1.26)	1.81** (0.90)	5.41*** (1.24)	5.79*** (2.05)	4.79*** (0.70)	2.22* (1.31)	-3.07 (9.00)	1.91 (2.72)
Race: Missing	0.33 (0.29)	0.98*** (0.30)	-0.69 (0.86)	-2.08*** (0.33)	-0.36 (0.71)	-13.84*** (0.97)	-5.03*** (0.75)	4.21*** (0.63)	1.66** (0.65)	2.77*** (0.52)	3.93*** (0.65)	-0.34 (1.09)	-1.13** (0.37)	-3.78*** (0.70)	14.10** (5.85)	0.53 (0.66)
Subordinate lien	31.62*** (0.93)			37.72*** (0.97)	-64.60*** (3.63)	95.27*** (11.25)	88.63*** (5.94)	77.71*** (3.63)	112.30*** (3.47)	76.46*** (2.08)	176.02*** (8.93)	204.98*** (4.35)	30.05*** (1.07)	67.60*** (2.25)	43.77*** (14.49)	-64.42*** (6.40)
Missing Credit Score	177.14*** (3.57)	177.27*** (3.67)	108.26*** (9.87)	180.55*** (3.72)	164.79*** (11.23)	230.79*** (17.14)	221.82*** (9.18)	203.49*** (7.25)	176.74*** (7.65)	158.82*** (5.17)	154.07*** (8.93)	158.70*** (18.72)	189.50*** (4.05)	171.36*** (9.33)	230.88*** (22.02)	27.25*** (10.60)
300 <= Credit Score < 520	232.32*** (3.41)	224.20*** (3.52)	326.99*** (10.53)	228.32*** (3.55)	266.85*** (10.78)	288.42*** (17.00)	262.66*** (8.72)	243.97*** (6.86)	254.03*** (7.25)	258.88*** (4.61)	175.05*** (8.37)	171.27*** (16.67)	229.47*** (3.81)	224.02*** (9.18)	260.17*** (18.60)	
520 <= Credit Score < 540	220.28*** (3.40)	213.08*** (3.51)	300.14*** (10.05)	217.06*** (3.55)	252.07*** (10.77)	274.12*** (16.97)	250.86*** (8.70)	230.13*** (6.85)	241.15*** (7.23)	250.64*** (4.61)	169.69*** (8.36)	163.68*** (16.69)	218.11*** (3.80)	212.37*** (9.17)	250.72*** (18.18)	
540 <= Credit Score < 560	199.18*** (3.40)	191.59*** (3.51)	298.71*** (9.71)	195.49*** (3.54)	232.73*** (10.76)	258.00*** (16.96)	237.35*** (8.69)	218.37*** (6.84)	217.11*** (7.22)	219.19*** (4.58)	151.56*** (8.36)	138.77*** (16.60)	196.44*** (3.80)	191.85*** (9.16)	228.52*** (17.89)	302.25*** (78.75)
560 <= Credit Score < 580	155.10*** (3.40)	150.23*** (3.50)	254.25*** (9.42)	150.81*** (3.54)	195.36*** (10.75)	217.21*** (16.96)	197.86*** (8.69)	183.54*** (6.83)	173.37*** (7.21)	171.42*** (4.55)	111.68*** (8.34)	110.43*** (16.57)	150.81*** (3.79)	150.32*** (9.15)	183.80*** (17.71)	157.46*** (24.50)
580 <= Credit Score < 600	120.07*** (3.39)	111.35*** (3.49)	258.14*** (9.20)	116.85*** (3.53)	153.98*** (10.73)	169.18*** (16.95)	147.48*** (8.67)	136.69*** (6.82)	130.97*** (7.20)	138.13*** (4.53)	104.69*** (8.33)	89.98*** (16.56)	116.20*** (3.78)	119.47*** (9.13)	148.09*** (17.52)	72.17*** (11.17)
600 <= Credit Score < 620	98.07*** (3.38)	84.92*** (3.49)	223.44*** (9.19)	95.44*** (3.52)	130.20*** (10.73)	142.43*** (16.94)	121.35*** (8.66)	110.38*** (6.80)	111.06*** (7.19)	106.71*** (4.52)	81.83*** (8.32)	76.36*** (16.55)	95.17*** (3.78)	97.93*** (9.13)	122.03*** (17.50)	49.16*** (7.56)
620 <= Credit Score < 640	71.72*** (3.38)	60.33*** (3.49)	178.48*** (9.18)	69.52*** (3.52)	97.31*** (10.71)	107.84*** (16.94)	90.11*** (8.66)	81.57*** (6.80)	82.96*** (7.18)	74.38*** (4.52)	61.69*** (8.32)	60.30*** (16.55)	69.12*** (3.78)	72.42*** (9.13)	100.09*** (17.41)	35.94*** (2.66)
640 <= Credit Score < 660	53.83*** (3.38)	48.15*** (3.49)	112.52*** (9.18)	51.84*** (3.52)	74.56*** (10.71)	90.48*** (16.95)	71.89*** (8.67)	61.11*** (6.80)	54.83*** (7.18)	55.36*** (4.52)	50.76*** (8.32)	48.06*** (16.54)	50.57*** (3.78)	58.76*** (9.13)	78.46*** (17.50)	37.27*** (1.64)
660 <= Credit Score < 680	31.37*** (3.39)	31.15*** (3.50)	57.64*** (9.18)	29.51*** (3.53)	47.60*** (10.73)	68.31*** (16.97)	51.12*** (8.68)	38.07*** (6.81)	31.00*** (7.19)	25.82*** (4.52)	35.08*** (8.33)	33.64*** (16.55)	27.80*** (3.78)	37.44*** (9.13)	51.94*** (17.73)	38.95*** (1.59)
680 <= Credit Score < 700	14.67*** (3.39)	19.05*** (3.50)	12.57 (9.18)	12.54*** (3.53)	32.91*** (10.76)	51.54*** (17.01)	33.34*** (8.71)	17.03** (6.82)	18.17** (7.21)	7.91* (4.54)	15.92* (8.36)	20.25 (16.59)	10.34** (3.79)	23.68*** (9.15)	38.05** (17.89)	30.70*** (1.58)
700 <= Credit Score < 720	2.14 (3.41)	8.02** (3.52)	-11.74 (32.95)	0.13 (3.53)	17.17 (10.76)	43.62*** (17.12)	18.58** (8.75)	6.51 (6.84)	8.13 (7.24)	-6.90 (4.56)	4.91 (8.42)	9.80 (16.70)	-1.78 (3.81)	9.21 (9.19)	32.22* (18.31)	21.41*** (1.63)
720 <= Credit Score < 740	-0.06 (3.43)	4.99 (3.54)	-12.59 (9.22)	-2.18 (3.57)	14.30 (10.88)	35.17** (17.22)	16.69* (8.81)	1.80 (6.90)	7.05 (7.28)	-9.51** (4.60)	2.33 (8.49)	2.42 (16.82)	-4.35 (3.83)	8.35 (9.25)	39.65** (18.83)	14.32*** (1.66)
740 <= Credit Score < 760	-3.51 (3.47)	1.62 (3.57)	-14.63 (9.33)	-5.06 (3.61)	6.55 (10.95)	28.98* (17.36)	6.57 (8.88)	-0.24 (6.97)	8.27 (7.35)	-10.45** (4.65)	-6.88 (8.67)	-0.46 (17.07)	-7.22* (3.88)	4.83 (9.30)	24.04 (20.32)	10.53*** (1.68)
760 <= Credit Score < 780	-5.44 (3.53)	-0.54 (3.64)	-17.12* (9.44)	-7.02* (3.67)	7.77 (11.15)	30.49* (17.87)	3.74 (9.14)	-1.40 (7.09)	7.30 (7.47)	-11.41** (4.71)	-5.83 (8.89)	-6.41 (17.25)	-9.94** (3.95)	8.03 (9.41)	25.73 (23.40)	7.35*** (1.69)
780 <= Credit Score < 800	-5.57 (3.70)	-1.79 (3.82)	-14.15 (9.71)	-7.20* (3.86)	5.84 (11.58)	11.41 (18.44)	-1.19 (9.46)	-5.39 (7.50)	4.35 (8.04)	-10.28** (4.96)	-5.19 (9.30)	8.60 (18.63)	-9.14** (4.16)	3.07 (9.78)	32.64 (25.73)	1.40 (1.70)
0K <= Loan Amount < 40K	165.02*** (1.00)	237.27*** (1.53)	0.89 (32.95)	156.34*** (1.04)	233.61*** (3.53)	208.58*** (5.11)	246.08*** (3.90)	221.64*** (3.24)	128.21*** (2.50)	128.99*** (1.36)	94.61*** (2.13)	38.03*** (6.41)	162.02*** (1.15)	121.40*** (2.52)	153.48*** (14.59)	143.43*** (6.85)
40K <= Loan Amount < 50K	174.04*** (1.09)	206.34*** (1.41)	-7.01 (32.95)	165.93*** (1.14)	218.32*** (3.67)	172.76*** (5.06)	235.53*** (3.81)	228.52*** (3.15)	117.58*** (3.01)	122.26*** (1.57)	113.42*** (2.83)	79.46*** (7.87)	170.84*** (1.25)	141.86*** (2.87)	135.87*** (15.50)	91.99*** (7.88)
50K <= Loan Amount < 75K	125.09*** (0.66)	125.03*** (0.67)	-17.30 (32.94)	119.81*** (0.69)	134.66*** (2.33)	124.74*** (4.86)	117.33*** (3.35)	113.87*** (2.50)	110.15*** (1.68)	136.26*** (1.02)	127.63*** (1.27)	143.61*** (2.79)	122.12*** (0.79)	112.36*** (1.49)	94.95*** (11.39)	19.13*** (2.97)
75K <= Loan Amount < 150K	66.13*** (0.58)	65.58*** (0.59)	-23.01 (32.93)	61.47*** (0.61)	85.19*** (2.21)	80.97*** (4.79)	69.76*** (3.26)	60.96*** (2.41)	56.36*** (1.55)	75.82*** (0.86)	69.02*** (0.92)	69.43*** (1.52)	64.93*** (0.70)	49.09*** (1.19)	42.52*** (9.78)	-2.24 (2.83)

Dependent variable: APR (basis points)	Model (4)	Model (4-L1) First lien loans only	Model (4-L2) Subordinate lien loans only	Model (4-W) OOMC loans only	Model (4-R) HRBMC loans only	Model (4-2001) 2001 loans only	Model (4-2002) 2002 loans only	Model (4-2003) 2003 loans only	Model (4-2004) 2004 loans only	Model (4-2005) 2005 loans only	Model (4-2006) 2006 loans only	Model (4-2007) 2007 loans only	Model (4-OOMCwo) OOMC "Wholesale" loans only	Model (4-OOMCcn) OOMC "Correspondent" loans only	Model (4-OOMCco) OOMC "concurrent" loans only	Model (4-Prime) HRBMC prime loans
150K <= Loan Amount < 200K	30.23*** (0.59)	32.42*** (0.58)	-42.18 (33.05)	26.78*** (0.61)	53.09*** (2.21)	49.23*** (4.83)	41.33*** (3.29)	30.53*** (2.43)	23.54*** (1.56)	40.01*** (0.86)	33.13*** (0.90)	27.49*** (1.41)	29.68*** (0.71)	17.52*** (1.19)	16.65* (9.67)	-7.40*** (2.82)
200K <= Loan Amount < 300K	15.12*** (0.56)	17.67*** (0.56)	-58.47* (33.64)	12.90*** (0.58)	38.53*** (2.19)	35.49*** (4.85)	30.48*** (3.29)	16.89*** (2.41)	12.04*** (1.52)	25.91*** (0.81)	16.05*** (0.81)	6.45*** (1.23)	15.28*** (0.68)	5.90*** (1.10)	1.03 (9.40)	-10.05*** (2.80)
300K <= Loan Amount < 500K	0.28 (0.56)	1.60** (0.56)	-60.48 (36.94)	-0.90 (0.58)	18.38*** (2.26)	30.13*** (5.03)	19.08*** (3.37)	7.17*** (2.47)	2.18 (1.56)	6.03*** (0.80)	-1.44* (0.75)	-5.50*** (1.12)	1.37* (0.68)	-6.21*** (1.05)	-7.85 (9.64)	-8.62*** (2.85)
No debt-to-income ratio	1.46 (3.62)	-0.59 (3.64)	30.32*** (9.80)	1.15 (3.67)	11.51 (14.87)	-0.78 (8.01)	0.91 (7.78)	2.30 (5.56)	-23.83** (10.75)	25.55*** (9.68)	3.71 (26.58)	30.68 (20.68)	-0.28 (3.89)	8.10 (11.14)	-25.09 (59.52)	1.59 (3.87)
Debt-to-income > 36%	1.48*** (0.22)	1.15*** (0.22)	1.09* (0.58)	1.28*** (0.23)	3.15*** (0.61)	0.76 (0.81)	0.18 (0.64)	-0.15 (0.50)	0.37 (0.44)	0.44 (0.35)	0.08 (0.50)	0.22 (0.87)	1.15*** (0.26)	1.87*** (0.53)	2.71 (3.02)	4.80*** (0.59)
(First lien) x (0% < LTV <= 60%)	-138.58*** (0.68)	-131.49*** (0.67)		-136.52*** (0.72)	-144.75*** (2.06)	-123.80*** (10.82)	-122.48*** (3.49)	-125.56*** (2.84)	-145.05*** (3.09)	-171.25*** (1.17)	-84.09*** (1.16)	-95.06*** (2.27)	-138.92*** (0.81)	-123.86*** (1.54)	-145.25*** (10.66)	
(First lien) x (60% < LTV <= 70%)	-120.88*** (0.64)	-113.47*** (0.63)		-117.99*** (0.68)	-135.47*** (1.97)	-93.76*** (10.79)	-100.84*** (3.46)	-105.71*** (2.81)	-128.13*** (3.06)	-157.39*** (1.09)	-73.69*** (1.03)	-86.51*** (2.05)	-118.53*** (0.76)	-111.35*** (1.43)	-138.08*** (10.11)	
(First lien) x (70% < LTV <= 80%)	-109.92*** (0.52)	-104.08*** (0.51)		-108.66*** (0.54)	-110.58*** (1.81)	-94.95*** (10.70)	-99.35*** (3.29)	-99.41*** (2.71)	-117.78*** (2.95)	-131.56*** (0.85)	-58.32*** (0.70)	-73.98*** (1.64)	-109.84*** (0.60)	-99.39*** (1.16)	-120.26*** (8.95)	
(First lien) x (80% < LTV <= 90%)	-69.17*** (0.53)	-61.53*** (0.53)		-68.92*** (0.55)	-72.87*** (1.80)	-42.26*** (10.70)	-49.88*** (3.26)	-51.81*** (2.69)	-69.73*** (2.96)	-88.13*** (0.90)	-39.47*** (0.74)	-47.39*** (1.60)	-68.77*** (0.62)	-65.96*** (1.19)	-73.46*** (9.13)	
(First lien) x (90% < LTV <= 95%)	-33.75*** (0.56)	-28.22*** (0.55)		-34.22*** (0.58)	-36.09*** (1.84)	-8.93 (10.73)	-15.82*** (3.28)	-17.53*** (2.72)	-31.65*** (2.99)	-43.07*** (0.94)	-14.03*** (0.81)	-19.26*** (1.78)	-33.91*** (0.64)	-32.71*** (1.27)	-41.47*** (9.40)	
(Subordinate lien) x (0% < CLTV <= 80%)	30.83*** (1.33)		-74.60*** (1.82)	29.57*** (1.42)	75.00*** (3.67)	-99.06*** (3.60)	11.63** (5.22)	38.40*** (3.51)	-9.72*** (3.05)	17.60*** (2.05)	22.01*** (5.37)	-99.28*** (47.82)	33.01*** (1.58)	16.20*** (3.21)	12.98 (17.26)	
(Subordinate lien) x (80% < CLTV <= 90%)	60.36*** (2.13)		-7.81*** (2.11)	56.59*** (2.47)	113.83*** (4.49)	49.51*** (5.43)	65.66*** (8.09)	73.35*** (5.98)	23.24*** (5.69)	60.01*** (2.85)	38.88*** (5.04)	17.79 (16.57)	52.89*** (2.80)	72.81*** (4.85)	15.18 (24.26)	
(Subordinate lien) x (90% < CLTV <= 95%)	-8.62*** (2.12)		-14.93*** (1.81)	-6.51*** (2.22)	-13.70** (6.94)	20.92 (18.19)	27.13 (46.09)	40.25*** (14.84)	3.86 (4.45)	-3.49 (2.21)	-10.51*** (3.92)	28.40*** (12.81)	-5.59** (2.44)	-6.84 (5.40)	-25.04 (25.60)	
Co-applicant	1.62*** (0.23)	1.96*** (0.23)	-2.85*** (0.53)	1.27*** (0.24)	3.43*** (0.62)	-0.70 (0.84)	0.83 (0.67)	1.89*** (0.53)	2.95*** (0.47)	0.72** (0.35)	1.46*** (0.48)	1.78*** (0.84)	1.62*** (0.27)	0.77 (0.53)	2.25 (3.07)	1.96*** (0.62)
Borrower or co-borrower self-employed	1.78*** (0.28)	1.05*** (0.28)	-1.28 (0.79)	2.32*** (0.28)	-0.34 (1.03)	-0.81 (1.07)	-0.20 (0.82)	-0.28 (0.66)	1.52*** (0.59)	1.58*** (0.44)	1.52*** (0.55)	3.06*** (0.91)	1.83*** (0.31)	1.86*** (0.65)	0.42 (3.56)	-1.78 (1.27)
Lender-paid mortgage insurance	-9.26*** (0.33)	-11.19*** (0.33)		-9.16*** (0.35)	-8.79*** (0.87)	-14.31*** (1.46)	-17.97*** (1.07)	-17.19*** (0.86)	-2.61*** (0.71)	-7.39*** (0.46)	-6.38*** (0.72)	-16.73*** (2.00)	-8.57*** (0.39)	-9.51*** (0.76)	-4.54 (5.61)	82.43*** (9.51)
Escrow waived	10.55*** (0.22)	7.17*** (0.22)	3.66*** (0.82)	12.39*** (0.23)	4.84*** (0.64)	19.63*** (0.83)	13.61*** (0.63)	8.98*** (0.52)	5.37*** (0.47)	5.36*** (0.36)	6.98*** (0.43)	3.21*** (0.76)	13.31*** (0.25)	13.73*** (0.52)	7.12** (3.05)	-2.67* (1.61)
Loan purpose																
CNS	-13.90 (10.83)	-12.25 (16.20)		-17.34* (10.53)						25.10*** (2.02)	-28.78*** (1.57)	-9.60*** (2.08)	-26.04*** (10.24)		18.96 (14.41)	5.65* (3.35)
Cash-out refinance	-13.80*** (0.24)	-12.82*** (0.24)	-3.54*** (0.73)	-17.63*** (0.25)	-24.87*** (1.23)	-21.17*** (0.90)	-21.91*** (0.73)	-16.60*** (0.59)	-9.87*** (0.51)	-8.81*** (0.38)	-9.29*** (0.49)	-16.12*** (0.91)	-16.15*** (0.27)	-15.63*** (0.57)	-14.47*** (3.24)	-21.94*** (1.81)
Rate & term refinance	-11.17*** (0.42)	-8.77*** (0.43)	-13.98*** (1.07)	-13.33*** (0.46)	-26.46*** (1.43)	-7.73*** (1.50)	-18.56*** (1.32)	-14.83*** (1.00)	-2.40*** (0.88)	-5.32*** (0.74)	-6.89*** (0.88)	-16.01*** (1.38)	-11.14*** (0.51)	-12.90*** (0.98)	-2.38 (6.72)	-25.37*** (1.84)
Documentation type																
Full/Alt																
Business Bank Statements	8.45*** (1.80)	6.50*** (1.75)	27.43*** (8.49)	8.02*** (1.85)	16.32** (6.46)				-1.98 (13.44)	-4.36 (6.12)	8.84*** (2.64)	8.66*** (1.93)	5.72*** (2.04)	9.56** (4.06)		
Easy Doc																17.97*** (4.23)
Limited	40.52*** (0.25)	39.07*** (0.26)	78.35*** (0.73)	41.72*** (0.26)	36.28*** (0.84)	50.92*** (1.02)	48.08*** (0.77)	44.97*** (0.58)	36.46*** (0.54)	40.14*** (0.42)	28.99*** (0.52)	44.33*** (0.92)	41.65*** (0.29)	40.92*** (0.59)	43.49*** (3.40)	28.02*** (3.46)
Lite Doc	29.79*** (1.29)	32.46*** (1.41)	82.52*** (2.68)	28.66*** (1.35)	29.69*** (4.02)	69.43*** (4.49)	67.07*** (3.85)	51.03*** (3.36)	31.13*** (3.18)	43.56*** (2.27)	-7.53*** (2.49)	5.84 (4.40)	22.68*** (1.48)	53.07*** (3.49)	30.18* (16.66)	
No Doc	48.96*** (3.79)	41.96*** (3.82)	113.85*** (10.11)	48.63*** (3.85)	65.05*** (15.49)		113.59*** (11.06)	76.49*** (6.09)	94.14*** (11.08)	49.60*** (9.78)	15.11 (26.72)	-12.62 (20.85)	44.76*** (4.09)	60.71*** (11.50)	84.33 (60.57)	
No Income/No Asset																55.52*** (5.32)
No Ratio	-15.86*** (5.19)	-40.23*** (5.67)	60.04*** (10.59)	-18.52*** (5.22)					9.03 (18.16)	16.88 (10.87)	-29.60 (26.58)	-64.40 (40.73)	-21.69*** (5.41)	-108.75*** (11.86)	-38.30 (67.20)	-56.64*** (5.86)

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Dependent variable: APR (basis points)	Model (4)	Model (4-L1) First lien loans only	Model (4-L2) Subordinate lien loans only	Model (4-W) OOMC loans only	Model (4-R) HRBMC loans only	Model (4-2001) 2001 loans only	Model (4-2002) 2002 loans only	Model (4-2003) 2003 loans only	Model (4-2004) 2004 loans only	Model (4-2005) 2005 loans only	Model (4-2006) 2006 loans only	Model (4-2007) 2007 loans only	Model (4-OOMCwo) OOMC "Wholesale" loans only	Model (4-OOMCcn) OOMC "Correspondent" loans only	Model (4-OOMCco) OOMC "Concurrent" loans only	Model (4-Prime) HRBMC prime loans
Reduced Doc																40.47*** (3.80)
Stated Income	43.66*** (7.11)	25.63*** (5.55)	86.92*** (25.74)	39.38*** (6.72)	57.36** (25.96)			49.65*** (17.78)		41.29*** (5.52)			33.57*** (7.00)	55.59*** (16.28)		71.49*** (8.74)
Income Stated Loan Plus	-17.29*** (1.30)	-13.59*** (1.29)		-7.60*** (1.35)				-3.32 (2.20)						-19.23*** (3.64)		78.68*** (28.49)
Super Streamline																-36.76 (28.92)
Xpress Full Doc	20.27*** (1.56)	14.46*** (1.57)		31.64** (14.35)	-7.17*** (1.66)					9.20*** (2.37)	21.72*** (1.51)	36.35*** (2.50)	25.12** (11.45)			
Xpress Stated Income	65.07*** (2.00)	58.94*** (2.00)		-40.73 (89.79)	38.74*** (2.08)					58.56*** (3.18)	54.75*** (1.84)	58.59*** (2.97)	-47.34 (85.35)			
No data on prepayment penalty																0.87 (2.76)
1-to-12-month prepayment penalty	12.12*** (0.60)	9.63*** (0.62)	-8.58*** (2.75)	15.33*** (0.62)	-13.48*** (1.99)	-8.54*** (2.99)	5.99*** (2.15)	-0.34 (1.46)	-2.50* (1.43)	-5.00*** (1.11)	4.65*** (1.18)	-5.00*** (1.76)	13.27*** (0.70)	16.58*** (1.33)	5.36 (11.49)	
13-to-24-month prepayment penalty	-15.33*** (0.34)	-23.86*** (0.35)	-14.01*** (0.95)	-13.53*** (0.36)	-11.93*** (1.13)	-10.61*** (1.93)	-16.10*** (1.45)	-14.20*** (0.98)	-14.98*** (0.90)	-10.98*** (0.59)	6.70*** (0.79)	-6.01*** (1.32)	-13.49*** (0.40)	-17.00*** (0.81)	-9.92* (5.19)	
25-to-36-month prepayment penalty	-12.62*** (0.50)	-20.47*** (0.53)	-11.51*** (1.27)	-9.87*** (0.54)	-15.81*** (1.25)	-19.13*** (1.97)	-10.01*** (1.59)	-12.53*** (1.08)	-8.20*** (1.13)	-13.67*** (0.87)	-2.87* (1.34)	-21.96*** (2.07)	-10.05*** (0.59)	-17.92*** (1.25)	4.95 (7.53)	
37-to-60-month prepayment penalty	-68.40*** (10.32)	-87.04*** (10.94)	23.88 (24.28)	-73.16*** (10.84)	23.46 (40.56)	-128.68*** (14.39)	-37.28* (22.56)	-15.95 (17.07)	98.68*** (2.31)	3.07 (17.04)	26.03 (21.07)		-25.90*** (13.01)	-72.47*** (13.16)	68.19*** (21.28)	
Occupancy & property type																
Non-owner occupied, ATH	2.22 (19.58)	-3.24 (19.38)		4.02 (20.12)						76.59*** (21.00)	39.54** (15.68)	-11.21 (32.79)	-18.41 (20.97)	147.26*** (3.77)		65.97*** (2.63)
Non-owner occupied, condo/hotel																
Non-owner occupied, 1-4 story condo	74.91*** (1.52)	70.38*** (1.50)	114.21*** (14.07)	77.24*** (1.55)	70.81*** (7.07)	64.66*** (8.19)	85.11*** (4.93)	88.62*** (3.95)	76.51*** (3.65)	73.89*** (2.55)	45.03*** (3.16)	49.95*** (4.16)	78.59*** (1.69)	68.53*** (3.75)	61.03*** (13.74)	30.27*** (6.36)
Non-owner occupied, 4+ story condo	87.17*** (4.80)	82.65*** (4.82)	72.79* (42.31)	86.55*** (4.65)	88.82*** (24.34)	101.89*** (23.26)	78.85*** (16.48)	102.23*** (10.68)	101.77*** (14.23)	80.02*** (7.84)	49.82*** (6.82)	56.61*** (15.77)	83.89*** (4.84)	95.73*** (15.12)		57.90* (33.17)
Non-owner occupied, condo conversion	96.44*** (8.90)	88.06*** (8.01)	-60.42*** (2.25)	97.91*** (0.68)						106.77*** (12.06)	41.58*** (10.34)	40.88*** (15.03)	100.86*** (8.43)	26.85 (36.60)		
Non-owner occupied, manufactured housing	109.06*** (11.25)	100.82*** (10.99)		118.49*** (10.70)		105.38*** (24.12)	129.27*** (21.18)	119.89*** (12.58)	-17.14*** (2.29)	87.74*** (33.21)			114.94*** (11.17)	125.55*** (33.37)	103.47*** (8.49)	27.88*** (3.28)
Non-owner occupied, Planned Urban Development	53.32*** (1.56)	49.21*** (1.50)	85.19*** (8.69)	54.49*** (1.60)	58.86*** (6.87)	65.08*** (10.93)	38.54*** (5.30)	50.80*** (3.85)	52.07*** (4.33)	52.96*** (2.64)	41.13*** (2.77)	39.02*** (4.29)	54.76*** (1.75)	47.84*** (3.67)	48.80*** (22.63)	20.38*** (5.39)
Non-owner occupied, single-family home	64.33*** (0.51)	58.29*** (0.51)	93.40*** (3.91)	66.88*** (0.53)	60.31*** (2.06)	62.68*** (2.54)	60.07*** (1.83)	60.91*** (1.30)	67.82*** (1.19)	62.45*** (0.85)	41.38*** (1.00)	37.88*** (1.67)	66.26*** (0.58)	64.20*** (1.34)	77.31*** (8.14)	23.61*** (2.00)
Non-owner occupied, 2-4 units	85.60*** (0.67)	82.37*** (0.67)	138.28*** (6.82)	87.36*** (0.68)	79.29*** (3.04)	100.75*** (3.48)	101.38*** (2.04)	93.24*** (1.38)	90.54*** (1.36)	80.48*** (1.18)	47.40*** (1.40)	50.41*** (2.29)	87.51*** (0.74)	81.25*** (1.77)	-104.45*** (19.26)	-2.91 (6.29)
Owner occupied, ATH	68.07*** (1.63)	77.81*** (1.67)		78.33*** (1.75)						61.96*** (2.36)			70.23*** (1.96)	-42.01 (36.66)		
Owner occupied, condo/hotel	-13.14 (24.58)	-17.52 (24.63)		-12.63 (25.92)	-18.85*** (6.21)					2.88 (21.05)	-14.83 (23.03)	22.29 (21.12)	-6.93 (30.15)			
Owner occupied, 1-4 story condo	11.65*** (0.49)	14.08*** (0.50)	0.30 (0.95)	12.02*** (0.51)	10.58*** (1.55)	22.07*** (1.91)	19.91*** (1.46)	15.50*** (1.20)	12.18*** (1.04)	10.70*** (0.73)	7.93*** (1.05)	6.46*** (1.99)	12.35*** (0.57)	10.88*** (1.14)	17.60*** (5.33)	6.99*** (1.37)
Owner occupied, 4+ story condo	20.28*** (1.80)	21.37*** (1.94)	-6.35*** (2.71)	19.94*** (1.87)	16.35*** (6.12)	16.45*** (5.09)	24.15*** (5.49)	15.60*** (4.28)	9.89*** (3.82)	14.57*** (2.63)	15.60*** (4.01)	18.77*** (4.90)	20.48*** (2.01)	16.35*** (4.93)	15.22 (18.19)	1.43 (4.37)
Owner occupied, condo conversion	24.21*** (5.24)	35.91*** (5.05)	8.95 (8.95)	24.56*** (5.32)	-16.22* (9.16)					11.62 (7.90)	18.17*** (6.06)	34.84*** (10.26)	26.30*** (5.70)	-.19 (12.44)		
Owner occupied, co-op	-53.63*** (27.28)	-38.62 (25.16)		-44.36* (26.73)					-30.71 (27.85)				-31.67 (40.27)	-41.14* (21.90)		
Owner occupied, manufactured housing	47.96*** (0.86)	50.41*** (0.86)	21.35 (22.38)	52.85*** (0.87)	20.14*** (7.54)	27.02*** (1.94)	71.55*** (2.37)	68.63*** (1.71)	42.12*** (1.57)	69.05*** (1.65)	127.39*** (12.36)		50.80*** (0.92)	56.32*** (2.67)	33.71* (17.65)	34.58*** (2.21)
Owner occupied, Planned Urban Development	-4.13*** (0.49)	-4.18*** (0.39)	-10.34*** (0.91)	-3.85*** (0.42)	-3.17*** (1.20)	-2.84* (1.46)	-8.85*** (1.16)	-6.06*** (0.93)	-5.35*** (0.89)	-2.95*** (0.58)	-6.10*** (0.78)	-0.61 (1.29)	-3.66*** (0.47)	-5.31*** (0.89)	-2.05 (5.76)	-0.83 (1.04)

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Dependent variable: APR (basis points)	Model (4)	Model (4-L1) First lien loans only	Model (4-L2) Subordinate lien loans only	Model (4-W) OOMC loans only	Model (4-R) HRBMC loans only	Model (4-2001) 2001 loans only	Model (4-2002) 2002 loans only	Model (4-2003) 2003 loans only	Model (4-2004) 2004 loans only	Model (4-2005) 2005 loans only	Model (4-2006) 2006 loans only	Model (4-2007) 2007 loans only	Model (4-OOMCwo) OOMC "Wholesale" loans only	Model (4-OOMCcm) OOMC "Correspondent" loans only	Model (4-OOMCco) OOMC "Concurrent" loans only	Model (4-Prime) HRBMC prime loans
Owner occupied, 2-4 units	13.33*** (0.46)	13.03*** (0.46)	8.61*** (1.26)	13.62*** (0.47)	14.91*** (1.64)	23.77*** (2.06)	26.03*** (1.30)	17.12*** (0.99)	9.40*** (0.89)	11.03*** (0.75)	5.35*** (1.00)	1.11 (1.64)	14.71*** (0.52)	8.40*** (1.10)	14.89*** (4.44)	-1.32 (1.59)
Second home, condo/hotel	-6.76 (11.99)	-11.81 (11.92)		-5.91 (12.37)	87.97*** (6.47)					-8.84 (9.09)	27.21* (14.55)	11.51 (8.62)	-21.15 (13.02)	-27.89 (45.99)		
Second home, 1-4 story condo	14.54*** (2.21)	13.99*** (2.19)	16.31 (12.99)	14.96*** (2.26)	15.37* (8.68)	4.35 (9.45)	14.59** (6.38)	13.90*** (5.33)	13.93*** (4.27)	21.11*** (3.24)	15.70*** (4.73)	18.00*** (7.42)	14.57*** (2.43)	12.32** (5.87)	43.32 (26.95)	2.04 (4.40)
Second home, 4+ story condo	27.87*** (5.01)	29.81*** (5.13)	43.03 (28.75)	29.69*** (5.22)	28.55* (15.97)	23.54 (20.25)	-4.10 (11.92)	42.36*** (12.29)	29.76** (13.48)	9.07 (7.47)	51.34*** (11.48)	40.82*** (10.84)	28.10*** (5.57)	31.00** (13.39)		-22.08*** (7.89)
Second home, condo conversion	47.09*** (16.32)	43.75*** (15.21)	-28.17*** (1.88)	46.64*** (16.35)						55.19* (29.47)	12.11 (16.79)	83.25*** (41.68)	35.19** (17.43)	99.64*** (33.52)		
Second home, manufactured housing	37.55*** (6.49)	38.26*** (6.28)		40.64*** (6.55)	66.27*** (6.29)	21.19 (15.85)	41.15*** (13.53)	71.62*** (10.48)	32.86*** (9.55)	68.12*** (12.44)			38.79*** (6.79)	37.87* (20.57)	93.59*** (13.83)	
Second home, Planned Urban Development	-8.30*** (1.89)	-6.94*** (1.84)	26.20** (10.88)	-8.08*** (1.93)	-5.74 (7.24)	-10.53 (6.75)	-13.99*** (5.34)	-17.77*** (3.82)	-15.73*** (4.15)	-4.69 (2.99)	10.51** (4.22)	30.18*** (6.30)	-8.71*** (2.06)	-5.02 (5.09)	22.56 (22.55)	-10.38*** (4.04)
Second home, single-family home	-1.37 (1.03)	-2.50** (1.02)	20.58*** (5.57)	-1.11 (1.06)	-1.43 (3.42)	-13.17*** (4.11)	-10.19*** (3.13)	-4.52* (2.41)	-6.09*** (2.22)	-0.20 (1.58)	10.44*** (2.09)	9.77*** (3.40)	-2.01* (1.17)	3.36 (2.52)	-11.11 (11.20)	0.80 (2.86)
Second home, 2-4 units	29.13*** (5.91)	30.55*** (5.73)	-41.22 (68.62)	29.21*** (6.44)	24.14* (13.85)	19.75 (45.37)	10.07 (18.55)	19.06*** (11.59)	24.98 (15.88)	26.19*** (8.87)	28.82** (11.94)	49.94*** (18.50)	28.53*** (7.21)	28.33** (13.52)	88.05*** (10.73)	
Loan program category																
10-year fixed	81.23*** (4.02)	65.67*** (4.08)	64.37*** (14.28)	61.56*** (8.26)	84.25*** (4.21)	0.18 (10.93)	26.24*** (9.67)	42.10*** (6.27)	64.48*** (6.21)	99.47*** (8.18)	91.15*** (28.46)	95.95*** (32.78)	74.37*** (8.99)	42.01*** (15.76)		-8.40*** (1.47)
15-year ARM, initial rate fixed 6 months	64.18 (80.00)	72.17 (76.08)		-103.52*** (1.41)	124.61*** (65.37)			35.87*** (2.21)	-126.26*** (2.17)	261.70*** (1.73)			-106.57*** (1.54)			
15-year ARM, initial rate fixed 2 years	67.07*** (2.50)	61.35*** (2.46)		34.97*** (3.99)	64.00*** (2.99)	-27.16*** (7.75)	3.58 (7.06)	12.97*** (4.90)	15.71*** (4.90)	126.93*** (4.41)	184.58*** (6.55)	196.15*** (9.96)	33.19*** (4.23)	26.45*** (10.60)	47.39*** (20.97)	
15-year ARM, initial rate fixed 3 years	27.47*** (8.43)	19.18** (8.29)		17.30 (11.18)	27.84** (11.29)	-66.90*** (15.97)	-31.33 (24.43)	-34.59*** (13.03)	-54.74*** (14.54)	11.76*** (14.39)	201.19*** (29.82)	240.57*** (43.41)	17.54 (12.21)	-7.68 (17.48)		
15-year fixed	45.55*** (0.96)	38.21*** (1.05)	23.63*** (2.20)	45.87*** (1.08)	44.80*** (1.98)	16.01*** (2.75)	12.71*** (2.23)	10.77*** (1.47)	14.05*** (1.78)	33.71*** (2.12)	29.00*** (5.87)	3.87 (9.42)	47.98*** (1.16)	35.84*** (2.66)	26.55* (15.40)	-19.07*** (0.91)
15-year fixed balloon	68.66*** (1.38)	75.90*** (1.72)	2.21 (3.42)	64.97*** (1.39)	31.32*** (9.84)	22.17*** (2.15)	14.49*** (2.95)	-72.62*** (4.02)		10.69 (62.09)	-37.60*** (4.21)		63.59*** (1.52)	72.82*** (3.47)	46.48*** (20.30)	128.77*** (6.08)
20-year fixed	54.39*** (1.07)	21.08*** (1.36)	5.88*** (1.48)	63.99*** (1.22)	21.65*** (2.04)	4.62 (3.59)	2.82 (2.74)	2.43 (1.58)	9.20*** (1.83)	18.02*** (2.44)	29.44*** (7.40)	-4.83 (14.36)	66.45*** (1.30)	54.96*** (3.25)	36.99*** (16.22)	-6.94*** (0.74)
25-year ARM	59.32*** (1.31)	43.35*** (1.28)		54.29*** (1.38)							145.68*** (2.44)			89.02*** (2.85)		
25-year fixed																-1.76 (1.16)
30-year ARM, initial rate fixed 6 months	61.57*** (4.14)	60.73*** (4.00)		31.72*** (5.05)	72.19*** (6.15)	-20.69 (18.09)	-58.74*** (14.46)	-64.33*** (12.61)	-19.35*** (8.82)	145.29*** (4.57)	167.04*** (2.04)	140.61*** (4.83)	21.49*** (5.85)	71.71*** (9.40)	10.51 (7.41)	
30-year ARM, initial rate fixed 2 years	44.38*** (0.48)	45.84*** (0.48)		41.27*** (0.49)	57.72*** (1.16)	-33.35*** (1.88)	-29.42*** (1.61)	-29.41*** (1.01)	-17.76*** (0.91)	117.67*** (0.76)	176.03*** (1.31)	191.36*** (1.90)	34.03*** (0.55)	68.65*** (1.11)	-4.13 (7.72)	62.54*** (3.57)
30-year ARM, initial rate fixed 3 years	22.33*** (0.58)	24.24*** (0.57)		21.03*** (0.60)	17.50*** (1.83)	-23.48*** (2.18)	-31.53*** (1.62)	-41.92*** (1.13)	-35.20*** (1.06)	99.06*** (1.15)	158.34*** (1.77)	165.15*** (2.31)	13.99*** (0.66)	51.53*** (1.53)	-12.72 (15.56)	0.55 (7.40)
30-year ARM, initial rate fixed 5 years	28.31*** (0.86)	18.92*** (0.86)		21.78*** (1.00)	24.58*** (1.67)					76.70*** (1.19)	120.73*** (1.63)	139.78*** (2.39)	14.14*** (1.09)	41.19*** (2.21)		50.08*** (6.40)
30-year ARM, initial rate fixed 7 years																51.70*** (6.55)
30-year ARM, initial rate fixed 10 years																70.27*** (9.93)
30-year ARM, initial rate fixed 15 years																
30-year interest-only ARM, initial rate fixed 2 years	47.36*** (2.26)	49.74*** (2.20)		49.44*** (2.28)	23.01 (17.71)		10.99*** (3.77)	-8.09*** (2.75)	0.78 (10.66)	32.40* (17.68)	61.47*** (22.05)	60.49* (34.16)	42.27*** (2.47)	83.06*** (5.83)	13.28 (20.36)	
30-year interest-only ARM, initial rate fixed 3 years	62.29*** (0.58)	59.33*** (0.59)		59.84*** (0.62)	67.11*** (1.59)			-31.52*** (11.55)	-25.14*** (1.29)	114.45*** (1.44)	177.18*** (1.44)	202.42*** (2.28)	53.24*** (1.30)	85.17*** (1.30)	48.19*** (9.03)	45.07*** (3.31)
30-year interest-only ARM, initial rate fixed 5 years	30.02*** (1.38)	26.34*** (1.35)		27.68*** (1.43)	53.07*** (4.28)			-109.86*** (26.18)	-33.87*** (2.51)	101.14*** (1.48)	114.47*** (5.25)	119.36*** (7.71)	20.90*** (1.65)	55.58*** (2.78)	36.87*** (18.39)	52.68*** (1.58)
30-year interest-only ARM, initial rate fixed 7 years	8.92*** (1.10)	0.22 (1.11)		3.84*** (1.19)	28.33*** (2.45)					76.92*** (1.18)	81.69*** (2.39)	98.26*** (3.85)	-5.04*** (1.42)	38.54*** (2.08)	-28.56 (18.30)	44.37*** (3.54)

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	Model (4)	Model (4-L1) First lien loans only	Model (4-L2) Subordinate lien loans only	Model (4-W) OOMC loans only	Model (4-R) HRBMC loans only	Model (4-2001) 2001 loans only	Model (4-2002) 2002 loans only	Model (4-2003) 2003 loans only	Model (4-2004) 2004 loans only	Model (4-2005) 2005 loans only	Model (4-2006) 2006 loans only	Model (4-2007) 2007 loans only	Model (4-OOMCwo) OOMC "Wholesale" loans only	Model (4-OOMCcn) OOMC "Correspondent" loans only	Model (4-OOMCco) OOMC "Concurrent" loans only	Model (4-Prime) HRBMC prime loans
Dependent variable: APR (basis points)																
30-year interest-only ARM, initial rate fixed 10 years																38.65***
																(4.35)
30-year interest-only ARM, initial rate fixed 15 years	-34.24**	-37.91**		-59.57***	-6.84				-33.53***	30.21**	-75.61***		-54.38***	-105.32***	-26.20*	
	(15.67)	(16.71)		(17.07)	(14.64)				(6.74)	(15.15)	(2.11)		(13.60)	(40.41)	(15.79)	
30-year ARM balloon, initial rate fixed 6 months	119.35***	110.31***		86.27***	86.35***					166.35***	191.28***		107.75***	96.37***		
	(15.99)	(15.73)		(17.77)	(20.69)					(16.94)	(26.67)		(22.36)	(21.19)		
30-year ARM balloon, initial rate fixed 2 years	94.17***	88.48***		92.85***	83.95***					131.81***	175.50***	199.37***	85.66***	116.33***	63.51***	
	(0.59)	(0.62)		(0.64)	(1.65)					(1.15)	(1.32)	(1.93)	(0.71)	(1.36)	(9.72)	
30-year ARM balloon, initial rate fixed 3 years	75.43***	70.00***		73.71***	61.35***					104.81***	159.49***	171.83***	64.43***	98.29***	19.10	
	(1.23)	(1.24)		(1.29)	(3.86)					(4.68)	(1.68)	(2.21)	(1.38)	(2.93)	(19.45)	
30-year ARM balloon, initial rate fixed 5 years	40.12***	34.12***		35.23***	28.45***			60.65***		81.65***	116.06***	144.06***	27.72***	60.94***	-21.52	
	(0.97)	(0.98)		(1.19)	(1.78)			(2.96)		(2.73)	(1.43)	(2.03)	(1.36)	(2.22)	(16.63)	
30-year interest-only fixed	-96.21***	-101.94***		-101.22***	-35.16***			2.64	-15.76***	-22.57***	-78.97***	-92.67***	-97.32***	-93.58***	-116.83***	
	(2.09)	(2.15)		(2.12)	(7.12)			(19.09)	(3.90)	(2.18)	(5.09)	(5.27)	(2.46)	(3.84)	(43.28)	
30-year fixed balloon	-153.13***	-159.01***		-156.49***	-107.66***					-72.32***	-75.67***	-54.08***	-154.52***	-144.92***	-178.00***	
	(1.19)	(1.19)		(1.21)	(4.88)					(2.57)	(1.98)	(2.35)	(1.43)	(2.13)	(16.07)	
Constant	968.07***	970.89***	1,111.90***	981.97***	886.24***	939.31***	783.79***	734.38***	684.37***	736.46	853.82***	772.07***	989.81***	943.18***	982.57***	
	(3.87)	(3.99)	(34.80)	(4.02)	(12.43)	(20.70)	(9.91)	(7.69)	(8.02)	(.)	(33.45)	(29.61)	(4.32)	(10.39)	(29.94)	
Observations	865052	767811	97241	778553	86499	71019	93576	131044	159953	227550	137601	44309	628735	145315	4503	26596
R-squared	0.73608	0.74375	0.71638	0.74103	0.76208	0.59550	0.63365	0.61937	0.69353	0.76577	0.66210	0.72315	0.74506	0.74352	0.77286	0.70950
Adjusted R-squared	0.73601	0.74367	0.71582	0.74095	0.76145	0.59471	0.63310	0.61894	0.69325	0.76560	0.66171	0.72216	0.74496	0.74310	0.76186	0.70754

Robust standard errors in parentheses

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

Coefficients and standard errors for rate lock month and state 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) Interact Race & FICO	Model (4-X) Interact Ethnicity & Race (2004-2007 only)	Model (4-Y) Allow Multiple Race Classifications
Race: African American	8.63***			
	(0.31)			
Race: Hispanic	1.25***			
	(0.32)			
Race: American Indian	7.57***			
	(1.56)			
Race: Asian, Hawaiian, or Pacific Islander	4.15***			
	(0.61)			
Race: Missing	0.33			
	(0.29)			
American Indian, non-Hispanic			5.31***	
			(1.76)	
American Indian, Hispanic			4.65***	
			(1.75)	
Asian, non-Hispanic			3.26***	
			(0.69)	
Asian, Hispanic			5.58**	
			(2.21)	
Black, non-Hispanic			5.83***	
			(0.36)	
Black, Hispanic			5.22***	
			(1.73)	
Missing, non-Hispanic			1.96***	
			(0.37)	
Missing, Hispanic			-1.71*	
			(0.91)	
White, Hispanic			0.26	
			(0.39)	
Black				6.51***
				(0.79)
Hispanic				-1.05
				(0.76)
Asian, Hawaiian, or Pacific Islander				2.17**
				(0.87)
American Indian				5.19***
				(1.19)
White				-2.16***
				(0.77)
Missing				-1.85**
				(0.82)
(Credit Score missing) x African American		19.92***		
		(3.22)		
(Credit Score < 520) x African American		10.28***		
		(1.23)		
(520 <= Credit Score < 540) x African American		11.39***		
		(1.19)		
(540 <= Credit Score < 560) x African American		13.41***		
		(1.10)		
(560 <= Credit Score < 580) x African American		8.08***		
		(1.03)		
(580 <= Credit Score < 600) x African American		7.18***		
		(0.78)		
(600 <= Credit Score < 620) x African American		6.83***		
		(0.75)		
(620 <= Credit Score < 640) x African American		6.39***		
		(0.79)		
(640 <= Credit Score < 660) x African American		8.09***		
		(0.87)		
(660 <= Credit Score < 680) x African American		8.23***		
		(1.07)		
(680 <= Credit Score < 700) x African American		8.16***		
		(1.39)		
(700 <= Credit Score < 720) x African American		6.23***		
		(1.82)		
(720 <= Credit Score < 740) x African American		7.39***		
		(2.34)		
(740 <= Credit Score < 760) x African American		7.39***		
		(2.86)		
(760 <= Credit Score < 780) x African American		5.87		
		(3.78)		
(780 <= Credit Score < 800) x African American		1.37		
		(6.02)		

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Dependent variable: APR (basis points)	Model (4)	Model (4-RF) Interact Race & FICO	Model (4-X) Interact Ethnicity & Race (2004-2007 only)	Model (4-Y) Allow Multiple Race Classifications
(Credit Score >= 800) x African American		10.46		
		(12.40)		
(Credit Score missing) x Hispanic		-15.84***		
		(3.65)		
(Credit Score < 520) x Hispanic		-4.62***		
		(1.57)		
(520 <= Credit Score < 540) x Hispanic		-3.72***		
		(1.44)		
(540 <= Credit Score < 560) x Hispanic		-5.76***		
		(1.27)		
(560 <= Credit Score < 580) x Hispanic		-5.39***		
		(1.18)		
(580 <= Credit Score < 600) x Hispanic		-1.24		
		(0.89)		
(600 <= Credit Score < 620) x Hispanic		1.23		
		(0.82)		
(620 <= Credit Score < 640) x Hispanic		3.32***		
		(0.80)		
(640 <= Credit Score < 660) x Hispanic		7.37***		
		(0.80)		
(660 <= Credit Score < 680) x Hispanic		6.29***		
		(0.93)		
(680 <= Credit Score < 700) x Hispanic		5.35***		
		(1.10)		
(700 <= Credit Score < 720) x Hispanic		6.80***		
		(1.38)		
(720 <= Credit Score < 740) x Hispanic		6.67***		
		(1.72)		
(740 <= Credit Score < 760) x Hispanic		3.60*		
		(2.15)		
(760 <= Credit Score < 780) x Hispanic		1.52		
		(2.93)		
(780 <= Credit Score < 800) x Hispanic		6.80		
		(4.38)		
(Credit Score >= 800) x Hispanic		-15.42		
		(12.80)		
(Credit Score missing) x American Indian		27.37*		
		(15.04)		
(Credit Score < 520) x American Indian		7.47		
		(6.70)		
(520 <= Credit Score < 540) x American Indian		15.43**		
		(6.57)		
(540 <= Credit Score < 560) x American Indian		15.59***		
		(5.81)		
(560 <= Credit Score < 580) x American Indian		7.20		
		(5.50)		
(580 <= Credit Score < 600) x American Indian		10.32***		
		(4.00)		
(600 <= Credit Score < 620) x American Indian		3.48		
		(3.97)		
(620 <= Credit Score < 640) x American Indian		3.52		
		(3.78)		
(640 <= Credit Score < 660) x American Indian		6.98		
		(4.71)		
(660 <= Credit Score < 680) x American Indian		0.06		
		(5.08)		
(680 <= Credit Score < 700) x American Indian		13.29*		
		(7.43)		
(700 <= Credit Score < 720) x American Indian		-0.56		
		(9.33)		
(720 <= Credit Score < 740) x American Indian		-5.25		
		(12.40)		
(740 <= Credit Score < 760) x American Indian		-14.89		
		(14.58)		
(760 <= Credit Score < 780) x American Indian		10.47		
		(20.48)		
(780 <= Credit Score < 800) x American Indian		6.62		
		(38.34)		
(Credit Score >= 800) x American Indian		-121.59*		
		(67.47)		
(Credit Score missing) x Asian		-41.10***		
		(7.48)		
(Credit Score < 520) x Asian		-2.25		
		(3.98)		
(520 <= Credit Score < 540) x Asian		1.86		
		(3.35)		
(540 <= Credit Score < 560) x Asian		-4.09		
		(2.83)		

Dependent variable: APR (basis points)	Model (4)	Model (4-RF) Interact Race & FICO	Model (4-X) Interact Ethnicity & Race (2004-2007 only)	Model (4-Y) Allow Multiple Race Classifications
(560 <= Credit Score < 580) x Asian		-1.69		
		(2.57)		
(580 <= Credit Score < 600) x Asian		1.51		
		(1.94)		
(600 <= Credit Score < 620) x Asian		2.26		
		(1.69)		
(620 <= Credit Score < 640) x Asian		3.46**		
		(1.60)		
(640 <= Credit Score < 660) x Asian		7.89***		
		(1.55)		
(660 <= Credit Score < 680) x Asian		11.27***		
		(1.67)		
(680 <= Credit Score < 700) x Asian		9.58***		
		(1.96)		
(700 <= Credit Score < 720) x Asian		11.92***		
		(2.43)		
(720 <= Credit Score < 740) x Asian		12.74***		
		(3.07)		
(740 <= Credit Score < 760) x Asian		12.21***		
		(3.95)		
(760 <= Credit Score < 780) x Asian		3.34		
		(4.98)		
(780 <= Credit Score < 800) x Asian		10.88		
		(7.49)		
(Credit Score >= 800) x Asian		15.99		
		(13.12)		
(Credit Score missing) x Missing race		-8.94***		
		(3.31)		
(Credit Score < 520) x Missing race		-0.55		
		(1.22)		
(520 <= Credit Score < 540) x Missing race		0.17		
		(1.13)		
(540 <= Credit Score < 560) x Missing race		1.36		
		(1.07)		
(560 <= Credit Score < 580) x Missing race		3.60***		
		(0.99)		
(580 <= Credit Score < 600) x Missing race		0.96		
		(0.79)		
(600 <= Credit Score < 620) x Missing race		1.10		
		(0.76)		
(620 <= Credit Score < 640) x Missing race		-2.05***		
		(0.76)		
(640 <= Credit Score < 660) x Missing race		-2.03**		
		(0.83)		
(660 <= Credit Score < 680) x Missing race		0.93		
		(0.99)		
(680 <= Credit Score < 700) x Missing race		2.76**		
		(1.25)		
(700 <= Credit Score < 720) x Missing race		1.10		
		(1.55)		
(720 <= Credit Score < 740) x Missing race		2.23		
		(2.02)		
(740 <= Credit Score < 760) x Missing race		-4.13*		
		(2.39)		
(760 <= Credit Score < 780) x Missing race		-1.54		
		(3.12)		
(780 <= Credit Score < 800) x Missing race		-0.85		
		(4.45)		
(Credit Score >= 800) x Missing race		-7.44		
		(10.00)		
Subordinate lien	31.62***	31.37***	98.80***	31.62***
	(0.93)	(0.93)	(1.02)	(0.93)
Missing credit score	177.14***	177.37***	159.13***	177.13***
	(3.57)	(4.44)	(4.19)	(3.57)
300 <= Credit Score < 520	232.32***	230.37***	229.30***	232.30***
	(3.41)	(4.21)	(3.93)	(3.41)
520 <= Credit Score < 540	220.28***	217.85***	219.62***	220.27***
	(3.40)	(4.21)	(3.92)	(3.40)
540 <= Credit Score < 560	199.18***	196.53***	191.17***	199.17***
	(3.40)	(4.20)	(3.91)	(3.40)
560 <= Credit Score < 580	155.10***	152.95***	144.84***	155.09***
	(3.40)	(4.19)	(3.90)	(3.39)
580 <= Credit Score < 600	120.07***	118.05***	118.04***	120.06***
	(3.39)	(4.18)	(3.89)	(3.39)
600 <= Credit Score < 620	98.07***	95.80***	96.92***	98.06***
	(3.38)	(4.17)	(3.89)	(3.38)
620 <= Credit Score < 640	71.72***	69.70***	70.98***	71.71***
	(3.38)	(4.17)	(3.89)	(3.38)

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Dependent variable: APR (basis points)	Model (4)	Model (4-RF) Interact Race & FICO	Model (4-X) Interact Ethnicity & Race (2004-2007 only)	Model (4-Y) Allow Multiple Race Classifications
640 <= Credit Score < 660	53.83***	50.79***	52.64***	53.82***
	(3.38)	(4.17)	(3.89)	(3.38)
660 <= Credit Score < 680	31.37***	27.80***	28.19***	31.36***
	(3.39)	(4.18)	(3.89)	(3.39)
680 <= Credit Score < 700	14.67***	10.90***	11.00***	14.66***
	(3.39)	(4.19)	(3.90)	(3.39)
700 <= Credit Score < 720	2.14	-1.58	-2.50	2.13
	(3.41)	(4.22)	(3.92)	(3.41)
720 <= Credit Score < 740	-0.06	-4.18	-3.64	-0.07
	(3.43)	(4.26)	(3.95)	(3.43)
740 <= Credit Score < 760	-3.51	-6.04	-6.37	-3.52
	(3.47)	(4.32)	(4.00)	(3.47)
760 <= Credit Score < 780	-5.44	-7.42*	-8.27**	-5.46
	(3.53)	(4.40)	(4.07)	(3.53)
780 <= Credit Score < 800	-5.57	-8.40*	-7.14*	-5.59
	(3.70)	(4.62)	(4.30)	(3.70)
0K <= Loan Amount < 40K	165.02***	165.19***	119.62***	165.02***
	(1.00)	(0.99)	(1.12)	(1.00)
40K <= Loan Amount < 50K	174.04***	174.05***	116.84***	174.04***
	(1.09)	(1.09)	(1.40)	(1.09)
50K <= Loan Amount < 75K	125.09***	125.09***	126.82***	125.09***
	(0.66)	(0.66)	(0.73)	(0.66)
75K <= Loan Amount < 150K	66.13***	66.22***	64.96***	66.13***
	(0.58)	(0.58)	(0.61)	(0.58)
150K <= Loan Amount < 200K	30.23***	30.36***	28.55***	30.23***
	(0.59)	(0.59)	(0.61)	(0.59)
200K <= Loan Amount < 300K	15.12***	15.26***	13.57***	15.12***
	(0.56)	(0.56)	(0.57)	(0.56)
300K <= Loan Amount < 500K	0.28	0.33	-1.66***	0.27
	(0.56)	(0.56)	(0.55)	(0.56)
No debt-to-income ratio	1.46	1.47	10.78	1.43
	(3.62)	(3.62)	(6.63)	(3.62)
Debt-to-income > 36%	1.48***	1.50***	1.29***	1.48***
	(0.22)	(0.22)	(0.26)	(0.22)
(First lien) x (0% < LTV <= 60%)	-138.58***	-138.68***	-134.17***	-138.59***
	(0.68)	(0.68)	(0.75)	(0.68)
(First lien) x (60% < LTV <= 70%)	-120.88***	-120.99***	-120.58***	-120.89***
	(0.64)	(0.64)	(0.69)	(0.64)
(First lien) x (70% < LTV <= 80%)	-109.92***	-110.04***	-104.40***	-109.92***
	(0.52)	(0.52)	(0.52)	(0.52)
(First lien) x (80% < LTV <= 90%)	-69.17***	-69.31***	-66.84***	-69.17***
	(0.53)	(0.54)	(0.54)	(0.53)
(First lien) x (90% < LTV <= 95%)	-33.75***	-33.80***	-30.15***	-33.76***
	(0.56)	(0.56)	(0.57)	(0.56)
(Subordinate lien) x (0% < CLTV <= 80%)	30.83***	31.09***	25.14***	30.84***
	(1.33)	(1.33)	(1.74)	(1.33)
(Subordinate lien) x (80% < CLTV <= 90%)	60.36***	60.43***	47.21***	60.37***
	(2.13)	(2.13)	(2.42)	(2.13)
(Subordinate lien) x (90% < CLTV <= 95%)	-8.62***	-8.68***	-6.09***	-8.62***
	(2.12)	(2.12)	(2.04)	(2.12)
Co-applicant	1.62***	1.68***	1.86***	1.68***
	(0.23)	(0.23)	(0.27)	(0.23)
Borrower or co-borrower self-employed	1.78***	1.78***	2.39***	1.79***
	(0.28)	(0.28)	(0.32)	(0.28)
Lender-paid mortgage insurance	-9.26***	-9.25***	-5.87***	-9.26***
	(0.33)	(0.33)	(0.37)	(0.33)
Escrow waived	10.55***	10.50***	7.76***	10.54***
	(0.22)	(0.22)	(0.25)	(0.22)
Loan purpose				
CNS	-13.90	-14.15	-0.06	-13.91
	(10.83)	(10.88)	(11.45)	(10.87)
Cash-out refinance	-13.80***	-13.78***	-9.26***	-13.80***
	(0.24)	(0.24)	(0.28)	(0.24)
Rate & term refinance	-11.17***	-11.18***	-8.66***	-11.17***
	(0.42)	(0.42)	(0.50)	(0.42)
Documentation type				
Business Bank Statements	8.45***	8.44***	5.96***	8.44***
	(1.80)	(1.80)	(1.64)	(1.80)
Limited	40.52***	40.51***	37.12***	40.52***
	(0.25)	(0.25)	(0.30)	(0.25)
Lite Doc	29.79***	29.92***	16.49***	29.79***
	(1.29)	(1.29)	(1.44)	(1.29)
No Doc	48.96***	49.20***	38.75***	48.99***
	(3.79)	(3.79)	(6.72)	(3.79)
No Ratio	-15.86***	-15.87***	-14.79***	-15.82***
	(5.19)	(5.19)	(7.44)	(5.19)
Stated Income	43.66***	43.67***	30.17***	43.60***
	(7.11)	(7.09)	(5.79)	(7.12)

	Model (4)	Model (4-RF)	Model (4-X)	Model (4-Y)
			Interact Ethnicity &	
		Interact Race &	Race	Allow Multiple Race
Dependent variable: APR (basis points)		FICO	(2004-2007 only)	Classifications
Income Stated Loan Plus	-17.29***	-17.42***		-17.29***
	(1.30)	(1.34)		(1.30)
Xpress Full Doc	20.27***	20.68***	20.64***	20.27***
	(1.56)	(1.57)	(1.36)	(1.56)
Xpress Stated Income	65.07***	65.52***	63.01***	65.08***
	(2.00)	(2.01)	(1.74)	(2.00)
1-to-12-month prepayment penalty	12.12***	12.16***	12.54***	12.12***
	(0.60)	(0.60)	(0.71)	(0.60)
13-to-24-month prepayment penalty	-15.33***	-15.36***	-8.15***	-15.34***
	(0.34)	(0.34)	(0.42)	(0.34)
25-to-36-month prepayment penalty	-12.62***	-12.66***	-10.12***	-12.62***
	(0.50)	(0.50)	(0.63)	(0.50)
37-to-60-month prepayment penalty	-68.40***	-67.88***	19.25	-68.45***
	(10.32)	(10.30)	(14.87)	(10.32)
Occupancy & property type				
Non-owner occupied, condo/hotel	2.22	1.81	19.51	2.05
	(19.58)	(19.52)	(16.83)	(19.63)
Non-owner occupied, 1-4 story condo	74.91***	75.04***	69.97***	74.91***
	(1.52)	(1.52)	(1.70)	(1.52)
Non-owner occupied, 4+ story condo	87.17***	87.23***	80.60***	87.17***
	(4.80)	(4.80)	(4.96)	(4.80)
Non-owner occupied, condo conversion	96.44***	95.96***	89.87***	96.44***
	(8.90)	(8.89)	(8.53)	(8.90)
Non-owner occupied, manufactured housing	109.06***	109.44***	48.02	109.10***
	(11.25)	(11.27)	(31.81)	(11.25)
Non-owner occupied, Planned Urban Development	53.32***	53.29***	52.28***	53.31***
	(1.56)	(1.56)	(1.69)	(1.56)
Non-owner occupied, single-family home	64.33***	64.62***	60.93***	64.32***
	(0.51)	(0.52)	(0.58)	(0.51)
Non-owner occupied, 2-4 units	85.60***	85.81***	76.26***	85.59***
	(0.67)	(0.67)	(0.80)	(0.67)
Owner occupied, ATH	68.07***	67.96***	61.17***	68.13***
	(1.63)	(1.75)	(1.91)	(1.64)
Owner occupied, condo/hotel	-13.14	-13.12	-4.61	-13.10
	(24.58)	(24.70)	(21.20)	(24.58)
Owner occupied, 1-4 story condo	11.65***	11.70***	8.39***	11.66***
	(0.49)	(0.49)	(0.57)	(0.49)
Owner occupied, 4+ story condo	20.28***	20.27***	17.38***	20.29***
	(1.80)	(1.80)	(2.13)	(1.80)
Owner occupied, condo conversion	24.21***	23.96***	26.29***	24.24***
	(5.24)	(5.25)	(4.82)	(5.24)
Owner occupied, co-op	-53.63**	-52.69*	-68.83**	-54.04**
	(27.28)	(27.13)	(27.26)	(27.05)
Owner occupied, manufactured housing	47.96***	47.96***	55.30***	47.95***
	(0.86)	(0.87)	(1.29)	(0.86)
Owner occupied, Planned Urban Development	-4.13***	-4.06***	-5.89***	-4.12***
	(0.40)	(0.40)	(0.46)	(0.40)
Owner occupied, 2-4 units	13.33***	13.29***	8.15***	13.33***
	(0.46)	(0.46)	(0.55)	(0.46)
Second home, condo/hotel	-6.76	-7.01	5.90	-6.85
	(11.99)	(12.05)	(10.02)	(11.99)
Second home, 1-4 story condo	14.54***	14.63***	15.53***	14.54***
	(2.21)	(2.21)	(2.51)	(2.21)
Second home, 4+ story condo	27.87***	27.86***	29.11***	27.88***
	(5.01)	(5.01)	(6.03)	(5.01)
Second home, condo conversion	47.09***	45.99***	46.37***	47.14***
	(16.32)	(16.27)	(16.48)	(16.31)
Second home, manufactured housing	37.55***	37.71***	38.30***	37.58***
	(6.49)	(6.48)	(9.61)	(6.49)
Second home, Planned Urban Development	-8.30***	-8.32***	-3.05	-8.32***
	(1.89)	(1.89)	(2.32)	(1.89)
Second home, single-family home	-1.37	-1.30	1.82	-1.37
	(1.03)	(1.03)	(1.19)	(1.03)
Second home, 2-4 units	29.13***	29.04***	28.81***	29.13***
	(5.91)	(5.90)	(7.14)	(5.91)
Loan program category				
10-year fixed	81.23***	81.38***	106.38***	81.23***
	(4.02)	(4.01)	(5.37)	(4.02)
15-year ARM, initial rate fixed 6 months	64.18	64.19	77.16	64.15
	(80.00)	(79.85)	(78.40)	(80.01)
15-year ARM, initial rate fixed 2 years	67.07***	66.87***	102.68***	67.07***
	(2.50)	(2.50)	(3.18)	(2.50)
15-year ARM, initial rate fixed 3 years	27.47***	27.38***	61.45***	27.43***
	(8.43)	(8.40)	(11.88)	(8.43)
15-year fixed	45.55***	45.59***	43.28***	45.55***
	(0.96)	(0.96)	(1.50)	(0.96)
15-year fixed balloon	68.66***	68.53***	-4.24	68.65***
	(1.38)	(1.38)	(43.51)	(1.38)

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Dependent variable: APR (basis points)	Model (4)	Model (4-RF) Interact Race & FICO	Model (4-X) Interact Ethnicity & Race (2004-2007 only)	Model (4-Y) Allow Multiple Race Classifications
20-year fixed	54.39***	54.42***	44.16***	54.39***
	(1.07)	(1.07)	(1.69)	(1.07)
25-year ARM	59.32***	60.40***	98.93***	59.34***
	(1.31)	(1.40)	(1.41)	(1.31)
30-year ARM, initial rate fixed 6 months	61.57***	61.49***	115.55***	61.55***
	(4.14)	(4.14)	(4.40)	(4.14)
30-year ARM, initial rate fixed 2 years	44.38***	44.30***	89.60***	44.38***
	(0.46)	(0.46)	(0.55)	(0.46)
30-year ARM, initial rate fixed 3 years	22.33***	22.18***	66.81***	22.33***
	(0.58)	(0.58)	(0.75)	(0.58)
30-year ARM, initial rate fixed 5 years	28.31***	28.14***	62.05***	28.32***
	(0.86)	(0.86)	(0.87)	(0.86)
30-year ARM, initial rate fixed 15 years	47.36***	47.24***	37.07***	47.36***
	(2.26)	(2.26)	(9.26)	(2.27)
30-year interest-only ARM, initial rate fixed 2 years	62.29***	61.88***	94.45***	62.28***
	(0.58)	(0.58)	(0.65)	(0.58)
30-year interest-only ARM, initial rate fixed 3 years	30.02***	29.82***	64.78***	30.02***
	(1.38)	(1.38)	(1.38)	(1.38)
30-year interest-only ARM, initial rate fixed 5 years	8.92***	8.67***	43.19***	8.92***
	(1.10)	(1.10)	(1.10)	(1.10)
30-year interest-only ARM, initial rate fixed 15 years	-34.24**	-34.73**	-0.77	-34.32**
	(15.67)	(15.78)	(15.34)	(15.64)
30-year ARM balloon, initial rate fixed 6 months	119.35***	119.35***	154.23***	119.43***
	(15.99)	(15.86)	(16.14)	(15.98)
30-year ARM balloon, initial rate fixed 2 years	94.17***	94.08***	126.06***	94.17***
	(0.59)	(0.59)	(0.65)	(0.59)
30-year ARM balloon, initial rate fixed 3 years	75.43***	75.36***	106.60***	75.42***
	(1.23)	(1.23)	(1.23)	(1.23)
30-year ARM balloon, initial rate fixed 5 years	40.12***	39.84***	71.57***	40.12***
	(0.97)	(0.97)	(0.96)	(0.97)
30-year interest-only fixed	-96.21***	-96.30***	-63.67***	-96.22***
	(2.09)	(2.09)	(2.11)	(2.09)
30-year fixed balloon	-153.13***	-153.14***	-121.04***	-153.14***
	(1.19)	(1.19)	(1.21)	(1.19)
Constant	968.07***	970.46***	996.98***	970.24***
	(3.87)	(4.57)	(17.99)	(3.94)
Observations	865052	865052	560536	865052
R-squared	0.73608	0.73627	0.77146	0.73608
Adjusted R-squared	0.73601	0.73617	0.77137	0.73601

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Coefficients and standard errors for rate lock month and state 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 co-borrower 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). Model (4-X) is only estimated for 2004-2007 loans because those are the only years in which race and ethnicity are reported separately in the data. 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, Native Hawaiian, or Other Pacific Islander, 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 "White" if (1) the race listed for the borrower is White, (2) the co-borrower's race is White, not applicable, or unknown, and (3) 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.