**UNITED STATES DISTRICT COURT**
**NORTHERN DISTRICT OF CALIFORNIA**

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| In re WELLS FARGO MORTGAGE LENDING PRACTICES LITIGATION | ) ) ) ) ) ) ) ) |

Case No. 08-CV-01930-MMC (JL)

**CLASS CERTIFICATION REPORT**
**OF HOWELL E. JACKSON**

CONFIDENTIAL—SUBJECT TO PROTECTIVE ORDER

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## I.   INTRODUCTION

1.      I have been asked by counsel for Gilbert Ventura, Sr., Tracy D. Ventura, Juan Rodriguez, Josefina Rodriguez, Howard Queensborough, Ruby Brown, Judy A. Williams, and similarly situated individuals ("Plaintiffs") to analyze whether (1) disparate impact of the mortgage loan pricing policies of Wells Fargo Bank, N.A. ("Wells Fargo" or "Defendant") on Class members can be proven with common evidence and methods, (2) the claims made by the named Plaintiffs are typical of the Class, and (3) the calculation of individual and aggregate monetary relief is manageable and may be reliably performed on an aggregate or class-wide basis. I have read the Amended Complaint ("Complaint"), filed December 4, 2009, in this matter. This and other materials that I relied upon in forming my opinions are listed in Appendix 1.[1]

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

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1.   Consultants from Oakton Partners provided assistance in the preparation of this report.
2.   First Consolidated and Amended Class Action Complaint, Case No. 08-CV-01930-MMC (JL), ¶ 2 [hereinafter *Complaint*].
3.   *Id.*, ¶45.

of exposure to discretionary points, fees, and interest rate mark-ups.[4] These allegations have been brought pursuant to the Equal Credit Opportunity Act (ECOA) and the Fair Housing Act (FHA).[5]

3.       Plaintiffs have brought an action on behalf of themselves and a proposed class of borrowers defined as "all minority borrowers (the "Class") who entered into residential mortgage loan contracts with Defendant Wells Fargo between January 1, 2001 and the present (the "Class Period"), originated in Wells Fargo's wholesale or retail channel. For the purposes of this class definition the term "minority" means all borrowers defined as black or Hispanic for the purposes of HMDA."[6]

## II. QUALIFICATIONS

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

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4.   *Id*., ¶2.
5.   *Id*., ¶1.
6.   *Id*., ¶155.

Inter-Disciplinary Approach to Budget Policy (Cambridge University Press 2008), co-author of

Analytical Methods for Lawyers (Foundation Press 2003) and Regulation of Financial

Institutions (West 1999), and author of numerous scholarly articles. Before joining the Harvard

Law School faculty in 1989, I was a law clerk for Associate Justice Thurgood Marshall and

practiced law in Washington, D.C., from 1984 to 1989. I received J.D. and M.B.A. degrees from

Harvard University in 1982 and a B.A. from Brown University in 1976.

5.       I have previously consulted with government agencies and private litigants in

litigation involving allegations of abusive and discriminatory practices in the origination of

residential mortgages. In one of those cases, I submitted expert reports that are now subject to a

confidentiality agreement. Partially on the basis of that work, I have written several scholarly

articles and testified before the Senate Banking Committee.[7] I have also served as an expert

witness on behalf of the Internal Revenue Service in a case involving international banking

transactions and on behalf of corporate defendants in suits arising under the Employee

Retirement Income Security Act of 1974. My curriculum vitae is included as Appendix 2. I have

testified as an expert witness once at deposition or trial in the last four years (Appendix 3).

6.       I file this report in my individual capacity and have no financial stake in the

outcome of this case. My hourly rate in this matter is $750. My compensation is not contingent

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

report.

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7.   See Howell E. Jackson & Laurie Burlingame, *Kickbacks or Compensation: The Case of Yield Spread Premiums*, 12 STANFORD J. L. BUS. & FIN. 289 (2007); Howell E. Jackson, *The Trilateral Dilemma in Financial Regulation*, in IMPROVING THE EFFECTIVENESS OF FINANCIAL EDUCATION & SAVINGS PROGRAMS (Anna Maria Lusardi, ed.) (University of Chicago Press 2008); *Predatory Mortgage Lending Practices: Abusive Uses of Yield Spread Premiums: Hearing Before the S. Comm. on Banking, Housing & Urban Affairs*, 107th Cong. (2002) (statement of Howell E. Jackson, Finn M.W. Caspersen and Household International Professor of Law and Associate Dean for Research and Special Programs, Harvard Law School), *available at* http://banking.senate.gov/02_01hrg/010802/jackson.htm.

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### III. SUMMARY OF CONCLUSIONS

7.      The disparate impact of Defendant's Discretionary Pricing Policy on the proposed

Class may be proven here through evidence and methods that are common to the Class. As a

disparate impact case under ECOA and FHA, Plaintiffs' claims cannot be proven by looking

only to the circumstances of their individual loans. Rather, the only way to prove Plaintiffs' case

is on a class-wide basis—that is, to look at how Defendant's policies affect minorities versus

whites, in general. For the reasons detailed in this report, I conclude that Wells Fargo maintains

sufficient data concerning its borrowers to permit just the kind of class-wide examination of

Wells Fargo's policies as required by a disparate impact case. In addition, my analysis of the data

provided to Plaintiffs shows that minorities paid more for Wells Fargo retail and wholesale

mortgage loans than whites with similar risk-characteristics. Table 1 shows the difference in loan

costs (represented by the annual percentage rate, or "APR") paid by white and minority

borrowers for first-lien Wells Fargo loans originated from 2001 to 2007.[8]

TABLE 1: SUMMARY OF DISPARATE IMPACT & MONETARY RELIEF

|  | African Americans | Hispanics | Total |
|---|---|---|---|
| Mean APR for Given Minority | 6.940% | 6.511% | |
| Mean APR for Whites | 6.266% | 6.266% | |
| Difference | 0.674% | 0.245% | |
| Difference after Controlling for Relevant Risk Factors with Regressions | 0.101% | 0.064% | |
| Undiscounted Monetary Relief over Five Years ($ Millions) | $265.1 Mil. | $294.2 Mil. | $559.3 Mil. |
| Number of Borrowers | 294,983 | 452,471 | 747,454 |
| Undiscounted Monetary Relief over Five Years per Borrower | $899 | $650 | $748 |

As Table 1 shows, the mean APR of a Wells Fargo loan to white borrowers was 6.266 percent,

whereas the mean APR to African-American and Hispanic borrowers was 6.940 percent and

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8.   As discussed below, I restrict my analysis to first-lien loans.

6.511 percent, respectively. Even when controlling with regression analysis the risk-based factors used by lenders to price mortgage loans, the APRs for African Americans and Hispanics were 10.1 and 6.4 basis points higher than the APRs for whites.[9] Using assumptions and methodologies (discussed below) that can be further refined once merits discovery is complete, I calculate aggregate undiscounted monetary relief to African Americans and Hispanics of $559.3 million over the five years following loan origination—an average of $748 per minority borrower. Monetary relief can also be calculated for other periods as the court deems appropriate.

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

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

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9.   A basis point is equal to $1/100^{th}$ of a percentage point. These estimates are based on my preferred regression model; comparable estimates of statistically significant differences in APRs using alternative model specifications are discussed below and in the appendices to this report.

10.     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 to illustrate the harm resulting from Defendant's challenged conduct. This model estimates the finance charges Class members would have paid but-for Defendant's alleged practices. The model uses Defendant's own data on its mortgage originations and could be further refined using actual loan payment history from loan servicing data and other information. 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.

11.     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

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

### A.     Mortgage Industry Overview

#### 1.     Overview

13.     In recent years, the capital markets have played an increasingly important role in financing residential mortgages in the United States. For many decades, under a variety of programs overseen by government sponsored enterprises such as the Federal National Mortgage Association (Fannie Mae) and Federal Home Loan Mortgage Corporation (Freddie Mac), conforming loans (or prime loans) have been repackaged into mortgage backed securities in a

process known as securitization and funded through the capital markets. Since the mid 1990's, non-conforming residential mortgages (subprime, Alt-A and jumbo) have had access to capital market funding, initially through securitization transactions sponsored by private firms but later with support from expanded programs of the government sponsored enterprises.[10] Access to capital market funding sparked a dramatic increase in the origination of subprime and Alt-A residential mortgages, with annual originations ballooning from an estimated $190 billion and $60 billion in 2001 to $600 billion and $400 billion in 2006.[11] Over the same period, the percentage of subprime and Alt-A loans sold into the capital markets also expanded dramatically. By the mid 2000's, an estimated 75 percent of all new subprime and 91 percent of new Alt-A loans were sold into the capital markets.[12] Wells Fargo was among the top ten originators of subprime residential loans each year from 2002 to 2008.[13] In total mortgage originations, Wells Fargo was among the top three residential loan originators over the same period.[14]

14.     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

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

11. *Id.* at 2. According to the business line and channel information from the loan-level data provided to Plaintiffs, 93 percent of Wells Fargo's first-lien loans originated from 2001 to 2007 were Prime loans, with the rest classified as Alt-A (2 percent) or Subprime (5 percent). Bates No. WFB 282925 – WFB 282926.

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

13. *Id.* at 4; Souphala Chomsisengphet & Anthony Pennington-Cross, *The Evolution of the Subprime Mortgage Market*, 88 FED. RES. BANK OF ST. LOUIS REV. 31, 39 (Jan./Feb. 2006); Inside Mortgage Finance Publications, Inc., *The 2009 Mortgage Market Statistical Annual, Volume 1* (2009), at 211-221.

14. Inside Mortgage Finance Publications, Inc., *The 2009 Mortgage Market Statistical Annual, Volume 1* (2009), at 42-52.

then resell large pools of mortgages to capital market investors in securitization transactions.[15]

With this "originate to distribute" model, many major mortgage originators 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 metropolitan statistical area (MSA)),

and a limited number of loan features (e.g., prepayment penalties and repricing formulas for

adjustable rate mortgages).[16] Through the period at issue in this litigation, major mortgage

originators constantly monitored the secondary mortgage market to ascertain changes that may

affect the value of the loans that the firms are about to originate and used that information to

update the pricing of their new mortgage originations. Under this originate-to-distribute business

model, originator profits depend largely on the difference between the secondary market value of

a loan at the time of origination and the originator's cost of making the loan, including most

significantly the principal amount of the loan extended to the borrower and the credit risk factors

associated with the loan.

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

16. 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). See also Howell E. Jackson, *Loan-Level Disclosure in Securitization Transactions: A Problem with Three Dimensions*, in MOVING FORWARD: THE FUTURE OF CONSUMER CREDIT AND MORTGAGE FINANCE (forthcoming Brookings Press 2010), *available* at http://ssrn.com/abstract=1649657.

15.     During each year of the Class period, Wells Fargo was one of the largest non-agency[17] issuers of mortgage-backed securities in the United States.[18] **REDACTED**

**REDACTED**

**REDACTED**

16.     Mortgage originators such as Wells Fargo had several different ways to originate residential mortgages.[21] For some of the mortgage loans it originated, Wells Fargo utilized mortgage brokers to identify buyers and facilitate the loan origination process. This market is often called the wholesale market for loan originations and Wells Fargo was one of the five largest participants in the wholesale originations market in every year during the Class period.[22] Up to 26 percent of Wells Fargo's loans originated from 2001 to 2007, including three of the five

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17. The term "agency" refers to the government-sponsored agencies Fannie Mae, Freddie Mac, and Ginnie Mae.

18. Inside Mortgage Finance Publications, Inc., *The 2009 Mortgage Market Statistical Annual*, *Volume 2* (2009), at 17-24.

19.     **REDACTED**

20.     **REDACTED**

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

22. Inside Mortgage Finance Publications, Inc., *The 2009 Mortgage Market Statistical Annual*, *Volume 1* (2009), at 79-86.

named Plaintiffs' loans, were originated through wholesale brokers.[23] To apprise mortgage brokers of current prices, loan originators such as Wells Fargo would typically provide standardized "rate sheets" indicating the loan terms available for a variety of loans programs (including a spectrum of fixed- and adjustable-rate mortgages) and reflecting a range of loan characteristics, based on the factors described above that affect the price at which individual loans could be sold into the secondary market.[24] For each loan program, the rate sheet would typically also offer a range of different prices. The "par value" rate would be the interest rate at which the originator would offer to fund the loan at precisely the face amount of the loan – that is $100,000 for a mortgage with a $100,000 face amount. An "above par" loan would bear a higher interest rate and would carry a higher price than the rate sheet price – that is, an originator, such as Wells Fargo, would offer to pay a premium to fund the loan of as much as several percent of the loan amount.[25] These premiums, known in the industry as yield spread premiums, reflect the higher price the "above par" loans fetch when resold through securitization transactions, and might generate on a $100,000 mortgage loan an additional payment to the mortgage broker of several thousand dollars. Between the mid-1990's and the mid-2000's, yield spread premiums became an increasingly important source of compensation for mortgage brokers, and were often more significant than the other principal source of mortgage broker compensation, origination fees and direct charges. With yield spread premiums, the cost of

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23. Based on Wells Fargo's loan-level data and the business channel classification scheme provided to Plaintiffs, 26 percent of the 6.3 million Wells Fargo loans originated from 2001 to 2007 were identified as broker-originated wholesale loans. Bates No. WFB 282925.

24. See Jackson & Burlingame, *supra* note 7. See Deposition of Gregory Pahl Pearsall at 19-21 (Oct. 13, 2009) (describing preparation and distribution of Wells Fargo rate sheets for mortgage brokers).

25. Rate sheets also typically include a variety of "below par" loans with lower interest rates for each loan program. With below par loans, originators fund less than the face amount of a loan (perhaps $98,000 on a $100,000) and the 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.

mortgage broker compensation is imposed on borrowers in the form of higher interest payments over the life of the mortgage.

17.     Wells Fargo's pricing policy for its wholesale channel included a discretionary component in addition to the nondiscretionary pricing structure reflected in Wells Fargo rate sheets. Through the wholesale lending channel, Wells Fargo like many other major mortgage lenders established a system that allowed their mortgage brokers substantial discretion in loan pricing, which allowed those brokers the opportunity and incentive to increase their compensation. This discretion comes from two sources. First, within fairly liberal constraints established for Wells Fargo loan programs, mortgage brokers could steer borrowers to above par loans with higher interest rates and larger yield spread premiums. In addition, the mortgage brokers had similar discretion in imposing upfront charges—that is, cash charges such as origination points or processing fees. Mortgage brokers working for firms such as Wells Fargo typically received compensation in the form of a combination of yield spread premiums and direct upfront charges.[26] As explained below, both of these forms of discretionary mortgage broker compensation constitute finance charges on the loans that Wells Fargo originated and thus factor into the cost of Wells Fargo loans as reflected in the APRs of these loans.

18.     The second major channel of mortgage originations by lenders such as Wells Fargo would be direct lending operations, sometimes referred to as retail loans. For Wells Fargo, these loans constitute the bulk of its residential mortgage originations, and were originated either through telemarketing processing centers or through home mortgage consultants at Wells Fargo

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26. See Deposition of Michael Christopher Murphy at 50-51 (Sept. 15, 2009) ("Generally, when it comes to compensation, I'll let them know there's three different ways I can be compensated. And that's by charging on the front of the loan, by making compensation on the back end of the loan, or a combination of the two.").

branches.[27] This channel is comparable to wholesale lending in that the originator's retail office is provided objective pricing information similar to the rate sheets provided to mortgage brokers.[28] <span>REDACTED</span>

<span>REDACTED</span>

<span>REDACTED</span> At Wells Fargo, sales personnel working in the retail channels were known as mortgage consultants and, like mortgage brokers in the wholesale channel, had discretion in setting interest rates on mortgage originations and adjusting fees.[29] 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 interest rates do, however, represent more valuable assets – whether by commanding higher prices when sold into loan securitization transactions or through generating more revenues as portfolio holdings – and so mortgage lenders do generate more profits when their retail offices steer borrowers into higher interest loans. REDACTED

REDACTED

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REDACTED Based on Wells Fargo's loan-level data

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27. See Deposition of Dominic Alfonso at 48, 49 (Nov. 10, 2009).
28. See Deposition of Jill Ann Hunt at 106-107 (June 17, 2009).
29. See *id.* at 79.
30. REDACTED

31. REDACTED

provided to Plaintiffs, 74 percent (4.6 million) of Wells Fargo loans originated from 2001 to 2007 were retail originations.[32]

19.     A third and less common channel for mortgage originations is through correspondent banking arrangements under which a correspondent bank identifies the borrower and facilitates the transaction. Economically, correspondent mortgage originations are similar to the wholesale market via mortgage brokers, though originators may devise separate loan programs and rate sheets for their correspondent relationships. Wells Fargo was one of the five largest correspondent lenders in the United States in every year from 2001 to 2008.[33] Correspondent loans are loans that Wells Fargo acquired from third-party lenders.[34] Plaintiffs do not include Wells Fargo's correspondent loans in the Class, and loan-level data on Wells Fargo's correspondent loans has not been provided to Plaintiffs as of the date of this report.

20.     A system of Federal regulations governed the disclosure of information to borrowers in residential mortgage originations during the Class Period. Under the Real Estate Settlement Procedures Act, originators were required to disclose both direct compensation and yield spread premiums paid to mortgage brokers for loan originations.[35] Retail originators were required to report direct compensation. Under regulations promulgated by the Federal Reserve Board under the Truth in Lending Act, borrowers were also required to be informed of the annual percentage rate (APR) of mortgage loans, an estimate of interest rates reflecting both the direct costs of origination (including origination fees and other direct charges) as well as

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32. Bates No. WFB 282925.
33. Inside Mortgage Finance Publications, Inc., *The 2009 Mortgage Market Statistical Annual, Volume 1* (2009), at 79-86.
34. See Deposition of Thomas Navara at 8 (June 19, 2009).
35. Jackson & Burlingame, *supra* note 7.

projected interest rates over the life of the loans.[36] The APR reflects the cost of yield spread

premiums on wholesale loans and of analogous overages on retail loans (to the extent such

overages reflected higher interest rates) as well as other financing charges and is generally

regarded as a more accurate measure of the costs of borrowing than the stated interest rate on a

loan.[37] 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.[38]

Finally, under the Equal Credit Opportunity Act[39] and Fair Housing Act,[40] mortgage originators

such as Wells Fargo are prohibited from engaging in discriminatory lending practices.

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

21.     Over the past two decades, a large number of academic studies have explored the

relationship between borrower race and the availability or the cost of obtaining residential

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

(2009)[41] and Courchane (2007).[42] As explained in greater detail in these reviews, early academic

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36. 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 (including lender points and broker fees) as components of APRs. See *id*. §226.18(b).

37. 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).

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

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

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

41. See White, *supra* note 21.

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

studies focused on the relationship between mortgage denials and the racial composition of neighborhoods.[43] 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.[44] The Urban Institute findings were based in part on paired audit testing conducted by the National Fair Housing Alliance that was carried out by people of different racial and ethnic backgrounds in a sample of seven cities. Each group of testers - including one white and one or more minorities - told lenders they had similar credit histories, incomes and financial histories, and had the same type of mortgage needs. The testing found that minorities were less likely to receive information about loan products, and received less time and information from loan officers. Most importantly for our purposes, this audit study found that minorities "were quoted higher interest rates in most of the cities where tests were conducted."[45]

22.     These earlier studies were suggestive of significant racial effects, but suffered from an absence of controls for credit risk and other underwriting considerations when examining substantially large samples of actual loan originations as opposed to more limited audit tests. Over time, as government reporting requirements improved and litigation and various investigations offered more complete data sets, researchers were able to include a number of these controls in their studies and developed more complete empirical models of the residential

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

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

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

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

mortgage origination process. Some focused on the impact of race on credit spreads and found statistically significant racial disparities.[46] Later studies expanded this analysis by controlling for loan channels, and found reduced, but still statistically significant racial effect on the APR of mortgage loans.[47] Yet other studies, including my own published work, found statistically and economically significant racial disparities in the amount of compensation earned by mortgage brokers on residential mortgage originals and in FHA closing costs charged to borrowers.[48]

23.      The notion that minority borrowers may pay more for home loans than similarly situated white borrowers due to discretionary pricing policies is not altogether surprising. A wide body of literature has shown that individuals can be influenced (even subconsciously) by race. The theory that the racial disparities in borrowing costs are the by-product (at least in part) of 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.[49] For example, the Implicit

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46. See Avery et al., *supra* note 38; 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 Subrime Lending* (Sept. 2005), *available at* http://www.consumerfed.org/pdfs/Subprimecities090805.pdf; and Allen J. Fishbein & Patrick Woodall, Consumer Federation of America, *Subprime Locations: Patterns of Geographic Disparity* (Sept. 2006), *available at* http://www.consumerfed.org/pdfs/SubprimeLocationsStudy090506.pdf (finding correlations between race and participation in subprime loan markets).

47. See Courchane, *supra* note 42; but see White, *supra* note 21, at 685-686 (questioning the appropriateness of controlling for loan channels). See also LaCour-Little, *supra* note 21 (finding racial effects on note rates in some but not all models based on a sample of loans within conforming loan size parameters).

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

49. *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).

Attitudes Tests (which can be completed in less than 5 minutes on the Internet)[50] suggest that many people of professed goodwill find it impossible not to treat African-American pictures differently than white pictures when asked to perform a simple sorting exercise. These tests are part of a growing literature documenting unconscious bias against African Americans and other minorities.[51] These studies are relevant to this litigation because, to the extent that economic decisionmakers often harbor unconscious, but biased racial stereotypes, it becomes more plausible that the subjective pricing process that Wells Fargo 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.")[52]

24.     There is a substantial body of empirical evidence finding that, even after controlling for differences in credit quality and other legitimate cost differentials, financial firms often charge minority borrowers more for credit than they charge similarly situation non-

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

51.  *See, e.g.*, Eric J. Vanman et al., *The Modem 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 Steroytpes 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).

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

minority borrowers. Outside of the mortgage field summarized earlier, this evidence extends to automobile financing,[53] commercial lending,[54] and even foreign lending markets.[55]

25.     Wells Fargo's Discretionary Pricing Policy was, in my view, susceptible to discrimination.[56] REDACTED

REDACTED

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

54.  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).

55.  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.

56.  That Wells Fargo's mortgage brokers might engage in discriminatory lending practices that could implicate Wells Fargo's legal obligations is confirmed by section 107.00 in Wells Fargo's Wholesale Lending Broker Origination Guide which is incorporated in Wells Fargo's agreements with mortgage brokers, which states that "Discrimination based on race, color, sexual orientation, disability, national or ethnic origin, marital or familial status, religion or age is contrary to Wells Fargo Wholesale Lending's fundamental principle and commitment and is unlawful.". See Wells Fargo Wholesale Lending Broker Guide ¶ 107.00, Deposition of James Wyble Exhibit 2 (Feb. 6, 2009). See also Deposition of James Wyble Exhibit 12 (June 4, 2009)

57.  REDACTED

58.  REDACTED

REDACTED

26.     An additional dimension of discretion relates to Wells Fargo's practice of granting pricing exceptions at the request of mortgage brokers.[60] That is, while mortgage brokers were initially required to price wholesale mortgages from objective rate sheets, Wells Fargo had a practice of granting exceptions, which created another source of discretion in the pricing of wholesale mortgages. Additionally, Wells Fargo witnesses have testified at deposition that the underwriting for all subprime loans was manual rather than automated.[61] Again, this latitude that Wells Fargo afforded its mortgage brokers increased the likelihood of discriminatory pricing with respect to vulnerable minority borrowers. Within the retail channel, branch managers also apparently had authority to make pricing exceptions.[62]

## B.     Introduction to Disparate Impact Testing

27.     A simple calculation of the average cost of a loan for borrowers of each race can show whether minorities pay more, on average, than white borrowers. In addition, one can break down the set of Wells Fargo loans into subsets to determine whether minority borrowers with

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59.                            REDACTED

60.  See Deposition of James Wyble at 198-206 (Feb. 6, 2009).

61.  Deposition of Dominic Alfonso at 202 (Nov. 10, 2009) ("Q. Are you aware of something called a – referred to as the decisioning engine in connection with underwriting? A. Yes. Q. And what does that refer to? A. A decisioning engine is a – we use for prime underwriting; not for subprime underwriting. Q. Okay. Is there any engine that's used in connection with subprime underwriting? A. No. Subprime is all manual.")

62.  See Deposition of Jill Ann Hunt at 176-177 (June 17, 2009).

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 minorities pay more for their loans than whites with similar risk characteristics.

28.      Regression analysis is a statistical method for determining the relationship that exists in a set of data between a variable to be explained—called the "dependent variable"—and one or more "explanatory variables." The type of regression analysis I use to evaluate disparate impact is known as "ordinary least squares" (OLS). In this case, the dependent variable is the cost of the loan to the consumer. This cost is reflected in the form of the APR of the loan, which is the measure that the staff of the Federal Reserve Board devised to communicate accurately the total cost of a loan to a consumer.[63] The explanatory variables include the race and ethnicity of the borrower and other non-race characteristics of the borrower and property that affect the cost of the loan to the lender. The regression model will show whether minority borrowers paid disproportionately higher APRs than non-minority borrowers even after controlling for plausible non-race "legitimate business need" characteristics.

### 1.      Prima Facie Evidence of Discrimination

29.      The appropriate test for assessing whether there is a *prima facie* disparate racial impact is both simple and straightforward. One must simply compare the average finance charges incurred by minority and white borrowers. To the extent one finds that the average finance charge paid by minority Wells Fargo borrowers is statistically larger than that paid by

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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).

white Wells Fargo borrowers, this evidence is consistent with an inference that the Defendant's Discretionary Pricing Policy has a disparate racial impact.

30.     In Section V.C of this report, I present statistics that show *prima facie* disparate racial impact. African-American borrowers incurred APRs on their residential mortgages that were on average 67.39 basis points higher than whites over the period 2001-2007. See Table 5, Column 1. Hispanic borrowers incurred APRs that were 24.53 basis points higher than whites over the same period. These differences are statistically significant at a high level of confidence.

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

31.     It is also possible with the aggregate data made available from Wells Fargo 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 differential pricing practice among borrowers. If, after including these "legitimate business need" variables in the regression, the racial disparity remains and is statistically significant, then the data establishes a strong inference of racial discrimination against the affected class.

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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).

32.     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 detect discriminatory lending practices in financial institutions. And, particularly since the Home Mortgage Disclosure Act (HMDA) amendments went into effect in 2004, borrower APRs as defined under the Truth-in-Lending Act is the most common measure of the cost of borrowing in these analyses.[65]

33.     A regression testing for unjustified disparate impacts should control for only those variables that would provide a plausible valid business justification. It is my opinion that only attributes related to a decisionmaker's expected marginal cost[66] provide a valid business justification – and hence only such attributes should be included in the business justification regression. This standard resonates with the standard approach in the literature. For example, John Yinger succinctly describes (i) the problem of "included variable bias" (what he calls "diverting variable bias"); (ii) the need to purposefully exclude certain non-legitimate controls from a regression; and (iii) what constitutes "legitimate" controls:

> Diverting variable bias arises when a variable that is not a legitimate control variable, but that is correlated with race or ethnicity, is included in the regression. The key issue, of course, is how to define what variables are "legitimate." Under most circumstances, economists are taught to err on the side of including too many variables. In this case, however, illegitimate controls may pick up some of the effect of race or ethnicity and lead one to conclude that there is no discrimination when in

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

66. "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.

> 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.[67]

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 relevant:

> Discrimination occurs whenever the terms of a transaction are affected by personal characteristics of the participants that are not relevant to the transaction. In credit markets, discrimination on the basis of race and/or gender exist if loan approval rates or interest rates charged differ across groups with equal ability to repay.[68]

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.[69]

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.[70]

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

68.  Blanchflower, et al., *supra* note 54, at 930.

69.  *Id.* at 940.

70.  See *A.B. & S. Auto Service, Inc. v. South Shore Bank of Chicago*, 962 F. Supp. 1056 (N.D. Ill. 1997) ("[In a disparate impact claim under the ECOA], once the plaintiff has made the prima facie case, the defendant-lender must demonstrate that any policy, procedure, or practice has a manifest relationship to the creditworthiness of the applicant….In other words, the onus is on the defendant to show that the particular practice makes defendant's credit evaluation system more predictive than it would be otherwise."). See also *Lewis v. ACB Business Services, Inc.*, 135 F.3d 389, 406 (6th Cir. 1998) ("The Act was only intended to prohibit credit determinations based on 'characteristics unrelated to creditworthiness.'"). Attributes related solely to the potential for supra-competitive revenues that a lender or broker might extract from different classes of consumers do not constitute a valid business justification. Extracting supra-competitive revenues from a class of consumers – not because they impose higher

34.     Wells Fargo's centralized electronic databases include abundant and comprehensive evidence of the basis on which Wells Fargo evaluated individual borrowers' creditworthiness. Wells Fargo's electronic data would allow them to statistically evaluate factors related to the borrower's credit history, the loan collateral, the borrower's "capacity" to borrow and the borrower's stability.

35.     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.[71]

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

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costs on a seller but merely because the seller has the power to do so – is not consistent with business necessity (and thus would constitute an unjustified disparate impact). Sellers are justified in charging higher prices to cover their expected costs of serving particular types of consumers. Such pricing is consistent with business necessity. But sellers are not justified in charging higher prices to a disproportionately African-American and Hispanic class of consumers simply to make supra-competitive profits.

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

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.[72]

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

- Loan pricing decisions are made en masse by automated systems of regularly updated rate sheets used for both wholesale and retail origination channels[73] and

- Loan pricing decisions are based on the formulaic application of objective, statistically-validated criteria, which also determine the price at which loans are sold into the secondary market.

The whole purpose of this centralized credit pricing process is to base credit determinations on arms-length, objective criteria whose validity can be periodically assessed with aggregate statistical analysis. This pricing model is supported through an objective underwriting process, which is designed to avoid bias against certain classes of consumers.[74] 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.

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

73.  See Deposition of Gregory Pahl Pearsall at 64-65 (Oct. 13, 2009) (explaining "[a]ll rates [on wholesale rate sheets] were determined by rate sheet characteristics"); Deposition of James Wyble at 169 (Feb, 6, 2009) (describing non-prime rate sheets); Deposition of Dominic Alfonso at 202 (Nov. 10, 2009) ("Q. Have you ever heard of a pricing engine? A. Yes. Q. What does that refer to? A. That was the -- the computer engine that price -- our pricing department used to price the [retail] loans.").

74.  In terms of loan underwriting, as noted above (see *supra* note 61), Wells Fargo utilized an automated underwriting process for prime loans and a manual, but an objective and race-neutral underwriting process for nonprime loans. See Deposition of Dominic Alfonso at 202, 229 (Nov. 10, 2009) ("Q. Because the factors that you're applying are objective; is that correct? A. I – because they're objective? Yes, we're objective. Q. And do you consider race at all in the underwriting process? A. No.").

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

37.     In this section, I describe Defendant's mortgage loan data provided to Plaintiffs, which is common evidence that I use to show the disparate impact of Defendant's Discretionary Pricing Policy to minority borrowers.

### A.     Overview of Defendant's Data

38.     Plaintiffs have been provided with a database of loans originated by Wells Fargo from 2001 through 2007 ("Defendant's loan database") along with files and correspondences from Wells Fargo's counsel explaining the data contained in that database.[75] This data constitutes common evidence of disparate impact to the Class. Defendant's loan database includes data about the applicants and the applicants' properties that Wells Fargo 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 Wells Fargo pursuant to HMDA regulations, including race and ethnicity.

39.     Each loan in Defendant's loan database is identified by a unique loan number. Loans in Defendant's loan database are classified as being originated in one of seven retail channels or one of six wholesale channels.[76] The database also includes a field representing the

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75.  Bates No. WFB 282925 – WFB 282926; Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (Nov. 13, 2009); Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., Gary Klein, Roddy Klein & Ryan, and Mark A. Chavez, Chavez & Gertler LLP (May 11, 2010); Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Gary Klein, Roddy Klein & Ryan (May 13, 2010); Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Gary Klein, Roddy Klein & Ryan (June 1, 2010); Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (July 1, 2010); Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (July 12, 2010).

76.  The seven retail channels are Centralized Retail Prime, Distributed Retail Prime, Retail AA (Alt-A Prime), Retail AM (Alt-A Minus), Retail Global Nonprime, Retail MEAA (Mortgage Express Alt-A), and Retail TNP (Traditional Nonprime). The six wholesale channels are Wholesale AA (Alt-A Prime), Wholesale AM (Alt-A Minus), Wholesale Global Nonprime, Wholesale MEAA (Mortgage Express Alt-A), Wholesale Prime, and Wholesale TNP (Traditional Nonprime).

lien status of the loan. I exclude subordinate-lien loans ████ REDACTED █████

████████████████████████████ from my analysis.[77] The lien status is not given

in Defendant's loan database for loans originated from 2001 to 2003 because HMDA reporting

regulations at the time did not require the reporting of lien status.[78] As of the date of this report,

Defendant has not provided supplemental data on the lien status for these loans.[79] I include all

these 2001-2003 loans in my analysis despite the lack of data on lien status. I reserve the right to

modify my analysis should additional data become available.

40.      Defendant's loan database includes information on the race and ethnicity of the

borrower and co-borrower. These race classifications appear to follow the conventions set forth

through HMDA data filing requirements. Before 2004, loan applicant race and ethnicity were

identified in a single variable according to the HMDA standards.[80] 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

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77.  Nearly all of the loans labeled as subordinate lien loans in Defendant's loan database were originated along with a first-lien Wells Fargo 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, such as broker fees, would be allocated to the first-lien loan in such combinations. For example, no loans classified as subordinate-lien loans in Defendant's loan database have a value for net total broker compensation. Because the APRs for subordinate lien loans may not include the same upfront fees that would be included for first-lien loans, and because subordinate-lien loans comprise such a small sample of the loans in the data, I exclude them from my analysis at this time. I reserve the right to undertake additional analysis of the relationship between subordinated and first-lien loans.

78.  Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (July 1, 2010).

79.  Defendant's counsel has indicated that they are investigating whether the information on the lien status of 2001-2003 loans is available. Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (July 12, 2010).

80.  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.

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.

41.     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".[81]

42.     For purposes of my basic analysis,[82] I assign each loan to a single race based on

the race and ethnicity of the borrower or co-borrower in Defendant's loan database in a

sequential order. First, I classify the race of a loan as "African American" if any of the races

given for either the borrower or co-borrower is African American. Next, I classify the race of a

loan as "Hispanic" if (1) the 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) any of the races given for either 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

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81. *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).

82. 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.

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

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

| Year | African American | Hispanic | American Indian | Asian | Missing | White | Total |
|---|---|---|---|---|---|---|---|
| 2001 | 35,883 | 53,126 | 3,111 | 37,900 | 107,359 | 557,555 | 796,935 |
| 2002 | 48,954 | 75,357 | 4,067 | 64,653 | 143,477 | 799,891 | 1,138,401 |
| 2003 | 67,447 | 104,968 | 6,064 | 76,043 | 142,303 | 1,088,582 | 1,487,410 |
| 2004 | 35,683 | 49,824 | 2,688 | 36,373 | 60,712 | 432,354 | 619,638 |
| 2005 | 43,372 | 62,485 | 3,266 | 42,987 | 96,844 | 522,160 | 773,119 |
| 2006 | 51,859 | 82,177 | 3,292 | 43,285 | 115,127 | 457,711 | 755,457 |
| 2007 | 43,913 | 70,497 | 3,090 | 39,625 | 100,933 | 432,027 | 757,428 |
| **Total** | **327,111** | **498,434** | **25,578** | **340,866** | **766,755** | **4,290,280** | **6,328,388** |
| **% of Total** | **5.2%** | **7.9%** | **0.4%** | **5.4%** | **12.1%** | **67.8%** | **100.0%** |

As Table 2 shows, 5.2 percent of the loans in Defendant's loan database were made to African-American borrowers, and another 7.9 percent were made to Hispanic borrowers. At least 825,000 Wells Fargo loans were made to African-American and Hispanic borrowers from 2001 to 2007.

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

interest rate for disparities would not account for disparities caused by anticipated future interest rate changes for adjustable-rate loans, especially if the initial interest rate is a low "teaser" rate in effect for a brief period. In addition, unlike the APR, the note rate does not incorporate any upfront fees paid by the borrower. For example, the loan for the named plaintiff Queensborough's loan has an APR (9.894 percent) that is nearly two percentage points higher than the initial interest rate of the loan (7.95 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.

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

45.     Loan characteristics in the database include the loan amount, the purpose of the loan (such as purchase, cash-out refinance, or rate term refinance), the term length of the loan (10-year, 15-year, 30-year, etc.), and the length of any prepayment penalty. The database also categorizes each loan from 2001 to 2007 by one of 37 unique loan product codes. General descriptions of the meaning and structure for the loan program codes are provided in

documentation provided to Plaintiffs.[83]   ██████   REDACTED   ██████

████████████████████████████████████████████████

████████████████████  Using this information, I categorized the 37 unique loan product

codes into 11 categories of loans based on their term structure, such as 30-year fixed, 15-year

fixed, and 5-year ARM.

46.   Appendix 4 includes summary statistics of the loan cost variables and the other

borrower, home, and loan characteristics contained in Defendant's loan database.[84] Should Wells

Fargo produce additional variables to Plaintiffs that would be appropriate to incorporate in a

disparate impact analysis, I will update my analysis accordingly.

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

47.   As I discussed above, regression analysis is the primary tool I use to estimate

disparity in the cost to minorities for Wells Fargo 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 Wells Fargo

mortgages for minorities and for whites. Table 3 shows the mean APR for loans made to whites

and minorities in Defendant's loan database.

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83.  Bates No. WFB 282925 – WFB 282926.
84.  Various technical refinements to the data set are presented in the note to Appendix 4.

TABLE 3: MEAN APR BY RACE, 2001-2007

| Year | Mean for White Borrowers | Mean for African-American Borrowers | Difference between African-American & White Borrowers | Mean APR for Hispanic Borrowers | Difference between Hispanic & White Borrowers |
|---|---|---|---|---|---|
| *APR (%)* | | | | | |
| 2001 | 7.044 | 7.625 | *0.581* | 7.334 | *0.290* |
| 2002 | 6.463 | 7.080 | *0.617* | 6.853 | *0.390* |
| 2003 | 5.650 | 6.198 | *0.548* | 5.976 | *0.325* |
| 2004 | 5.714 | 6.478 | *0.764* | 6.025 | *0.311* |
| 2005 | 6.206 | 6.929 | *0.724* | 6.451 | *0.245* |
| 2006 | 6.953 | 7.739 | *0.787* | 6.847 | *-0.106* |
| 2007 | 6.676 | 7.018 | *0.342* | 6.665 | *-0.011* |
| Total | 6.266 | 6.940 | *0.674* | 6.511 | *0.245* |

Table 3 shows that the mean APR for African-American borrowers is consistently higher than the mean APR for white borrowers in every year. The mean APR for Hispanic borrowers is higher than the mean APR for white borrowers in all years except 2006-2007. Across all years, the average African American APR is 67.4 basis points higher and the average Hispanic APR is 24.5 basis points higher than the average white APR. These averages by themselves provide evidence of disparate racial impact. While these differences present *prima facie* evidence of discrimination, these raw differences in APRs are not as informative as the regression analysis I perform below because the risk-based characteristics of the loan are not taken into account in Table 3. It is possible that the differences shown in Table 3 may be explained by the risk characteristics of the borrower and loan with valid business justification. The regression analysis will control for these risk-based characteristics.

48.     Before moving on to the regression analysis, I examine loan costs for borrowers with similar risk profiles by comparing the mean APR for borrowers of a given race and risk profile to the mean APR for borrowers of another race and the same risk profile. My measure of borrower risk profile in this illustrative comparison is the borrower credit score. Table 4 shows

the mean APR for loans made to minorities and whites in Defendant's loan database broken down by credit score ranges.

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

| | African American | | Hispanic | | Whites | | Difference between Mean Af. Amer. APR & Mean White APR | Difference between Mean Hisp. APR & Mean White APR |
|---|---|---|---|---|---|---|---|---|
| | Loans | Mean APR | Loans | Mean APR | Loans | Mean APR | | |
| Missing score | 24,994 | 6.370 | 33,811 | 6.336 | 190,503 | 5.986 | 0.384 | 0.350 |
| 300-539 | 10,506 | 8.847 | 5,163 | 8.609 | 25,806 | 8.875 | -0.028 | -0.266 |
| 540-559 | 8,615 | 8.395 | 5,171 | 8.149 | 26,662 | 8.279 | 0.116 | -0.131 |
| 560-579 | 13,573 | 8.286 | 8,752 | 7.906 | 45,688 | 7.954 | 0.332 | -0.048 |
| 580-599 | 18,144 | 7.984 | 13,375 | 7.648 | 70,260 | 7.618 | 0.367 | 0.031 |
| 600-619 | 22,675 | 7.609 | 20,145 | 7.251 | 107,043 | 7.181 | 0.428 | 0.070 |
| 620-639 | 29,809 | 7.333 | 32,065 | 7.014 | 165,535 | 6.882 | 0.452 | 0.133 |
| 640-659 | 30,519 | 7.086 | 37,265 | 6.807 | 218,907 | 6.630 | 0.456 | 0.177 |
| 660-679 | 31,058 | 6.776 | 46,209 | 6.567 | 294,162 | 6.395 | 0.381 | 0.172 |
| 680-699 | 29,454 | 6.562 | 52,537 | 6.416 | 365,036 | 6.246 | 0.315 | 0.170 |
| 700-719 | 26,177 | 6.424 | 52,855 | 6.335 | 412,046 | 6.169 | 0.255 | 0.166 |
| 720-739 | 22,676 | 6.355 | 49,844 | 6.268 | 450,023 | 6.126 | 0.229 | 0.143 |
| 740-759 | 21,136 | 6.263 | 50,019 | 6.194 | 525,970 | 6.071 | 0.192 | 0.123 |
| 760-779 | 18,679 | 6.171 | 46,681 | 6.111 | 617,954 | 6.019 | 0.152 | 0.092 |
| 780-799 | 14,106 | 6.124 | 33,932 | 6.053 | 563,555 | 6.014 | 0.110 | 0.039 |
| ≥ 800 | 4,990 | 6.125 | 10,610 | 6.045 | 211,130 | 6.055 | 0.070 | -0.010 |
| **All Credit Scores** | **327,111** | **6.940** | **498,434** | **6.511** | **4,290,280** | **6.266** | **0.674** | **0.245** |

As Table 4 shows, the mean APR for Wells Fargo African-American borrowers is higher than the mean APR for its white borrowers for all but one of the ranges of credit scores. The mean APR for Hispanic borrowers is higher than the mean APR for white borrowers for all credit scores between 580 and 800.

## C.     Regression Models Show Disparate Impact on Minorities

49.     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.[85]

50.     Defendant's own data, rate sheets,[86] and the existing academic literature inform my choices of the characteristics to use as explanatory variables in the regressions. Major explanatory variables considered in the literature and rate sheets include the applicant's credit history, the type of the property, the applicant's total debt ratio, the amount of the loan, the loan-to-value ratio, the combined loan-to-value ratio, the loan term, the level of documentation provided by the applicant, the presence of any prepayment penalties, and the purpose of the loan.[87] The explanatory variables in the regression model could also include the time at which the interest rate was locked on the loan and the location of the property in terms of broad geographic boundaries such as states or metropolitan areas.

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

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

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

where $APR_i$ is the APR of customer $i$'s loan, $AfAm_i$ is an indicator (or "dummy") variable equal to one when borrower $_i$ is an African American, $Hispanic_i$ is an indicator variable equal to one when borrower $i$ is an Hispanic, $x_{r,t}$ 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 $\varepsilon_t$ 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.

86.  *See* Deposition of Mary Borchers Exhibits A-E (Apr. 16, 2009); Deposition of James Wyble Exhibits 5, 6 (Feb. 6, 2009).

87.  *See, e.g., id.*; Bocian, et al., *supra* note 46; Courchane, *supra* note 42; Jackson & Burlingame, *supra* note 7; Elaine Fortowsky & Michael LaCour-Little, *Credit Scoring and Disparate Impact*, Working Paper, Wells Fargo Home Mortgage, *available at* http://fic.wharton.upenn.edu/fic/lacour.pdf.

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

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

| Race | Model (1) | Model (2) | Model (3) | Model (4) |
|---|---|---|---|---|
| African American | 67.39*** | 62.53*** | 26.24*** | 10.10*** |
| | (0.29) | (0.26) | (0.22) | (0.16) |
| | | | | |
| Hispanic | 24.53*** | 24.69*** | 13.41*** | 6.39*** |
| | (0.19) | (0.16) | (0.14) | (0.11) |
| Observations | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 |
| R-squared | 2.6% | 30.7% | 46.4% | 70.5% |
| Adjusted R-squared | 2.6% | 30.7% | 46.4% | 70.5% |

*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 and interest rate lock month dummy variables.
Model (3): Same as Model (2), but add FICO score bin dummy variables.
Model (4): Same as Model (3), but add loan amount bin dummy variables, total debt-to-income ratio bin dummy variables, housing debt-to-income ratio dummy variables, LTV bin dummy variables, CLTV bin dummy variables, HMDA loan type dummy variables, self-employed borrower/co-borrower dummy variable, loan purpose dummy variables, loan term dummy variables (e.g., 15-year, 20-year, 30-year), dummy variables for occupancy type interacted with property type, property subclass dummy variables, dummy variables for credit report items (such as the presence of bankruptcies, foreclosures, collections, and late payments), documentation type dummy variables, loan amortization type dummy variables, loan product category dummy variables (e.g., 30-year fixed, 5-year ARM), escrow waiver dummy variables, length of rate lock dummy variables, rate float-down option dummy variables, lender-paid mortgage insurance dummy variable, combination loan dummy variable, prepayment penalty length dummy variables, state dummy variables, and metropolitan area (MSA) dummy variables.
Alternative model specifications estimated on the entire sample of loans can be found in Appendix 5.

Model (1) is the most basic regression model in Table 5; it controls for the race of the borrowers but no other characteristics of the loans. This model implies that African Americans pay 67.4 basis points more in APR than whites, and Hispanics pay 24.5 basis points more in APR than

whites. These differences are statistically significant (p < 1%). Model (2) controls for race as well as the month at which the loan's interest rate was locked. This addition helps control for interest rate movements over time.

53.     Because Model (2) does not control for any credit-related characteristics of the borrower, Model (3) adds controls for the borrower's credit score. Model (3) shows that, after adding basic controls for borrower credit worthiness, African Americans' APRs are 26.2 basis points greater than whites' APRs, and Hispanics' APRs are 13.4 basis points greater than whites' APRs. Finally, Model (4) controls for a host of other potential risk-based characteristics, in addition to credit scores, widely considered in the literature to be useful in predicting loan performance. Some of these additional characteristics include loan-to-value ratios, debt ratios, the structure of the loan (in terms of whether it has a fixed or adjustable rate, the fixed-period before rate adjustment, etc.), and the term of the loan (10-year, 20-year, 30-year, etc.).[88] Model (4) shows that even when a comprehensive list of risk-based characteristics are controlled for, African Americans' APRs are 10.1 basis points greater than whites' APRs, and Hispanics' APRs are 6.4 basis points greater than whites' APRs. These disparities are statistically significant at the 1 percent confidence level. These regression results show that Defendant's minority borrowers pay more in finance charges (reflected by the APR) than white borrowers with similar risk characteristics. 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 and it produces a good fit

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88. Should Wells Fargo provide evidence that additional variables are appropriate for including in a pricing regression, I can adjust my model as appropriate.

with the dependent variable, generating an adjusted R-squared of 0.70506, meaning that the model explains over 70 percent of the variation in loan pricing.

54.     One factor not included as an explanatory variable in Model (4) is an indicator for whether the loan was originated through Wells Fargo's retail or wholesale business channel. Wells Fargo 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. Wells Fargo witnesses have testified that the underwriting guidelines are essentially the same in the wholesale business channel as in the retail business channel.[89] 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 minorities' disproportionate representation in the more expensive wholesale loans.

55.     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 loan. I also estimate a regression model identical to Model (4) with the addition of dummy variables for each of the 13 business lines and channels. The results for these regressions are included in Appendix 5 as Models (20) and (21). The coefficient for the retail dummy in Model (20) is positive—holding all other characteristics constant, a retail loan has a greater APR than a wholesale loan. In Model (21), the

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89.  See Deposition of Dominic Alfonso at 30 (Nov. 10, 2009).

coefficients for all channels except the prime channels are positive, relative to the omitted channel of Distributed Retail Prime, indicating that loans originated in nonprime channels have greater APRs than loans distributed in prime channels when holding all other characteristics constant. Controlling for all these categories is, in my view, potentially misleading because I already control for other risk-based characteristics that would correlate with these categories. To the extent that borrowers were steered by Defendant or its brokers into more expensive nonprime loans when they could have qualified for conforming loans, controlling for these categories in a regression would understate the true disparity in loan costs for minorities compared to whites. Despite the inclusion of the business channel dummy variables, Models (20) and (21) show that the APRs for minority borrowers remain greater than the APRs for white borrowers, and the differences are statistically significant.

56.     In addition to estimating several regression models over all loans in Defendant's loan database, I also estimate separate regressions for different samples of loans within the database to check the robustness of my results. Table 6 shows the coefficients for African Americans and Hispanics when estimating regressions using the same explanatory variables as Model (4) over subsets of the database rather than all loans in the database. The results in Table 6 reflect Model (4) estimated separately for wholesale loans, retail 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.[90]

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90. Although estimating separate models for prime and nonprime loans is not an appropriate method for measuring disparate impact, as I discussed above, I nevertheless estimate Model (4) separately for prime (Model (4-P)) and nonprime (including Alt-A) loans (Model (4-NP)) in Appendix 6. Appendix 6 shows that the statistically significant disparities between minority and white borrower loan costs persist within both prime loans and nonprime loans.

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

|  | African American | Hispanic | Observations | Adj. R-sq. |
|---|---|---|---|---|
| *Model (4) Estimated for All Loans* | 10.10*** | 6.39*** | 5,654,985 | 70.5% |
|  | (0.16) | (0.11) |  |  |
|  |  |  |  |  |
| *Model (4) Estimated Separately by Business Channel* |  |  |  |  |
| Model (4-R): Retail | 5.68*** | 3.52*** | 4,469,160 | 72.3% |
|  | (0.16) | (0.12) |  |  |
|  |  |  |  |  |
| Model (4-R): Wholesale | 16.25*** | 8.56*** | 1,185,825 | 74.7% |
|  | (0.35) | (0.25) |  |  |
|  |  |  |  |  |
| *Model (4) Estimated Separately by Year of Origination* |  |  |  |  |
| Model (4-2001) | 8.42*** | 3.41*** | 528,370 | 75.6% |
|  | (0.50) | (0.34) |  |  |
|  |  |  |  |  |
| Model (4-2002) | 8.81*** | 5.67*** | 903,665 | 79.8% |
|  | (0.37) | (0.25) |  |  |
|  |  |  |  |  |
| Model (4-2003) | 7.86*** | 5.51*** | 1,409,772 | 76.8% |
|  | (0.27) | (0.18) |  |  |
|  |  |  |  |  |
| Model (4-2004) | 6.08*** | 3.19*** | 616,324 | 75.1% |
|  | (0.43) | (0.31) |  |  |
|  |  |  |  |  |
| Model (4-2005) | 5.31*** | 1.82*** | 770,517 | 67.2% |
|  | (0.35) | (0.24) |  |  |
|  |  |  |  |  |
| Model (4-2006) | 9.67*** | 4.55*** | 748,332 | 75.9% |
|  | (0.37) | (0.27) |  |  |
|  |  |  |  |  |
| Model (4-2007) | 6.60*** | 4.13*** | 678,005 | 68.2% |
|  | (0.34) | (0.25) |  |  |

*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 6 shows, every subset of the data examined shows a statistically significant, positive

disparity between minority and white APRs. These results indicate that the disparities between

whites and minorities persist across the spectrum of Wells Fargo loans, and are not isolated to a

specific time period or loan type.

57.     To further illustrate the persistence of disparities between minorities and whites regardless of borrower credit characteristics, I construct an alternative regression specification to Model (4) called Model (4-RF) in which I interact the race dummy variables with the FICO score dummy variables. All other explanatory variables in Model (4-RF) are the same as Model (4). By using interactive terms in Model (4-RF), I can measure the effect of minority status on APR for borrowers within a given range of FICO scores. Using the interactive terms in the regression analysis is analogous to Table 4, with the addition that the regression controls for the other risk-based characteristics of the borrower and loan, such as rate lock month, loan-to-value ratio, and loan program characteristics, that the mean comparisons in Table 4 do not incorporate. Table 7 shows the coefficients for the interactive terms of minority and FICO scores.[91]

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

TABLE 7: RACE EFFECTS ON APR (BASIS POINTS) USING INTERACTIONS OF RACE & FICO SCORE

| Model (4-RF) | African American | Hispanic | Model (4-RF) | African American | Hispanic |
|---|---|---|---|---|---|
| FICO missing | 25.28*** | 13.23*** | 660 ≤ FICO < 680 | 10.28*** | 6.72*** |
| | (0.61) | (0.45) | | (0.45) | (0.35) |
| 300 ≤ FICO < 540 | -6.44*** | -9.91*** | 680 ≤ FICO < 700 | 9.59*** | 7.55*** |
| | (2.10) | (2.88) | | (0.41) | (0.29) |
| 540 ≤ FICO < 560 | 1.79 | -1.40 | 700 ≤ FICO < 720 | 8.47*** | 7.46*** |
| | (1.73) | (2.18) | | (0.39) | (0.28) |
| 560 ≤ FICO < 580 | 14.69*** | 1.33 | 720 ≤ FICO < 740 | 8.34*** | 6.46*** |
| | (1.26) | (1.48) | | (0.40) | (0.27) |
| 580 ≤ FICO < 600 | 16.04*** | 6.58*** | 740 ≤ FICO < 760 | 7.41*** | 6.77*** |
| | (0.95) | (1.05) | | (0.39) | (0.25) |
| 600 ≤ FICO < 620 | 17.40*** | 6.14*** | 760 ≤ FICO < 780 | 7.29*** | 6.33*** |
| | (0.76) | (0.75) | | (0.39) | (0.25) |
| 620 ≤ FICO < 640 | 13.95*** | 6.57*** | 780 ≤ FICO < 800 | 6.65*** | 5.54*** |
| | (0.60) | (0.54) | | (0.44) | (0.28) |
| 640 ≤ FICO < 660 | 13.39*** | 6.87*** | FICO ≥ 800 | 7.65*** | 5.80*** |
| | (0.54) | (0.46) | | (0.69) | (0.48) |
| Observations | 5,654,985 | | | | |
| Adj. R-sq. | 70.6% | | | | |

*Note:* Standard errors in parentheses.
*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%.
Coefficients and standard errors for other explanatory variables are shown in Appendix 7.

The coefficients in Table 7 show the disparity in APR between minorities with the given range of FICO scores and whites with the given range of FICO scores, when controlling for all the other risk-based characteristics included in Model (4). For example, the APR for a Wells Fargo loan made to an African American with a FICO score between 600 and 620 is an average of 17.4 basis points greater than the APR for a loan made to a white borrower with the same FICO score, after controlling for the other variables included in Model (4). As credit scores increase, the disparities in APRs between minority and white borrowers persist, but tend to decrease for African Americans. For example, the APR for a Wells Fargo loan made to an African American with a credit score of at least 800 is an average of 7.65 basis points greater than the APR for a white borrower with a similar credit score. The coefficients for African-American borrowers with credit scores below 560 and Hispanic borrowers with credit scores below 580 (representing

only 38,000 of the 825,000 minority loans with APR data, as shown in Table 4) are the only

coefficients that are not positive and statistically significant in Table 7. The results for all other

subsets in Table 7 are further confirmation that disparities in loan costs between minorities and

whites cannot be explained by differences in credit quality.

58.     The analysis of Defendant's data using regression analysis shows that

Defendant's policies had a disparate impact on the Class as alleged by Plaintiffs. Defendant's

data shows that African Americans and Hispanics paid more for loans than whites with similar

risk characteristics. As elaborated in Appendices 5-7, these findings are robust to numerous

alternative formulations of my basic model. This data analysis is common to all Class members,

using data that is common to all Class members, and shows disparate impact which is common

to the Class.

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

59.     Using information provided in the Complaint,[92] I have identified each of the five

loans for the individual named plaintiffs in the data produced by Wells Fargo to Plaintiffs. All

named plaintiffs are minority borrowers who obtained first-lien loans from Wells Fargo between

2005 and 2006.[93] Three named Plaintiffs (Brown, Queensborough, and Williams) are African-

American borrowers, and the other two named Plaintiffs (Rodriguez and Ventura) are Hispanic

borrowers. Named Plaintiffs Brown and Williams obtained their Wells Fargo loans through retail

channels, and named Plaintiffs Queensborough, Rodriguez, and Ventura obtained their loans

through Wells Fargo's wholesale brokers. The data for each of the named Plaintiffs' loans

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92. *Complaint* at ¶¶106-153, Ex. 1-10.
93. *Id.*

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.

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

61.     Table 8 shows the named Plaintiffs' actual APRs, less the marginal effect that their minority status had on the actual APR. This is calculated by subtracting the race coefficient corresponding to the Plaintiff's race from the Plaintiff's actual APR. The race coefficients and estimated race-neutral APRs are calculated using (1) Model (4) as it was estimated on the entire sample of loans in Defendant's loan database (shown in Table 5), (2) Model (4-R) and (4-W) as they were estimated separately on retail and wholesale channel loans (shown in Table 6), (3) Model (4-2005) and (4-2006) as they were estimated separately by the year of the loan origination (shown in Table 6), and (5) Model (4-RF) using the interaction of race indicator variables and FICO range indicator variables (shown in Table 7).

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

| | Brown | Queensborough | Rodriguez | Ventura | Williams |
|---|---|---|---|---|---|
| Actual APR | 8.716 | 9.894 | 9.855 | 8.602 | 9.953 |
| *Model (4) Estimated for All Loans* | | | | | |
| Actual APR less Marginal Effect of Minority Status | 8.615 | 9.793 | 9.791 | 8.538 | 9.852 |
| Difference from Actual | 0.101 | 0.101 | 0.064 | 0.064 | 0.101 |
| *Model (4) Estimated Separately by Channel (Retail or Wholesale)* | | | | | |
| Actual APR less Marginal Effect of Minority Status | 8.659 | 9.731 | 9.769 | 8.516 | 9.896 |
| Difference from Actual | 0.057 | 0.163 | 0.086 | 0.086 | 0.057 |
| *Model (4) Estimated Separately by Year* | | | | | |
| Actual APR less Marginal Effect of Minority Status | 8.663 | 9.797 | 9.809 | 8.584 | 9.856 |
| Difference from Actual | 0.053 | 0.097 | 0.046 | 0.018 | 0.097 |
| *Model (4) (Race & FICO interactions) Estimated for All Loans* | | | | | |
| Actual APR less Marginal Effect of Minority Status | 8.569 | 9.747 | 9.789 | 8.533 | 9.779 |
| Difference from Actual | 0.147 | 0.147 | 0.066 | 0.069 | 0.174 |

62.     Because the regression coefficients for the African-American and Hispanic indicator variables are positive and statistically significant (as shown in Section V), the members of the proposed Class pay, on average, more for their mortgage loans than white borrowers with similar risk characteristics. Table 8 shows that when the coefficients from the regressions are subtracted from the named Plaintiffs' actual APRs (thus removing the average disparate impact to the Class), their APRs decrease for each of these model specifications. For example, Ms. Brown's actual APR is 8.716 percent. When the disparate impact to African Americans (as calculated using Model (4)) is removed from her APR, her APR decreases to 8.615 percent.

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

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

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

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

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

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

68.      To estimate monetary relief, I first determine the APR for each individual Class member after removing the marginal effect on APR of the member's minority status as estimated in my regression model.[94] 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 Wells Fargo loans.

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

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

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

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

expected life of each loan.[95] The likelihood of prepayment for any given loan depends on various factors, including the underwriting factors of the loan, the interest rate of the loan relative to current and forecasted market rates, and home prices. If I were to use a prepayment model in my calculations of monetary relief, this model would use inputs that are common to the Class.

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

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

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

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

72.     The assumption of a shorter calculation period of five years may be closest to the actual experience of Wells Fargo loans, based on the recent history of mortgage longevity before prepayment. In a 2008 position paper, the Mortgage Bankers Association noted that issuers of securities backed by ARM mortgages assumed a Constant Prepayment Rate (CPR) within a range of 18 to 30 percent, with 25 percent being the most commonly used CPR.[96] 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.[97] 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.[98]

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

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96. 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.

97. 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.

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

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

74.     In addition to considerations of prepayments, the choice of a term over which to estimate finance charge disparity using the APR also depends on the degree to which disparity in the APR results from disparity in upfront fees as opposed to disparities in note rates or yield spread premia. Upfront fees are included in the calculation of an APR by spreading out the effect of those fees over the loan term, even though those fees are typically paid immediately at origination.[99] 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 and retail overages for Wells Fargo 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).[100] To the extent that disparate impact in the APR is due to disparate impact in yield spread premium and retail overages, calculating finance charge differentials over a shorter period closer to the actual life of the loan is appropriate.

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

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99. In mortgage lending, upfront closing fees are sometimes added to the loan principal rather than paid upfront at loan closing.

100. It is unclear from documents produced to date in this case whether yield spread premia raises finance costs through higher interest rates over the entire term of Wells Fargo ARMs or just through the initial fixed-rate term.

overages, or prepayments.[101] Instead, I present monetary relief under the three scenarios (estimating finance charge disparities using the APR over the full-term, 10 years, and 5 years) outlined above. Aggregate monetary relief to the Class is merely equal to the sum of the monetary relief for all Class members. Table 9 shows the aggregate results of my calculations of monetary relief, based on regression Model (4) estimated on all loans in Defendant's loan database. Again, with additional data, I could develop a more nuanced estimate of damages based on the structure of APRs for individual borrowers. And, again, any such refinement to calculate monetary relief for a given Class member would use common methods and data that are common to the Class.

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

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

| | African Americans | Hispanics | Total |
|---|---|---|---|
| **Over entire loan term** | | | |
| Undiscounted ($Millions) | $1,191.0 | $1,282.8 | **$2,473.8** |
| Present Value of Relief ($Millions) | $923.0 | $996.7 | **$1,919.7** |
| | | | |
| **Over 10 years** | | | |
| Undiscounted ($Millions) | $521.8 | $575.7 | **$1,097.5** |
| Present Value of Relief ($Millions) | $539.8 | $592.9 | **$1,132.7** |
| | | | |
| **Over 5 years** | | | |
| Undiscounted ($Millions) | $265.1 | $294.2 | **$559.3** |
| *Number of Loans** | *294,983* | *452,471* | ***747,454*** |
| *Avg undiscounted relief per loan over 5 years ($)* | *$899* | *$650* | ***$748*** |
| | | | |
| Present Value of Relief ($Millions) | $297.7 | $329.2 | **$627.0** |
| *Number of Loans** | *294,983* | *452,471* | ***747,454*** |
| *Avg. present value of relief per loan over 5 years ($)* | *$1,009* | *$728* | ***$839*** |

*Note*: Monetary relief calculations are restricted to those loans in Defendant's loan database with APR data. For loans without loan term data, I use the mean loan term for all loans in the data. For purposes of these illustrations, the present value (as of August 2010) of the undiscounted relief for each loan is calculated using the Treasury Constant Maturity rate as of the origination date for that loan that matches the term over which monetary relief is being calculated. For example, when calculating monetary relief over the entire loan term for a 30-year loan that originated on April 30, 2007, I use the 30-year Treasury constant maturity rate as of April 30, 2007 (4.81 percent) as the discount rate. When calculating monetary relief over 5 years for the same loan, I use the 5-year Treasury rate as of April 30, 2007 (4.51 percent) as the discount rate. The Treasury rates are available from Federal Reserve Statistical Release H.15, Data Download Program, *available at* http://www.federalreserve.gov/datadownload/Choose.aspx?rel=H.15; U.S. Treasury, Daily Treasury Long-Term Rates, *available at* http://www.treas.gov/offices/domestic-finance/debt-management/interest-rate/ltcompositeindex_historical.shtml. For the 30-year scenarios, in which most of the harm comes in the form of disparities in future interest payments, the present value is smaller than the undiscounted value. For the 5-year and 10-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. The Treasury rates used here are illustrative, and I reserve the right to estimate more precise discount rates in future analyses to estimate class-wide monetary damages.

76.     As Table 9 shows, minorities would suffer $2.47 billion in harm if they paid their loans over their full terms. The present value of this $2.47 billion harm is $1.92 billion. When measured over five years, minorities suffer $559.3 million in (undiscounted) harm. African-American borrowers who are assigned monetary relief based on my methodology suffer an average of $899 per loan (undiscounted) over five years, and Hispanic borrowers suffer an average of $650 per loan (undiscounted).

77.     The monetary relief for each individual Class member is easily ascertainable. My methodology estimates the monetary relief for each individual Class member based on his or her loan characteristics. For example, the undiscounted monetary relief under the 5-year scenario for named Plaintiff Queensborough is $2,315. This relief of $2,315 is equal to the difference in Mr. Queensborough's interest payments over the first five years of his loan, based on his loan amount ($447,000) and fixed-rate amortization schedules using his actual APR (9.894 percent) and his but-for APR when removing the effect of the disparate impact (9.793 percent—10.1 basis points lower than his actual APR). The aggregate monetary relief shown in Table 9 is merely the sum of the effect of the disparate impact on each Class member's loan terms.
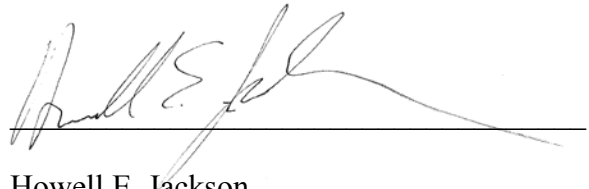
## VIII.   CONCLUSION

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

* * *

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

-55-

Executed on August 6, 2010.

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Howell E. Jackson

**APPENDIX 1: MATERIALS RELIED UPON**

*Pleadings:*

- First Consolidated and Amended Class Action Complaint, Case No. 08-CV-01930-MMC (JL) (N.D. Cal.).

*Deposition Testimony:*

- Deposition of Dominic Alfonso (Nov. 10, 2009) & exhibits.
- Deposition of Hector Benavidez, (Oct. 8, 2009) & exhibits.
- Deposition of Mary Frances Borchers (Apr. 16, 2009) & exhibits.
- Deposition of Tamara Denton (Jan. 22, 2009) & exhibits.
- Deposition of Tamara Denton (Oct. 8, 2009) & exhibits.
- Deposition of Jill Ann Hunt (June 17, 2009) & exhibits.
- Deposition of Kevin C. Kelly (Jan. 8, 2009) & exhibits.
- Deposition of Brian S. Kroll (Oct. 6, 2009) & exhibits.
- Deposition of Michael Christopher Murphy (Sep. 15, 2009) & exhibits.
- Deposition of Thomas Navara (June 19, 2009) & exhibits.
- Deposition of Gregory Pahl Pearsall (Oct. 13, 2009) & exhibits.
- Deposition of Katie Peterson (Oct. 7, 2009) & exhibits.
- Deposition of Babak Siminou (Sep. 14, 2009) & exhibits.
- Deposition of James Wyble (Feb. 6, 2009) & exhibits.
- Deposition of James Wyble (June 4, 2009) & exhibits.

*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:*

- *Predatory Mortgage Lending Practices: Abusive Uses of Yield Spread Premiums: Hearing Before the S. Comm. on Banking, Housing & Urban Affairs*, 107th Cong. (2002) (statement of Howell E. Jackson, Finn M.W. Caspersen and Household International Professor of Law and Associate Dean for Research and Special Programs, Harvard Law School), *available at* http://banking.senate.gov/02_01hrg/010802/jackson.htm.
- *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/MBATestimony6262007EndingMortgageAbuse SafeguardingHomebuyers.pdf.

*Data*

- Bates No. WFB 282925 – WFB 282926.
- Federal Reserve Statistical Release H.15, Data Download Program, *available at* http://www.federalreserve.gov/datadownload/Choose.aspx?rel=H.15.
- U.S. Treasury, Daily Treasury Long-Term Rates, *available at* http://www.treas.gov/offices/domestic-finance/debt-management/interest-rate/ltcompositeindex_historical.shtml.
- U.S. Census Bureau, Metropolitan & Micropolitan Statistical Areas & Components, December 2006, with Codes (http://www.census.gov/population/www/metroareas/lists/2006/List1.txt).

- Fannie Mae, Fannie Mae Historical Conventional Loan Limits, *available at* http://www.fanniemae.com/aboutfm/pdf/historicalloanlimits.pdf.

*Other Bates-Labeled Documents*

- WFHM Wholesale Price Monitoring File List, 2003-2007 (Bates No. WFB 282928 – WFB 282931).
- Overview of Fair Lending, Broker Price Monitoring for WFHM (Bates No. WFB 282932 – WFB 282939).
- Overview of Fair Lending, Retail Price Monitoring for WFHM (Bates No. WFB 282940 – WFB 282948).
- Fair Lending Risk Reviews, Statistical Models Development Timeline (Bates No. WFB 282949 – WFB 282948).

*Letters, E-Mails, and Other Correspondences*

- Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (Nov. 13, 2009).
- Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., Gary Klein, Roddy Klein & Ryan, and Mark A. Chavez, Chavez & Gertler LLP (May 11, 2010).
- Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Gary Klein, Roddy Klein & Ryan (May 13, 2010).
- Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Gary Klein, Roddy Klein & Ryan (June 1, 2010).
- Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (July 1, 2010).
- Letter from Tyree P. Jones, Jr., Reed Smith LLP, to Andrew S. Friedman, Bonnett, Fairbourn, Friedman & Balint, P.C., and Gary Klein, Roddy Klein & Ryan (July 12, 2010).

*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).
- 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).

*Books:*

- IAN AYRES, PERVASIVE PREJUDICE?: NON-TRADITIONAL EVIDENCE OF RACE & GENDER DISCRIMINATION (University of Chicago Press 2002).

*Trade Publications*

- Inside Mortgage Finance Publications, Inc., *The 2009 Mortgage Market Statistical Annual, Volume 1* (2009).
- Inside Mortgage Finance Publications, Inc., *The 2009 Mortgage Market Statistical Annual, Volume 2* (2009).

*Academic Articles & Other Studies, Presentations:*

- Adam B. Ashcraft & Til Schuermann, *Understanding the Securitization of Subprime Mortgage Credit*, Federal Reserve Bank of New York Staff Report No. 318 (Mar. 2008).
- Robert B. Avery et al., *Credit Risk, Credit Scoring, and the Performance of Home Mortgages*, FED. RES. BULL., July 1996.
- Robert B. Avery et al., *New Information Reported Under HMDA and Its Application in Fair Lending Enforcement,* FED. RES. BULL., Summer 2005.
- Ian Ayres, *Further Evidence of Discrimination in New Car Negotiations and Estimates of Its Cause*, 94 MICHIGAN LAW REV. 109 (1995).
- 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.
- 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.
- David G. Blanchflower, Phillip B. Levine, & David J. Zimmerman, *Discrimination in the Small Business Credit Market*, 85 REV. ECON. & STAT. 930 (Nov. 2003).
- Charles A Calhoun & Yongheng Dung, *A Dynamic Analysis of Fixed- and Adjustable-Rate Mortgage Terminations*, 24 J. REAL ESTATE FIN. & ECON. 9 (2002).
- 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).
- 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.
- Mark Chen & John A. Bargh, *Nonconscious Behavioral Confirmation Processes: The Self-Fulfilling Consequences of Automatic Stereotype Activation*, 33 J. EXPERIMENTAL SOC. PSYCHOL. 541 (1997).
- Souphala Chomsisengphet & Anthony Pennington-Cross, *The Evolution of the Subprime Mortgage Market*, 88 FED. RES. BANK OF ST. LOUIS REV. 31 (Jan./Feb. 2006).
- Mark A. Cohen, *Imperfect Competition in Auto Lending: Subjective Markup, Racial Disparity, and Class Action Litigation* (2008), *available at* http://works.bepress.com/mark_cohen/1.
- 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).
- John F. Dovidio et al, *Racial Stereotypes: The Contents of Their Cognitive Representations*, 22 J. EXPERIMENTAL SOC. PSYCHOL. 22 (1986).
- Kathleen C. Engel & Patricia A. McCoy, *Turning a Blind Eye: Wall Street Finance of Predatory Lending*, 75 FORDHAM L. REV. 102 (2007).
- Allen J. Fishbein & Patrick Woodall, Consumer Federation of America, *Subprime Cities: Patterns of Geographic Disparity in Subrime Lending* (Sept. 2005), *available at* http://www.consumerfed.org/pdfs/Subprimecities090805.pdf.
- Allen J. Fishbein & Patrick Woodall, Consumer Federation of America, *Subprime Locations: Patterns of Geographic Disparity* (Sept. 2006), *available at* http://www.consumerfed.org/pdfs/SubprimeLocationsStudy090506.pdf.
- Elaine Fortowsky & Michael LaCour-Little, *Credit Scoring and Disparate Impact*, Working Paper (Dec. 2001), *available at* http://fic.wharton.upenn.edu/fic/lacour.pdf.
- Scott Frame, Andreas Lehnert, & Ned Prescott, *A Snapshot of Mortgage Conditions with an Emphasis on Subprime Mortgage Performance* (Aug. 2008), *available at* http://federalreserveonline.org/pdf/MF_Knowledge_Snapshot-082708.pdf.
- Lynn Gottschalk, *Fair Lending Modeling of Pricing Decisions* (Sept. 10, 2008), *available at* http://www.occ.treas.gov/flc/2008/Lynn%20Gottschalk.pdf.
- 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* (May 31, 2008), *available at* http://www.responsiblelending.org/mortgage-lending/research-analysis/rr011-Unfair_Lending-0506.pdf.

- Howell E. Jackson & Laurie Burlingame, *Kickbacks or Compensation: The Case of Yield Spread Premiums*, 12 STANFORD J. L. BUS. & FIN. 289 (2007).
- Howell E. Jackson, *The Trilateral Dilemma in Financial Regulation*, in IMPROVING THE EFFECTIVENESS OF FINANCIAL EDUCATION & SAVINGS PROGRAMS (Anna Maria Lusardi, ed.) (University of Chicago Press 2008).
- Howell E. Jackson, *Loan-Level Disclosure in Securitization Transactions: A Problem with Three Dimensions*, in MOVING FORWARD: THE FUTURE OF CONSUMER CREDIT AND MORTGAGE FINANCE (forthcoming Brookings Press 2010), *available* at http://ssrn.com/abstract=1649657.
- 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).
- Michael LaCour-Little, *The Pricing of Mortgages by Brokers: an Agency Problem?,* 31 J. REAL EST. RES. 235 (2009).
- 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.
- Alicia H. Munnell et al., *Mortgage Lending in Boston: Interpreting HMDA Data*, 86 AM. ECON. REV. 25 (1996).
- Yolanda F. Niemann et al., *Intergroup Sterotypes of Working Class Blacks and Whites: Implications for Stereotype Threat*, 22 WESTERN J. BLACK STUD. 103 (1988).
- 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).
- Lyn C. Thomas, *A Survey of Credit and Behavioural Scoring: Forecasting Financial Risk of Lending to Consumers*, 16 INT'L J. FORECASTING 149 (2000).
- Margery Austin Turner & Felicity Skidmore, the Urban Institute, MORTGAGE LENDING DISCRIMINATION: A REVIEW OF EXISTING EVIDENCE (1999).
- Eric J. Vanman et al., *The Modem Face of Prejudice and Structural Features That Moderate the Effect of Cooperation on Affect*, 73 J. PERSONALITY & SOC. PSYCHOL. 941 (1997).
- Alan M. White, *Risk-Based Mortgage Pricing: Present & Future Research*, 15 HOUSING POL'Y DEBATE 503 (2004).
- Alan M. White, *Borrowing While Black: Applying Fair Lending Laws to Risk-Based Mortgage Pricing*, 60 S. CAROLINA L. REV. 677 (2009).
- 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.
- Ararat Yesayan, *Mortgage Pricing* (June 4, 2009), *available at* http://ssrn.com/abstract=1414351.
- John Yinger, *Evidence of Discrimination in Consumer Markets*, 12 J. ECON PERSPECTIVES 23 (1998).


*Web sites:*

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

**APPENDIX 2: CURRICULUM VITAE OF HOWELL JACKSON**

**HOWELL E. JACKSON**
Griswold 510
Harvard Law School
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**EMPLOYMENT**

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|---|---|---|
| **1989-present** | **HARVARD LAW SCHOOL** | **CAMBRIDGE, MA** |

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

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|---|---|---|
| **1987-1989** | **ARNOLD & PORTER** | **WASHINGTON, DC** |

Associate: Financial Institutions Practice Group.

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| **1984-1986** | **CAPLIN & DRYSDALE, CHARTERED** | **WASHINGTON, DC** |

Associate: Corporate/Banking/Securities Group.

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|---|---|---|
| **1983-1984** | **UNITED STATES SUPREME COURT** | **WASHINGTON, DC** |

Law Clerk to Associate Justice Thurgood Marshall.

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|---|---|---|
| **1982-1983** | **UNITED STATES COURT OF APPEALS** **FOR THE SECOND CIRCUIT** | **HARTFORD, CT** |

Law Clerk to Judge Jon O. Newman.

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|---|---|---|
| **1976-1978** | **NATIONAL COUNCIL FOR US-CHINA TRADE** | **WASHINGTON, DC** |

Escort Officer and Associate Editor *China Business Review*.

**ACADEMIC**

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|---|---|---|
| **1978-1982** | **HARVARD UNIVERSITY** | **CAMBRIDGE, MA** |

MBA & JD, *magna cum laude*.

| | | |
|---|---|---|
| **1972-1976** | **BROWN UNIVERSITY** | **PROVIDENCE, RI** |

B.A., *magna cum laude*:

**PROFESSIONAL ACTIVITIES**

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

Member, Social Security Academic Advisory Board for NBER Retirement Research Program; National Academy of Social Insurance; and Bar of the District of Columbia.

Miscellaneous consulting projects for World Bank, International Monetary Fund, U.S. Treasury Department,

and various other foreign and domestic regulatory agencies.

## SELECTED PUBLICATIONS

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

Howell E. Jackson, Loan-Level Disclosure in Securitization Transactions: A Problem with Three Dimensions (draft of Feb. 15, 2010).

John C. Campbell, Howell E. Jackson. Brigitte Madrian, and Peter Tufano, The Regulation of Consumer Finance, *Journal of Economic Perspectives* (forthcoming 2010).

Howell E. Jackson, *Toward a New Regulatory Paradigm for the Trans-Atlantic Financial Market and Beyond: Legal and Economic Perspectives*, EUROPEAN BUS. ORG. L. REV. (forthcoming 2010).

Matthew C. Stephenson & Howell E. Jackson, Lobbyists as Imperfect Agents: Implications for Public Policy in a Pluralist System 57 *Harvard Journal of Legislation* 1 (2010) (avail at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1331503).

Howell E. Jackson & Mark J. Roe, Public Enforcement of Securities Laws: Resource-Based Evidence, 93 *Journal of Financial Economics 207* (2009)(avail at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1000086).

FISCAL CHALLENGES: AN INTERDISCIPLINARY APPROACH TO BUDGET POLICY (Elizabeth Garrett, Elizabeth Graddy, & Howell E. Jackson, eds.) (Cambridge University Press 2009) (paperback edition).

Howell E. Jackson, *Learning from Eddy: A Meditation Upon Organizational Reform of Financial Supervision*, in PERSPECTIVES IN COMPANY LAW AND FINANCIAL REGULATION (Michel Tison, et al. eds.) (Cambridge University Press 2009) (avail. at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1325510).

Testimony of Howell E. Jackson Before the Senate Committee on Homeland Security and Government Affairs, Hearings on The Financial Crisis and the Breakdown of Financial Governance (Jan. 21, 2009).

Howell E. Jackson, A Pragmatic Approach to the Phased Consolidation of Financial Regulation in the United States (Nov. 12, 2008) (avail. at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1300431).

Howell E. Jackson & Eric Pan, *Regulatory Competition in International Securities Markets: Evidence from Europe – Part II*, 3 VA. L. & BUS. REV. 207 (2008).

Howell E. Jackson, *Building a Better Bailout*, CHRISTIAN SCIENCE MONITOR, Sept. 25, 2008.

Margaret E. Tayhar, Jaap Willeumier, Eric J. Pan, Howell E. Jackson, & Eilis Ferran, Final Report of the Securities Law Subcommittee of the Task Force on Extraterritorial Jurisdiction of the International B a r A ssociation (July 1, 2008) (avail. at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1109061).

Howell E. Jackson, *The Impact of Enforcement: A Reflection*, 156 U. PENN. L. REV. PENNumbra 400 (2008) (avail. at http://www.pennumbra.com/responses/02-2008/Jackson.pdf).

Howell E. Jackson, "The Trilateral Dilemma in Financial Regulation," in IMPROVING THE EFFECTIVESNESS OF FINANCIAL EDUCATION AND SAVINGS PROGRAMS (Anna Maria Lusardi, ed.)

(University        of        Chicago        Press        2008)        (avail.        at
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1300419).

FISCAL CHALLENGES: AN INTERDISCIPLINARY APPROACH TO BUDGET POLICY (Elizabeth Garrett, Elizabeth Graddy, & Howell E. Jackson, eds.) (Cambridge University Press 2008).

Howell E. Jackson, "Counting the Ways: The Structure of Federal Spending," in FISCAL CHALLENGES: AN INTERDISCIPLINARY APPROACH TO BUDGET POLICY (Elizabeth Garrett, Elizabeth Graddy, & Howell E.        Jackson,        eds.)        (Cambridge        University        Press        2008)        (avail. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=985201).

Howell E. Jackson, Enlisting Market Mechanisms To Police the Origination of Home Mortgages (draft of Nov. 2007).

Stavros Gadinis & Howell E. Jackson, *Markets as Regulators: A Survey*, 80 S.C. L. REV. 1239 (2007) (previously avail. as John M. Olin Center Working Paper No. 579 (Oct. 6, 2006) at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=960168).

Howell E. Jackson & Stacy A. Anderson, *Can States Tax National Banks to Educate Consumers About Predatory Lending Practices?*, 30 HARV J. LAW & PUB. POL'Y 831 (2007) (avail. at http://www.law.harvard.edu/students/orgs/jlpp/Vol30_No3_Jacksononline.pdf ).

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

Howell E. Jackson, *Variation in the Intensity of Financial Regulation: Preliminary Evidence and Potential        Implications*,        24        YALE        J.        REGULATION        253        (2007)        (avail.        at
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=839250).

Howell E. Jackson, *A System of Selective Substitute Compliance*, 48 HARV. INT'L L.J.105 (Winter 2007) (avail at http://www.harvardilj.org/attach.php?id=77).

Kern Alexander, Eilis Ferran, Howell Jackson & Niamh Moloney, *Transatlantic Financial Services Regulatory Dialogue*, 7 EUROPEAN BUS. ORGANIZATION LAW REV. 647 (2006) (avail. at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=963381).

Howell E. Jackson, Regulatory Intensity in the Regulation of Capital Markets: A Preliminary Comparison of Canadian and U.S. Approaches (July 30, 2006) (Study Commissioned by the Task Force to Modernize Securities Legislation in Canada) (avail. at http://www.tfmsl.ca/docs/V6(2)%20Jackson.pdf).

Howell E. Jackson, *Big Liability: Social Security, Medicare, and Accounting*, NEW REPUBLIC ONLINE (July 12, 2006) (avail. at http://www.tnr.com/docprint.mhtml?i=w060710&s=jackson071206).

Howell E. Jackson, Mark Gurevich, & Andreas M, Fleckner, *The Controversy Over the Placement of Remote Trading Screens from Foreign Exchanges in the United States,* 1 CAPITAL MARKETS LAW J. 54 (2006). (avail. at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=921435).

Howell E. Jackson, "Accounting for Social Security Benefits," in BEHAVIORAL PUBLIC FINANCE (2006) (Edward J. McCaffery & Joel Slemrod, eds) (previously released as John M. Olin C e nter W o rking Paper No. 520)( available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=839246).

Howell E. Jackson, An American Perspective on the FSA: Politics, Goals & Regulatory Intensity, in REGULATORY REFORMS IN THE AGE OF FINANCIAL CONSOLIDATION: THE EMERGING MARKET ECONOMY AND ADVANCED COUNTRIES 39 (2006) (Lee-Jay Cho & Joonkyung Kim, eds.)(avail. at http://www.kdi.re.kr/kdi_eng/database/report_read05.jsp?1=1&pub_no=00009931) (also avail. in draft at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=839284).

Howell E, Jackson, Commentary on The Supervisory Challenges of Financial Conglomerates in Korea, in REGULATORY REFORMS IN THE AGE OF FINANCIAL CONSOLIDATION: THE EMERGING MARKET ECONOMY AND ADVANCED COUNTRIES 285(2006) (Lee-Jay Cho & Joonkyung Kim, eds.)

Contributor to National Academy of Social Insurance Study Panel Final Report on Uncharted Waters: Paying Benefits from Individual Accounts in Federal Retirement Policy (Jan. 2005) (Kenneth S. Apfel & Michael J. Graetz, co-chairs).

Howell E. Jackson, Consolidated "Capital Regulation for Financial Conglomerates," in CAPITAL ADEQUACY BEYOND BASEL: BANKING, SECURITIES AND INSURANCE, 123- 45 (2005, Hal S. Scott, ed.) (Oxford University Press).

Howell E. Jackson, The True Cost of Privatizing Social Security, TAX NOTES, Jan. 3, 2005, at 109.

Howell E. Jackson, Mind the Gap, TAX NOTES, Dec. 20, 2004, at 4.

HOWELL E. JACKSON, ACCOUNTING AND FINANCE (Foundation Press 2004).

Howell E. Jackson, *Reply*, 41 HARV. J. LEGIS. 221 (Winter 2004).

Howell E. Jackson, *Accounting for Social Security and Its Reform*, 41 HARV. J. LEGIS. 59 (Winter 2004).

HOWELL E. JACKSON, LOUIS KAPLOW, STEVEN SHAVELL, KIP VISCUSI, DAVID COPE, & HEATHER MAHAR, TEACHERS' MANUAL FOR ANALYTICAL METHODS FOR LAWYERS (2004).

Howell E. Jackson, *To What Extent Should We Rely on the Mechanisms of Market Efficiency: A Preliminary Investigation of Dispersion in Individual Investor Returns*, 28 J. CORP. 671 (Summer 2003).

Howell E. Jackson, *Analytical Methods for Lawyers*, 53 J. LEGAL EDUCATION 321 (Sept. 2003).

Howell E. Jackson, *It's Even Worse than You Think*, N.Y. TIMES, Oct. 9, 2003, at A35.

HOWELL E. JACKSON, LOUIS KAPLOW, STEVEN SHAVELL, KIP VISCUSI, & DAVID COPE, ANALYTICAL METHODS FOR LAWYERS (2003) (Foundation Press).

Howell E. Jackson, *Centralization, Competition, and Privatization in Financial Regulation*, 2 THEORETICAL INQUIRIES IN LAW 649 (2001).

Howell E. Jackson, *The Role of Rating Agencies in the Establishment of Capital Standards for Financial Institutions in a Global Economy*, in THE CHALLENGES FACING FINANCIAL REGULATION 311 (2001) (Eilis Ferran & Charles A.E. Goodhart, eds) (available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=250166&high=%20Howell%20Jackson).

Howell E. Jackson, *Could We Invest the Surplus?*, 90 TAX NOTES 1245 (Feb. 26, 2001).

Howell E. Jackson & Eric Pan, *Regulatory Competition in International Securities Markets: Evidence from Europe in 1999 – Part I*, 56 BUS. LAW. 653 (2001).

Howell E. Jackson, *Regulation of a Multisectored Financial Services Industry: An Exploratory Essay*, 77 WASH. U. L.Q. 319 (1999) (avail. at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=166651).

HOWELL E. JACKSON & EDWARD L. SYMONS, THE REGULATION OF FINANCIAL INSTITUTIONS: CASES AND MATERIALS (1999) (West Publications).

HOWELL E. JACKSON & EDWARD L. SYMONS, THE REGULATION OF FINANCIAL INSTITUTIONS: SELECTED STATUTES, REGULATIONS AND FORMS (1999) (West Publications).

Howell E. Jackson, *Selective Incorporation of Foreign Legal Systems to Promote Nepal as an International Financial Services Center* in REGULATION AND DEREGULATION: POLICY AND PRACTICE IN THE UTILITIES AND FINANCIAL SERVICES INDUSTRY (1999)(Christopher McCrudden, ed.) (Clarendon Press, Oxford).

Howell E. Jackson. *Regulatory Problems in Privatizing Social Security*, in FRAMING THE SOCIAL SECURITY DEBATE: VALUES, POLITICS AND ECONOMICS (1999) (Brookings Institute).

Howell E. Jackson. *Entry on the Regulation of Financial Holding Companies*, The New Palgrave for Law & Economics (1998).

Howell E. Jackson, *Fees and the Investment Company Industry: An Analysis of Current Developments*, in ALI-ABA MATERIALS FOR ADVANCE COURSE ON INVESTMENT MANAGEMENT (October 1996).

Howell E. Jackson, The Securitization of Financial Assets: An Introductory Essay (Nov. 14, 1994) (working paper).

Howell E. Jackson, *The Expanding Obligations of Financial Holding Companies*, 107 HARVARD LAW REV. 507 (January 1994).

Howell E. Jackson, *Note on Double Liability of Bank Shareholders: A Response to Macey and Miller*, 28 WAKE FOREST LAW REV. 919 (December 1993).

Howell E. Jackson, *The Superior Performance of Savings and Loan Associations with Substantial Holding Companies*, 22 J. LEGAL STUDIES 405 (June 1993).

Howell E. Jackson, *Reflections Upon Kaye, Scholer: Enlisting Lawyers to Improve the Regulation of Financial Institutions*, 66 SOUTHERN CALIFORNIA LAW REV. 1019 (1993)

Howell E. Jackson, *Commentary on Helen A. Garten, Whatever Happened to Market Discipline of Banks?*, 1991 NYU ANNUAL SURVEY OF AMERICAN LAW 801 (1992).

Howell E. Jackson, *Commentary on Mark J. Flannery, Government Risk-Bearing in the Financial Sector of a Capitalist Economy*, in GOVERNMENT RISK-BEARING: PROCEEDINGS OF A CONFERENCE HELT AT THE FEDERAL RESERVE BANK OF CLEVELAND, MAY 1991 (Mark. S. Sniderman, ed. 1993).

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

1. Ramirez v. Greenpoint Mortgage Funding, Inc. (2010) No. 3:08-cv-00369-TEH (N.D. Ca.) (testifying expert; re: disparate impact of discretionary pricing policies).

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**Appendix 5: Results of APR Regressions Estimated Over Entire Sample**

| VARIABLES | (1) Race dummies only | (2) Race & rate lock month dummies | (3) Add FICO bin dummies | (4) Baseline Model (4) | (5) Same as Model (3), but substitute rate lock week dummies for rate lock month dummies | (6) Add loan amount, debt-to-income ratio, LTV, CLTV, loan type, loan purpose, loan term, occupancy & property type, self-employed dummy, and state | (7) Add housing debt-to-income ratio dummies | (8) Add credit bureau variable dummies | (9) Add doc type dummies | (10) Add fixed dummy, balloon dummy, and amortization type dummies |
|---|---|---|---|---|---|---|---|---|---|---|
| African American | 67.39*** (0.29) | 62.53*** (0.26) | 26.24*** (0.22) | 10.10*** (0.16) | 26.05*** (0.19) | 15.98*** (0.19) | 15.46*** (0.19) | 13.97*** (0.19) | 13.75*** (0.19) | 13.82*** (0.19) |
| Hispanic | 24.53*** (0.19) | 24.69*** (0.16) | 13.41*** (0.14) | 6.39*** (0.11) | 13.24*** (0.14) | 9.19*** (0.13) | 8.33*** (0.13) | 8.86*** (0.13) | 8.97*** (0.13) | 8.33*** (0.13) |
| American Indian | 17.08*** (0.77) | 12.67*** (0.67) | -1.02* (0.60) | 0.17 (0.43) | -1.19** (0.60) | 0.47 (0.53) | 0.47 (0.53) | 0.63 (0.52) | 0.44 (0.52) | -0.00 (0.52) |
| Asian | -27.02*** (0.19) | -27.93*** (0.15) | -19.04*** (0.14) | -2.33*** (0.11) | -18.86*** (0.14) | -4.30*** (0.13) | -5.42*** (0.13) | -5.05*** (0.13) | -4.81*** (0.12) | -2.04*** (0.12) |
| Missing Race | 26.73*** (0.18) | 19.02*** (0.16) | 10.81*** (0.14) | 3.82*** (0.09) | 10.54*** (0.14) | 7.91*** (0.11) | 7.74*** (0.11) | 6.91*** (0.11) | 7.34*** (0.11) | 8.39*** (0.11) |
| Missing FICO | | | 29.07*** (0.20) | 15.28*** (0.18) | 28.14*** (0.20) | 27.19*** (0.22) | 27.77*** (0.22) | 24.79*** (0.21) | 23.00*** (0.21) | 24.39*** (0.21) |
| 300 <= FICO < 540 | | | 272.67*** (1.09) | 167.77*** (0.84) | 271.74*** (1.09) | 244.00*** (0.99) | 243.55*** (0.99) | 211.27*** (0.99) | 209.07*** (0.99) | 221.34*** (1.03) |
| 540 <= FICO < 560 | | | 222.09*** (0.88) | 113.79*** (0.66) | 221.18*** (0.88) | 191.35*** (0.78) | 191.16*** (0.77) | 161.20*** (0.77) | 158.29*** (0.77) | 169.56*** (0.81) |
| 560 <= FICO < 580 | | | 189.72*** (0.62) | 79.34*** (0.47) | 188.88*** (0.62) | 154.81*** (0.54) | 154.87*** (0.54) | 127.11*** (0.55) | 123.96*** (0.54) | 133.43*** (0.57) |
| 580 <= FICO < 600 | | | 162.25*** (0.49) | 63.42*** (0.38) | 161.47*** (0.49) | 128.81*** (0.43) | 129.32*** (0.43) | 105.32*** (0.44) | 101.95*** (0.43) | 109.24*** (0.44) |
| 600 <= FICO < 620 | | | 119.11*** (0.37) | 39.94*** (0.28) | 118.46*** (0.37) | 88.28*** (0.34) | 89.19*** (0.33) | 69.44*** (0.33) | 66.46*** (0.33) | 70.82*** (0.34) |
| 620 <= FICO < 640 | | | 88.34*** (0.27) | 21.52*** (0.21) | 87.88*** (0.27) | 55.66*** (0.25) | 56.79*** (0.25) | 41.44*** (0.25) | 39.24*** (0.25) | 41.14*** (0.25) |
| 640 <= FICO < 660 | | | 63.93*** (0.23) | 11.67*** (0.18) | 63.59*** (0.22) | 34.58*** (0.20) | 35.96*** (0.20) | 24.03*** (0.21) | 22.08*** (0.21) | 23.13*** (0.20) |
| 660 <= FICO < 680 | | | 39.03*** (0.18) | 4.11*** (0.15) | 38.82*** (0.18) | 16.01*** (0.17) | 17.55*** (0.17) | 8.75*** (0.17) | 7.20*** (0.17) | 7.56*** (0.16) |
| 680 <= FICO < 700 | | | 23.55*** (0.16) | 1.01*** (0.13) | 23.46*** (0.16) | 5.82*** (0.15) | 7.37*** (0.15) | 1.24*** (0.15) | -0.12 (0.15) | -0.15 (0.14) |
| 700 <= FICO < 720 | | | 15.75*** (0.15) | 0.03 (0.12) | 15.71*** (0.15) | 1.86*** (0.14) | 3.35*** (0.14) | -0.62*** (0.14) | -1.69*** (0.14) | -1.58*** (0.13) |
| 720 <= FICO < 740 | | | 11.24*** (0.14) | -0.16 (0.12) | 11.25*** (0.14) | -0.43*** (0.13) | 0.93*** (0.13) | -1.12*** (0.13) | -2.01*** (0.13) | -1.73*** (0.13) |
| 740 <= FICO < 760 | | | 6.61*** (0.14) | -0.48*** (0.11) | 6.68*** (0.13) | -1.55*** (0.13) | -0.42*** (0.13) | -1.54*** (0.13) | -2.36*** (0.13) | -1.99*** (0.12) |
| 760 <= FICO < 780 | | | 2.57*** (0.13) | -0.36*** (0.11) | 2.68*** (0.13) | -1.09*** (0.12) | -0.22 (0.12) | -1.01*** (0.12) | -1.74*** (0.12) | -1.46*** (0.11) |
| 780 <= FICO < 800 | | | 0.33*** (0.13) | 0.11 (0.11) | 0.48*** (0.13) | 0.15 (0.12) | 0.68*** (0.12) | 0.28** (0.12) | -0.32*** (0.12) | -0.34*** (0.11) |
| $0K < Loan Amount <= $40K | | | | 76.44*** (0.56) | | 101.27*** (0.59) | 101.90*** (0.59) | 100.71*** (0.59) | 104.01*** (0.59) | 97.40*** (0.61) |
| $40K < Loan Amount <= $50K | | | | 53.82*** (0.49) | | 75.72*** (0.51) | 76.35*** (0.51) | 74.96*** (0.51) | 78.12*** (0.52) | 71.16*** (0.53) |
| $50K < Loan Amount <= $75K | | | | 35.02*** (0.44) | | 53.67*** (0.44) | 54.30*** (0.44) | 53.03*** (0.44) | 56.11*** (0.45) | 48.83*** (0.46) |
| $75K < Loan Amount <= $150K | | | | 11.31*** (0.42) | | 23.67*** (0.42) | 24.16*** (0.42) | 23.04*** (0.42) | 26.19*** (0.43) | 19.54*** (0.44) |
| $150K < Loan Amount <= $275K | | | | -5.75*** (0.42) | | 2.12*** (0.42) | 2.30*** (0.42) | 1.52*** (0.42) | 4.95*** (0.43) | -0.78* (0.43) |
| $275K < Loan Amount <= Conforming Limit | | | | -11.13*** (0.42) | | -7.37*** (0.42) | -7.74*** (0.42) | -7.59*** (0.42) | -3.97*** (0.43) | -8.91*** (0.43) |
| Conforming Limit < Loan Amount <= $1 Million | | | | -11.66*** (0.41) | | -11.75*** (0.42) | -12.31*** (0.42) | -12.48*** (0.42) | -9.26*** (0.43) | -8.63*** (0.43) |
| 36% < Debt-to-Income Ratio <= 50% | | | | 1.15*** (0.07) | | 5.22*** (0.07) | 0.87*** (0.08) | 1.87*** (0.08) | 1.69*** (0.08) | 1.07*** (0.08) |
| Debt-to-Income Ratio > 50% | | | | 4.10*** (0.13) | | 19.73*** (0.14) | 10.66*** (0.15) | 11.64*** (0.15) | 11.12*** (0.15) | 11.86*** (0.15) |

| VARIABLES | (11) Substitute product ID dummies for fixed dummy | (12) Substitute broader product categories for product ID | (13) Add escrow waiver dummies | (14) Add rate lock length dummies | (15) Add float-down option dummies | (16) Add lender-paid mortgage insurance dummy | (17) Add combination loan dummy | (18) Add prepayment penalty dummies | (19) Add MSA dummies (Baseline Model (4)) | (20) Same as Model (4), add retail channel dummy | (21) Same as Model (4), add dummies for each business line & channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| African American | 9.31*** | 12.30*** | 12.46*** | 12.12*** | 11.30*** | 11.27*** | 11.28*** | 9.52*** | 10.10*** | 9.94*** | 6.11*** |
|  | (0.15) | (0.18) | (0.17) | (0.17) | (0.17) | (0.17) | (0.17) | (0.16) | (0.16) | (0.16) | (0.13) |
| Hispanic | 6.89*** | 8.03*** | 8.16*** | 7.98*** | 8.20*** | 8.21*** | 8.23*** | 6.69*** | 6.39*** | 5.80*** | 4.92*** |
|  | (0.10) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.11) | (0.11) | (0.11) | (0.10) |
| American Indian | -1.36*** | 0.19 | 0.76 | 1.06** | 0.70 | 0.71 | 0.70 | 0.20 | 0.17 | -0.09 | -0.49 |
|  | (0.41) | (0.48) | (0.48) | (0.47) | (0.46) | (0.46) | (0.46) | (0.44) | (0.43) | (0.43) | (0.37) |
| Asian | 2.84*** | -1.98*** | -3.32*** | -4.40*** | -6.05*** | -6.07*** | -6.07*** | -3.82*** | -2.33*** | -1.35*** | 0.57*** |
|  | (0.10) | (0.12) | (0.12) | (0.12) | (0.13) | (0.13) | (0.13) | (0.11) | (0.11) | (0.11) | (0.10) |
| Missing Race | 3.79*** | 6.51*** | 6.32*** | 6.01*** | 6.04*** | 6.00*** | 5.99*** | 3.74*** | 3.82*** | 3.23*** | 0.48*** |
|  | (0.09) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.09) | (0.09) | (0.09) | (0.08) |
| Missing FICO | 11.85*** | 18.13*** | 20.37*** | 20.16*** | 19.13*** | 19.22*** | 19.17*** | 15.46*** | 15.28*** | 15.85*** | 7.92*** |
|  | (0.17) | (0.20) | (0.20) | (0.20) | (0.20) | (0.20) | (0.20) | (0.18) | (0.18) | (0.18) | (0.17) |
| 300 <= FICO < 540 | 151.77*** | 196.25*** | 196.87*** | 194.58*** | 188.79*** | 189.06*** | 189.07*** | 168.41*** | 167.77*** | 167.73*** | 145.29*** |
|  | (0.78) | (0.94) | (0.93) | (0.92) | (0.90) | (0.90) | (0.90) | (0.84) | (0.84) | (0.84) | (0.72) |
| 540 <= FICO < 560 | 100.60*** | 145.00*** | 145.57*** | 143.09*** | 136.67*** | 136.81*** | 136.84*** | 114.39*** | 113.79*** | 113.55*** | 87.98*** |
|  | (0.62) | (0.73) | (0.73) | (0.72) | (0.70) | (0.70) | (0.70) | (0.66) | (0.66) | (0.66) | (0.54) |
| 560 <= FICO < 580 | 69.51*** | 110.56*** | 111.04*** | 108.64*** | 102.14*** | 102.08*** | 102.10*** | 79.96*** | 79.34*** | 79.46*** | 51.30*** |
|  | (0.45) | (0.52) | (0.51) | (0.51) | (0.49) | (0.49) | (0.49) | (0.48) | (0.47) | (0.47) | (0.39) |
| 580 <= FICO < 600 | 55.04*** | 90.01*** | 90.75*** | 88.67*** | 83.10*** | 83.07*** | 83.09*** | 63.98*** | 63.42*** | 62.76*** | 39.40*** |
|  | (0.36) | (0.41) | (0.41) | (0.40) | (0.39) | (0.39) | (0.39) | (0.38) | (0.38) | (0.37) | (0.33) |
| 600 <= FICO < 620 | 34.94*** | 58.08*** | 59.12*** | 57.51*** | 53.81*** | 53.80*** | 53.83*** | 40.43*** | 39.94*** | 39.48*** | 23.18*** |
|  | (0.26) | (0.31) | (0.31) | (0.30) | (0.30) | (0.30) | (0.30) | (0.28) | (0.28) | (0.28) | (0.24) |
| 620 <= FICO < 640 | 23.39*** | 34.76*** | 35.77*** | 34.40*** | 31.16*** | 31.16*** | 31.20*** | 21.91*** | 21.52*** | 21.35*** | 14.35*** |
|  | (0.20) | (0.23) | (0.23) | (0.23) | (0.22) | (0.22) | (0.22) | (0.21) | (0.21) | (0.21) | (0.18) |
| 640 <= FICO < 660 | 13.84*** | 20.01*** | 21.21*** | 20.26*** | 18.05*** | 18.11*** | 18.14*** | 12.01*** | 11.67*** | 11.47*** | 7.84*** |
|  | (0.17) | (0.19) | (0.19) | (0.19) | (0.19) | (0.19) | (0.19) | (0.18) | (0.18) | (0.18) | (0.16) |
| 660 <= FICO < 680 | 6.63*** | 7.57*** | 8.69*** | 8.11*** | 7.15*** | 7.24*** | 7.27*** | 4.41*** | 4.11*** | 4.07*** | 4.12*** |
|  | (0.14) | (0.16) | (0.16) | (0.16) | (0.16) | (0.16) | (0.16) | (0.15) | (0.15) | (0.15) | (0.13) |
| 680 <= FICO < 700 | 2.74*** | 1.66*** | 2.78*** | 2.37*** | 2.11*** | 2.15*** | 2.18*** | 1.27*** | 1.01*** | 1.12*** | 2.50*** |
|  | (0.13) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.13) | (0.13) | (0.13) | (0.12) |
| 700 <= FICO < 720 | 1.53*** | 0.35*** | 1.17*** | 0.87*** | 0.70*** | 0.74*** | 0.76*** | 0.26** | 0.03 | 0.19 | 1.37*** |
|  | (0.12) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.12) | (0.12) | (0.12) | (0.11) |
| 720 <= FICO < 740 | 1.16*** | 0.06 | 0.60*** | 0.37*** | 0.21* | 0.24* | 0.26** | 0.02 | -0.16 | 0.04 | 0.65*** |
|  | (0.11) | (0.13) | (0.12) | (0.13) | (0.13) | (0.13) | (0.13) | (0.12) | (0.12) | (0.12) | (0.11) |
| 740 <= FICO < 760 | 0.54*** | -0.25** | 0.16 | -0.01 | -0.18 | -0.16 | -0.14 | -0.33*** | -0.48*** | -0.27** | -0.09 |
|  | (0.11) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.11) | (0.11) | (0.11) | (0.10) |
| 760 <= FICO < 780 | 0.12 | -0.08 | 0.27** | 0.16 | 0.17 | 0.18 | 0.20* | -0.26** | -0.36*** | -0.27** | -0.51*** |
|  | (0.10) | (0.11) | (0.11) | (0.11) | (0.12) | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.10) |
| 780 <= FICO < 800 | 0.04 | 0.40*** | 0.65*** | 0.62*** | 0.77*** | 0.77*** | 0.78*** | 0.18 | 0.11 | 0.06 | -0.37*** |
|  | (0.10) | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.10) |
| $0K < Loan Amount <= $40K | 79.93*** | 95.26*** | 95.05*** | 93.16*** | 86.63*** | 86.65*** | 86.72*** | 80.34*** | 76.44*** | 78.47*** | 60.06*** |
|  | (0.59) | (0.60) | (0.59) | (0.59) | (0.58) | (0.58) | (0.58) | (0.56) | (0.56) | (0.56) | (0.54) |
| $40K < Loan Amount <= $50K | 54.59*** | 69.91*** | 70.17*** | 68.24*** | 62.44*** | 62.48*** | 62.56*** | 57.21*** | 53.82*** | 55.88*** | 42.09*** |
|  | (0.51) | (0.52) | (0.52) | (0.52) | (0.51) | (0.51) | (0.51) | (0.49) | (0.49) | (0.49) | (0.48) |
| $50K < Loan Amount <= $75K | 33.98*** | 48.11*** | 48.66*** | 46.79*** | 41.68*** | 41.72*** | 41.80*** | 37.78*** | 35.02*** | 37.12*** | 26.14*** |
|  | (0.45) | (0.46) | (0.46) | (0.46) | (0.45) | (0.45) | (0.45) | (0.43) | (0.44) | (0.44) | (0.44) |
| $75K < Loan Amount <= $150K | 9.23*** | 19.91*** | 20.72*** | 18.91*** | 14.61*** | 14.72*** | 14.81*** | 13.00*** | 11.31*** | 13.40*** | 4.89*** |
|  | (0.44) | (0.44) | (0.44) | (0.44) | (0.44) | (0.44) | (0.44) | (0.42) | (0.42) | (0.42) | (0.43) |
| $150K < Loan Amount <= $275K | -7.60*** | 0.16 | 1.24*** | -0.45 | -4.52*** | -4.33*** | -4.24*** | -4.50*** | -5.75*** | -3.65*** | -10.38*** |
|  | (0.44) | (0.44) | (0.44) | (0.44) | (0.43) | (0.43) | (0.43) | (0.42) | (0.42) | (0.42) | (0.43) |
| $275K < Loan Amount <= Conforming Limit | -12.93*** | -7.36*** | -6.62*** | -8.20*** | -11.91*** | -11.74*** | -11.67*** | -10.13*** | -11.13*** | -9.02*** | -14.18*** |
|  | (0.44) | (0.44) | (0.44) | (0.44) | (0.44) | (0.44) | (0.44) | (0.42) | (0.42) | (0.42) | (0.43) |
| Conforming Limit < Loan Amount <= $1 Million | -9.52*** | -7.34*** | -7.81*** | -9.33*** | -14.85*** | -14.76*** | -14.68*** | -11.91*** | -11.66*** | -9.19*** | -13.41*** |
|  | (0.44) | (0.44) | (0.43) | (0.43) | (0.43) | (0.43) | (0.43) | (0.41) | (0.41) | (0.41) | (0.43) |
| 36% < Debt-to-Income Ratio <= 50% | 1.20*** | 0.86*** | 1.02*** | 1.01*** | 1.11*** | 1.13*** | 1.13*** | 1.26*** | 1.15*** | 1.14*** | 1.19*** |
|  | (0.06) | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) | (0.06) |
| Debt-to-Income Ratio > 50% | 1.61*** | 7.09*** | 7.54*** | 7.50*** | 6.92*** | 6.90*** | 6.89*** | 4.33*** | 4.10*** | 3.65*** | -0.30*** |
|  | (0.12) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.13) | (0.13) | (0.13) | (0.11) |

| VARIABLES | (1) Race dummies only | (2) Race & rate lock month dummies | (3) Add FICO bin dummies | (4) Baseline Model (4) | (5) Same as Model (3), but substitute rate lock week dummies for rate lock month dummies | (6) Add loan amount, debt-to-income ratio, LTV, CLTV, loan type, loan purpose, loan term, occupancy & property type, self-employed dummy, and state | (7) Add housing debt-to-income ratio dummies | (8) Add credit bureau variable dummies | (9) Add doc type dummies | (10) Add fixed dummy, balloon dummy, and amortization type dummies |
|---|---|---|---|---|---|---|---|---|---|---|
| Debt-to-Income Ratio Missing | | | | 11.63*** | | 34.59*** | 23.56*** | 24.96*** | 27.80*** | 31.99*** |
| | | | | (0.33) | | (0.25) | (0.36) | (0.36) | (0.36) | (0.36) |
| 28% < Housing Debt-to-Income Ratio <= 33% | | | | 2.19*** | | | 6.36*** | 5.66*** | 5.34*** | 5.48*** |
| | | | | (0.09) | | | (0.11) | (0.11) | (0.11) | (0.11) |
| 33% < Housing Debt-to-Income Ratio <= 40% | | | | 4.74*** | | | 12.38*** | 11.08*** | 10.62*** | 11.11*** |
| | | | | (0.11) | | | (0.13) | (0.13) | (0.13) | (0.13) |
| Housing Debt-to-Income Ratio > 40% | | | | 8.96*** | | | 21.68*** | 19.49*** | 19.38*** | 20.22*** |
| | | | | (0.16) | | | (0.19) | (0.18) | (0.18) | (0.18) |
| Housing Debt-to-Income Ratio Missing | | | | 10.27*** | | | 13.19*** | 13.04*** | 13.99*** | 11.92*** |
| | | | | (0.25) | | | (0.29) | (0.29) | (0.29) | (0.29) |
| LTV missing | | | | -20.24*** | | -68.73*** | -68.24*** | -66.09*** | -66.23*** | -66.78*** |
| | | | | (0.21) | | (0.20) | (0.19) | (0.19) | (0.19) | (0.19) |
| 0% < LTV <= 60% | | | | -59.98*** | | -66.41*** | -66.43*** | -66.48*** | -65.28*** | -65.55*** |
| | | | | (0.17) | | (0.21) | (0.21) | (0.21) | (0.21) | (0.20) |
| 60% < LTV <= 70% | | | | -62.25*** | | -66.69*** | -66.74*** | -66.83*** | -65.72*** | -65.79*** |
| | | | | (0.17) | | (0.21) | (0.21) | (0.21) | (0.21) | (0.20) |
| 70% < LTV <= 80% | | | | -60.30*** | | -65.17*** | -64.99*** | -64.53*** | -63.48*** | -63.03*** |
| | | | | (0.14) | | (0.17) | (0.17) | (0.17) | (0.17) | (0.17) |
| 80% < LTV <= 90% | | | | -14.02*** | | -2.71*** | -2.76*** | -4.42*** | -3.30*** | -2.10*** |
| | | | | (0.19) | | (0.23) | (0.23) | (0.23) | (0.23) | (0.23) |
| CLTV missing | | | | -2.80*** | | -22.20*** | -22.23*** | -17.95*** | -16.48*** | -17.90*** |
| | | | | (0.21) | | (0.19) | (0.19) | (0.19) | (0.19) | (0.23) |
| 0% < CLTV <= 60% | | | | -22.22*** | | -33.13*** | -32.74*** | -32.23*** | -29.76*** | -31.20*** |
| | | | | (0.18) | | (0.21) | (0.21) | (0.21) | (0.21) | (0.20) |
| 60% < CLTV <= 70% | | | | -18.70*** | | -27.75*** | -27.43*** | -27.22*** | -24.82*** | -26.75*** |
| | | | | (0.18) | | (0.21) | (0.21) | (0.20) | (0.20) | (0.20) |
| 70% < CLTV <= 80% | | | | -16.07*** | | -24.55*** | -24.24*** | -24.33*** | -22.03*** | -24.47*** |
| | | | | (0.14) | | (0.16) | (0.16) | (0.16) | (0.16) | (0.16) |
| 80% < CLTV <= 90% | | | | -13.54*** | | -25.18*** | -24.95*** | -24.18*** | -21.96*** | -23.36*** |
| | | | | (0.16) | | (0.18) | (0.18) | (0.18) | (0.18) | (0.18) |
| 90% < CLTV <= 95% | | | | -12.14*** | | -22.28*** | -21.94*** | -21.43*** | -19.17*** | -19.70*** |
| | | | | (0.15) | | (0.18) | (0.18) | (0.17) | (0.17) | (0.17) |
| Retail channel | | | | | | | | | | |
| Business line & channel: Centralized Retail Prime | | | | | | | | | | |
| Business line & channel: Retail AA | | | | | | | | | | |
| Business line & channel: Retail AM | | | | | | | | | | |
| Business line & channel: Retail Global | | | | | | | | | | |
| Business line & channel: Retail MEAA | | | | | | | | | | |
| Business line & channel: Retail TNP | | | | | | | | | | |
| Business line & channel: Wholesale AA | | | | | | | | | | |
| Business line & channel: Wholesale AM | | | | | | | | | | |
| Business line & channel: Wholesale Global | | | | | | | | | | |
| Business line & channel: Wholesale MEAA | | | | | | | | | | |
| Business line & channel: Wholesale Prime | | | | | | | | | | |
| Business line & channel: Wholesale TNP | | | | | | | | | | |
| FHA Loan | | | | -52.37*** | | -85.76*** | -85.38*** | -82.66*** | -79.82*** | -83.87*** |
| | | | | (0.20) | | (0.23) | (0.23) | (0.22) | (0.22) | (0.22) |
| VA Loan | | | | -71.55*** | | -85.29*** | -89.93*** | -88.93*** | -89.68*** | -95.87*** |
| | | | | (0.26) | | (0.26) | (0.30) | (0.30) | (0.30) | (0.30) |

| VARIABLES | (11) Substitute product ID dummies for fixed dummy | (12) Substitute broader product categories for product ID | (13) Add escrow waiver dummies | (14) Add rate lock length dummies | (15) Add float-down option dummies | (16) Add lender-paid mortgage insurance dummy | (17) Add combination loan dummy | (18) Add prepayment penalty dummies | (19) Add MSA dummies (Baseline Model (4)) | (20) Same as Model (4), add retail channel dummy | (21) Same as Model (4), add dummies for each business line & channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Debt-to-Income Ratio Missing | 22.67*** | 24.10*** | 23.66*** | 23.04*** | 17.61*** | 17.82*** | 17.81*** | 11.88*** | 11.63*** | 12.35*** | 18.98*** |
| | (0.33) | (0.35) | (0.35) | (0.35) | (0.34) | (0.34) | (0.34) | (0.33) | (0.33) | (0.33) | (0.30) |
| 28% < Housing Debt-to-Income Ratio <= 33% | 2.58*** | 4.32*** | 4.04*** | 3.58*** | 2.60*** | 2.64*** | 2.67*** | 1.95*** | 2.19*** | 2.67*** | 1.46*** |
| | (0.08) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.09) | (0.09) | (0.09) | (0.08) |
| 33% < Housing Debt-to-Income Ratio <= 40% | 5.03*** | 8.65*** | 8.02*** | 7.30*** | 5.91*** | 5.96*** | 5.98*** | 4.42*** | 4.74*** | 5.35*** | 2.83*** |
| | (0.10) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.11) | (0.11) | (0.11) | (0.10) |
| Housing Debt-to-Income Ratio > 40% | 7.92*** | 15.02*** | 14.26*** | 13.30*** | 12.03*** | 12.08*** | 12.10*** | 8.66*** | 8.96*** | 9.45*** | 3.81*** |
| | (0.15) | (0.17) | (0.17) | (0.17) | (0.17) | (0.17) | (0.17) | (0.16) | (0.16) | (0.16) | (0.14) |
| Housing Debt-to-Income Ratio Missing | 10.75*** | 9.69*** | 9.36*** | 9.22*** | 11.39*** | 11.21*** | 11.20*** | 10.13*** | 10.27*** | 9.39*** | 8.59*** |
| | (0.24) | (0.27) | (0.27) | (0.27) | (0.26) | (0.26) | (0.26) | (0.25) | (0.25) | (0.25) | (0.22) |
| LTV missing | -59.25*** | -62.92*** | -37.85*** | -34.19*** | -4.77*** | -6.34*** | -6.02*** | -21.21*** | -20.24*** | -14.13*** | -35.02*** |
| | (0.15) | (0.18) | (0.21) | (0.21) | (0.22) | (0.22) | (0.22) | (0.21) | (0.21) | (0.22) | (0.19) |
| 0% < LTV <= 60% | -58.02*** | -63.04*** | -64.00*** | -62.82*** | -61.96*** | -63.53*** | -63.33*** | -60.72*** | -59.98*** | -60.78*** | -57.31*** |
| | (0.16) | (0.19) | (0.19) | (0.19) | (0.18) | (0.19) | (0.19) | (0.17) | (0.17) | (0.17) | (0.16) |
| 60% < LTV <= 70% | -59.54*** | -64.21*** | -64.53*** | -63.72*** | -63.52*** | -65.13*** | -64.95*** | -62.75*** | -62.25*** | -62.80*** | -59.92*** |
| | (0.16) | (0.19) | (0.19) | (0.19) | (0.19) | (0.19) | (0.19) | (0.17) | (0.17) | (0.17) | (0.15) |
| 70% < LTV <= 80% | -59.93*** | -60.97*** | -60.88*** | -60.41*** | -59.88*** | -61.65*** | -61.53*** | -60.59*** | -60.30*** | -61.14*** | -60.50*** |
| | (0.12) | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) | (0.14) | (0.14) | (0.14) | (0.12) |
| 80% < LTV <= 90% | -15.98*** | -7.70*** | -7.41*** | -7.68*** | -10.03*** | -10.05*** | -9.91*** | -13.97*** | -14.02*** | -14.39*** | -17.44*** |
| | (0.18) | (0.21) | (0.21) | (0.21) | (0.20) | (0.20) | (0.20) | (0.19) | (0.19) | (0.19) | (0.16) |
| CLTV missing | -10.86*** | -18.88*** | -12.68*** | -12.83*** | -3.13*** | -3.35*** | -3.50*** | -3.21*** | -2.80*** | 5.18*** | -6.65*** |
| | (0.19) | (0.22) | (0.23) | (0.23) | (0.23) | (0.23) | (0.21) | (0.21) | (0.21) | (0.22) | (0.19) |
| 0% < CLTV <= 60% | -21.45*** | -26.71*** | -26.47*** | -26.90*** | -26.11*** | -26.41*** | -26.58*** | -22.36*** | -22.22*** | -20.93*** | -19.26*** |
| | (0.18) | (0.20) | (0.20) | (0.20) | (0.19) | (0.19) | (0.19) | (0.18) | (0.18) | (0.18) | (0.17) |
| 60% < CLTV <= 70% | -17.91*** | -22.39*** | -22.28*** | -22.53*** | -21.76*** | -22.02*** | -22.18*** | -18.53*** | -18.70*** | -17.45*** | -16.13*** |
| | (0.17) | (0.19) | (0.19) | (0.19) | (0.19) | (0.19) | (0.19) | (0.18) | (0.18) | (0.18) | (0.17) |
| 70% < CLTV <= 80% | -14.40*** | -21.08*** | -21.16*** | -21.13*** | -20.17*** | -20.34*** | -20.44*** | -15.86*** | -16.07*** | -14.78*** | -11.90*** |
| | (0.13) | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) | (0.14) | (0.14) | (0.14) | (0.13) |
| 80% < CLTV <= 90% | -12.24*** | -19.04*** | -18.72*** | -18.58*** | -17.32*** | -17.51*** | -17.62*** | -13.46*** | -13.54*** | -12.51*** | -9.21*** |
| | (0.15) | (0.17) | (0.17) | (0.17) | (0.16) | (0.16) | (0.16) | (0.16) | (0.16) | (0.16) | (0.15) |
| 90% < CLTV <= 95% | -11.69*** | -16.75*** | -16.06*** | -15.91*** | -15.21*** | -15.29*** | -15.35*** | -11.99*** | -12.14*** | -11.71*** | -8.89*** |
| | (0.13) | (0.16) | (0.16) | (0.16) | (0.16) | (0.16) | (0.16) | (0.15) | (0.15) | (0.15) | (0.13) |
| Retail channel | | | | | | | | | | 22.48*** | |
| | | | | | | | | | | (0.13) | |
| Business line & channel: Centralized Retail Prime | | | | | | | | | | | -9.52*** |
| | | | | | | | | | | | (0.12) |
| Business line & channel: Retail AA | | | | | | | | | | | 58.54*** |
| | | | | | | | | | | | (0.82) |
| Business line & channel: Retail AM | | | | | | | | | | | 141.18*** |
| | | | | | | | | | | | (0.95) |
| Business line & channel: Retail Global | | | | | | | | | | | 262.07*** |
| | | | | | | | | | | | (0.53) |
| Business line & channel: Retail MEAA | | | | | | | | | | | 92.67*** |
| | | | | | | | | | | | (0.43) |
| Business line & channel: Retail TNP | | | | | | | | | | | 391.85*** |
| | | | | | | | | | | | (0.71) |
| Business line & channel: Wholesale AA | | | | | | | | | | | 33.48*** |
| | | | | | | | | | | | (0.65) |
| Business line & channel: Wholesale AM | | | | | | | | | | | 168.44*** |
| | | | | | | | | | | | (1.10) |
| Business line & channel: Wholesale Global | | | | | | | | | | | 217.26*** |
| | | | | | | | | | | | (0.60) |
| Business line & channel: Wholesale MEAA | | | | | | | | | | | 108.68*** |
| | | | | | | | | | | | (0.48) |
| Business line & channel: Wholesale Prime | | | | | | | | | | | -2.99*** |
| | | | | | | | | | | | (0.10) |
| Business line & channel: Wholesale TNP | | | | | | | | | | | 375.29*** |
| | | | | | | | | | | | (0.88) |
| FHA Loan | -37.49*** | -82.34*** | -81.84*** | -79.45*** | -70.98*** | -72.62*** | -72.47*** | -52.66*** | -52.37*** | -51.62*** | -30.21*** |
| | (0.17) | (0.22) | (0.22) | (0.21) | (0.21) | (0.21) | (0.21) | (0.20) | (0.20) | (0.20) | (0.17) |
| VA Loan | -70.58*** | -88.63*** | -88.32*** | -86.28*** | -81.89*** | -83.45*** | -83.43*** | -71.86*** | -71.55*** | -70.19*** | -58.35*** |
| | (0.23) | (0.28) | (0.28) | (0.28) | (0.27) | (0.27) | (0.27) | (0.25) | (0.26) | (0.26) | (0.23) |

| VARIABLES | (1) Race dummies only | (2) Race & rate lock month dummies | (3) Add FICO bin dummies | (4) Baseline Model (4) | (5) Same as Model (3), but substitute rate lock week dummies for rate lock month dummies | (6) Add loan amount, debt-to-income ratio, LTV, CLTV, loan type, loan purpose, loan term, occupancy & property type, self-employed dummy, and state | (7) Add housing debt-to-income ratio dummies | (8) Add credit bureau variable dummies | (9) Add doc type dummies | (10) Add fixed dummy, balloon dummy, and amortization type dummies |
|---|---|---|---|---|---|---|---|---|---|---|
| FSA/RHS Loan | | | | -78.45*** | | -89.65*** | -88.59*** | -85.66*** | -85.90*** | -94.31*** |
| | | | | (0.71) | | (0.88) | (0.87) | (0.85) | (0.86) | (0.87) |
| Self-employed borrower or co-borrower | | | | 4.37*** | | 9.42*** | 9.93*** | 9.70*** | 10.28*** | 10.65*** |
| | | | | (0.10) | | (0.11) | (0.11) | (0.11) | (0.11) | (0.10) |
| Cash-out Refi | | | | 10.23*** | | 21.94*** | 21.73*** | 20.41*** | 20.49*** | 20.62*** |
| | | | | (0.09) | | (0.11) | (0.11) | (0.10) | (0.10) | (0.10) |
| Rate Term Refi | | | | -3.82*** | | -3.98*** | -3.65*** | -4.23*** | -4.03*** | -4.54*** |
| | | | | (0.08) | | (0.09) | (0.09) | (0.09) | (0.09) | (0.09) |
| Streamline Refi | | | | -2.33*** | | -2.91*** | -3.12*** | -5.83*** | -6.61*** | -8.73*** |
| | | | | (0.24) | | (0.27) | (0.27) | (0.27) | (0.28) | (0.28) |
| Unknown loan purpose | | | | 38.37*** | | 23.46*** | 24.10*** | 23.81*** | 23.99*** | 21.39*** |
| | | | | (4.51) | | (4.92) | (4.92) | (4.95) | (5.02) | (4.63) |
| Loan Term Missing | | | | 11.68*** | | -24.47*** | -23.75*** | -23.26*** | -16.09*** | -17.69*** |
| | | | | (0.19) | | (0.15) | (0.15) | (0.15) | (0.17) | (0.16) |
| Loan Term (years) <= 5 | | | | -19.30 | | -48.22*** | -47.66*** | -49.31*** | -46.89*** | -79.47*** |
| | | | | (13.80) | | (12.35) | (12.33) | (12.38) | (12.37) | (12.54) |
| 5 < Loan Term (years) <= 7 | | | | -3.11*** | | -44.22*** | -43.57*** | -44.89*** | -39.21*** | -97.65*** |
| | | | | (0.78) | | (0.84) | (0.84) | (0.80) | (0.81) | (1.05) |
| 7 < Loan Term (years) <= 10 | | | | -6.49*** | | -53.40*** | -53.28*** | -52.91*** | -54.34*** | -62.09*** |
| | | | | (1.25) | | (0.18) | (0.18) | (0.18) | (0.18) | (0.18) |
| 10 < Loan Term (years) <= 15 | | | | -13.81*** | | -32.63*** | -32.43*** | -32.11*** | -32.33*** | -40.98*** |
| | | | | (0.20) | | (0.08) | (0.08) | (0.08) | (0.08) | (0.08) |
| 15 < Loan Term (years) <= 20 | | | | -5.12*** | | -5.10*** | -4.71*** | -3.73*** | -3.79*** | -10.59*** |
| | | | | (0.28) | | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) |
| 20 < Loan Term (years) <= 25 | | | | 4.43*** | | 7.08*** | 7.58*** | 8.18*** | 6.64*** | 0.35 |
| | | | | (0.38) | | (0.48) | (0.48) | (0.48) | (0.47) | (0.48) |
| Loan Term (years) > 30 | | | | -19.22*** | | 0.18 | -1.53* | -1.46* | -2.75*** | -19.52*** |
| | | | | (2.76) | | (0.87) | (0.85) | (0.85) | (0.81) | (0.81) |
| Investment, Single Family | | | | 51.20*** | | 54.33*** | 55.80*** | 56.30*** | 55.35*** | 56.12*** |
| | | | | (0.21) | | (0.22) | (0.22) | (0.22) | (0.22) | (0.22) |
| Investment, Multi Family 2 | | | | 46.17*** | | 53.87*** | 54.99*** | 55.34*** | 54.41*** | 53.36*** |
| | | | | (0.43) | | (0.44) | (0.44) | (0.44) | (0.45) | (0.44) |
| Investment, Multi Family 3 | | | | 50.47*** | | 64.22*** | 65.52*** | 65.85*** | 64.78*** | 63.25*** |
| | | | | (0.84) | | (0.88) | (0.88) | (0.87) | (0.88) | (0.88) |
| Investment, Multi Family 4 | | | | 49.02*** | | 63.05*** | 64.38*** | 64.35*** | 63.10*** | 61.35*** |
| | | | | (0.64) | | (0.68) | (0.69) | (0.69) | (0.69) | (0.68) |
| Investment, Low Rise Condo | | | | 45.75*** | | 40.04*** | 42.15*** | 42.84*** | 41.49*** | 44.71*** |
| | | | | (0.40) | | (0.41) | (0.41) | (0.41) | (0.42) | (0.40) |
| Investment, High Rise Condo | | | | 48.77*** | | 34.11*** | 36.54*** | 37.09*** | 34.55*** | 40.16*** |
| | | | | (1.07) | | (1.08) | (1.08) | (1.09) | (1.09) | (1.06) |
| Investment, Co-op | | | | 34.72*** | | 51.99*** | 54.20*** | 54.05*** | 53.00*** | 55.20*** |
| | | | | (2.27) | | (2.53) | (2.52) | (2.55) | (2.56) | (2.61) |
| Primary home, Multi Family 2 | | | | 8.61*** | | 15.58*** | 13.35*** | 13.68*** | 12.93*** | 12.12*** |
| | | | | (0.30) | | (0.34) | (0.33) | (0.33) | (0.33) | (0.33) |
| Primary home, Multi Family 3 | | | | 18.47*** | | 29.20*** | 26.08*** | 26.57*** | 25.10*** | 24.72*** |
| | | | | (0.85) | | (0.95) | (0.95) | (0.94) | (0.94) | (0.93) |
| Primary home, Multi Family 4 | | | | 22.04*** | | 35.65*** | 32.80*** | 32.88*** | 31.55*** | 30.62*** |
| | | | | (1.09) | | (1.23) | (1.23) | (1.22) | (1.22) | (1.20) |
| Primary home, Low Rise Condo | | | | -0.93*** | | -9.48*** | -10.33*** | -9.31*** | -9.22*** | -6.33*** |
| | | | | (0.12) | | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) |
| Primary home, Townhouse (detached) | | | | 6.27*** | | 29.77*** | 17.13*** | 19.95*** | 22.84*** | 14.91*** |
| | | | | (0.31) | | (0.34) | (0.37) | (0.36) | (0.36) | (0.34) |
| Primary home, High Rise Condo | | | | 3.86*** | | -12.58*** | -13.33*** | -12.14*** | -12.22*** | -7.80*** |
| | | | | (0.31) | | (0.34) | (0.34) | (0.34) | (0.34) | (0.33) |
| Primary home, Co-op | | | | -1.89*** | | -0.05 | -0.14 | 1.24*** | 2.36*** | 5.22*** |
| | | | | (0.35) | | (0.39) | (0.39) | (0.40) | (0.40) | (0.40) |
| Primary home, 'P' (undefined) | | | | 17.13 | | 2.10 | 1.28 | -2.75 | -4.20 | 21.32 |
| | | | | (21.06) | | (21.52) | (21.42) | (22.24) | (22.28) | (22.13) |
| Second home, Single Family | | | | 6.09*** | | 1.58*** | 3.97*** | 3.97*** | 3.98*** | 5.25*** |
| | | | | (0.15) | | (0.16) | (0.16) | (0.16) | (0.16) | (0.15) |
| Second home, Multi Family 2 | | | | 6.45*** | | 2.02 | 4.86*** | 4.42*** | 3.15** | 4.80*** |
| | | | | (1.33) | | (1.49) | (1.49) | (1.49) | (1.49) | (1.44) |

| VARIABLES | (11) Substitute product ID dummies for fixed dummy | (12) Substitute broader product categories for product ID | (13) Add escrow waiver dummies | (14) Add rate lock length dummies | (15) Add float-down option dummies | (16) Add lender-paid mortgage insurance dummy | (17) Add combination loan dummy | (18) Add prepayment penalty dummies | (19) Add MSA dummies (Baseline Model (4)) | (20) Same as Model (4), add retail channel dummy | (21) Same as Model (4), add dummies for each business line & channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FSA/RHS Loan | -70.80*** | -88.59*** | -88.81*** | -86.90*** | -89.87*** | -91.76*** | -91.76*** | -77.82*** | -78.45*** | -77.46*** | -62.31*** |
|  | (0.64) | (0.77) | (0.77) | (0.77) | (0.80) | (0.80) | (0.80) | (0.71) | (0.71) | (0.72) | (0.59) |
| Self-employed borrower or co-borrower | 6.05*** | 9.61*** | 7.45*** | 6.98*** | 6.80*** | 6.74*** | 6.74*** | 4.79*** | 4.37*** | 4.39*** | 2.04*** |
|  | (0.09) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.08) |
| Cash-out Refi | 12.22*** | 16.10*** | 15.76*** | 15.88*** | 12.86*** | 12.88*** | 12.86*** | 10.36*** | 10.23*** | 10.73*** | 5.95*** |
|  | (0.09) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.09) | (0.09) | (0.09) | (0.08) |
| Rate Term Refi | -1.70*** | -3.89*** | -5.47*** | -4.65*** | -5.65*** | -5.68*** | -5.71*** | -3.97*** | -3.82*** | -3.09*** | -3.47*** |
|  | (0.07) | (0.08) | (0.08) | (0.08) | (0.08) | (0.08) | (0.08) | (0.08) | (0.08) | (0.08) | (0.07) |
| Streamline Refi | -2.10*** | -2.96*** | -3.93*** | -3.29*** | -5.42*** | -5.21*** | -5.24*** | -2.99*** | -2.33*** | -0.03 | -3.19*** |
|  | (0.21) | (0.27) | (0.27) | (0.27) | (0.26) | (0.26) | (0.26) | (0.24) | (0.24) | (0.24) | (0.20) |
| Unknown loan purpose | 37.98*** | 14.63*** | 15.46*** | 16.06*** | 21.84*** | 32.06*** | 32.06*** | 38.21*** | 38.37*** | 38.39*** | 42.99*** |
|  | (3.82) | (4.98) | (4.96) | (4.88) | (4.76) | (5.08) | (5.08) | (4.51) | (4.51) | (4.53) | (4.10) |
| Loan Term Missing | -3.47*** | -7.70*** | 16.44*** | 17.03*** | 10.87*** | 10.83*** | 10.90*** | 11.61*** | 11.68*** | 10.41*** | 10.67*** |
|  | (0.14) | (0.19) | (0.21) | (0.21) | (0.21) | (0.21) | (0.19) | (0.19) | (0.19) | (0.19) | (0.17) |
| Loan Term (years) <= 5 | -22.44 | -30.22** | -35.82*** | -29.04** | -22.78 | -22.88* | -23.05* | -20.42 | -19.30 | -16.76 | -11.18 |
|  | (13.78) | (13.82) | (13.95) | (13.83) | (13.86) | (13.85) | (13.85) | (13.85) | (13.80) | (13.85) | (13.65) |
| 5 < Loan Term (years) <= 7 | -2.33*** | -2.65*** | -7.91*** | -4.91*** | -2.12*** | -2.87*** | -2.86*** | -2.90*** | -3.11*** | -1.81** | -3.17*** |
|  | (0.73) | (0.79) | (0.80) | (0.80) | (0.82) | (0.82) | (0.82) | (0.77) | (0.78) | (0.80) | (0.73) |
| 7 < Loan Term (years) <= 10 | -4.05*** | -12.64*** | -13.83*** | -14.03*** | -10.19*** | -10.35*** | -10.52*** | -6.63*** | -6.49*** | -4.25*** | 1.79 |
|  | (1.27) | (1.28) | (1.28) | (1.27) | (1.27) | (1.27) | (1.27) | (1.25) | (1.25) | (1.25) | (1.25) |
| 10 < Loan Term (years) <= 15 | -8.32*** | -14.43*** | -14.44*** | -15.28*** | -13.67*** | -13.95*** | -13.96*** | -13.74*** | -13.81*** | -13.74*** | -12.45*** |
|  | (0.19) | (0.22) | (0.22) | (0.22) | (0.22) | (0.22) | (0.22) | (0.20) | (0.20) | (0.20) | (0.18) |
| 15 < Loan Term (years) <= 20 | -6.36*** | -9.71*** | -9.11*** | -9.27*** | -5.78*** | -5.90*** | -5.91*** | -4.92*** | -5.12*** | -5.10*** | -3.55*** |
|  | (0.26) | (0.31) | (0.31) | (0.31) | (0.30) | (0.30) | (0.30) | (0.28) | (0.28) | (0.28) | (0.26) |
| 20 < Loan Term (years) <= 25 | -0.65* | 0.56 | 0.64 | 1.29*** | 4.21*** | 4.24*** | 4.25*** | 4.52*** | 4.43*** | 3.86*** | 4.00*** |
|  | (0.35) | (0.43) | (0.43) | (0.43) | (0.42) | (0.43) | (0.43) | (0.38) | (0.38) | (0.38) | (0.33) |
| Loan Term (years) > 30 | -52.67*** | -71.41*** | -57.78*** | -54.84*** | -35.28*** | -34.93*** | -34.90*** | -18.86*** | -19.22*** | -15.34*** | 39.77*** |
|  | (3.03) | (2.64) | (2.66) | (2.64) | (2.63) | (2.63) | (2.63) | (2.76) | (2.76) | (2.78) | (2.58) |
| Investment, Single Family | 54.36*** | 54.06*** | 53.43*** | 52.20*** | 50.52*** | 50.40*** | 50.41*** | 50.82*** | 51.20*** | 51.23*** | 50.89*** |
|  | (0.20) | (0.21) | (0.21) | (0.21) | (0.20) | (0.20) | (0.21) | (0.21) | (0.21) | (0.21) | (0.17) |
| Investment, Multi Family 2 | 53.13*** | 52.27*** | 51.56*** | 50.37*** | 48.14*** | 48.05*** | 48.07*** | 45.54*** | 46.17*** | 45.95*** | 47.57*** |
|  | (0.43) | (0.42) | (0.42) | (0.42) | (0.41) | (0.41) | (0.41) | (0.43) | (0.43) | (0.42) | (0.36) |
| Investment, Multi Family 3 | 58.19*** | 60.08*** | 59.21*** | 57.95*** | 54.69*** | 54.56*** | 54.58*** | 50.23*** | 50.47*** | 50.18*** | 51.45*** |
|  | (0.87) | (0.85) | (0.84) | (0.83) | (0.81) | (0.81) | (0.81) | (0.85) | (0.84) | (0.84) | (0.69) |
| Investment, Multi Family 4 | 56.42*** | 58.38*** | 57.20*** | 55.93*** | 52.73*** | 52.66*** | 52.68*** | 48.99*** | 49.02*** | 48.85*** | 50.04*** |
|  | (0.65) | (0.65) | (0.65) | (0.64) | (0.63) | (0.63) | (0.63) | (0.64) | (0.64) | (0.64) | (0.52) |
| Investment, Low Rise Condo | 45.17*** | 44.02*** | 43.52*** | 42.65*** | 41.97*** | 41.87*** | 41.87*** | 44.99*** | 45.75*** | 44.88*** | 48.27*** |
|  | (0.38) | (0.40) | (0.40) | (0.39) | (0.39) | (0.39) | (0.39) | (0.40) | (0.40) | (0.39) | (0.34) |
| Investment, High Rise Condo | 49.43*** | 43.37*** | 43.60*** | 44.69*** | 47.84*** | 47.69*** | 47.68*** | 48.38*** | 48.77*** | 46.19*** | 50.84*** |
|  | (1.10) | (1.14) | (1.13) | (1.13) | (1.10) | (1.10) | (1.10) | (1.07) | (1.07) | (1.07) | (1.03) |
| Investment, Co-op | 55.95*** | 51.05*** | 44.72*** | 40.32*** | 21.65*** | 21.87*** | 21.91*** | 33.97*** | 34.72*** | 36.63*** | 53.18*** |
|  | (2.31) | (2.46) | (2.48) | (2.49) | (2.48) | (2.48) | (2.48) | (2.26) | (2.27) | (2.31) | (2.21) |
| Primary home, Multi Family 2 | 8.10*** | 10.65*** | 10.55*** | 9.69*** | 8.40*** | 8.44*** | 8.44*** | 8.09*** | 8.61*** | 8.61*** | 5.45*** |
|  | (0.28) | (0.31) | (0.31) | (0.31) | (0.31) | (0.31) | (0.31) | (0.30) | (0.30) | (0.30) | (0.27) |
| Primary home, Multi Family 3 | 20.59*** | 21.54*** | 21.61*** | 20.41*** | 19.48*** | 19.38*** | 19.39*** | 18.05*** | 18.47*** | 17.94*** | 14.31*** |
|  | (0.74) | (0.92) | (0.92) | (0.91) | (0.88) | (0.88) | (0.88) | (0.85) | (0.85) | (0.84) | (0.71) |
| Primary home, Multi Family 4 | 24.95*** | 27.93*** | 27.53*** | 25.95*** | 24.92*** | 24.78*** | 24.77*** | 21.91*** | 22.04*** | 21.18*** | 19.26*** |
|  | (0.97) | (1.19) | (1.18) | (1.17) | (1.14) | (1.14) | (1.14) | (1.09) | (1.09) | (1.08) | (0.93) |
| Primary home, Low Rise Condo | 0.38*** | -3.17*** | -3.84*** | -3.89*** | -3.58*** | -3.46*** | -3.43*** | -1.71*** | -0.93*** | -0.84*** | 0.69*** |
|  | (0.11) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.11) | (0.12) | (0.12) | (0.10) |
| Primary home, Townhouse (detached) | 2.77*** | 2.81*** | 0.37 | 6.09*** | 0.83** | 1.16*** | 1.14*** | 4.81*** | 6.27*** | 5.96*** | 8.15*** |
|  | (0.27) | (0.34) | (0.34) | (0.34) | (0.33) | (0.33) | (0.33) | (0.31) | (0.31) | (0.31) | (0.27) |
| Primary home, High Rise Condo | 3.45*** | -1.65*** | -1.44*** | 0.01 | 2.40*** | 2.55*** | 2.52*** | 3.31*** | 3.86*** | 1.63*** | 4.43*** |
|  | (0.30) | (0.34) | (0.33) | (0.34) | (0.32) | (0.32) | (0.32) | (0.30) | (0.31) | (0.31) | (0.30) |
| Primary home, Co-op | 8.01*** | 4.59*** | 0.68* | -1.05** | -10.57*** | -10.63*** | -10.58*** | -2.71*** | -1.89*** | 0.24 | 8.85*** |
|  | (0.32) | (0.36) | (0.37) | (0.37) | (0.38) | (0.38) | (0.38) | (0.34) | (0.35) | (0.35) | (0.33) |
| Primary home, 'P' (undefined) | 25.14* | 26.40 | 21.61 | 15.14 | -2.27 | -2.12 | -2.07 | 15.36 | 17.13 | 16.36 | 28.71* |
|  | (14.00) | (21.55) | (21.36) | (21.70) | (21.76) | (21.75) | (21.75) | (21.25) | (21.06) | (20.92) | (15.23) |
| Second home, Single Family | 8.37*** | 6.27*** | 4.52*** | 4.83*** | 6.48*** | 6.47*** | 6.48*** | 7.37*** | 6.09*** | 6.09*** | 6.80*** |
|  | (0.14) | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) | (0.14) | (0.15) | (0.15) | (0.15) | (0.13) |
| Second home, Multi Family 2 | 8.66*** | 6.75*** | 5.60*** | 5.62*** | 6.75*** | 6.81*** | 6.82*** | 5.62*** | 6.45*** | 5.73*** | 7.44*** |
|  | (1.27) | (1.40) | (1.39) | (1.38) | (1.35) | (1.35) | (1.35) | (1.33) | (1.33) | (1.33) | (1.16) |

| VARIABLES | (1) Race dummies only | (2) Race & rate lock month dummies | (3) Add FICO bin dummies | (4) Baseline Model (4) | (5) Same as Model (3), but substitute rate lock week dummies for rate lock month dummies | (6) Add loan amount, debt-to-income ratio, LTV, CLTV, loan type, loan purpose, loan term, occupancy & property type, self-employed dummy, and state | (7) Add housing debt-to-income ratio dummies | (8) Add credit bureau variable dummies | (9) Add doc type dummies | (10) Add fixed dummy, balloon dummy, and amortization type dummies |
|---|---|---|---|---|---|---|---|---|---|---|
| Second home, Multi Family 3 | | | | 39.38** | | 53.46*** | 55.79*** | 56.61*** | 56.12*** | 58.32*** |
| | | | | (16.88) | | (20.36) | (20.48) | (21.19) | (21.36) | (21.86) |
| Second home, Multi Family 4 | | | | 29.22 | | 55.04*** | 57.22*** | 52.05*** | 49.38*** | 47.99*** |
| | | | | (18.93) | | (16.36) | (16.41) | (15.75) | (16.26) | (16.49) |
| Second home, Low Rise Condo | | | | 7.27*** | | -2.74*** | -0.10 | 0.04 | 0.25 | 3.30*** |
| | | | | (0.23) | | (0.24) | (0.24) | (0.24) | (0.24) | (0.22) |
| Second home, High Rise Condo | | | | 16.26*** | | 2.65*** | 5.58*** | 5.31*** | 5.04*** | 9.66*** |
| | | | | (0.51) | | (0.50) | (0.50) | (0.51) | (0.51) | (0.50) |
| Second home, Co-op | | | | -10.66*** | | -1.73 | 1.03 | -0.09 | 1.14 | 4.22*** |
| | | | | (1.09) | | (1.11) | (1.11) | (1.09) | (1.09) | (1.11) |
| Dome | | | | 2.50 | | -8.44* | -8.74* | -7.25 | -6.68 | -7.53 |
| | | | | (4.74) | | (4.91) | (4.96) | (4.98) | (4.98) | (4.99) |
| Earthen Home | | | | 5.15 | | -2.61 | -2.28 | -1.43 | -1.92 | -3.98 |
| | | | | (3.34) | | (3.93) | (3.92) | (3.81) | (3.78) | (3.65) |
| Hotel-Condo | | | | 28.75*** | | 44.34*** | 44.75*** | 44.96*** | 39.95*** | 40.91*** |
| | | | | (3.39) | | (3.40) | (3.40) | (3.42) | (3.46) | (3.40) |
| Log Home | | | | 4.48*** | | -1.51 | -1.53 | -0.18 | -0.53 | -1.55 |
| | | | | (0.98) | | (1.10) | (1.10) | (1.10) | (1.09) | (1.09) |
| Manufactured Home | | | | 13.59*** | | 12.60*** | 13.02*** | 12.93*** | 11.41*** | 8.60*** |
| | | | | (0.23) | | (0.27) | (0.27) | (0.27) | (0.27) | (0.27) |
| Bankruptcy within 7 years present on credit report | | | | 18.10*** | | | | 37.02*** | 35.78*** | 37.40*** |
| | | | | (0.25) | | | | (0.28) | (0.28) | (0.29) |
| Foreclosure within 7 years present on credit report | | | | 23.94*** | | | | 39.18*** | 38.47*** | 41.06*** |
| | | | | (0.53) | | | | (0.59) | (0.58) | (0.61) |
| Judgement present on credit report | | | | 11.17*** | | | | 21.77*** | 21.22*** | 22.82*** |
| | | | | (0.24) | | | | (0.28) | (0.28) | (0.29) |
| Collections present on credit report | | | | 3.41*** | | | | 7.89*** | 7.22*** | 7.94*** |
| | | | | (0.09) | | | | (0.11) | (0.11) | (0.11) |
| Late mortgage payment present on credit report | | | | 20.49*** | | | | 38.27*** | 37.28*** | 40.25*** |
| | | | | (0.33) | | | | (0.36) | (0.35) | (0.37) |
| Late payment (non-mortgage) present on credit report | | | | 3.75*** | | | | 10.00*** | 9.22*** | 10.30*** |
| | | | | (0.26) | | | | (0.29) | (0.29) | (0.30) |
| Doc type: Missing/Unknown | | | | -26.06*** | | | | | -54.26*** | -27.48*** |
| | | | | (0.72) | | | | | (0.70) | (0.70) |
| Doc type: No Doc | | | | -14.45*** | | | | | -12.04*** | -12.34*** |
| | | | | (0.10) | | | | | (0.11) | (0.11) |
| Doc type: Quick Doc | | | | -25.45 | | | | | -33.69 | -17.41 |
| | | | | (39.44) | | | | | (38.17) | (51.93) |
| Doc type: Stated Income/Asset | | | | 24.92 | | | | | 9.62 | 6.96 |
| | | | | (25.10) | | | | | (21.48) | (22.54) |
| Doc type: Substitute Doc | | | | -30.65*** | | | | | -51.75*** | -52.21*** |
| | | | | (6.93) | | | | | (8.39) | (8.97) |
| Doc type: Verify Assets | | | | -4.34*** | | | | | -7.52*** | -7.05*** |
| | | | | (0.09) | | | | | (0.11) | (0.11) |
| Doc type: Verify Income | | | | -19.42*** | | | | | -7.06*** | -3.52*** |
| | | | | (0.30) | | | | | (0.33) | (0.34) |
| Balloon indicator | | | | 73.65*** | | | | | | 94.38*** |
| | | | | (0.81) | | | | | | (0.59) |
| Interest-only amortization | | | | 47.58*** | | | | | | 27.88*** |
| | | | | (0.14) | | | | | | (0.15) |
| Unknown amortization type | | | | 28.03*** | | | | | | -1.53*** |
| | | | | (0.22) | | | | | | (0.22) |
| Fixed-rate loan | | | | | | | | | | 40.85*** |
| | | | | | | | | | | (0.13) |
| Product ID: ABL26 = 2/6 LIBOR ARM/Balloon | | | | | | | | | | |
| Product ID: ABL51 = 5 Year LIBOR ARM/Balloon | | | | | | | | | | |
| Product ID: AL540 = 5 Yr. LIBOR ARM (40 Year) | | | | | | | | | | |
| Product ID: ALB01 = 1/1 Yr. Adjustable Rate Mortgage (LIBOR) | | | | | | | | | | |

| VARIABLES | (11) Substitute product ID dummies for fixed dummy | (12) Substitute broader product categories for product ID | (13) Add escrow waiver dummies | (14) Add rate lock length dummies | (15) Add float-down option dummies | (16) Add lender-paid mortgage insurance dummy | (17) Add combination loan dummy | (18) Add prepayment penalty dummies | (19) Add MSA dummies (Baseline Model (4)) | (20) Same as Model (4), add retail channel dummy | (21) Same as Model (4), add dummies for each business line & channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Second home, Multi Family 3 | 61.63*** | 52.97** | 53.15*** | 55.02*** | 52.63*** | 53.22*** | 53.19*** | 40.27** | 39.38** | 36.76** | 22.83 |
|  | (20.00) | (21.48) | (21.15) | (20.84) | (19.34) | (19.29) | (19.29) | (17.03) | (16.88) | (16.28) | (14.82) |
| Second home, Multi Family 4 | 41.77*** | 47.44*** | 46.30*** | 45.78*** | 38.86** | 38.70** | 38.72** | 29.91 | 29.22 | 26.49 | 17.12 |
|  | (15.44) | (15.86) | (15.93) | (15.81) | (15.67) | (15.64) | (15.64) | (18.80) | (19.26) | (19.26) | (14.42) |
| Second home, Low Rise Condo | 9.59*** | 6.25*** | 4.42*** | 4.47*** | 6.10*** | 6.12*** | 6.14*** | 7.38*** | 7.27*** | 7.59*** | 8.38*** |
|  | (0.21) | (0.23) | (0.23) | (0.23) | (0.22) | (0.22) | (0.21) | (0.21) | (0.23) | (0.22) | (0.20) |
| Second home, High Rise Condo | 17.34*** | 13.44*** | 11.70*** | 13.40*** | 17.32*** | 17.45*** | 17.45*** | 16.60*** | 16.26*** | 13.97*** | 14.97*** |
|  | (0.52) | (0.54) | (0.53) | (0.54) | (0.52) | (0.52) | (0.52) | (0.50) | (0.51) | (0.51) | (0.50) |
| Second home, Co-op | 4.77*** | 1.45 | -6.36*** | -8.77*** | -18.91*** | -18.91*** | -18.86*** | -10.21*** | -10.66*** | -9.37*** | 0.62 |
|  | (1.02) | (1.09) | (1.10) | (1.11) | (1.24) | (1.23) | (1.23) | (1.09) | (1.09) | (1.07) | (0.98) |
| Dome | 2.22 | -4.99 | -8.54 | -7.96 | -0.53 | -0.07 | -0.09 | 2.75 | 2.50 | 0.40 | 6.39 |
|  | (4.42) | (5.27) | (5.26) | (5.24) | (5.11) | (5.08) | (5.08) | (4.74) | (4.74) | (4.74) | (4.55) |
| Earthen Home | 3.66 | -1.21 | -3.94 | -2.50 | 4.12 | 4.54 | 4.51 | 5.73* | 5.15 | 5.54* | 8.22** |
|  | (3.25) | (3.62) | (3.60) | (3.60) | (3.56) | (3.56) | (3.34) | (3.34) | (3.35) | (3.35) | (3.34) |
| Hotel-Condo | 32.30*** | 40.66*** | 41.20*** | 39.89*** | 34.17*** | 33.96*** | 33.96*** | 30.08*** | 28.75*** | 28.41*** | 23.96*** |
|  | (3.53) | (3.42) | (3.40) | (3.39) | (3.48) | (3.47) | (3.47) | (3.40) | (3.39) | (3.38) | (3.50) |
| Log Home | 4.24*** | -0.21 | -2.96*** | -1.00 | 4.02*** | 3.98*** | 3.96*** | 5.63*** | 4.48*** | 2.96*** | 5.96*** |
|  | (0.98) | (1.09) | (1.09) | (1.10) | (1.04) | (1.04) | (1.04) | (0.98) | (0.98) | (0.98) | (0.94) |
| Manufactured Home | 18.80*** | 12.77*** | 11.90*** | 11.29*** | 8.34*** | 8.34*** | 8.39*** | 14.42*** | 13.59*** | 15.06*** | 24.45*** |
|  | (0.22) | (0.25) | (0.25) | (0.25) | (0.24) | (0.24) | (0.24) | (0.23) | (0.23) | (0.23) | (0.21) |
| Bankruptcy within 7 years present on credit report | 17.43*** | 29.79*** | 29.40*** | 28.84*** | 25.61*** | 25.56*** | 25.55*** | 18.27*** | 18.10*** | 17.94*** | 7.66*** |
|  | (0.23) | (0.27) | (0.26) | (0.26) | (0.25) | (0.25) | (0.25) | (0.25) | (0.25) | (0.25) | (0.21) |
| Foreclosure within 7 years present on credit report | 19.71*** | 33.14*** | 33.06*** | 32.50*** | 30.47*** | 30.47*** | 30.46*** | 23.96*** | 23.94*** | 23.65*** | 11.62*** |
|  | (0.49) | (0.55) | (0.55) | (0.54) | (0.53) | (0.53) | (0.53) | (0.53) | (0.53) | (0.53) | (0.46) |
| Judgement present on credit report | 10.31*** | 18.34*** | 17.81*** | 17.49*** | 15.95*** | 15.91*** | 15.92*** | 11.28*** | 11.17*** | 10.90*** | 5.47*** |
|  | (0.23) | (0.26) | (0.26) | (0.26) | (0.25) | (0.25) | (0.25) | (0.24) | (0.24) | (0.24) | (0.21) |
| Collections present on credit report | 3.68*** | 6.60*** | 6.05*** | 6.15*** | 4.93*** | 4.91*** | 4.94*** | 3.46*** | 3.41*** | 2.65*** | 0.54*** |
|  | (0.09) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.09) | (0.09) | (0.09) | (0.08) |
| Late mortgage payment present on credit report | 15.14*** | 30.74*** | 30.50*** | 29.74*** | 26.61*** | 26.62*** | 26.61*** | 20.48*** | 20.49*** | 20.22*** | 6.47*** |
|  | (0.30) | (0.34) | (0.33) | (0.33) | (0.32) | (0.32) | (0.32) | (0.33) | (0.33) | (0.32) | (0.27) |
| Late payment (non-mortgage) present on credit report | 1.52*** | 6.96*** | 6.78*** | 6.80*** | 5.45*** | 5.45*** | 5.45*** | 3.69*** | 3.75*** | 2.82*** | -2.84*** |
|  | (0.24) | (0.27) | (0.27) | (0.27) | (0.26) | (0.26) | (0.26) | (0.26) | (0.26) | (0.25) | (0.21) |
| Doc type: Missing/Unknown | -16.74*** | -58.26*** | -58.85*** | -53.72*** | -49.20*** | -48.31*** | -48.67*** | -25.50*** | -26.06*** | -28.36*** | -4.79*** |
|  | (0.67) | (0.71) | (0.71) | (0.75) | (0.74) | (0.74) | (0.74) | (0.72) | (0.72) | (0.72) | (0.72) |
| Doc type: No Doc | -11.18*** | -13.00*** | -8.43*** | -7.51*** | -12.27*** | -12.12*** | -12.15*** | -14.42*** | -14.45*** | -17.39*** | -4.55*** |
|  | (0.09) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.09) |
| Doc type: Quick Doc | -0.39 | -51.13* | -51.52* | -51.22 | -39.68 | -39.55 | -39.60 | -27.24 | -25.45 | -28.16 | 1.51 |
|  | (57.45) | (28.16) | (28.56) | (35.24) | (33.59) | (33.48) | (33.45) | (37.47) | (39.44) | (42.31) | (52.17) |
| Doc type: Stated Income/Asset | 32.65 | 24.56 | 22.63 | 22.83 | 34.96 | 36.77 | 36.73 | 23.66 | 24.92 | 20.32 | 23.52 |
|  | (24.06) | (24.44) | (24.04) | (24.79) | (24.85) | (25.22) | (25.22) | (25.15) | (25.10) | (25.29) | (22.55) |
| Doc type: Substitute Doc | -32.34*** | -47.06*** | -47.13*** | -43.16*** | -35.97*** | -35.66*** | -35.74*** | -31.18*** | -30.65*** | -33.21*** | -25.53*** |
|  | (7.94) | (7.73) | (7.72) | (7.73) | (7.32) | (7.37) | (7.37) | (7.00) | (6.93) | (6.95) | (7.27) |
| Doc type: Verify Assets | -1.85*** | -7.03*** | -5.87*** | -4.94*** | -6.57*** | -6.49*** | -6.54*** | -4.27*** | -4.34*** | -5.42*** | 0.96*** |
|  | (0.09) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.09) | (0.09) | (0.09) | (0.08) |
| Doc type: Verify Income | -13.18*** | -11.92*** | -10.63*** | -12.56*** | -23.35*** | -23.24*** | -23.25*** | -19.72*** | -19.42*** | -19.11*** | -21.07*** |
|  | (0.25) | (0.31) | (0.31) | (0.31) | (0.31) | (0.31) | (0.31) | (0.30) | (0.30) | (0.29) | (0.23) |
| Balloon indicator | -19.68 | 133.35*** | 130.22*** | 124.15*** | 106.91*** | 106.61*** | 106.59*** | 73.50*** | 73.65*** | 72.71*** | -16.43*** |
|  | (71.39) | (0.70) | (0.70) | (0.71) | (0.73) | (0.73) | (0.73) | (0.82) | (0.81) | (0.81) | (0.70) |
| Interest-only amortization | 50.10*** | 51.96*** | 49.41*** | 47.72*** | 47.99*** | 47.90*** | 47.89*** | 47.82*** | 47.58*** | 48.19*** | 49.84*** |
|  | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.13) |
| Unknown amortization type | -0.48*** | 2.52*** | 21.51*** | 16.82*** | 39.04*** | 38.78*** | 38.83*** | 27.88*** | 28.03*** | 46.77*** | 16.10*** |
|  | (0.17) | (0.21) | (0.23) | (0.23) | (0.24) | (0.24) | (0.24) | (0.22) | (0.22) | (0.26) | (0.22) |
| Fixed-rate loan |  |  |  |  |  |  |  |  |  |  |  |
| Product ID: ABL26 = 2/6 LIBOR ARM/Balloon | 336.70*** |  |  |  |  |  |  |  |  |  |  |
|  | (72.98) |  |  |  |  |  |  |  |  |  |  |
| Product ID: ABL51 = 5 Year LIBOR ARM/Balloon | 129.00* |  |  |  |  |  |  |  |  |  |  |
|  | (71.25) |  |  |  |  |  |  |  |  |  |  |
| Product ID: AL540 = 5 Yr. LIBOR ARM (40 Year) | 82.91*** |  |  |  |  |  |  |  |  |  |  |
|  | (6.06) |  |  |  |  |  |  |  |  |  |  |
| Product ID: ALB01 = 1/1 Yr. Adjustable Rate Mortgage (LIBOR) | -79.03 |  |  |  |  |  |  |  |  |  |  |
|  | (55.11) |  |  |  |  |  |  |  |  |  |  |

| VARIABLES | (1)<br>Race dummies only | (2)<br>Race & rate lock month dummies | (3)<br>Add FICO bin dummies | (4)<br>Baseline Model (4) | (5)<br>Same as Model (3), but substitute rate lock week dummies for rate lock month dummies | (6)<br>Add loan amount, debt-to-income ratio, LTV, CLTV, loan type, loan purpose, loan term, occupancy & property type, self-employed dummy, and state | (7)<br>Add housing debt-to-income ratio dummies | (8)<br>Add credit bureau variable dummies | (9)<br>Add doc type dummies | (10)<br>Add fixed dummy, balloon dummy, and amortization type dummies |
|---|---|---|---|---|---|---|---|---|---|---|
| Product ID: ALB1M = 1 Month Libor ARM | | | | | | | | | | |
| Product ID: ALB26 = 2/6 Mo. Adjustable Rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: ALB31 = 3/1 Yr. Adjustable rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: ALB36 = 3/6 Mo. Adjustable Rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: ALB51 = 5/1 Yr. Adjustable rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: ALB56 = 5/6 Mo. Ajdustable Rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: ALB6M = 1 Yr. ARM with a L6 index type | | | | | | | | | | |
| Product ID: ALB71 = 7/1 Yr. Adjustable Rate Mortgage | | | | | | | | | | |
| Product ID: ALB76 = 7/6 Mo. Adjustable Rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: ALBT1 = 10/1 Yr. Adjustable Rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: ALBT6 = 10/6 Mo. Adjustable Rate Mortgage (LIBOR) | | | | | | | | | | |
| Product ID: AR331 = 3/3/1 Yr. Adjustable Rate Mortgage | | | | | | | | | | |
| Product ID: ARM, ARM01, ACE01 = 1 Yr. Adjustable Rate Mortgage | | | | | | | | | | |
| Product ID: ARM03 = 3-Yr ARM (assumed) | | | | | | | | | | |
| Product ID: ARM1M = 1 Month ARM | | | | | | | | | | |
| Product ID: ARM31 = 3/1 Intermediate ARM | | | | | | | | | | |
| Product ID: ARM51 = 5/1 Intermediate ARM | | | | | | | | | | |
| Product ID: ARM6M = 6 Month ARM | | | | | | | | | | |
| Product ID: ARM71 = 7/1 Intermediate ARM | | | | | | | | | | |
| Product ID: ARMT1 = 10/1 Intermediate ARM | | | | | | | | | | |
| Product ID: B1530 = 15 Yr. Balloon Mortgage | | | | | | | | | | |
| Product ID: B3040 = 30 Yr. Balloon Mortgage | | | | | | | | | | |
| Product ID: BL530 = 5 Yr. Balloon Mortgage | | | | | | | | | | |
| Product ID: BL730 = 7 Yr. Balloon Mortgage | | | | | | | | | | |
| Product ID: FIX10 = 10 Yr. Fixed | | | | | | | | | | |
| Product ID: FIX15 = 15 Yr. Fixed | | | | | | | | | | |
| Product ID: FIX20 = 20 Yr. Fixed | | | | | | | | | | |
| Product ID: FIX40 = 40 Yr. Fixed | | | | | | | | | | |
| Product ID: IRM6M = 6 Mo. Improving Rate Mortgage | | | | | | | | | | |
| Product category: 1-Month to 3-Year ARM | | | | -34.92***<br>(0.30) | | | | | | |
| Product category: 5-Year ARM | | | | -87.86***<br>(0.12) | | | | | | |

| VARIABLES | (11) Substitute product ID dummies for fixed dummy | (12) Substitute broader product categories for product ID | (13) Add escrow waiver dummies | (14) Add rate lock length dummies | (15) Add float-down option dummies | (16) Add lender-paid mortgage insurance dummy | (17) Add combination loan dummy | (18) Add prepayment penalty dummies | (19) Add MSA dummies (Baseline Model (4)) | (20) Same as Model (4), add retail channel dummy | (21) Same as Model (4), add dummies for each business line & channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Product ID: ALB1M = 1 Month Libor ARM | -290.60*** (2.79) | | | | | | | | | | |
| Product ID: ALB26 = 2/6 Mo. Adjustable Rate Mortgage (LIBOR) | 160.48*** (0.31) | | | | | | | | | | |
| Product ID: ALB31 = 3/1 Yr. Adjustable rate Mortgage (LIBOR) | -177.69*** (0.30) | | | | | | | | | | |
| Product ID: ALB36 = 3/6 Mo. Adjustable Rate Mortgage (LIBOR) | 99.58*** (0.90) | | | | | | | | | | |
| Product ID: ALB51 = 5/1 Yr. Adjustable rate Mortgage (LIBOR) | -109.26*** (0.27) | | | | | | | | | | |
| Product ID: ALB56 = 5/6 Mo. Ajdustable Rate Mortgage (LIBOR) | 91.20*** (7.78) | | | | | | | | | | |
| Product ID: ALB6M = 1 Yr. ARM with a L6 index type | -130.70*** (4.94) | | | | | | | | | | |
| Product ID: ALB71 = 7/1 Yr. Adjustable Rate Mortgage | -8.24*** (0.75) | | | | | | | | | | |
| Product ID: ALB76 = 7/6 Mo. Adjustable Rate Mortgage (LIBOR) | 6.38 (13.20) | | | | | | | | | | |
| Product ID: ALBT1 = 10/1 Yr. Adjustable Rate Mortgage (LIBOR) | -12.36*** (0.80) | | | | | | | | | | |
| Product ID: ALBT6 = 10/6 Mo. Adjustable Rate Mortgage (LIBOR) | 23.10 (19.61) | | | | | | | | | | |
| Product ID: AR331 = 3/3/1. Adjustable Rate Mortgage | 337.89*** (6.79) | | | | | | | | | | |
| Product ID: ARM, ARM01, ACE01 = 1 Yr. Adjustable Rate Mortgage | -184.72*** (0.61) | | | | | | | | | | |
| Product ID: ARM03 = 3-Yr ARM (assumed) | -94.56*** (10.15) | | | | | | | | | | |
| Product ID: ARM1M = 1 Month ARM | -93.44*** (0.89) | | | | | | | | | | |
| Product ID: ARM31 = 3/1 Intermediate ARM | -100.90*** (0.29) | | | | | | | | | | |
| Product ID: ARM51 = 5/1 Intermediate ARM | -91.26*** (0.12) | | | | | | | | | | |
| Product ID: ARM6M = 6 Month ARM | -207.98*** (2.93) | | | | | | | | | | |
| Product ID: ARM71 = 7/1 Intermediate ARM | -79.91*** (0.13) | | | | | | | | | | |
| Product ID: ARMT1 = 10/1 Intermediate ARM | -41.70*** (0.12) | | | | | | | | | | |
| Product ID: B1530 = 15 Yr. Balloon Mortgage | 124.40* (73.93) | | | | | | | | | | |
| Product ID: B3040 = 30 Yr. Balloon Mortgage | 101.09 (75.83) | | | | | | | | | | |
| Product ID: BL530 = 5 Yr. Balloon Mortgage | -39.25 (70.48) | | | | | | | | | | |
| Product ID: BL730 = 7 Yr. Balloon Mortgage | -29.42 (69.42) | | | | | | | | | | |
| Product ID: FIX10 = 10 Yr. Fixed | -62.75*** (1.28) | | | | | | | | | | |
| Product ID: FIX15 = 15 Yr. Fixed | -36.05*** (0.18) | | | | | | | | | | |
| Product ID: FIX20 = 20 Yr. Fixed | -3.80*** (0.25) | | | | | | | | | | |
| Product ID: FIX40 = 40 Yr. Fixed | 41.09*** (3.08) | | | | | | | | | | |
| Product ID: IRM6M = 6 Mo. Improving Rate Mortgage | 35.83*** (6.05) | | | | | | | | | | |
| Product category: 1-Month to 3-Year ARM | | 27.73*** (0.28) | 24.82*** (0.28) | 22.00*** (0.27) | 8.97*** (0.27) | 8.81*** (0.27) | 8.76*** (0.27) | -35.22*** (0.30) | -34.92*** (0.30) | -38.45*** (0.30) | -95.96*** (0.24) |
| Product category: 5-Year ARM | | -90.72*** (0.12) | -90.59*** (0.12) | -89.82*** (0.12) | -89.19*** (0.12) | -88.97*** (0.12) | -89.02*** (0.12) | -88.35*** (0.12) | -87.86*** (0.12) | -89.03*** (0.12) | -89.65*** (0.12) |

| VARIABLES | (1) Race dummies only | (2) Race & rate lock month dummies | (3) Add FICO bin dummies | (4) Baseline Model (4) | (5) Same as Model (3), but substitute rate lock week dummies for rate lock month dummies | (6) Add loan amount, debt-to-income ratio, LTV, CLTV, loan type, loan purpose, loan term, occupancy & property type, self-employed dummy, and state | (7) Add housing debt-to-income ratio dummies | (8) Add credit bureau variable dummies | (9) Add doc type dummies | (10) Add fixed dummy, balloon dummy, and amortization type dummies |
|---|---|---|---|---|---|---|---|---|---|---|
| Product category: 7-Year ARM | | | | -74.59*** | | | | | | |
| | | | | (0.13) | | | | | | |
| Product category: 10-Year ARM | | | | -37.78*** | | | | | | |
| | | | | (0.13) | | | | | | |
| Product category: 5-Year Fixed | | | | -127.02*** | | | | | | |
| | | | | (3.23) | | | | | | |
| Product category: 7-Year Fixed | | | | -119.36*** | | | | | | |
| | | | | (0.86) | | | | | | |
| Product category: 10-Year Fixed | | | | -57.56*** | | | | | | |
| | | | | (1.26) | | | | | | |
| Product category: 15-Year Fixed | | | | -29.82*** | | | | | | |
| | | | | (0.19) | | | | | | |
| Product category: 20-Year Fixed | | | | -0.90*** | | | | | | |
| | | | | (0.26) | | | | | | |
| Product category: 40-Year Fixed | | | | 7.27*** | | | | | | |
| | | | | (2.82) | | | | | | |
| Escrow waived | | | | 8.02*** | | | | | | |
| | | | | (0.09) | | | | | | |
| Escrow waiver unknown | | | | -33.85*** | | | | | | |
| | | | | (0.14) | | | | | | |
| 1 <= Rate lock days <= 30 | | | | 26.41*** | | | | | | |
| | | | | (0.81) | | | | | | |
| 31 <= Rate lock days <= 60 | | | | 18.96*** | | | | | | |
| | | | | (0.81) | | | | | | |
| 61 <= Rate lock days <= 1000 | | | | 9.34*** | | | | | | |
| | | | | (0.80) | | | | | | |
| Float-down indicator: Executed | | | | -11.20*** | | | | | | |
| | | | | (0.24) | | | | | | |
| Float-down indicator: Unknown/Missing | | | | 22.76*** | | | | | | |
| | | | | (0.11) | | | | | | |
| Float-down indicator: Yes | | | | 29.97*** | | | | | | |
| | | | | (0.19) | | | | | | |
| Lender-paid mortgage insurance | | | | -17.92*** | | | | | | |
| | | | | (0.25) | | | | | | |
| Combo loan indicator | | | | -28.60*** | | | | | | |
| | | | | (1.04) | | | | | | |
| 6 months <= Prepayment penalty <= 24 months | | | | 146.67*** | | | | | | |
| | | | | (0.43) | | | | | | |
| 36 months <= Prepayment penalty <= 60 months | | | | 84.65*** | | | | | | |
| | | | | (0.42) | | | | | | |
| Constant | 626.57*** | 763.00 | 762.67*** | 743.96*** | 600.89*** | 820.33*** | 819.60*** | 819.47*** | 813.30*** | 783.26*** |
| | (0.06) | (.) | (0.14) | (1.34) | (0.11) | (0.53) | (0.53) | (0.53) | (0.53) | (0.58) |
| | | | | | | | | | | |
| Observations | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 |
| R-squared | 0.02569 | 0.30735 | 0.46408 | 0.70513 | 0.46759 | 0.58316 | 0.58503 | 0.59585 | 0.59767 | 0.61443 |
| Adjusted R-squared | 0.02569 | 0.30733 | 0.46407 | 0.70506 | 0.46755 | 0.58314 | 0.58501 | 0.59583 | 0.59765 | 0.61442 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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

| VARIABLES | (11) Substitute product ID dummies for fixed dummy | (12) Substitute broader product categories for product ID | (13) Add escrow waiver dummies | (14) Add rate lock length dummies | (15) Add float-down option dummies | (16) Add lender-paid mortgage insurance dummy | (17) Add combination loan dummy | (18) Add prepayment penalty dummies | (19) Add MSA dummies (Baseline Model (4)) | (20) Same as Model (4), add retail channel dummy | (21) Same as Model (4), add dummies for each business line & channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Product category: 7-Year ARM | | -77.76*** | -77.64*** | -76.24*** | -76.24*** | -75.97*** | -76.00*** | -74.80*** | -74.59*** | -75.82*** | -75.10*** |
| | | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.12) |
| Product category: 10-Year ARM | | -38.56*** | -39.66*** | -37.34*** | -37.95*** | -37.86*** | -37.92*** | -37.80*** | -37.78*** | -39.91*** | -39.24*** |
| | | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) | (0.12) |
| Product category: 5-Year Fixed | | -184.72*** | -182.87*** | -174.96*** | -159.98*** | -159.68*** | -159.62*** | -126.60*** | -127.02*** | -127.32*** | -41.91*** |
| | | (3.25) | (3.27) | (3.27) | (3.27) | (3.27) | (3.23) | (3.23) | (3.23) | (3.25) | (3.15) |
| Product category: 7-Year Fixed | | -181.50*** | -178.27*** | -172.00*** | -152.81*** | -152.33*** | -152.29*** | -119.53*** | -119.36*** | -119.45*** | -31.51*** |
| | | (0.76) | (0.76) | (0.76) | (0.78) | (0.78) | (0.78) | (0.86) | (0.86) | (0.86) | (0.74) |
| Product category: 10-Year Fixed | | -54.85*** | -54.86*** | -53.12*** | -54.49*** | -54.38*** | -54.25*** | -57.36*** | -57.56*** | -61.44*** | -63.88*** |
| | | (1.29) | (1.29) | (1.29) | (1.28) | (1.29) | (1.28) | (1.27) | (1.26) | (1.26) | (1.26) |
| Product category: 15-Year Fixed | | -30.53*** | -30.20*** | -28.72*** | -30.23*** | -29.98*** | -29.97*** | -29.74*** | -29.82*** | -30.38*** | -30.88*** |
| | | (0.21) | (0.21) | (0.21) | (0.21) | (0.21) | (0.21) | (0.19) | (0.19) | (0.19) | (0.17) |
| Product category: 20-Year Fixed | | -2.51*** | -2.11*** | -0.90*** | -2.62*** | -2.60*** | -2.58*** | -0.87*** | -0.90*** | -1.51*** | 0.29 |
| | | (0.29) | (0.29) | (0.29) | (0.28) | (0.28) | (0.28) | (0.26) | (0.26) | (0.26) | (0.24) |
| Product category: 40-Year Fixed | | 54.31*** | 40.01*** | 37.30*** | 18.82*** | 18.98*** | 19.61*** | 7.10** | 7.27*** | 4.09 | -39.39*** |
| | | (2.70) | (2.73) | (2.71) | (2.70) | (2.70) | (2.70) | (2.82) | (2.82) | (2.83) | (2.63) |
| Escrow waived | | | 12.75*** | 11.58*** | 8.42*** | 8.25*** | 8.28*** | 7.72*** | 8.02*** | 8.87*** | 4.32*** |
| | | | (0.10) | (0.10) | (0.10) | (0.10) | (0.10) | (0.09) | (0.09) | (0.09) | (0.08) |
| Escrow waiver unknown | | | -24.90*** | -21.96*** | -48.83*** | -49.00*** | -48.98*** | -33.52*** | -33.85*** | -42.52*** | -13.23*** |
| | | | (0.12) | (0.12) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.16) | (0.15) |
| 1 <= Rate lock days <= 30 | | | | 37.20*** | 40.74*** | 39.96*** | 39.56*** | 25.89*** | 26.41*** | 35.45*** | 28.65*** |
| | | | | (0.87) | (0.85) | (0.85) | (0.85) | (0.81) | (0.81) | (0.81) | (0.80) |
| 31 <= Rate lock days <= 60 | | | | 20.81*** | 30.63*** | 29.94*** | 29.53*** | 18.64*** | 18.96*** | 23.99*** | 27.94*** |
| | | | | (0.86) | (0.85) | (0.85) | (0.85) | (0.81) | (0.81) | (0.81) | (0.80) |
| 61 <= Rate lock days <= 1000 | | | | 18.22*** | 18.68*** | 18.12*** | 18.21*** | 8.89*** | 9.34*** | 13.79*** | 13.82*** |
| | | | | (0.86) | (0.84) | (0.84) | (0.84) | (0.80) | (0.80) | (0.80) | (0.79) |
| Float-down indicator: Executed | | | | | -8.56*** | -8.59*** | -8.58*** | -10.75*** | -11.20*** | -11.78*** | -14.65*** |
| | | | | | (0.25) | (0.25) | (0.25) | (0.24) | (0.24) | (0.24) | (0.22) |
| Float-down indicator: Unknown/Missing | | | | | 41.13*** | 40.64*** | 40.63*** | 22.24*** | 22.76*** | 35.44*** | 1.49*** |
| | | | | | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.15) | (0.11) |
| Float-down indicator: Yes | | | | | 36.78*** | 36.45*** | 36.22*** | 30.04*** | 29.97*** | 36.95*** | 25.28*** |
| | | | | | (0.20) | (0.20) | (0.20) | (0.19) | (0.19) | (0.19) | (0.18) |
| Lender-paid mortgage insurance | | | | | | -24.21*** | -24.18*** | -18.16*** | -17.92*** | -19.81*** | -14.02*** |
| | | | | | | (0.26) | (0.26) | (0.25) | (0.25) | (0.25) | (0.23) |
| Combo loan indicator | | | | | | | -24.30*** | -28.62*** | -28.60*** | -27.50*** | -31.88*** |
| | | | | | | | (1.13) | (1.04) | (1.04) | (1.04) | (0.95) |
| 6 months <= Prepayment penalty <= 24 months | | | | | | | | 147.58*** | 146.67*** | 140.93*** | 9.37*** |
| | | | | | | | | (0.43) | (0.43) | (0.43) | (0.45) |
| 36 months <= Prepayment penalty <= 60 months | | | | | | | | 85.27*** | 84.65*** | 80.34*** | -68.16*** |
| | | | | | | | | (0.42) | (0.42) | (0.42) | (0.61) |
| Constant | 818.28*** | 814.12*** | 792.56*** | 762.32*** | 697.11*** | 700.60*** | 700.85*** | 739.18*** | 743.96*** | 700.47*** | 778.19*** |
| | (0.54) | (0.58) | (0.58) | (1.02) | (1.02) | (1.02) | (1.02) | (0.98) | (1.34) | (1.38) | (1.26) |
| Observations | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 | 5,654,985 |
| R-squared | 0.73990 | 0.65248 | 0.65655 | 0.66016 | 0.67174 | 0.67217 | 0.67221 | 0.70389 | 0.70513 | 0.70773 | 0.77063 |
| Adjusted R-squared | 0.73989 | 0.65246 | 0.65653 | 0.66014 | 0.67172 | 0.67216 | 0.67219 | 0.70388 | 0.70506 | 0.70767 | 0.77058 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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

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

| VARIABLES | Model (4) | Model (4-R) Retail loans only | Model (4-W) Wholesale 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-P) Prime loans only | Model (4-NP) Nonprime loans only |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| African American | 10.10*** | 5.68*** | 16.25*** | 8.42*** | 8.81*** | 7.86*** | 6.08*** | 5.31*** | 9.67*** | 6.60*** | 5.62*** | 4.24*** |
|  | (0.16) | (0.16) | (0.35) | (0.50) | (0.37) | (0.27) | (0.43) | (0.35) | (0.37) | (0.34) | (0.11) | (0.39) |
| Hispanic | 6.39*** | 3.52*** | 8.56*** | 3.41*** | 5.67*** | 5.51*** | 3.19*** | 1.82*** | 4.55*** | 4.13*** | 5.26*** | 4.02*** |
|  | (0.11) | (0.12) | (0.25) | (0.34) | (0.25) | (0.18) | (0.31) | (0.24) | (0.27) | (0.25) | (0.08) | (0.42) |
| American Indian | 0.17 | -0.35 | 0.58 | 0.30 | 0.16 | 0.39 | 2.79** | -1.11 | 2.22** | -1.71* | -1.11*** | 4.49** |
|  | (0.43) | (0.44) | (1.09) | (1.19) | (0.90) | (0.65) | (1.22) | (1.01) | (1.06) | (0.93) | (0.31) | (1.84) |
| Asian | -2.33*** | 1.76*** | -6.21*** | -2.11*** | -3.93*** | -3.18*** | -2.21*** | -0.87*** | 0.57** | 0.33 | 1.25*** | -2.17*** |
|  | (0.11) | (0.13) | (0.21) | (0.28) | (0.20) | (0.16) | (0.26) | (0.26) | (0.28) | (0.26) | (0.09) | (0.71) |
| Missing Race | 3.82*** | 1.53*** | 5.67*** | -1.23*** | -0.35* | 3.16*** | 5.75*** | 4.68*** | 5.46*** | 2.98*** | -0.10 | 2.17*** |
|  | (0.09) | (0.10) | (0.25) | (0.21) | (0.18) | (0.17) | (0.28) | (0.25) | (0.27) | (0.26) | (0.07) | (0.35) |
| Missing FICO | 15.28*** | 7.02*** | 57.18*** | -0.16 | 0.13 | 10.83*** | 52.04*** | 28.52*** | 18.89*** | 22.02*** | 5.73*** | 275.26*** |
|  | (0.18) | (0.18) | (0.65) | (0.41) | (0.33) | (0.22) | (0.81) | (1.09) | (0.99) | (1.12) | (0.15) | (3.20) |
| 300 <= FICO < 540 | 167.77*** | 143.80*** | 216.09*** | 137.07*** | 160.72*** | 159.15*** | 220.51*** | 197.87*** | 151.96*** | 67.78*** | 20.32*** | 318.48*** |
|  | (0.84) | (0.94) | (1.46) | (2.81) | (2.40) | (1.92) | (1.88) | (1.89) | (1.84) | (1.79) | (0.48) | (2.17) |
| 540 <= FICO < 560 | 113.79*** | 92.65*** | 152.77*** | 63.74*** | 90.28*** | 105.95*** | 144.28*** | 143.54*** | 125.56*** | 58.42*** | 20.68*** | 208.54*** |
|  | (0.66) | (0.72) | (1.18) | (1.89) | (1.66) | (1.38) | (1.42) | (1.51) | (1.55) | (1.60) | (0.46) | (2.16) |
| 560 <= FICO < 580 | 79.34*** | 62.31*** | 108.61*** | 36.02*** | 55.99*** | 63.90*** | 92.97*** | 90.80*** | 97.82*** | 57.85*** | 20.28*** | 141.71*** |
|  | (0.47) | (0.52) | (0.87) | (1.28) | (1.12) | (0.92) | (1.05) | (1.06) | (1.19) | (1.60) | (0.36) | (2.13) |
| 580 <= FICO < 600 | 63.42*** | 51.17*** | 81.27*** | 20.09*** | 37.87*** | 50.66*** | 78.07*** | 81.69*** | 77.40*** | 42.36*** | 28.43*** | 115.67*** |
|  | (0.38) | (0.41) | (0.72) | (0.90) | (0.78) | (0.67) | (0.88) | (0.97) | (0.99) | (0.90) | (0.35) | (2.11) |
| 600 <= FICO < 620 | 39.94*** | 29.67*** | 59.04*** | 10.55*** | 19.20*** | 28.36*** | 53.75*** | 55.84*** | 54.38*** | 30.16*** | 19.21*** | 93.97*** |
|  | (0.28) | (0.30) | (0.58) | (0.60) | (0.52) | (0.45) | (0.70) | (0.75) | (0.79) | (0.70) | (0.23) | (2.11) |
| 620 <= FICO < 640 | 21.52*** | 12.24*** | 37.07*** | 5.24*** | 12.12*** | 18.91*** | 30.34*** | 33.25*** | 32.41*** | 20.41*** | 14.99*** | 62.82*** |
|  | (0.21) | (0.23) | (0.44) | (0.47) | (0.38) | (0.33) | (0.55) | (0.54) | (0.61) | (0.57) | (0.18) | (2.09) |
| 640 <= FICO < 660 | 11.67*** | 4.52*** | 24.84*** | 2.39*** | 6.38*** | 9.12*** | 17.87*** | 19.94*** | 23.18*** | 14.17*** | 10.13*** | 47.48*** |
|  | (0.18) | (0.19) | (0.39) | (0.37) | (0.30) | (0.26) | (0.46) | (0.44) | (0.54) | (0.50) | (0.15) | (2.09) |
| 660 <= FICO < 680 | 4.11*** | -0.32** | 13.04*** | 1.40*** | 3.07*** | 4.27*** | 8.50*** | 8.32*** | 9.21*** | 7.07*** | 6.28*** | 33.44*** |
|  | (0.15) | (0.16) | (0.34) | (0.32) | (0.25) | (0.22) | (0.39) | (0.33) | (0.44) | (0.39) | (0.13) | (2.09) |
| 680 <= FICO < 700 | 1.01*** | -1.74*** | 7.63*** | 0.79*** | 1.83*** | 2.20*** | 4.85*** | 4.13*** | 3.25*** | 6.41*** | 3.02*** | 20.99*** |
|  | (0.13) | (0.14) | (0.31) | (0.29) | (0.22) | (0.19) | (0.35) | (0.28) | (0.38) | (0.33) | (0.12) | (2.10) |
| 700 <= FICO < 720 | 0.03 | -1.73*** | 4.69*** | 0.44 | 1.45*** | 1.33*** | 3.20*** | 2.47*** | 1.11*** | 3.98*** | 1.69*** | 14.36*** |
|  | (0.12) | (0.13) | (0.29) | (0.28) | (0.20) | (0.18) | (0.33) | (0.25) | (0.35) | (0.31) | (0.11) | (2.12) |
| 720 <= FICO < 740 | -0.16 | -1.19*** | 2.94*** | -0.04 | 0.72*** | 0.76*** | 3.09*** | 2.41*** | 0.21 | 2.09*** | 0.83*** | 8.05*** |
|  | (0.12) | (0.13) | (0.28) | (0.27) | (0.19) | (0.17) | (0.32) | (0.24) | (0.33) | (0.29) | (0.11) | (2.14) |
| 740 <= FICO < 760 | -0.48*** | -1.23*** | 2.19*** | -1.10*** | -0.09 | 0.11 | 2.50*** | 2.21*** | 0.03 | 0.47* | -0.07 | 6.33*** |
|  | (0.11) | (0.12) | (0.27) | (0.25) | (0.17) | (0.16) | (0.31) | (0.22) | (0.32) | (0.28) | (0.10) | (2.17) |
| 760 <= FICO < 780 | -0.36*** | -1.18*** | 1.68*** | -1.42*** | -0.44*** | -0.25 | 2.26*** | 1.91*** | -0.02 | -0.34 | -0.61*** | 2.71 |
|  | (0.11) | (0.11) | (0.27) | (0.24) | (0.16) | (0.15) | (0.30) | (0.21) | (0.30) | (0.27) | (0.10) | (2.21) |
| 780 <= FICO < 800 | 0.11 | -0.72*** | 1.10*** | -1.07*** | -0.37** | -0.10 | 2.05*** | 1.20*** | 0.06 | -0.49* | -0.50*** | -4.31* |
|  | (0.11) | (0.11) | (0.27) | (0.24) | (0.16) | (0.15) | (0.30) | (0.21) | (0.30) | (0.26) | (0.10) | (2.31) |
| $0K < Loan Amount <= $40K | 76.44*** | 60.50*** | 133.20*** | 48.23*** | 67.70*** | 77.00*** | 102.24*** | 87.79*** | 66.00*** | 64.86*** | 40.05*** | 133.01*** |
|  | (0.56) | (0.58) | (1.42) | (2.01) | (1.54) | (1.45) | (1.63) | (1.01) | (1.31) | (1.19) | (0.53) | (5.63) |
| $40K < Loan Amount <= $50K | 53.82*** | 42.56*** | 88.58*** | 23.85*** | 45.29*** | 58.87*** | 76.09*** | 62.85*** | 42.86*** | 46.75*** | 29.70*** | 107.14*** |
|  | (0.49) | (0.51) | (1.28) | (1.63) | (1.35) | (1.38) | (1.53) | (0.83) | (1.20) | (1.05) | (0.47) | (5.63) |
| $50K < Loan Amount <= $75K | 35.02*** | 27.84*** | 54.90*** | 9.02*** | 28.15*** | 42.36*** | 53.04*** | 42.88*** | 19.33*** | 34.17*** | 17.32*** | 85.63*** |
|  | (0.44) | (0.47) | (1.12) | (1.56) | (1.28) | (1.33) | (1.39) | (0.56) | (0.95) | (0.78) | (0.45) | (5.60) |
| $75K < Loan Amount <= $150K | 11.31*** | 7.80*** | 19.95*** | -7.03*** | 8.72*** | 22.03*** | 27.05*** | 18.04*** | -6.90*** | 7.06*** | -0.21 | 48.63*** |
|  | (0.42) | (0.45) | (1.08) | (1.54) | (1.26) | (1.32) | (1.35) | (0.46) | (0.87) | (0.68) | (0.44) | (5.59) |
| $150K < Loan Amount <= $275K | -5.75*** | -8.00*** | 0.97 | -22.50*** | -8.08*** | 5.59*** | 8.14*** | 2.73*** | -18.37*** | -5.85*** | -12.95*** | 17.01*** |
|  | (0.42) | (0.45) | (1.07) | (1.53) | (1.26) | (1.32) | (1.34) | (0.44) | (0.84) | (0.66) | (0.44) | (5.58) |
| $275K < Loan Amount <= Conforming Limit | -11.13*** | -12.67*** | -6.47*** | -25.08*** | -14.14*** | -1.95 | 0.73 | -2.82*** | -20.90*** | -11.10*** | -17.14*** | 9.78* |
|  | (0.42) | (0.45) | (1.07) | (2.08) | (1.27) | (1.33) | (1.35) | (0.44) | (0.83) | (0.65) | (0.44) | (5.58) |
| Conforming Limit < Loan Amount <= $1 Million | -11.66*** | -11.16*** | -7.85*** | -4.51*** | -6.62*** | 6.33*** | 3.37** | 0.69* | -12.84*** | 0.36 | -14.09*** | 4.28 |
|  | (0.41) | (0.44) | (1.06) | (1.51) | (1.25) | (1.32) | (1.33) | (0.41) | (0.81) | (0.64) | (0.44) | (5.58) |
| 36% < Debt-to-Income Ratio <= 50% | 1.15*** | 0.84*** | 1.37*** | 0.19 | 0.93*** | 1.28*** | 2.44*** | 1.00*** | -0.18 | 1.27*** | 1.48*** | -1.56*** |
|  | (0.07) | (0.07) | (0.15) | (0.15) | (0.12) | (0.11) | (0.17) | (0.14) | (0.19) | (0.16) | (0.05) | (0.32) |

| VARIABLES | Model (4) | Model (4-R) Retail loans only | Model (4-W) Wholesale 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-P) Prime loans only | Model (4-NP) Nonprime loans only |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Debt-to-Income Ratio > 50% | 4.10*** | 3.53*** | 1.85*** | 1.38*** | 0.09 | -0.11 | 6.12*** | 1.51*** | 2.31*** | 2.32*** | 1.84*** | -0.82* |
| | (0.13) | (0.14) | (0.28) | (0.39) | (0.27) | (0.21) | (0.35) | (0.29) | (0.34) | (0.29) | (0.09) | (0.42) |
| Debt-to-Income Ratio Missing | 11.63*** | 11.05*** | -5.66*** | -5.66*** | 13.98*** | 2.96*** | -4.20*** | 32.57*** | 15.80*** | 21.25*** | 18.33*** | 9.61*** |
| | (0.33) | (0.41) | (0.60) | (0.70) | (0.57) | (0.42) | (0.96) | (1.02) | (1.29) | (1.09) | (0.30) | (1.51) |
| 28% < Housing Debt-to-Income Ratio <= 33% | 2.19*** | 1.86*** | 3.65*** | 1.37*** | 1.96*** | 2.93*** | 4.04*** | 1.22*** | 0.27 | 0.64*** | 0.75*** | 4.06*** |
| | (0.09) | (0.10) | (0.19) | (0.22) | (0.18) | (0.15) | (0.23) | (0.18) | (0.24) | (0.20) | (0.07) | (0.38) |
| 33% < Housing Debt-to-Income Ratio <= 40% | 4.74*** | 3.82*** | 6.85*** | 3.47*** | 3.71*** | 4.73*** | 5.62*** | 2.23*** | 2.02*** | 2.17*** | 1.90*** | 7.88*** |
| | (0.11) | (0.12) | (0.22) | (0.31) | (0.23) | (0.20) | (0.28) | (0.22) | (0.27) | (0.24) | (0.09) | (0.39) |
| Housing Debt-to-Income Ratio > 40% | 8.96*** | 6.48*** | 10.88*** | 4.51*** | 4.43*** | 5.36*** | 6.65*** | 4.63*** | 5.64*** | 3.75*** | 3.67*** | 11.07*** |
| | (0.16) | (0.18) | (0.30) | (0.46) | (0.33) | (0.28) | (0.42) | (0.32) | (0.37) | (0.34) | (0.12) | (0.43) |
| Housing Debt-to-Income Ratio Missing | 10.27*** | 7.04*** | 0.83* | 6.56*** | 6.55*** | 7.72*** | 2.51*** | 2.27*** | 7.77*** | 4.59*** | 8.51*** | 9.39*** |
| | (0.25) | (0.31) | (0.48) | (0.58) | (0.43) | (0.33) | (0.83) | (0.80) | (0.91) | (0.75) | (0.21) | (1.45) |
| LTV missing | -20.24*** | 94.92*** | -61.62*** | -34.11*** | -25.74*** | -15.50*** | -46.65*** | -20.84*** | -10.82*** | -21.95*** | -26.92*** | 25.65*** |
| | (0.21) | (0.48) | (2.71) | (7.17) | (1.48) | (0.49) | (0.54) | (0.49) | (0.64) | (0.58) | (0.17) | (9.55) |
| 0% < LTV <= 60% | -59.98*** | -46.75*** | -81.38*** | -72.02*** | -51.15*** | -57.79*** | -64.53*** | -69.02*** | -76.72*** | -64.23*** | -50.10*** | -153.96*** |
| | (0.17) | (0.19) | (0.39) | (0.98) | (0.32) | (0.24) | (0.49) | (0.48) | (0.67) | (0.50) | (0.14) | (1.61) |
| 60% < LTV <= 70% | -62.25*** | -48.44*** | -87.86*** | -64.55*** | -54.36*** | -60.69*** | -67.56*** | -68.74*** | -75.78*** | -62.71*** | -51.71*** | -150.02*** |
| | (0.17) | (0.19) | (0.38) | (0.65) | (0.33) | (0.25) | (0.46) | (0.46) | (0.62) | (0.49) | (0.14) | (1.21) |
| 70% < LTV <= 80% | -60.30*** | -51.86*** | -81.46*** | -59.48*** | -55.62*** | -61.11*** | -65.47*** | -71.63*** | -78.34*** | -61.74*** | -51.71*** | -136.49*** |
| | (0.14) | (0.15) | (0.32) | (0.43) | (0.27) | (0.21) | (0.36) | (0.42) | (0.42) | (0.32) | (0.11) | (0.59) |
| 80% < LTV <= 90% | -14.02*** | -11.55*** | -26.21*** | -25.83*** | -15.20*** | -21.49*** | -14.83*** | -12.01*** | -10.89*** | -5.84*** | -15.51*** | -71.29*** |
| | (0.19) | (0.21) | (0.38) | (0.58) | (0.41) | (0.29) | (0.50) | (0.47) | (0.55) | (0.45) | (0.14) | (0.96) |
| CLTV missing | -2.80*** | -9.68*** | -36.59*** | 12.90*** | -12.35*** | 20.27*** | 6.06*** | -8.37*** | -7.11*** | 38.49*** | -12.09*** | -0.57 |
| | (0.21) | (0.23) | (0.62) | (1.37) | (0.54) | (0.71) | (0.44) | (0.42) | (0.78) | (1.07) | (0.17) | (0.90) |
| 0% < CLTV <= 60% | -22.22*** | -24.96*** | -21.83*** | 25.45*** | -15.90*** | -12.02*** | -15.96*** | -30.29*** | -33.09*** | -15.34*** | -20.98*** | -5.00*** |
| | (0.18) | (0.21) | (0.42) | (1.32) | (0.39) | (0.22) | (0.47) | (0.52) | (0.72) | (0.55) | (0.17) | (1.61) |
| 60% < CLTV <= 70% | -18.70*** | -22.04*** | -15.49*** | 19.76*** | -12.10*** | -7.75*** | -12.93*** | -29.98*** | -33.87*** | -16.20*** | -19.08*** | -8.60*** |
| | (0.18) | (0.20) | (0.42) | (0.99) | (0.39) | (0.22) | (0.44) | (0.48) | (0.64) | (0.53) | (0.16) | (1.19) |
| 70% < CLTV <= 80% | -16.07*** | -16.71*** | -11.51*** | 15.53*** | -10.37*** | -5.62*** | -8.87*** | -22.97*** | -24.03*** | -11.85*** | -16.54*** | -2.04*** |
| | (0.14) | (0.15) | (0.34) | (0.80) | (0.34) | (0.19) | (0.32) | (0.33) | (0.38) | (0.33) | (0.13) | (0.50) |
| 80% < CLTV <= 90% | -13.54*** | -14.47*** | -8.92*** | 18.14*** | -6.46*** | -3.56*** | -8.06*** | -22.76*** | -24.73*** | -12.04*** | -13.91*** | -6.60*** |
| | (0.16) | (0.17) | (0.37) | (0.83) | (0.37) | (0.21) | (0.34) | (0.38) | (0.42) | (0.37) | (0.14) | (0.92) |
| 90% < CLTV <= 95% | -12.14*** | -12.64*** | -9.01*** | 13.36*** | -6.55*** | -6.40*** | -10.48*** | -19.60*** | -14.24*** | -4.86*** | -11.97*** | -30.92*** |
| | (0.15) | (0.15) | (0.41) | (0.64) | (0.33) | (0.21) | (0.33) | (0.35) | (0.39) | (0.33) | (0.12) | (0.61) |
| FHA Loan | -52.37*** | -36.43*** | -76.43*** | -2.56*** | -22.09*** | -35.21*** | -71.03*** | -94.33*** | -111.70*** | -43.97*** | -10.67*** | |
| | (0.20) | (0.21) | (0.44) | (0.63) | (0.39) | (0.31) | (0.55) | (0.60) | (0.59) | (0.48) | (0.16) | |
| VA Loan | -71.55*** | -58.24*** | -92.07*** | -35.85*** | -46.63*** | -60.30*** | -65.04*** | -95.19*** | -126.41*** | -78.98*** | -48.95*** | |
| | (0.26) | (0.31) | (0.52) | (0.79) | (0.52) | (0.38) | (0.83) | (0.93) | (0.77) | (0.55) | (0.21) | |
| FSA/RHS Loan | -78.45*** | -62.03*** | -96.18*** | -27.01*** | -52.13*** | -64.39*** | -71.64*** | -92.40*** | -136.48*** | -94.37*** | -53.08*** | |
| | (0.71) | (0.69) | (1.97) | (1.41) | (1.39) | (1.11) | (1.81) | (1.80) | (1.96) | (1.08) | (0.51) | |
| Self-employed borrower or co-borrower | 4.37*** | 1.48*** | 6.30*** | 2.75*** | 1.90*** | 2.64*** | 3.25*** | 3.13*** | 4.28*** | 5.33*** | 1.85*** | -0.15 |
| | (0.10) | (0.10) | (0.20) | (0.22) | (0.17) | (0.15) | (0.24) | (0.22) | (0.27) | (0.23) | (0.08) | (0.38) |
| Cash-out Refi | 10.23*** | 9.54*** | 10.14*** | 5.60*** | 1.62*** | 4.20*** | 13.99*** | 8.43*** | 17.22*** | 15.64*** | 9.19*** | -2.68*** |
| | (0.09) | (0.10) | (0.19) | (0.23) | (0.19) | (0.17) | (0.26) | (0.22) | (0.26) | (0.22) | (0.07) | (0.33) |
| Rate Term Refi | -3.82*** | -0.84*** | -5.38*** | 0.44** | -8.27*** | -8.79*** | -6.12*** | -6.22*** | 3.55*** | 3.26*** | -0.24*** | -13.62*** |
| | (0.08) | (0.08) | (0.18) | (0.17) | (0.14) | (0.12) | (0.20) | (0.20) | (0.26) | (0.20) | (0.06) | (0.48) |
| Streamline Refi | -2.33*** | 8.08*** | -4.34*** | -6.70*** | -9.36*** | -3.96*** | -8.49*** | -19.81*** | -9.95*** | -10.25*** | -2.48*** | -5.15*** |
| | (0.24) | (0.29) | (0.41) | (0.66) | (0.49) | (0.30) | (0.77) | (0.92) | (1.55) | (1.11) | (0.18) | (1.64) |
| Unknown loan purpose | 38.37*** | 40.26*** | 41.61*** | 25.61*** | 45.19*** | 43.73*** | -69.15*** | -16.65** | -103.30*** | -1.16 | 50.87*** | |
| | (4.51) | (4.18) | (0.78) | (8.57) | (3.73) | (5.29) | (26.39) | (7.84) | (29.19) | (25.12) | (3.70) | |
| Loan Term Missing | 11.68*** | 21.64*** | -29.35*** | -7.81 | -3.54** | 16.88*** | 13.74*** | 23.53*** | 54.36*** | 74.99*** | 10.94*** | 69.04*** |
| | (0.19) | (0.20) | (0.83) | (5.48) | (1.43) | (0.30) | (2.50) | (4.96) | (10.92) | (12.43) | (0.14) | (1.52) |
| Loan Term (years) <= 5 | -19.30 | 2.34 | 7.52 | -36.08** | 55.48 | 108.22*** | | 16.83 | 103.20 | 119.71 | -5.49 | |
| | (13.80) | (14.02) | (15.99) | (14.47) | (58.63) | (32.81) | | (40.73) | (64.71) | (184.88) | (13.54) | |
| 5 < Loan Term (years) <= 7 | -3.11*** | 3.61*** | 19.21*** | -4.11*** | 7.31*** | 36.55*** | -12.00* | -53.71*** | 284.91*** | 271.55*** | -7.11*** | |
| | (0.78) | (0.80) | (5.09) | (0.69) | (2.35) | (7.87) | (6.62) | (19.55) | (15.47) | (29.32) | (0.75) | |
| 7 < Loan Term (years) <= 10 | -6.49*** | 13.17*** | 9.09*** | 51.22*** | -16.71*** | 3.78*** | -13.32*** | -4.40 | 16.43 | 86.35*** | 7.41*** | -213.65*** |
| | (1.25) | (2.33) | (1.34) | (5.84) | (2.89) | (1.32) | (4.47) | (8.56) | (15.32) | (13.10) | (1.25) | (45.68) |
| 10 < Loan Term (years) <= 15 | -13.81*** | -9.52*** | 4.14*** | -3.93*** | -9.72*** | -9.92*** | -18.65*** | -19.80*** | -13.85 | 49.24*** | -13.21*** | -3.42 |
| | (0.20) | (0.21) | (1.01) | (0.50) | (0.23) | (0.25) | (3.45) | (7.06) | (13.66) | (11.04) | (0.15) | (2.65) |

| VARIABLES | Model (4) | Model (4-R) Retail loans only | Model (4-W) Wholesale 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-P) Prime loans only | Model (4-NP) Nonprime loans only |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 < Loan Term (years) <= 20 | -5.12*** | -2.89*** | 1.00* | -3.67*** | -4.78*** | -5.41*** | -4.95** | 4.65* | 19.10*** | 17.03*** | -3.70*** | 20.75 |
| | (0.28) | (0.32) | (0.57) | (1.08) | (0.37) | (0.31) | (2.18) | (2.38) | (2.77) | (1.99) | (0.24) | (52.52) |
| 20 < Loan Term (years) <= 25 | 4.43*** | 4.31*** | -0.06 | 0.98 | -0.56 | -3.02*** | -7.90*** | -6.09*** | 8.53*** | 4.96*** | 3.18*** | -90.36*** |
| | (0.38) | (0.36) | (0.94) | (0.69) | (0.56) | (0.45) | (1.56) | (1.61) | (2.54) | (1.61) | (0.29) | (33.66) |
| Loan Term (years) > 30 | -19.22*** | -3.51 | -49.46*** | -11.71*** | 26.65*** | | | | 21.28*** | -30.68*** | 45.90*** | 1.77 |
| | (2.76) | (3.37) | (4.13) | (0.84) | (9.23) | | | | (3.58) | (3.77) | (4.70) | (2.48) |
| Investment, Single Family | 51.20*** | 47.52*** | 56.14*** | 50.71*** | 47.28*** | 47.00*** | 43.62*** | 43.50*** | 61.77*** | 58.49*** | 53.48*** | 45.17*** |
| | (0.21) | (0.23) | (0.41) | (0.54) | (0.40) | (0.36) | (0.52) | (0.46) | (0.54) | (0.46) | (0.18) | (0.56) |
| Investment, Multi Family 2 | 46.17*** | 44.65*** | 47.53*** | 52.14*** | 47.68*** | 45.09*** | 44.09*** | 42.72*** | 56.25*** | 55.68*** | 51.34*** | 41.54*** |
| | (0.43) | (0.49) | (0.80) | (1.21) | (0.77) | (0.74) | (1.07) | (0.89) | (1.06) | (1.06) | (0.38) | (1.13) |
| Investment, Multi Family 3 | 50.47*** | 42.89*** | 62.68*** | 54.67*** | 45.55*** | 42.37*** | 57.99*** | 54.91*** | 63.11*** | 56.30*** | 48.22*** | 68.28*** |
| | (0.84) | (0.92) | (1.61) | (2.12) | (1.28) | (1.36) | (2.28) | (1.80) | (2.23) | (2.07) | (0.73) | (2.05) |
| Investment, Multi Family 4 | 49.02*** | 43.00*** | 61.15*** | 52.00*** | 43.45*** | 40.78*** | 55.39*** | 50.02*** | 61.80*** | 54.71*** | 46.54*** | 69.97*** |
| | (0.64) | (0.73) | (1.16) | (1.60) | (0.92) | (1.05) | (1.67) | (1.55) | (1.84) | (1.63) | (0.55) | (1.86) |
| Investment, Low Rise Condo | 45.75*** | 42.22*** | 50.63*** | 45.35*** | 41.71*** | 39.40*** | 37.66*** | 38.38*** | 46.22*** | 49.55*** | 49.71*** | 46.28*** |
| | (0.40) | (0.43) | (0.81) | (1.01) | (0.72) | (0.76) | (1.06) | (0.84) | (0.90) | (0.78) | (0.35) | (1.28) |
| Investment, High Rise Condo | 48.77*** | 46.42*** | 39.99*** | 47.89*** | 41.52*** | 37.61*** | 33.29*** | 36.62*** | 41.14*** | 48.84*** | 52.92*** | 94.75*** |
| | (1.07) | (1.09) | (4.85) | (2.66) | (2.69) | (1.99) | (3.02) | (2.54) | (2.00) | (2.00) | (1.07) | (12.17) |
| Investment, Co-op | 34.72*** | 29.90*** | 36.56*** | 45.56*** | | 41.02*** | | | 70.83*** | 55.63*** | 53.77*** | 26.38* |
| | (2.27) | (3.48) | (2.67) | (2.08) | | (0.34) | | | (13.33) | (11.58) | (1.76) | (14.41) |
| Primary home, Multi Family 2 | 8.61*** | 6.47*** | 10.62*** | 11.74*** | 9.52*** | 7.91*** | 7.87*** | 1.61** | 10.21*** | 9.00*** | 8.71*** | -3.27*** |
| | (0.30) | (0.33) | (0.56) | (0.82) | (0.56) | (0.46) | (0.79) | (0.75) | (0.89) | (0.70) | (0.23) | (0.85) |
| Primary home, Multi Family 3 | 18.47*** | 12.70*** | 29.61*** | 18.45*** | 14.44*** | 11.27*** | 15.53*** | 18.81*** | 28.04*** | 19.22*** | 13.82*** | 31.03*** |
| | (0.85) | (0.91) | (1.59) | (1.94) | (1.37) | (1.17) | (2.20) | (2.49) | (3.25) | (1.87) | (0.66) | (2.18) |
| Primary home, Multi Family 4 | 22.04*** | 18.30*** | 25.37*** | 24.15*** | 20.38*** | 15.59*** | 22.13*** | 19.65*** | 26.78*** | 18.37*** | 18.00*** | 28.48*** |
| | (1.09) | (1.21) | (2.03) | (2.53) | (1.81) | (1.57) | (3.05) | (3.29) | (3.51) | (2.63) | (0.87) | (3.09) |
| Primary home, Low Rise Condo | -0.93*** | -0.40*** | -1.66*** | -0.39 | -0.10 | -1.05*** | -0.64** | -1.38*** | -1.06*** | -0.59** | 1.72*** | 6.09*** |
| | (0.12) | (0.12) | (0.24) | (0.30) | (0.21) | (0.17) | (0.28) | (0.25) | (0.31) | (0.26) | (0.10) | (0.58) |
| Primary home, Townhouse (detached) | 6.27*** | 7.55*** | | | | -18.00*** | | | | | 9.94*** | |
| | (0.31) | (0.32) | | | | (0.42) | | | | | (0.23) | |
| Primary home, High Rise Condo | 3.86*** | 0.41 | -13.18*** | -0.96 | 1.35** | 1.05*** | -0.92 | 0.24 | 3.63*** | 3.45*** | 5.37*** | 23.87*** |
| | (0.31) | (0.30) | (1.49) | (0.68) | (0.56) | (0.41) | (0.65) | (0.57) | (0.70) | (0.58) | (0.29) | (7.27) |
| Primary home, Co-op | -1.89*** | -0.46 | 3.69*** | 0.31 | -0.73 | -1.61*** | 4.62*** | -2.00*** | 0.67 | 0.82 | 5.23*** | 16.29*** |
| | (0.35) | (0.38) | (0.54) | (0.54) | (0.62) | (0.56) | (0.82) | (0.68) | (0.98) | (0.71) | (0.25) | (4.92) |
| Primary home, 'P' (undefined) | 17.13 | 90.63** | 24.73 | 31.25 | 36.00 | | | | -140.55*** | | 15.00* | 68.25* |
| | (21.06) | (40.58) | (23.16) | (25.14) | (23.64) | | | | (6.37) | | (7.79) | (39.85) |
| Second home, Single Family | 6.09*** | 6.73*** | 6.05*** | 6.94*** | 4.43*** | 3.16*** | 1.76*** | 2.83*** | 6.77*** | 7.70*** | 8.17*** | 9.54*** |
| | (0.15) | (0.16) | (0.36) | (0.35) | (0.26) | (0.22) | (0.36) | (0.28) | (0.37) | (0.31) | (0.13) | (1.06) |
| Second home, Multi Family 2 | 6.45*** | 5.31*** | 12.04*** | 12.24*** | 10.36*** | 7.03*** | 0.02 | 8.14*** | 6.40** | 13.75*** | 10.02*** | -7.74 |
| | (1.33) | (1.42) | (3.23) | (2.69) | (1.92) | (1.68) | (3.17) | (2.36) | (3.26) | (3.53) | (1.16) | (7.21) |
| Second home, Multi Family 3 | 39.38** | 26.68 | 47.81*** | | -1.08 | -105.24*** | 69.21*** | 23.87 | 60.20*** | 67.08*** | 12.90 | 47.53* |
| | (16.88) | (16.60) | (3.32) | | (7.82) | (0.50) | (22.54) | (23.51) | (15.44) | (24.36) | (19.61) | (25.56) |
| Second home, Multi Family 4 | 29.22 | -7.04 | 93.24** | 40.21*** | 117.10*** | -69.02 | 35.87 | 33.15 | 8.41 | 66.07*** | 16.95 | 23.06 |
| | (18.93) | (20.11) | (38.86) | (1.06) | (42.69) | (64.72) | (32.04) | (39.00) | (36.64) | (17.48) | (25.06) | (20.02) |
| Second home, Low Rise Condo | 7.27*** | 8.73*** | 7.30*** | 6.57*** | 2.75*** | 2.51*** | 0.54 | 4.20*** | 8.32*** | 7.39*** | 10.13*** | 10.00*** |
| | (0.23) | (0.24) | (0.51) | (0.53) | (0.38) | (0.34) | (0.55) | (0.38) | (0.52) | (0.47) | (0.20) | (1.87) |
| Second home, High Rise Condo | 16.26*** | 13.51*** | -6.10*** | 7.06*** | 7.34*** | 5.95*** | 5.29*** | 7.26*** | 9.35*** | 11.03*** | 16.81*** | 11.28 |
| | (0.51) | (0.52) | (2.16) | (1.24) | (1.05) | (0.71) | (1.04) | (0.85) | (1.12) | (0.90) | (0.52) | (12.30) |
| Second home, Co-op | -10.66*** | 1.53 | -19.04*** | -2.71*** | 45.63*** | 16.64* | 15.96*** | 13.97*** | 10.95*** | 2.90 | 5.45*** | -151.35*** |
| | (1.09) | (1.56) | (1.56) | (1.13) | (19.09) | (9.42) | (4.52) | (2.72) | (2.58) | (2.33) | (0.99) | (27.62) |
| Dome | 2.50 | 2.47 | 18.54 | 24.61* | 5.44 | 7.06 | -14.10 | -7.73 | 6.90 | -4.83 | 8.47* | -71.41*** |
| | (4.74) | (4.73) | (15.62) | (14.51) | (7.01) | (8.61) | (12.79) | (13.14) | (7.79) | (9.90) | (4.55) | (26.31) |
| Earthen Home | 5.15 | 6.61* | 5.45 | -1.16 | 8.50* | 2.16 | 13.29** | -0.99 | 4.93 | -1.12 | 8.83*** | -143.21*** |
| | (3.34) | (3.58) | (7.85) | (5.45) | (4.95) | (3.70) | (6.04) | (5.10) | (10.89) | (6.97) | (3.22) | (3.33) |
| Hotel-Condo | 28.75*** | 25.59*** | 42.82*** | 76.84*** | 51.33*** | 46.69*** | 62.54*** | 4.13 | 12.25 | 23.81*** | 28.83*** | -66.97*** |
| | (3.39) | (4.04) | (4.70) | (20.42) | (13.13) | (7.10) | (6.48) | (5.34) | (8.28) | (5.31) | (3.92) | (7.50) |
| Log Home | 4.48*** | 2.24** | -1.04 | -2.45 | 4.90** | 4.87*** | -4.45 | 1.39 | 2.00 | 4.72*** | 5.39*** | 8.98 |
| | (0.98) | (0.96) | (9.73) | (2.87) | (2.37) | (1.77) | (2.74) | (1.78) | (1.94) | (1.71) | (0.93) | (13.40) |
| Manufactured Home | 13.59*** | 11.56*** | 29.38*** | 8.34*** | 12.63*** | 15.26*** | 16.47*** | 20.41*** | 18.98*** | 28.89*** | 25.12*** | 15.47*** |
| | (0.23) | (0.26) | (0.44) | (1.08) | (0.70) | (0.53) | (0.52) | (0.51) | (0.55) | (0.49) | (0.19) | (2.01) |

| VARIABLES | Model (4) | Model (4-R) Retail loans only | Model (4-W) Wholesale 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-P) Prime loans only | Model (4-NP) Nonprime loans only |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bankruptcy within 7 years present on credit report | 18.10*** | 16.18*** | 18.04*** | | 12.57*** | 14.45*** | 19.25*** | 18.72*** | 17.22*** | 12.45*** | 8.55*** | 11.17*** |
| | (0.25) | (0.27) | (0.47) | | (0.73) | (0.44) | (0.53) | (0.54) | (0.54) | (0.51) | (0.21) | (0.33) |
| Foreclosure within 7 years present on credit report | 23.94*** | 18.99*** | 27.85*** | | 19.12*** | 19.23*** | 25.67*** | 21.23*** | 16.25*** | 14.26*** | 7.72*** | 13.09*** |
| | (0.53) | (0.58) | (0.96) | | (1.55) | (0.99) | (1.17) | (1.14) | (1.04) | (1.11) | (0.48) | (0.57) |
| Judgement present on credit report | 11.17*** | 9.91*** | 9.07*** | 24.22*** | 10.27*** | 8.92*** | 10.25*** | 10.02*** | 10.59*** | 7.12*** | 3.57*** | 2.88*** |
| | (0.24) | (0.26) | (0.49) | (0.73) | (0.69) | (0.42) | (0.52) | (0.52) | (0.52) | (0.48) | (0.20) | (0.34) |
| Collections present on credit report | 3.41*** | 3.24*** | 3.89*** | | 4.65*** | 2.06*** | 2.23*** | 5.97*** | 4.81*** | 0.68*** | 0.64*** | 1.10*** |
| | (0.09) | (0.10) | (0.21) | | (0.22) | (0.15) | (0.21) | (0.21) | (0.25) | (0.21) | (0.07) | (0.31) |
| Late mortgage payment present on credit report | 20.49*** | 20.34*** | 12.22*** | | -25.07*** | 23.75*** | 19.66*** | 14.92*** | 20.77*** | 14.43*** | 5.71*** | 13.71*** |
| | (0.33) | (0.36) | (0.55) | | (5.21) | (0.74) | (0.62) | (0.59) | (0.56) | (0.63) | (0.28) | (0.37) |
| Late payment (non-mortgage) present on credit report | 3.75*** | 5.27*** | -5.81*** | | 20.16*** | 2.49*** | 5.28*** | 5.53*** | 4.99*** | 1.48*** | 1.60*** | 1.59*** |
| | (0.26) | (0.27) | (0.50) | | (5.27) | (0.48) | (0.49) | (0.50) | (0.52) | (0.47) | (0.20) | (0.35) |
| Doc type: Missing/Unknown | -26.06*** | -17.22*** | -13.36*** | | -196.65*** | -0.49 | -10.91*** | -48.70*** | -85.11*** | -90.86*** | 22.57*** | 44.81 |
| | (0.72) | (0.72) | (4.43) | | (81.80) | (7.85) | (4.35) | (10.95) | (1.34) | (3.14) | (0.71) | (81.04) |
| Doc type: No Doc | -14.45*** | -19.76*** | -3.36*** | -7.52*** | 4.56*** | -1.48*** | -9.82*** | -8.73*** | -15.60*** | -11.56*** | -3.35*** | -38.45*** |
| | (0.10) | (0.11) | (0.24) | (0.20) | (0.22) | (0.23) | (0.27) | (0.23) | (0.32) | (0.31) | (0.08) | (0.50) |
| Doc type: Quick Doc | -25.45 | -12.07 | | | | | | | -41.49*** | | 26.35 | |
| | (39.44) | (49.85) | | | | | | | (13.94) | | (58.74) | |
| Doc type: Stated Income/Asset | 24.92 | 46.13* | | | | | | | -3.34 | 69.56* | 26.98 | 12.31 |
| | (25.10) | (25.30) | | | | | | | (14.86) | (41.43) | (29.81) | (33.80) |
| Doc type: Substitute Doc | -30.65*** | -27.93*** | | 17.02 | | | | -15.35 | -30.20*** | 30.43 | -14.37* | |
| | (6.93) | (6.93) | | (30.89) | | | | (10.69) | (10.00) | (27.52) | (7.41) | |
| Doc type: Verify Assets | -4.34*** | -5.94*** | 8.08*** | 2.04*** | 0.55** | 0.87*** | -0.44* | -14.76*** | -14.64*** | -10.29*** | 2.03*** | 14.09*** |
| | (0.09) | (0.10) | (0.24) | (0.36) | (0.21) | (0.19) | (0.23) | (0.17) | (0.28) | (0.30) | (0.08) | (0.53) |
| Doc type: Verify Income | -19.42*** | -6.48*** | -16.13*** | -1.99 | -7.82*** | -23.83*** | -17.24*** | -10.91*** | -17.25*** | -15.70*** | -12.71*** | 10.84*** |
| | (0.30) | (0.39) | (0.43) | (1.24) | (0.75) | (0.61) | (0.64) | (0.51) | (0.62) | (0.64) | (0.17) | (0.54) |
| Balloon indicator | 73.65*** | 52.74*** | 75.02*** | -43.25*** | -56.92*** | 16.30*** | 39.47*** | 10.77*** | 18.51*** | 68.62*** | -6.05*** | 0.53 |
| | (0.81) | (1.16) | (1.04) | (6.64) | (2.89) | (1.64) | (1.69) | (2.10) | (1.20) | (1.57) | (2.81) | (0.70) |
| Interest-only amortization | 47.58*** | 47.53*** | 47.88*** | -5.20*** | 8.12*** | 9.08*** | 15.52*** | 8.04*** | 14.57*** | 12.88*** | 51.47*** | 11.65*** |
| | (0.14) | (0.16) | (0.26) | (0.77) | (0.34) | (0.24) | (0.24) | (0.24) | (0.33) | (0.24) | (0.14) | (0.66) |
| Unknown amortization type | 28.03*** | 1.30*** | 7.60*** | -2.43*** | 30.42*** | 19.96*** | 32.32*** | 43.64*** | 88.14*** | 43.46** | 23.32*** | -3.51 |
| | (0.22) | (0.39) | (0.47) | (0.32) | (1.52) | (0.75) | (3.38) | (5.60) | (19.47) | (17.34) | (0.17) | (6.55) |
| Product category: 1-Month to 3-Year ARM | -34.92*** | -65.35*** | -8.89*** | -88.05*** | -159.04*** | -132.51*** | -76.01*** | 22.82*** | 84.97*** | 69.09*** | -135.98*** | 25.34*** |
| | (0.30) | (0.32) | (0.61) | (1.07) | (0.58) | (0.62) | (0.50) | (0.54) | (0.91) | (1.59) | (0.25) | (0.41) |
| Product category: 5-Year ARM | -87.86*** | -95.66*** | -66.70*** | -79.33*** | -156.25*** | -159.85*** | -126.59*** | 1.14*** | 10.19*** | 2.75*** | -96.80*** | -44.07*** |
| | (0.12) | (0.14) | (0.26) | (0.33) | (0.16) | (0.12) | (0.20) | (0.22) | (0.34) | (0.35) | (0.12) | (1.30) |
| Product category: 7-Year ARM | -74.59*** | -80.86*** | -55.16*** | -76.66*** | -127.19*** | -130.87*** | -103.46*** | -1.53*** | 12.04*** | -4.48*** | -79.95*** | -60.40*** |
| | (0.13) | (0.14) | (0.32) | (0.29) | (0.17) | (0.13) | (0.21) | (0.22) | (0.32) | (0.46) | (0.12) | (2.52) |
| Product category: 10-Year ARM | -37.78*** | -49.25*** | -26.58*** | -18.20*** | -94.11*** | -92.51*** | -70.09*** | 2.33*** | 14.11*** | 14.88*** | -45.97*** | -56.24*** |
| | (0.13) | (0.15) | (0.26) | (3.43) | (0.46) | (0.17) | (0.24) | (0.21) | (0.31) | (0.32) | (0.12) | (1.67) |
| Product category: 5-Year Fixed | -127.02*** | -114.20*** | -114.82*** | -5.03 | -22.33*** | | -119.53*** | | | | -52.15*** | |
| | (3.23) | (3.31) | (1.64) | (8.60) | (4.15) | | (5.37) | | | | (4.14) | |
| Product category: 7-Year Fixed | -119.36*** | -100.36*** | -146.32*** | -4.71 | 1.20 | -97.91*** | -110.79*** | -13.97 | -33.60*** | -76.00*** | -40.34*** | |
| | (0.86) | (1.19) | (2.62) | (6.65) | (2.94) | (2.26) | (2.39) | (15.23) | (5.07) | (7.24) | (2.82) | |
| Product category: 10-Year Fixed | -57.56*** | -77.34*** | -192.03*** | -95.49*** | -45.51*** | -81.03*** | -93.37*** | -64.13*** | -50.56*** | -123.18*** | -69.66*** | |
| | (1.26) | (2.34) | (5.63) | (5.84) | (2.91) | (1.34) | (4.48) | (8.60) | (15.34) | (13.11) | (1.26) | |
| Product category: 15-Year Fixed | -29.82*** | -34.54*** | -45.42*** | -42.23*** | -44.07*** | -48.93*** | -36.48*** | -17.51* | -8.09 | -73.19*** | -31.33*** | 18.97*** |
| | (0.19) | (0.20) | (1.00) | (0.48) | (0.21) | (0.24) | (3.44) | (7.05) | (13.66) | (11.03) | (0.14) | (2.64) |
| Product category: 20-Year Fixed | -0.90*** | -3.07*** | -8.89*** | -9.79*** | -11.64*** | -6.53*** | -19.69*** | -15.75*** | -23.52*** | -15.72*** | -0.73*** | -95.46* |
| | (0.26) | (0.29) | (0.66) | (0.96) | (0.31) | (0.29) | (2.19) | (2.41) | (2.92) | (2.05) | (0.22) | (53.42) |
| Product category: 40-Year Fixed | 7.27*** | -2.23 | 32.54*** | | | | | | -34.49*** | 37.72*** | -46.19*** | 84.16* |
| | (2.82) | (3.43) | (4.25) | | | | | | (3.73) | (3.81) | (4.74) | (47.61) |
| Escrow waived | 8.02*** | 7.21*** | 10.82*** | -2.27*** | 4.35*** | 5.04*** | 12.62*** | 10.59*** | 9.14*** | 4.18*** | 0.59*** | 7.07*** |
| | (0.09) | (0.10) | (0.20) | (0.21) | (0.21) | (0.16) | (0.25) | (0.20) | (0.22) | (0.22) | (0.06) | (0.29) |
| Escrow waiver unknown | -33.85*** | -139.75*** | 33.12*** | -7.13 | -23.94*** | -44.07*** | -29.86*** | -41.80*** | -52.48*** | -33.81*** | -21.92*** | -69.32*** |
| | (0.14) | (0.43) | (0.58) | (5.49) | (1.45) | (0.40) | (0.29) | (0.25) | (0.32) | (0.39) | (0.11) | (1.01) |
| 1 <= Rate lock days <= 30 | 26.41*** | 36.61*** | 7.20*** | 40.90*** | | 12.14*** | -2.78*** | 27.15* | 68.28*** | -52.80*** | 10.59*** | 58.62 |
| | (0.81) | (0.81) | (0.14) | (0.59) | | (0.27) | (0.15) | (15.36) | (1.11) | (7.24) | (0.74) | (10,162.79) |
| 31 <= Rate lock days <= 60 | 18.96*** | 26.33*** | | 36.60*** | -2.93*** | 9.76*** | | 25.05 | 63.91*** | -57.86*** | 10.71*** | 44.74 |
| | (0.81) | (0.81) | | (0.60) | (0.11) | (0.27) | | (15.36) | (1.11) | (7.24) | (0.74) | (7,380.25) |

| VARIABLES | Model (4) | Model (4-R) | Model (4-W) | Model (4-2001) | Model (4-2002) | Model (4-2003) | Model (4-2004) | Model (4-2005) | Model (4-2006) | Model (4-2007) | Model (4-P) | Model (4-NP) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Retail loans only | Wholesale loans only | 2001 loans only | 2002 loans only | 2003 loans only | 2004 loans only | 2005 loans only | 2006 loans only | 2007 loans only | Prime loans only | Nonprime loans only |
| 61 <= Rate lock days <= 1000 | 9.34*** | -3.33*** | 1.52*** | | -22.86*** | | 0.61 | 13.39 | 44.02*** | -74.54*** | -0.16 | 43.93 |
| | (0.80) | (0.80) | (0.45) | | (0.41) | | (0.43) | (15.35) | (1.13) | (7.22) | (0.73) | (6,927.89) |
| Float-down indicator: Executed | -11.20*** | -13.25*** | | -32.47*** | -37.28*** | -25.18*** | 2.14*** | 16.49*** | -2.16*** | -4.22*** | -17.81*** | |
| | (0.24) | (0.23) | | (0.82) | (0.52) | (0.41) | (0.50) | (0.42) | (0.55) | (0.62) | (0.21) | |
| Float-down indicator: Unknown/Missing | 22.76*** | 127.81*** | 13.84*** | 14.03*** | 14.60*** | 20.72*** | 21.32*** | 24.87*** | 36.48*** | 20.86*** | -0.32*** | 60.43*** |
| | (0.11) | (0.44) | (0.16) | (0.41) | (0.30) | (0.25) | (0.21) | (0.21) | (0.27) | (0.34) | (0.07) | (1.13) |
| Float-down indicator: Yes | 29.97*** | 91.14*** | 1.74*** | 5.60*** | 8.04*** | 12.08*** | 12.86*** | 29.81*** | 26.60*** | 15.25*** | 22.87*** | -12.69*** |
| | (0.19) | (0.30) | (0.32) | (0.68) | (0.37) | (0.26) | (0.34) | (0.43) | (0.46) | (0.41) | (0.17) | (2.70) |
| Lender-paid mortgage insurance | -17.92*** | -9.42*** | | 15.83*** | 2.96*** | -6.62*** | -23.04*** | -22.88*** | -32.73*** | -26.63*** | -6.12*** | -0.23 |
| | (0.25) | (0.24) | | (0.69) | (0.50) | (0.49) | (1.08) | (0.70) | (0.90) | (0.35) | (0.22) | (3.55) |
| Combo loan indicator | -28.60*** | -20.00*** | | | | | 5.44 | -7.37*** | 1.98 | 2.57* | -39.64*** | |
| | (1.04) | (1.00) | | | | | (3.44) | (2.51) | (2.13) | (1.51) | (0.89) | |
| 6 months <= Prepayment penalty <= 24 months | 146.67*** | 89.35*** | 116.12*** | 386.52*** | 332.98*** | 243.25*** | 73.71*** | 31.14*** | 123.28*** | 211.15*** | 115.20*** | -18.75*** |
| | (0.43) | (0.60) | (0.74) | (2.19) | (1.39) | (1.12) | (0.67) | (0.61) | (1.03) | (2.15) | (2.71) | (0.36) |
| 36 months <= Prepayment penalty <= 60 months | 84.65*** | 26.52*** | 64.00*** | 327.46*** | 222.67*** | 125.51*** | 18.17*** | 55.38*** | 44.72*** | 132.51*** | 151.13*** | -42.60*** |
| | (0.42) | (0.77) | (0.49) | (2.70) | (1.58) | (0.94) | (0.78) | (1.00) | (0.72) | (1.84) | (3.24) | (0.45) |
| Constant | 743.96*** | 758.42 | 798.47*** | 769.62*** | 773.95*** | 514.72 | 968.26*** | 613.73 | 746.35 | 863.94*** | 789.58*** | 998.40 |
| | (1.34) | (646.49) | (2.13) | (4.36) | (3.01) | (6,072.87) | (3.77) | (7,201.15) | (.) | (7.65) | (1.15) | (.) |
| | | | | | | | | | | | | |
| Observations | 5,654,985 | 4,469,160 | 1,185,825 | 528,370 | 903,665 | 1,409,772 | 616,324 | 770,517 | 748,332 | 678,005 | 5,210,354 | 444,631 |
| R-squared | 0.70513 | 0.72291 | 0.74711 | 0.75662 | 0.79839 | 0.76820 | 0.75153 | 0.67217 | 0.75981 | 0.68248 | 0.72216 | 0.79714 |
| Adjusted R-squared | 0.70506 | 0.72283 | 0.74685 | 0.75610 | 0.79813 | 0.76801 | 0.75106 | 0.67167 | 0.75943 | 0.68192 | 0.72209 | 0.79660 |

Robust standard errors in parentheses

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

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

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

| VARIABLES | Model (4) | Model (4-RF) Interact Race & FICO | Model (4-Y) Allow Multiple Race Classifications |
|---|---|---|---|
| African American | 10.10*** | | |
| | (0.16) | | |
| Hispanic | 6.39*** | | |
| | (0.11) | | |
| American Indian | 0.17 | | |
| | (0.43) | | |
| Asian | -2.33*** | | |
| | (0.11) | | |
| Missing Race | 3.82*** | | |
| | (0.09) | | |
| African American | | | 6.59*** |
| | | | (0.21) |
| Hispanic | | | 4.93*** |
| | | | (0.13) |
| American Indian | | | -1.87*** |
| | | | (0.34) |
| Asian | | | -5.32*** |
| | | | (0.16) |
| Missing Race | | | 0.12 |
| | | | (0.18) |
| White | | | -3.70*** |
| | | | (0.15) |
| (FICO missing) x African American | | 25.28*** | |
| | | (0.61) | |
| (FICO < 540) x African American | | -6.44*** | |
| | | (2.10) | |
| (540 <= FICO < 560) x African American | | 1.79 | |
| | | (1.73) | |
| (560 <= FICO < 580) x African American | | 14.69*** | |
| | | (1.26) | |
| (580 <= FICO < 600) x African American | | 16.04*** | |
| | | (0.95) | |
| (600 <= FICO < 620) x African American | | 17.40*** | |
| | | (0.76) | |
| (620 <= FICO < 640) x African American | | 13.95*** | |
| | | (0.60) | |
| (640 <= FICO < 660) x African American | | 13.39*** | |
| | | (0.54) | |
| (660 <= FICO < 680) x African American | | 10.28*** | |
| | | (0.45) | |
| (680 <= FICO < 700) x African American | | 9.59*** | |
| | | (0.41) | |
| (700 <= FICO < 720) x African American | | 8.47*** | |
| | | (0.39) | |
| (720 <= FICO < 740) x African American | | 8.34*** | |
| | | (0.40) | |

| VARIABLES | Model (4) | Model (4-RF)<br>Interact Race &<br>FICO | Model (4-Y)<br>Allow Multiple Race<br>Classifications |
|---|---|---|---|
| (740 <= FICO < 760) x African American | | 7.41***<br>(0.39) | |
| (760 <= FICO < 780) x African American | | 7.29***<br>(0.39) | |
| (780 <= FICO < 800) x African American | | 6.65***<br>(0.44) | |
| (FICO >= 800) x African American | | 7.65***<br>(0.69) | |
| (FICO missing) x Hispanic | | 13.23***<br>(0.45) | |
| (FICO < 540) x Hispanic | | -9.91***<br>(2.88) | |
| (540 <= FICO < 560) x Hispanic | | -1.40<br>(2.18) | |
| (560 <= FICO < 580) x Hispanic | | 1.33<br>(1.48) | |
| (580 <= FICO < 600) x Hispanic | | 6.58***<br>(1.05) | |
| (600 <= FICO < 620) x Hispanic | | 6.14***<br>(0.75) | |
| (620 <= FICO < 640) x Hispanic | | 6.57***<br>(0.54) | |
| (640 <= FICO < 660) x Hispanic | | 6.87***<br>(0.46) | |
| (660 <= FICO < 680) x Hispanic | | 6.72***<br>(0.35) | |
| (680 <= FICO < 700) x Hispanic | | 7.55***<br>(0.29) | |
| (700 <= FICO < 720) x Hispanic | | 7.46***<br>(0.28) | |
| (720 <= FICO < 740) x Hispanic | | 6.46***<br>(0.27) | |
| (740 <= FICO < 760) x Hispanic | | 6.77***<br>(0.25) | |
| (760 <= FICO < 780) x Hispanic | | 6.33***<br>(0.25) | |
| (780 <= FICO < 800) x Hispanic | | 5.54***<br>(0.28) | |
| (FICO >= 800) x Hispanic | | 5.80***<br>(0.48) | |
| (FICO missing) x American Indian | | 7.20***<br>(1.81) | |
| (FICO < 540) x American Indian | | -30.19***<br>(10.92) | |
| (540 <= FICO < 560) x American Indian | | -16.19**<br>(7.91) | |
| (560 <= FICO < 580) x American Indian | | -3.06<br>(5.54) | |
| (580 <= FICO < 600) x American Indian | | -7.36**<br>(3.72) | |

| VARIABLES | Model (4) | Model (4-RF)<br>Interact Race &<br>FICO | Model (4-Y)<br>Allow Multiple Race<br>Classifications |
|---|---|---|---|
| (600 <= FICO < 620) x American Indian | | -6.51**<br>(2.56) | |
| (620 <= FICO < 640) x American Indian | | 3.72*<br>(2.12) | |
| (640 <= FICO < 660) x American Indian | | 1.73<br>(1.70) | |
| (660 <= FICO < 680) x American Indian | | 1.89<br>(1.37) | |
| (680 <= FICO < 700) x American Indian | | 1.77<br>(1.19) | |
| (700 <= FICO < 720) x American Indian | | 2.05*<br>(1.07) | |
| (720 <= FICO < 740) x American Indian | | 1.49<br>(1.01) | |
| (740 <= FICO < 760) x American Indian | | 1.06<br>(1.04) | |
| (760 <= FICO < 780) x American Indian | | 1.76*<br>(0.99) | |
| (780 <= FICO < 800) x American Indian | | 0.69<br>(1.04) | |
| (FICO >= 800) x American Indian | | -3.78**<br>(1.86) | |
| (FICO missing) x Asian | | -0.09<br>(0.49) | |
| (FICO < 540) x Asian | | -44.22***<br>(6.91) | |
| (540 <= FICO < 560) x Asian | | -5.91<br>(5.31) | |
| (560 <= FICO < 580) x Asian | | -18.10***<br>(3.25) | |
| (580 <= FICO < 600) x Asian | | -10.82***<br>(2.21) | |
| (600 <= FICO < 620) x Asian | | -5.26***<br>(1.49) | |
| (620 <= FICO < 640) x Asian | | -6.12***<br>(0.98) | |
| (640 <= FICO < 660) x Asian | | -3.77***<br>(0.73) | |
| (660 <= FICO < 680) x Asian | | -1.82***<br>(0.48) | |
| (680 <= FICO < 700) x Asian | | -1.81***<br>(0.37) | |
| (700 <= FICO < 720) x Asian | | -1.85***<br>(0.33) | |
| (720 <= FICO < 740) x Asian | | -3.09***<br>(0.30) | |
| (740 <= FICO < 760) x Asian | | -3.43***<br>(0.27) | |
| (760 <= FICO < 780) x Asian | | -3.17***<br>(0.25) | |

| VARIABLES | Model (4) | Model (4-RF) Interact Race & FICO | Model (4-Y) Allow Multiple Race Classifications |
|---|---|---|---|
| (780 <= FICO < 800) x Asian | | -0.72*** | |
| | | (0.26) | |
| (FICO >= 800) x Asian | | 0.03 | |
| | | (0.45) | |
| (FICO missing) x Missing race | | 7.99*** | |
| | | (0.43) | |
| (FICO < 540) x Missing race | | 4.54** | |
| | | (2.17) | |
| (540 <= FICO < 560) x Missing race | | 18.70*** | |
| | | (1.80) | |
| (560 <= FICO < 580) x Missing race | | 13.04*** | |
| | | (1.34) | |
| (580 <= FICO < 600) x Missing race | | 45.07*** | |
| | | (1.21) | |
| (600 <= FICO < 620) x Missing race | | 33.96*** | |
| | | (0.95) | |
| (620 <= FICO < 640) x Missing race | | 20.14*** | |
| | | (0.71) | |
| (640 <= FICO < 660) x Missing race | | 12.04*** | |
| | | (0.57) | |
| (660 <= FICO < 680) x Missing race | | 5.42*** | |
| | | (0.44) | |
| (680 <= FICO < 700) x Missing race | | 1.75*** | |
| | | (0.35) | |
| (700 <= FICO < 720) x Missing race | | -1.44*** | |
| | | (0.30) | |
| (720 <= FICO < 740) x Missing race | | -2.24*** | |
| | | (0.27) | |
| (740 <= FICO < 760) x Missing race | | -2.52*** | |
| | | (0.24) | |
| (760 <= FICO < 780) x Missing race | | -2.95*** | |
| | | (0.21) | |
| (780 <= FICO < 800) x Missing race | | -1.51*** | |
| | | (0.21) | |
| (FICO >= 800) x Missing race | | 3.61*** | |
| | | (0.35) | |
| Missing FICO | 15.28*** | 12.88*** | 15.24*** |
| | (0.18) | (0.19) | (0.18) |
| 300 <= FICO < 540 | 167.77*** | 173.36*** | 167.71*** |
| | (0.84) | (1.17) | (0.84) |
| 540 <= FICO < 560 | 113.79*** | 113.75*** | 113.74*** |
| | (0.66) | (0.87) | (0.66) |
| 560 <= FICO < 580 | 79.34*** | 78.11*** | 79.29*** |
| | (0.47) | (0.60) | (0.47) |
| 580 <= FICO < 600 | 63.42*** | 56.30*** | 63.36*** |
| | (0.38) | (0.43) | (0.38) |
| 600 <= FICO < 620 | 39.94*** | 34.97*** | 39.90*** |
| | (0.28) | (0.31) | (0.28) |
| 620 <= FICO < 640 | 21.52*** | 19.17*** | 21.48*** |
| | (0.21) | (0.23) | (0.21) |

| VARIABLES | Model (4) | Model (4-RF) Interact Race & FICO | Model (4-Y) Allow Multiple Race Classifications |
|---|---|---|---|
| 640 <= FICO < 660 | 11.67*** | 10.39*** | 11.63*** |
| | (0.18) | (0.19) | (0.18) |
| 660 <= FICO < 680 | 4.11*** | 3.88*** | 4.09*** |
| | (0.15) | (0.16) | (0.15) |
| 680 <= FICO < 700 | 1.01*** | 1.14*** | 0.99*** |
| | (0.13) | (0.14) | (0.13) |
| 700 <= FICO < 720 | 0.03 | 0.57*** | 0.02 |
| | (0.12) | (0.13) | (0.12) |
| 720 <= FICO < 740 | -0.16 | 0.63*** | -0.17 |
| | (0.12) | (0.13) | (0.12) |
| 740 <= FICO < 760 | -0.48*** | 0.36*** | -0.48*** |
| | (0.11) | (0.12) | (0.11) |
| 760 <= FICO < 780 | -0.36*** | 0.52*** | -0.36*** |
| | (0.11) | (0.12) | (0.11) |
| 780 <= FICO < 800 | 0.11 | 0.71*** | 0.12 |
| | (0.11) | (0.11) | (0.11) |
| $0K < Loan Amount <= $40K | 76.44*** | 76.39*** | 76.37*** |
| | (0.56) | (0.56) | (0.56) |
| $40K < Loan Amount <= $50K | 53.82*** | 53.81*** | 53.77*** |
| | (0.49) | (0.49) | (0.49) |
| $50K < Loan Amount <= $75K | 35.02*** | 35.02*** | 34.97*** |
| | (0.44) | (0.43) | (0.44) |
| $75K < Loan Amount <= $150K | 11.31*** | 11.33*** | 11.30*** |
| | (0.42) | (0.42) | (0.42) |
| $150K < Loan Amount <= $275K | -5.75*** | -5.70*** | -5.73*** |
| | (0.42) | (0.42) | (0.42) |
| $275K < Loan Amount <= Conforming Limit | -11.13*** | -11.05*** | -11.06*** |
| | (0.42) | (0.42) | (0.42) |
| Conforming Limit < Loan Amount <= $1 Million | -11.66*** | -11.58*** | -11.58*** |
| | (0.41) | (0.41) | (0.41) |
| 36% < Debt-to-Income Ratio <= 50% | 1.15*** | 1.14*** | 1.14*** |
| | (0.07) | (0.07) | (0.07) |
| Debt-to-Income Ratio > 50% | 4.10*** | 4.06*** | 4.11*** |
| | (0.13) | (0.13) | (0.13) |
| Debt-to-Income Ratio Missing | 11.63*** | 11.05*** | 11.62*** |
| | (0.33) | (0.33) | (0.33) |
| 28% < Housing Debt-to-Income Ratio <= 33% | 2.19*** | 2.15*** | 2.15*** |
| | (0.09) | (0.09) | (0.09) |
| 33% < Housing Debt-to-Income Ratio <= 40% | 4.74*** | 4.66*** | 4.68*** |
| | (0.11) | (0.11) | (0.11) |
| Housing Debt-to-Income Ratio > 40% | 8.96*** | 8.88*** | 8.89*** |
| | (0.16) | (0.16) | (0.16) |
| Housing Debt-to-Income Ratio Missing | 10.27*** | 10.19*** | 10.26*** |
| | (0.25) | (0.25) | (0.25) |
| LTV missing | -20.24*** | -20.29*** | -20.17*** |
| | (0.21) | (0.21) | (0.21) |
| 0% < LTV <= 60% | -59.98*** | -60.25*** | -59.93*** |
| | (0.17) | (0.17) | (0.17) |
| 60% < LTV <= 70% | -62.25*** | -62.46*** | -62.22*** |
| | (0.17) | (0.17) | (0.17) |

| VARIABLES | Model (4) | Model (4-RF) Interact Race & FICO | Model (4-Y) Allow Multiple Race Classifications |
|---|---|---|---|
| 70% < LTV <= 80% | -60.30*** | -60.37*** | -60.26*** |
| | (0.14) | (0.14) | (0.14) |
| 80% < LTV <= 90% | -14.02*** | -14.11*** | -13.99*** |
| | (0.19) | (0.19) | (0.19) |
| CLTV missing | -2.80*** | -2.52*** | -2.84*** |
| | (0.21) | (0.21) | (0.21) |
| 0% < CLTV <= 60% | -22.22*** | -21.67*** | -22.24*** |
| | (0.18) | (0.18) | (0.18) |
| 60% < CLTV <= 70% | -18.70*** | -18.22*** | -18.72*** |
| | (0.18) | (0.18) | (0.18) |
| 70% < CLTV <= 80% | -16.07*** | -15.73*** | -16.10*** |
| | (0.14) | (0.14) | (0.14) |
| 80% < CLTV <= 90% | -13.54*** | -13.23*** | -13.56*** |
| | (0.16) | (0.16) | (0.16) |
| 90% < CLTV <= 95% | -12.14*** | -11.86*** | -12.14*** |
| | (0.15) | (0.15) | (0.15) |
| FHA Loan | -52.37*** | -51.45*** | -52.42*** |
| | (0.20) | (0.19) | (0.20) |
| VA Loan | -71.55*** | -70.82*** | -71.47*** |
| | (0.26) | (0.26) | (0.26) |
| FSA/RHS Loan | -78.45*** | -77.55*** | -78.43*** |
| | (0.71) | (0.71) | (0.71) |
| Self-employed borrower or co-borrower | 4.37*** | 4.34*** | 4.36*** |
| | (0.10) | (0.10) | (0.10) |
| Cash-out Refi | 10.23*** | 10.14*** | 10.27*** |
| | (0.09) | (0.09) | (0.09) |
| Rate Term Refi | -3.82*** | -3.76*** | -3.79*** |
| | (0.08) | (0.08) | (0.08) |
| Streamline Refi | -2.33*** | -2.86*** | -2.29*** |
| | (0.24) | (0.24) | (0.24) |
| Unknown loan purpose | 38.37*** | 38.59*** | 38.31*** |
| | (4.51) | (4.49) | (4.51) |
| Loan Term Missing | 11.68*** | 11.78*** | 11.73*** |
| | (0.19) | (0.19) | (0.19) |
| Loan Term (years) <= 5 | -19.30 | -18.33 | -19.28 |
| | (13.80) | (13.77) | (13.80) |
| 5 < Loan Term (years) <= 7 | -3.11*** | -2.82*** | -3.08*** |
| | (0.78) | (0.79) | (0.78) |
| 7 < Loan Term (years) <= 10 | -6.49*** | -6.25*** | -6.50*** |
| | (1.25) | (1.25) | (1.25) |
| 10 < Loan Term (years) <= 15 | -13.81*** | -13.58*** | -13.79*** |
| | (0.20) | (0.20) | (0.20) |
| 15 < Loan Term (years) <= 20 | -5.12*** | -5.09*** | -5.13*** |
| | (0.28) | (0.28) | (0.28) |
| 20 < Loan Term (years) <= 25 | 4.43*** | 4.30*** | 4.42*** |
| | (0.38) | (0.37) | (0.38) |
| Loan Term (years) > 30 | -19.22*** | -20.58*** | -19.18*** |
| | (2.76) | (2.77) | (2.76) |
| Investment, Single Family | 51.20*** | 51.27*** | 51.20*** |
| | (0.21) | (0.21) | (0.21) |

| VARIABLES | Model (4) | Model (4-RF)<br>Interact Race &<br>FICO | Model (4-Y)<br>Allow Multiple Race<br>Classifications |
|---|---|---|---|
| Investment, Multi Family 2 | 46.17***<br>(0.43) | 46.18***<br>(0.43) | 46.15***<br>(0.43) |
| Investment, Multi Family 3 | 50.47***<br>(0.84) | 50.53***<br>(0.84) | 50.44***<br>(0.84) |
| Investment, Multi Family 4 | 49.02***<br>(0.64) | 49.08***<br>(0.64) | 48.98***<br>(0.64) |
| Investment, Low Rise Condo | 45.75***<br>(0.40) | 45.83***<br>(0.40) | 45.77***<br>(0.40) |
| Investment, High Rise Condo | 48.77***<br>(1.07) | 48.99***<br>(1.07) | 48.77***<br>(1.07) |
| Investment, Co-op | 34.72***<br>(2.27) | 34.69***<br>(2.28) | 34.70***<br>(2.27) |
| Primary home, Multi Family 2 | 8.61***<br>(0.30) | 8.55***<br>(0.30) | 8.52***<br>(0.30) |
| Primary home, Multi Family 3 | 18.47***<br>(0.85) | 18.30***<br>(0.85) | 18.32***<br>(0.85) |
| Primary home, Multi Family 4 | 22.04***<br>(1.09) | 21.93***<br>(1.09) | 21.93***<br>(1.09) |
| Primary home, Low Rise Condo | -0.93***<br>(0.12) | -0.90***<br>(0.12) | -0.93***<br>(0.12) |
| Primary home, Townhouse (detached) | 6.27***<br>(0.31) | 11.61***<br>(0.37) | 6.40***<br>(0.31) |
| Primary home, High Rise Condo | 3.86***<br>(0.31) | 4.00***<br>(0.31) | 3.84***<br>(0.31) |
| Primary home, Co-op | -1.89***<br>(0.35) | -1.75***<br>(0.35) | -1.88***<br>(0.35) |
| Primary home, 'P' (undefined) | 17.13<br>(21.06) | 17.17<br>(21.08) | 17.08<br>(21.07) |
| Second home, Single Family | 6.09***<br>(0.15) | 6.07***<br>(0.15) | 6.08***<br>(0.15) |
| Second home, Multi Family 2 | 6.45***<br>(1.33) | 6.41***<br>(1.33) | 6.46***<br>(1.33) |
| Second home, Multi Family 3 | 39.38**<br>(16.88) | 39.73**<br>(16.90) | 39.47**<br>(16.91) |
| Second home, Multi Family 4 | 29.22<br>(18.93) | 29.32<br>(18.91) | 29.11<br>(18.89) |
| Second home, Low Rise Condo | 7.27***<br>(0.23) | 7.29***<br>(0.22) | 7.27***<br>(0.23) |
| Second home, High Rise Condo | 16.26***<br>(0.51) | 16.31***<br>(0.51) | 16.23***<br>(0.51) |
| Second home, Co-op | -10.66***<br>(1.09) | -10.54***<br>(1.10) | -10.62***<br>(1.09) |
| Dome | 2.50<br>(4.74) | 2.53<br>(4.71) | 2.46<br>(4.74) |
| Earthen Home | 5.15<br>(3.34) | 5.01<br>(3.32) | 5.12<br>(3.34) |
| Hotel-Condo | 28.75***<br>(3.39) | 29.31***<br>(3.36) | 28.63***<br>(3.38) |
| Log Home | 4.48***<br>(0.98) | 4.41***<br>(0.98) | 4.44***<br>(0.98) |

| VARIABLES | Model (4) | Model (4-RF) Interact Race & FICO | Model (4-Y) Allow Multiple Race Classifications |
|---|---|---|---|
| Manufactured Home | 13.59*** | 13.63*** | 13.61*** |
| | (0.23) | (0.23) | (0.23) |
| Bankruptcy within 7 years present on credit report | 18.10*** | 17.99*** | 18.11*** |
| | (0.25) | (0.25) | (0.25) |
| Foreclosure within 7 years present on credit report | 23.94*** | 23.69*** | 23.91*** |
| | (0.53) | (0.53) | (0.53) |
| Judgement present on credit report | 11.17*** | 10.95*** | 11.16*** |
| | (0.24) | (0.24) | (0.24) |
| Collections present on credit report | 3.41*** | 3.45*** | 3.43*** |
| | (0.09) | (0.09) | (0.09) |
| Late mortgage payment present on credit report | 20.49*** | 20.47*** | 20.50*** |
| | (0.33) | (0.33) | (0.33) |
| Late payment (non-mortgage) present on credit report | 3.75*** | 3.84*** | 3.77*** |
| | (0.26) | (0.25) | (0.26) |
| Doc type: Missing/Unknown | -26.06*** | -25.59*** | -26.08*** |
| | (0.72) | (0.72) | (0.72) |
| Doc type: No Doc | -14.45*** | -14.32*** | -14.47*** |
| | (0.10) | (0.10) | (0.10) |
| Doc type: Quick Doc | -25.45 | -25.84 | -25.52 |
| | (39.44) | (39.51) | (39.47) |
| Doc type: Stated Income/Asset | 24.92 | 26.60 | 25.14 |
| | (25.10) | (25.16) | (25.12) |
| Doc type: Substitute Doc | -30.65*** | -30.22*** | -30.66*** |
| | (6.93) | (6.82) | (6.93) |
| Doc type: Verify Assets | -4.34*** | -4.21*** | -4.36*** |
| | (0.09) | (0.09) | (0.09) |
| Doc type: Verify Income | -19.42*** | -18.84*** | -19.42*** |
| | (0.30) | (0.30) | (0.30) |
| Balloon indicator | 73.65*** | 74.14*** | 73.70*** |
| | (0.81) | (0.81) | (0.81) |
| Interest-only amortization | 47.58*** | 47.62*** | 47.60*** |
| | (0.14) | (0.14) | (0.14) |
| Unknown amortization type | 28.03*** | 27.98*** | 27.99*** |
| | (0.22) | (0.22) | (0.22) |
| Product category: 1-Month to 3-Year ARM | -34.92*** | -35.07*** | -34.93*** |
| | (0.30) | (0.30) | (0.30) |
| Product category: 5-Year ARM | -87.86*** | -87.79*** | -87.87*** |
| | (0.12) | (0.12) | (0.12) |
| Product category: 7-Year ARM | -74.59*** | -74.55*** | -74.59*** |
| | (0.13) | (0.13) | (0.13) |
| Product category: 10-Year ARM | -37.78*** | -37.74*** | -37.79*** |
| | (0.13) | (0.13) | (0.13) |
| Product category: 5-Year Fixed | -127.02*** | -127.08*** | -127.05*** |
| | (3.23) | (3.23) | (3.23) |
| Product category: 7-Year Fixed | -119.36*** | -119.78*** | -119.37*** |
| | (0.86) | (0.86) | (0.86) |
| Product category: 10-Year Fixed | -57.56*** | -57.68*** | -57.56*** |
| | (1.26) | (1.26) | (1.26) |
| Product category: 15-Year Fixed | -29.82*** | -30.01*** | -29.86*** |
| | (0.19) | (0.19) | (0.19) |

| VARIABLES | Model (4) | Model (4-RF) Interact Race & FICO | Model (4-Y) Allow Multiple Race Classifications |
|---|---|---|---|
| Product category: 20-Year Fixed | -0.90*** | -1.01*** | -0.91*** |
|  | (0.26) | (0.26) | (0.26) |
| Product category: 40-Year Fixed | 7.27*** | 8.52*** | 7.24** |
|  | (2.82) | (2.83) | (2.82) |
| Escrow waived | 8.02*** | 7.86*** | 8.01*** |
|  | (0.09) | (0.09) | (0.09) |
| Escrow waiver unknown | -33.85*** | -33.92*** | -33.85*** |
|  | (0.14) | (0.14) | (0.14) |
| 1 <= Rate lock days <= 30 | 26.41*** | 25.67*** | 26.39*** |
|  | (0.81) | (0.83) | (0.81) |
| 31 <= Rate lock days <= 60 | 18.96*** | 18.21*** | 18.97*** |
|  | (0.81) | (0.83) | (0.81) |
| 61 <= Rate lock days <= 1000 | 9.34*** | 8.71*** | 9.32*** |
|  | (0.80) | (0.83) | (0.80) |
| Float-down indicator: Executed | -11.20*** | -11.17*** | -11.19*** |
|  | (0.24) | (0.24) | (0.24) |
| Float-down indicator: Unknown/Missing | 22.76*** | 22.81*** | 22.75*** |
|  | (0.11) | (0.11) | (0.11) |
| Float-down indicator: Yes | 29.97*** | 29.95*** | 29.97*** |
|  | (0.19) | (0.19) | (0.19) |
| Lender-paid mortgage insurance | -17.92*** | -17.89*** | -17.97*** |
|  | (0.25) | (0.25) | (0.25) |
| Combo loan indicator | -28.60*** | -28.31*** | -28.48*** |
|  | (1.04) | (1.04) | (1.04) |
| 6 months <= Prepayment penalty <= 24 months | 146.67*** | 146.21*** | 146.67*** |
|  | (0.43) | (0.43) | (0.43) |
| 36 months <= Prepayment penalty <= 60 months | 84.65*** | 83.88*** | 84.61*** |
|  | (0.42) | (0.42) | (0.42) |
| Constant | 743.96*** | 743.75*** | 747.75*** |
|  | (1.34) | (1.36) | (1.35) |
|  |  |  |  |
| Observations | 5,654,985 | 5,654,985 | 5,654,985 |
| R-squared | 0.70513 | 0.70610 | 0.70515 |
| Adjusted R-squared | 0.70506 | 0.70603 | 0.70508 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1


Coefficients and standard errors for rate lock month, state, and MSA dummy variables are excluded from this table for brevity.
*Notes* : Model (4) assigns each loan to a single race as described in Section V.
Model (4-RF) uses the interaction of the race and FICO score dummy variables as described in Section V.
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. If no race or ethnicity is given for either borrower, then the dummy variable for "Missing Race" is equal to 1 for that loan.