

Rates and Race: An Analysis of Racial Disparities in Mortgage Rates

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Abstract

We use a model based on the 1991–2001 American Housing Survey to determine whether differences in mortgage rates among whites, blacks, and Hispanics are due to differences in the property and loan characteristics of the borrowers themselves or to racial differences in how those characteristics are priced into rates. We separate loans into major market categories and present decompositions to assess the differences and distinguish between them.

Very little information on mortgage pricing has been generally available to researchers, and the literature that discusses what information there is has not used a scheme that allows rate differences to be classified by characteristics and pricing. We find that significant differentials are more likely in the conventional mortgage market. The largest occur among blacks, who pay a much higher annual percentage rate than whites for both purchases and refinancing. For government-insured loans, Hispanics do slightly better than whites.

Keywords: Discrimination; Homeownership; Mortgages

Introduction

We will examine the determinants of interest rates on mortgages, focusing on the differences in rates among white, black, and Hispanic borrowers. This research is motivated by the expansion of subprime lending and the associated problems of predatory lending during the 1990s.¹ Subprime borrowers are

¹ See U.S. Department of Housing and Urban Development and U.S. Department of the Treasury 2000 and U.S. Department of Housing and Urban Development 2000. For recent analyses of the subprime mortgage market and predatory lending, see Staten and Yezer (2004, 2005) and the themed issue of *Housing Policy Debate* edited by McCoy and Wyly (2004).

more likely to be members of a minority group, to be single, to be women, to have lower incomes, to be older, and have lower levels of educational attainment. These groups of borrowers are more likely to fall victim to predatory lending practices such as “steering,” “packing,” and “flipping.” As a result, local, state, and federal governments have passed laws and regulations to curb abusive practices or are considering them.²

However, it is important to note that the discussion of policies on mortgage lending in general and predatory lending in particular is handicapped by the relative lack of studies on the rates charged for mortgages. The voluminous literature on discrimination in mortgage markets has largely focused on discrimination and redlining in the mortgage approval process or on an examination of loan default rates. However, comparatively few studies have focused on mortgage rates because of the lack of readily available pricing data. This served as the motivation for the focus of this article. The fundamental research question is whether observed differences in rates are due to differences in borrower characteristics or to racial differences in how those characteristics are priced into mortgage rates. For instance, the level of education a borrower attained might be expected to influence his or her ability to obtain the lowest possible rate. The total difference in rates associated with levels of education for minority and white households has two dimensions. First, minority borrowers might have lower educational levels than whites (e.g., a smaller proportion of college graduates). Second, the level of education that minority borrowers attained might not have as much of an impact on the interest rates they pay as it does for whites: That is, the interest rates paid by minority college graduates might not be as far below the rates paid by other minority households as is the case for white college graduates and other white households.

We use data from the American Housing Survey (AHS) for the period 1989 to 2001 to develop and analyze an empirical model of mortgage rates (U.S. Department of Housing and Urban Development [HUD] 2004). The data lend themselves to this sort of examination for several reasons. Every other year, the AHS collects data on a national sample of approximately 55,000 housing units in the United States and includes, among other things, information on household characteristics, unit characteristics, housing and neighborhood quality, housing costs, and loan terms, as well as detailed information on the purchase and financing of the home. It is particularly relevant to note that we can determine from the data the year the primary mortgage was taken out and whether it is the original mortgage or a refinancing loan. We use data on primary mort-

² For a summary of recent state and local legislation, see Freddie Mac (2002).

gages for nonmanufactured, owner-occupied housing units. Because the AHS does not contain information on households' credit situation or net wealth and because we have no information on the financial institutions making the loans or their underwriting criteria, this analysis cannot determine whether or not discriminatory mortgage pricing exists. However, a number of worthwhile insights into the nature of differentials in mortgage pricing in the United States can be derived.

In this context, our purpose is to determine whether there are systematic differences in the rates paid by various racial groups at the national level and to decompose the differences. Our primary focus is on exploring whether the rates paid by blacks and Hispanics differ systematically from the rates paid by whites.³ To facilitate our analysis, we use two sets of criteria to disaggregate the mortgage market into its critical submarkets, namely, the conventional market versus the Federal Housing Administration/Department of Veterans Affairs (FHA/VA) market and the home purchase market versus the refinancing market.

Our approach differs from most of the current literature on discrimination in mortgage lending in which a binary variable is used to indicate minority status. The drawback of such an approach is that it forces all pricing factors to have the same effect on rates for both majority and minority groups (except, of course, for simple membership). This is a very questionable assumption. Rather than estimating a single regression that includes all racial/ethnic groups, we estimate separate regressions for blacks, Hispanics, and whites.

We also use the Blinder (1973) decomposition to determine the effects of ethnicity on mortgage rates. This technique has been widely applied in labor economics to examine the effects of demographic characteristics on wages.⁴ An important advantage of the Blinder (1973) decomposition is that it allows a much more detailed analysis of the possible sources of differences in mortgage interest rates. The difference in the average mortgage rate paid by different demographic groups can be decomposed into two components. The first is the difference in rates due to differences in the average characteristics of two groups—for example, different loan-to-value ratios for blacks and whites. The second is the difference in rates due to differences in the *effects* of these characteristics on mortgage rates—or differences in mortgage rates for the same

³ We experimented with other sub-segments of the population (single women, low-income borrowers, etc.). Including all of these tables and discussing them would make an already lengthy article much longer. However, these tables are available from the authors upon request.

⁴ See Altonji and Blank (1999) for a review of this literature. Also, Oaxaca (1973) developed this technique independently.

loan-to-value ratio. As noted earlier, this analysis encompasses both conventional and FHA/VA markets.

The next two sections provide a brief review of the literature and describe the data. A discussion of the regression results follows. The Blinder (1973) technique and the empirical results of the decompositions are then presented, and we also discuss the policy implications of the approach. The final section presents a brief summary and concluding remarks.

Literature review

Discussions of public policy on mortgage pricing have been handicapped by the relative lack of studies by race and type of mortgage market. The existing literature on discrimination in mortgage markets has largely focused on discrimination and redlining in the approval process. Examples include Yinger (1996), Ross and Yinger (1999), and Ladd (1998). An extensive discussion of the literature appears in Ross and Yinger (2002), while other studies (Berkovec et al. 1996; Cotterman 2002) examine loan default rates.

The small but growing literature that uses recent data to analyze mortgage rates includes Courchane and Nickerson (1997), Crawford and Rosenblatt (1999), Nothaft and Perry (2002), Black, Boehm, and DeGennaro (2003), and Susin (2003).⁵ Courchane and Nickerson (1997) report the results from three analyses by the Office of the Comptroller of the Currency. They conclude that differences in rates may be due to discrimination, to lenders' market power, or to legal restrictions on lenders. After examining a single national mortgage lender for 1988 and 1989, Crawford and Rosenblatt (1999) conclude that conventional loan rates are race neutral. Because of data limitations, neither of these studies uses a representative national sample or analyzes refinancing loans in any detail. Nothaft and Perry (2002), using data from the Mortgage Interest Rate Survey for 1993 to 1996, analyze neighborhood effects and find that rates are slightly higher in predominantly Hispanic neighborhoods, but may be slightly lower in predominantly black neighborhoods. Black, Boehm, and DeGennaro (2003) analyze 1996 overages in purchase and refinancing loans by a single national mortgage lender and conclude that the differences in overages are due to market power and differential bargaining skill.

Using data from the AHS for 2001, Susin (2003) examines a sample of all homeowners who have mortgages (12,524 households). He looks at interest rates as a function of several household characteristics (race/ethnicity, house

⁵ Earlier studies of mortgage rates include Schaefer and Ladd (1981), Black and Schweitzer (1985), and Benston and Horsky (1991).

value, education, age, and a wealth proxy in the form of dividend income), mortgage characteristics, and neighborhood characteristics (the poverty rate and the percentage of blacks and Hispanics in the census tracts in which the households reside).⁶ In addition, he uses an interest rate index (the 10-year Treasury bond rate) to control for differences in rates at the time the home was purchased. Although he experiments with several different specifications, he does not stratify the sample to compare results across racial/ethnic subgroups. His study finds that blacks pay an average of 44 basis points more than whites, although the differential appears to be smaller for more recent mortgages. His analysis suggests that most of the black-white differential is due to the difference in blacks' refinancing behavior: Specifically, the rate differential is larger for blacks who refinance. He also finds that Hispanics pay an average of 23 basis points more than whites and that most of the differential is due to neighborhood effects.

Since Susin (2003) also uses AHS data to explore mortgage pricing, it is important to delineate clearly the differences between his research and ours. First, he considers all outstanding mortgages for all homeowners in a given year (2001). However, this includes mortgages that were originated as long ago as 1962. Conversely, our analysis considers only originations in the particular year in which they occur (1989 to 2001). Our approach is consistent with the recent study by Lam and Kaul (2003) on the reliability of AHS data.⁷ Thus, in our analysis, borrower, location, and mortgage characteristics are observed at the point in time when the mortgage was actually originated. We avoid concerns about whether respondents can remember the exact mortgage rate and loan amount as time passes (a potential problem observed by Lam and Kaul 2003). For these reasons, we believe our approach yields a much better match of independent variables to mortgage rates. In addition, mortgage markets and institutions have changed substantially since 1962. It is reasonable to expect that the relationship between, for example, income and mortgage rates has changed as well. If so, then regression coefficients may not be stable over such a long period.

Added to fundamental differences in sample selection is an important difference in the regression methodology. We estimate separate regressions for blacks, Hispanics, and whites in addition to estimating a single regression including all racial/ethnic groups. Susin (2003) estimates only a single (pooled)

⁶ Census tract information is not normally available with the AHS data released to researchers. However, because the author was employed by the U.S. Bureau of the Census at the time of the study, he was able to acquire this information.

⁷ The study by Lam and Kaul (2003) is discussed at greater length in the Data section.

regression equation for these groups, including dummy variables to shift the intercept. This forces the regressors in his analysis to have the same effect for all groups. The *t*-test for a significant “coefficient effect” in our decomposition analysis is equivalent to the *t*-test for equality of the coefficients in the separate regression. The fact that we find significant coefficient effects implies that the null hypothesis of equal coefficients for different groups is rejected. That is, we find that pooling is rejected, at least for our sample.

Finally, Susin (2003) includes manufactured housing in his sample and we do not. As he points out, loans for manufactured housing are more like automobile loans than conventional mortgages. He also apparently included second mortgages in his sample and we do not. Thus, while both studies use AHS data, they take very different approaches.

Data

As noted earlier, the AHS data were extracted from the 1991, 1993, 1995, 1997, 1999, and 2001 sampling years, that is, mortgages originated between 1989 and 2001. Because the AHS contains information on the year a mortgage was originated and the year in which the home was purchased and because units can be matched from one survey to the next, no mortgage or property was included twice and refinancing loans can be distinguished from new purchases. Only new first mortgages (not assumptions or wraparounds) were considered, and they must have been made by a financial institution (not a seller or relative). They were also restricted to traditional owner-occupied housing, and manufactured housing was excluded.

This initial sample contained 31,268 observations. The loan had to have a term of 10, 15, 20, 25, or 30 years. This constraint was imposed to ensure that contract interest rates could be accurately calculated and to constrain the financing to genuinely long-term real estate loans that might be expected to have been originated using relatively comparable underwriting criteria. This constraint reduced the sample size to 26,536 observations. In addition, the value of the house and the loan amount had to be at least \$5,000 and \$3,000, respectively, reducing the sample to 25,005 observations. Also, loans had to have a valid annual percentage rate (APR) of at least 5 percent. This yielded a sample of 24,229 observations meeting these criteria—15,347 purchase loans and 8,882 refinancing loans.⁸

⁸ Subsequently, because the regressions focused on only white, black, or Hispanic families, the sample size for the APR regressions was reduced to 23,283.

Table 1 reports the number of originations and the APRs for the aggregate sample by year separately for purchase and refinancing loans. Later we will examine conventional and FHA/VA markets separately. As shown in table 1, there is substantial variation in the number of originations across years. For purchase loans, the number of originations ranges from 818 in 1990 to 1,549 in 1999. For refinancing loans, the number ranges from 103 in 1996 to 1,964 in 1993. There is also substantial variation in the average APRs over time. The general trend is downward, with the highest average APRs in 1989 (9.87 percent for purchase and 10.45 percent for refinancing) and the lowest in 1998 (7.29 percent for purchase and 7.25 percent for refinancing).

AHS data include the term of the loan, the amount, and the monthly payment. For fully amortizing loans with a fixed term and a fixed payment, we can compute the contract interest rate and a measure of the up-front fees as a percentage of the loan. Initially, we analyzed points as well as APR. The problem with this calculation is that for most of the observations, the monthly payment includes private mortgage insurance, homeowner's insurance, and taxes. These amounts need to be subtracted from the monthly payment to arrive at the loan payment. As a result of data problems (missing and inaccurate amounts), we were unable to compute the contract rate for a number of

Table 1. APRs for Primary Mortgages, 1989 to 2001

Year Originated	Purchase Loans		Refinancing Loans	
	Number of Originations	Mean Value (%)	Number of Originations	Mean Value (%)
1989	849	9.870	210	10.449
1990	818	9.753	187	10.309
1991	986	9.015	555	9.136
1992	973	7.953	1,064	7.944
1993	1,385	7.566	1,964	7.586
1994	1,243	7.894	677	7.860
1995	1,509	7.922	352	8.463
1996	1,097	7.697	103	7.930
1997	1,417	7.577	568	7.870
1998	1,014	7.288	956	7.250
1999	1,549	7.380	1,226	7.440
2000	1,159	7.753	341	7.790
2001	1,348	7.461	679	7.260
Total	15,347		8,882	

observations. Consequently, the analysis of points was dropped from this article.⁹

We include a number of control variables in our analysis. Definitions of variables, along with their means, are reported in table 2. We include indicator variables for the ethnicity, marital status, and education of the borrower and for whether the borrower is a first-time homeowner. Other characteristics include age, family size, and income. We also include variables that categorize the property—what the census region is, whether the property has an urban or rural location, and whether the unit is a condominium—as well as the current price. Loan characteristics are indicators of whether it is a purchase or refinancing; whether there is private, government (FHA, VA, or Farmers Home Administration) or no mortgage insurance; and what the term of the loan is (10, 15, 20, 25, or 30 years). We also include the loan-to-value ratio, the ratio of the payment to income, and, as controls, categorical variables for the year the loan was originated.¹⁰

Since this study is based on the AHS, it is instructive to comment on the fundamental issue of data reliability. Recently, using other data sources as benchmarks, Lam and Kaul (2003) analyzed the apparent reliability of the housing finance variables in the AHS for HUD and, in addition, examined the consistency of information provided by respondents over time in subsequent waves of the data. The variables examined for reliability and consistency include mortgage market segment (conventional, VA, FHA, etc.), original loan amount, interest rate on fixed-rate loans, loan-to-value ratio at origination, type of loan (refinancing or purchase), payment product type (adjustable rate mortgage versus fixed rate), and loan-to-value ratio. Of these variables only

⁹ It is algebraically straightforward to calculate points from the term, the mortgage payment, and original loan amount if we treat points as though they were financed. However, there are several reasons why this calculation could be off. In particular, one of the three values could be wrong. The mortgage payment is particularly problematic because a number of these mortgages are budget mortgages. Specifically, property taxes and hazard insurance are part of the payment. These need to be factored out to leave the debt service. This can be done with the AHS because households are asked the amount of their tax and insurance payments and whether they are included as part of the mortgage payment. With the APR provided by the borrower and points calculated based on the variables available in the AHS, we find approximately as many points calculations to be less than 0 but greater than or equal to -1 as were included in the sample employed in our initial analysis of points. While the nature of this calculation might be expected to lead to a substantially reduced sample size, there is no reason to believe that any systematic bias is present. Although not included in this analysis, these results are available from the authors upon request.

¹⁰ Because the top-most categories for the variable “Value” are open ended (\$999,998 or more), the AHS units falling into this category were excluded from the analysis. The primary concern was that the arbitrary assignment of house values to this category could distort the loan-to-value ratios for these units. Only a few high-income households and no low-income households were excluded as a result, and the empirical results do not change in any fundamental way.

Table 2. Variable Definitions and Sample Means by Purchase/Refinancing Loans

Name	Variable Definition	Purchase Loans	Refinancing Loans
APR	Annual percentage rate on a first mortgage	7.9674	7.8552
1989 origination	1 = mortgage originated in 1989; 0 = otherwise	0.0553	0.0236
1990 origination	1 = mortgage originated in 1990; 0 = otherwise	0.0533	0.0211
1991 origination	1 = mortgage originated in 1991; 0 = otherwise	0.0642	0.0625
1992 origination	1 = mortgage originated in 1992; 0 = otherwise	0.0634	0.1198
1993 origination	1 = mortgage originated in 1993; 0 = otherwise	0.0902	0.2211
1994 origination	1 = mortgage originated in 1994; 0 = otherwise	0.0810	0.0762
1995 origination	1 = mortgage originated in 1995; 0 = otherwise	0.0983	0.0396
1996 origination	1 = mortgage originated in 1996; 0 = otherwise	0.0715	0.0116
1997 origination	1 = mortgage originated in 1997; 0 = otherwise	0.0923	0.0639
1998 origination	1 = mortgage originated in 1998; 0 = otherwise	0.0661	0.1076
1999 origination	1 = mortgage originated in 1999; 0 = otherwise	0.1009	0.1380
2000 origination	1 = mortgage originated in 2000; 0 = otherwise	0.0755	0.0384
2001 origination	1 = mortgage originated in 2001; 0 = otherwise	0.0878	0.0764
White	1 = race of household head is white; 0 = otherwise	0.8086	0.8762
Black	1 = race of household head is black; 0 = otherwise	0.0678	0.0481
Hispanic	1 = race of household head is Hispanic; 0 = otherwise	0.0794	0.0456
Other race	1 = race of household head is other than black, white, or Hispanic; 0 = otherwise	0.0442	0.0302
Married	1 = household head is married; 0 = otherwise	0.7004	0.7624
Single woman	1 = household head is a single woman; 0 = otherwise	0.1564	0.1403
Single man	1 = household head is a single man; 0 = otherwise	0.1432	0.0973
Family size	Number of people in the household	2.9537	3.1859
No high school	1 = household head is not a high school graduate; 0 = otherwise	0.0689	0.0598
High school graduate	1 = household head is a high school graduate, but no more; 0 = otherwise	0.2451	0.2537
Post high school	1 = household head has some education beyond high school, but is not a college graduate	0.2954	0.2832
College graduate	1 = household head is a college graduate or more; 0 = otherwise	0.3906	0.4034
Low income	1 = household income is less than \$40,000 per year; 0 = otherwise	0.3102	0.2391
Moderate income	1 = household income is more than \$40,000 and less than \$61,000 per year; 0 = otherwise	0.2831	0.2602
Middle income	1 = household income is more than \$61,000 and less than \$90,000 per year; 0 = otherwise	0.2139	0.2456
Upper income	1 = household income is over \$90,000; 0 = otherwise	0.1928	0.2551
Age less than 25	1 = age of the household head is less than 25; 0 = otherwise	0.0291	0.0011
Age 25 to 44	1 = age of the household head is between 25 and 44; 0 = otherwise	0.7000	0.4938

Table 2. Variable Definitions and Sample Means by Purchase/Refinancing Loans
Continued

Name	Variable Definition	Purchase Loans	Refinancing Loans
Age 45 to 61	1 = age of the household head is between 45 and 61; 0 = otherwise	0.2091	0.4080
Age more than 61	1 = age of the household head is over 61; 0 = otherwise	0.0451	0.0964
First-time owner	1 = household head is a first-time homeowner; 0 = otherwise	0.3668	0.2946
Northeast	1 = dwelling unit is located in the Northeast; 0 = otherwise	0.1645	0.1880
Midwest	1 = dwelling unit is located in the Midwest; 0 = otherwise	0.2785	0.3076
South	1 = dwelling unit is located in the South; 0 = otherwise	0.3266	0.2227
West	1 = dwelling unit is located in the West; 0 = otherwise	0.2304	0.2817
MSA central city	1 = dwelling unit is located in the central city of an MSA; 0 = otherwise	0.2475	0.2237
MSA suburban	1 = dwelling unit is located in the suburbs of an MSA; 0 = otherwise	0.4261	0.4493
MSA rural	1 = dwelling unit is located in the rural area of an MSA; 0 = otherwise	0.1682	0.1674
Non-MSA urban	1 = dwelling unit is located in an urban area outside an MSA; 0 = otherwise	0.0583	0.0490
Non-MSA rural	1 = dwelling unit is located in a rural area outside an MSA; 0 = otherwise	0.0999	0.1106
Property value	Current value of the owned property in thousands of dollars	150.2219	168.8427
Condominium	1 = dwelling unit is a condominium; 0 = otherwise	0.0801	0.0388
Fixed-payment	1 = loan payment remains fixed throughout the loan term; 0 = otherwise	0.7059	0.8112
No insurance	1 = loan has no private or government mortgage insurance or guarantees; 0 = otherwise	0.0479	0.0096
Government insurance	1 = loan has FHA, VA, or Farmers Home Administration mortgage insurance or guarantee; 0 = otherwise	0.2595	0.1134
Private insurance	1 = loan has private mortgage insurance; 0 = otherwise	0.6926	0.8771
10-year term	1 = the loan term is 10 years; 0 = otherwise	0.0143	0.0761
15-year term	1 = the loan term is 15 years; 0 = otherwise	0.1247	0.3691
20-year term	1 = the loan term is 20 years; 0 = otherwise	0.0375	0.0578
25-year term	1 = the loan term is 25 years; 0 = otherwise	0.0155	0.0197
30-year term	1 = the loan term is 30 years; 0 = otherwise	0.8079	0.4774
Loan to value	Original loan balance divided by the value of the house	0.7231	0.5755
Payment to income	Mortgage payment (including taxes, etc., where appropriate) divided by the monthly income	0.2419	0.2162
Observations		15,347	8,882

Note: The extreme high-end property values may be truncated for the years 1989 to 1995 of the AHS and, in addition, constitute a small set of open-ended observations. Therefore, they were not used in the analysis.

MSA = metropolitan statistical area.

refinancing loans, payment product type, and loan-to-value ratio were found to be somewhat suspect; the others appeared to be quite reliable. However, over time, the answers respondents gave in subsequent waves of the data became inconsistent for both the interest rate and the mortgage amount at the time of origination. The fundamental conclusion in the reliability study was that researchers should use AHS mortgage information as close as possible to the actual origination date of the loans.

Thus, the AHS appears to be a relatively reliable and rich data source to use for investigating the mortgage rate issue. However, there are two important limitations. First, the data set does not contain information on the lender. Consequently, loans made by prime and subprime lenders cannot be distinguished. Second, the AHS does not contain information on credit histories. To the extent that credit histories are correlated with observable borrower characteristics such as ethnicity, the estimated effects of those characteristics on mortgage rates will be affected.¹¹ The exclusion of credit quality is critically important since minorities have been found to have lower credit quality (Hirad and Zorn 2002; Zorn, Gates, and Perry 2001). We argue that the likely effect of excluding lender type and credit history is to bias the coefficients for blacks and Hispanics upward relative to the coefficients for whites. In addition, it is known that different ethnicities do not sort randomly among lenders (Bostic 2003; Kim and Squires 1998). If lenders differ in their underwriting, then the systematic differences we observe could be partly an aggregation issue. Fully capturing discrimination requires knowing the specifics of lenders' rules on pricing decisions and being able to account for them in the regression analysis. The implication is that our estimates cannot be interpreted as pure estimates of the effects of discrimination. This is, of course, the same problem faced by many studies that focus solely on loan approval rates and default rates.

Rates and race

Average mortgage rates

As a first step in the analysis, we analyze the APRs paid by different demographic groups in the aggregate sample for purchase and refinancing loans (see table 3). Whites pay an average APR of 7.96 percent on a purchase loan, while blacks pay an average of 8.07 percent. This difference of 0.11 percentage points is statistically significant. However, the economic significance is small; at these rates, blacks pay 7 cents more per month for each \$1,000 borrowed

¹¹ See Scheessele (2002) for a summary of the evidence on this point.

Table 3. Differences in APR, Purchase and Refinancing Loans, 1989 to 2001

Comparison	Mean for Purchase Loans			Mean for Refinancing Loans		
	White	Other	t-Statistic	White	Other	t-Statistic
White versus black	7.964% (12,410)	8.069% (1,041)	2.21**	7.809% (7,782)	8.820% (427)	8.58***
White versus Hispanic	7.964% (12,410)	7.965% (1,218)	0.04	7.809% (7,782)	7.840% (405)	0.43

Note: Sample sizes are in parentheses.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

on a 30-year mortgage. The average APR paid by white and Hispanic borrowers for purchase loans is virtually identical.

Whites pay an average APR of 7.81 percent on a refinancing loan, while blacks pay an average of 8.82 percent. The difference of 1.01 percentage points is highly statistically significant. More important, the difference is substantial in economic terms, implying that blacks pay 71 cents more per month for each \$1,000 borrowed on a 30-year mortgage. We should also point out that the APR that blacks pay on refinancing loans is actually three-quarters of a percent higher than the APR on purchase loans. By contrast, the average rate paid by Hispanics for refinancing loans is only 3 basis points higher than the average rate paid by whites. Neither difference is significant. This result is unexpected since Hispanics use subprime lenders more than whites do and, on average, have worse credit histories. The most important finding is that blacks fare substantially worse than whites (and Hispanics) in the market for refinancing loans.

Table 4 presents the number of loan originations by race and type over time. Blacks and Hispanics make up a slightly smaller proportion of the refinancing loans than of the purchase loans (about 10 percent and 15 percent, respectively). This is consistent with the observation that minorities are less likely to refinance. Also, it is interesting to note that for both refinancing loans and purchases, a significantly smaller proportion of the loans are made in the first half of this 13-year period for minority households than for white households. For purchases, this would suggest that earlier in the period, minorities had more difficulty acquiring housing and associated loans. It is also interesting that this effect is more pronounced in the refinancing market, suggesting that minorities were either unwilling or unable to refinance as readily in the first years of the sample as they were later. Some have pointed to the easing of credit standards and automated underwriting as possible reasons for this.

Table 4. Loan Originations by Race and Type, over Time

Years	Purchase Loans			Refinancing Loans		
	Hispanic	Black	White	Hispanic	Black	White
1989	43	51	780	2	14	211
1990	43	44	719	9	8	189
1991	74	51	887	22	22	522
1992	53	55	876	37	25	1,005
1993	112	94	1,163	82	69	1,799
1994	104	98	995	28	26	605
1995	118	116	1,215	11	32	301
1996	80	74	906	3	5	93
1997	128	120	1,118	29	38	490
1998	94	79	786	51	45	849
1999	153	136	1,192	68	100	1,034
2000	111	79	910	24	27	280
2001	133	80	1,094	43	35	582
Total	1,246	1,077	12,641	409	446	7,960
Percentage of observations, 1989 to 1995	34.43	36.49	42.88	44.01	36.77	54.41
Z score ^a	-5.761	-4.071		-4.115	-7.267	

^a Shows whether the proportion is significantly different from the proportion for whites.

The information from table 4 is also intriguing when it is viewed in light of the APR trends reported in table 1 and the major results of our analysis (shown in table 3). Specifically, over time, the trend in interest rates is generally downward. Given the significantly larger proportion of loans that black borrowers obtain later in the period, we might have reasonably expected them, in a general sense, to have done better. However, this is not the case. One possible explanation (which we cannot test with these data) could be that the higher rates paid by black borrowers parallel the rise in subprime lending that occurred during this period, since minorities may be more likely to use the subprime market. This explanation seems consistent with the detailed market overview of Belsky and Duda (2002).

Regression analysis of rates

In this first section of results, we examine the determinants of APR where race is treated as it is in most of the literature—with a variable for minority status. Because of fundamental differences in both the nature of the purchase

and refinancing markets and the reasons for obtaining a loan, refinancing and purchase are considered separately. Further, as previously noted, these loans are also separated by market (conventional and FHA/VA). Although these procedures result in a four-way classification scheme, they allow the reporting of new results.

The independent variables in the estimated equations can be divided into three broad categories of characteristics: loan, property, and borrower. The variables categorizing loan type, terms, and year of origination are included primarily to control for interest rate differences that might result from loan characteristic differentials. For conciseness, the coefficients on the categorical variables corresponding to the year of origination are suppressed.

A number of household characteristics could influence the APR. In particular, minorities, women, older borrowers, and those who are less educated may not negotiate as effectively or be as likely to shop for or be offered the best rate. In addition, single individuals, first-time homeowners, those with large families, and those with lower income might experience differential prices for a variety of reasons. All of these household-specific factors are controlled for in our regression equations.

Regarding the property characteristics, the location of the property (e.g., within the central city and in a particular part of the country) can certainly affect the risk assessment and thus potentially the cost of funds. Perhaps the best single measure of the risk inherent in lending money on a particular property is its value.¹² Also, it might be expected that condominiums and single-family detached homes would fall into different risk classes.

Finally, all of the loan characteristics might be expected to be used to identify differential risk and, therefore, to correspond to rate differentials. In particular, insured loans have less default risk than a given borrower and property would otherwise have and thus might be expected to have a lower cost. Fixed-payment loans and those with longer terms might be expected to have more inflationary and interest rate risk and therefore would be expected to have a higher rate. The loan-to-value ratio and the mortgage payment-to-income (front-end) ratio might be expected to influence rates. The higher each of these

¹² Systematic pricing differentials for properties across different neighborhoods could be construed as a form of redlining. However, the significance of this variable does not indicate that redlining has necessarily taken place. Less costly properties across all neighborhoods may be higher lending risks for a number of reasons. For example, such properties may be more likely to experience declines in value over time, thereby leading to higher loan-to-value ratios. In addition, this variable may partially capture differences in borrower characteristics that cannot be included in the analysis, such as household credit quality and/or net wealth. Thus, while a clean interpretation of this variable's impact on pricing is not possible, including it as a control variable in a study focusing on racial pricing differentials seems warranted.

ratios is, the higher the level of default risk and the higher the interest rate. Finally, as mentioned earlier, refinancing loans are generally considered to have different risk characteristics than purchase loans. Consequently, we analyze them separately.

Given the model specification, the results of the regression analysis are presented in table 5.¹³ In these initial regressions, the sample is stratified into mortgage market subsamples by purchase versus refinancing and conventional versus VA/FHA loan types. As noted, racial differences are considered only in the context of a simple classification variable. Subsequently, to more fully investigate differences by race, we estimate separate regressions for whites, blacks, and Hispanics to examine the determinants of APRs for types of loans by mortgage market. Means and regression results are presented in later tables. Ultimately, the APR differentials found between black and Hispanic households relative to whites will be decomposed into characteristic effects and coefficient effects to determine the relative importance of inherent differences across borrower groups versus the pricing of those characteristics in generating the observed differentials. Together, they represent the two components of the total differential between minority and white households for a particular variable or a particular group of variables considered together.

We can identify a number of interesting and potentially policy-relevant results in table 5.¹⁴ First, while the geographic area variables are relatively broadly defined, significant results are obtained for them. Particularly for purchases, areas in the Northeast and those outside of metropolitan statistical areas (MSAs) appear to have significantly higher interest rates. We observe that outlying areas have generally higher rates for refinancing as well. One possible explanation could involve secondary market inefficiency. Even though the secondary market acts to promote capital flows that should equilibrate costs, it may not be working perfectly to reduce costs in areas with high demand like the Northeast or in outlying areas that are not part of an MSA. In any event, from a policy perspective, it would be interesting to be able to investigate further to understand why these rate differentials are observed and develop strategies to eliminate them. This would be even more important to the extent that protected classes are more geographically concentrated in higher-cost areas.

¹³ Means for the variables included in this set of regressions are presented in table A.1.

¹⁴ We will not discuss at length the mean values of the sample. However, it is reassuring to note that differences in the sample means for such variables as percent minority, income level, and loan to value are consistent with a priori expectations. These differences also suggest that the two markets should be treated separately.

Table 5. Determinants of Mortgage APRs Stratified by Purchase/Refinancing Loans and Conventional/FHA-VA Loans, 1989 to 2001

Variable	Purchase—Conventional		Purchase—FHA/VA		Refinancing—Conventional		Refinancing—FHA/VA	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Intercept	10.0695***	94.93	10.2168***	62.81	10.2587***	49.03	10.4590***	25.26
Property								
Midwest	-0.0500	-1.56	-0.0591	-0.97	-0.0674	-1.59	0.1699	1.30
South	-0.0311	-0.97	-0.1306**	-2.25	0.0167	0.36	-0.0436	-0.34
West	-0.0573	-1.63	-0.1432**	-2.34	-0.0691	-1.51	0.0826	0.65
MSA central city	-0.1239***	-3.45	0.0067	0.12	-0.0549	-1.09	0.0177	0.14
MSA suburban	-0.1657***	-5.08	-0.0138	-0.25	-0.1255***	-2.84	0.0233	0.19
MSA rural	-0.1266***	-3.39	0.0445	0.69	-0.1005**	-1.98	-0.0484	-0.34
Property value	-0.0008***	-6.64	-0.0014***	-4.55	-0.0010***	-5.98	-0.0011**	-2.34
Condominium	-0.0918**	-2.28	-0.0483	-0.71	-0.1239	-1.58	0.0590	0.35
Borrower								
Black	0.1970***	3.91	0.2369***	4.53	0.9388***	12.52	0.7699***	6.40
Hispanic	0.1224***	2.69	0.1183**	2.17	0.0440	0.59	-0.0282	-0.21
Other	0.0233	0.45	0.1404	1.47	0.0276	0.31	0.2375	1.23
Single woman	-0.0752**	-2.19	-0.0949*	-1.89	0.0888*	1.83	0.1098	1.04
Single man	0.0253	0.74	-0.0789	-1.52	0.1139**	2.11	0.0613	0.53
Age less than 25	-0.1258*	-1.74	-0.2210***	-2.76	-0.3047	-0.68	0.0572	0.08
Age 45 to 61	-0.0083	-0.31	0.0474	1.01	0.1560***	4.71	0.1716**	2.20
Age more than 61	-0.0125	-0.24	-0.0664	-0.60	0.2264***	3.95	0.1487	1.02
High school graduate	-0.0729	-1.50	-0.0399	-0.60	-0.2681***	-4.00	-0.2284	-1.54
Post high school	-0.1177**	-2.42	0.0284	0.44	-0.4360***	-6.46	-0.1425	-0.97
College graduate	-0.1976***	-4.06	-0.0902	-1.32	-0.5529***	-8.11	-0.2581*	-1.70

Table 5. Determinants of Mortgage APRs Stratified by Purchase/Refinancing Loans and Conventional/FHA-VA Loans, 1989 to 2001
Continued

Variable	Purchase—Conventional		Purchase—FHA/VA		Refinancing—Conventional		Refinancing—FHA/VA	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>Borrower Continued</i>								
Family size	0.0360***	4.02	0.0233*	1.81	0.0788***	6.44	0.0537**	1.98
Low income	0.1322***	3.29	-0.1227*	-1.72	0.4311***	7.79	0.1135	0.87
Moderate income	0.1088***	3.14	-0.0757	-1.18	0.1906***	4.09	0.1402	1.24
Middle income	0.0707**	2.09	-0.0600	-0.91	0.0638	1.46	0.0511	0.47
First-time owner	-0.0307	-1.28	0.0043	0.12	-0.0558*	-1.65	0.0260	0.35
<i>Loan</i>								
Fixed payment	0.2296***	8.94	0.2949***	8.15	0.2645***	6.77	0.1268	1.55
Private insurance	-0.0441	-0.93	NA	NA	0.0493	0.35	NA	NA
10-year term	0.5370***	6.67	0.0733	0.18	0.1673***	2.81	-0.2619	-1.15
15-year term	0.0158	0.50	0.0152	0.19	-0.1349***	-3.95	-0.2671***	-3.28
20-year term	0.0961*	1.86	0.4162***	2.90	0.0060	0.09	0.2784*	1.77
25-year term	0.1510*	1.90	0.1811	0.97	0.1523	1.45	-0.1409	-0.57
Loan to value	-0.1575***	-2.78	-0.5065***	-5.37	-0.1155	-1.56	-0.5926***	-3.61
Payment to income	0.1042**	2.17	0.1300	1.62	0.0600	0.97	0.0713	0.43
Observations	11,123		3,970		7,600		1,001	
Adjusted R ²	0.3276		0.3790		0.3165		0.2602	

Note: All models include indicators for the year the mortgage was originated (coefficients not reported).

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

MSA = metropolitan statistical area; NA = not applicable.

For variables characterizing the housing unit itself, we observe substantially lower APRs for highly valued units. In addition, in all but the FHA/VA refinancing market, the discrete variable for condominium has a relatively substantial negative impact on interest rates. In both cases, it is likely that this result derives from the fact that these housing units are lower-risk options from the lending institution's perspective.¹⁵ However, the purchasers of condominiums and more highly valued units also might be expected to have more net wealth and/or better credit histories than other purchasers. The lack of this information as part of the data set might be partially responsible for the significance of these variables.

As noted earlier, the AHS allows borrowers to be categorized by race, sex and marital status, income, education, age, and previous homeownership.¹⁶ Once again, from a policy perspective, some very interesting results can be observed.

Specifically, other things being equal, in the conventional market, blacks pay APRs that are about 20 basis points higher for purchase loans and approximately 94 basis points higher for refinancing loans than whites. However, Hispanics pay approximately 12 basis points more than whites in the conventional market for purchase loans, but they do not pay significantly more in the refinancing market. It would be interesting to see whether these pricing results hold for other data sets, and if they do, whether it is possible to dig down to a more detailed level of information to find out why the outcomes for Hispanics and blacks look so different relative to each another across these two loan types.¹⁷

The results for borrower's income and education are as anticipated. Generally speaking, higher education and higher income lead to lower APRs. It is interesting to note that these results are much more pronounced in the refinancing market. If refinancing is done primarily to lower the cost of debt, whereas obtaining financing to purchase a home is not (rather, the timing may be associated with changes in the household's socioeconomic situation), then

¹⁵ This is not to imply that condominiums are inherently less risky than single-family detached housing. Rather, it may be that the condominium owners in the sample are, on average, wealthier, or have better credit ratings, and so on. As a result, these loans may be priced more favorably.

¹⁶ It is worth noting that the AHS does a particularly good job of identifying Hispanic households by asking a question about the race of the head of the household and a separate question about Hispanic or Spanish-American origin. A number of individuals categorized as black and white for race are also categorized as of Hispanic or Spanish-American origin.

¹⁷ In the FHA/VA market, the results for Hispanic borrowers are quite similar to the results in the conventional market. For black borrowers, there is a smaller differential in the APR for refinancing loans.

education and income might be expected to be more highly correlated with lower refinancing rates, since those with greater financial sophistication are more likely to refinance when it is most beneficial. This suggests that educating less financially sophisticated borrowers about the benefits, costs, and potential pitfalls of refinancing could have a substantial impact on their overall cost of funds.¹⁸

In terms of other borrower characteristics, factors appear generally consistent between the conventional and FHA/VA markets. Holding income constant, larger family size might be expected to generate expenditure needs that could cause a borrower to have greater difficulty in making the mortgage payment. Indeed, larger families exhibit higher interest rates in both the refinancing and purchase markets. Older people appear to have significantly higher interest rates in the refinancing market, but not in the purchase market. This may be due to the fact that these families are more likely to refinance not to lower rates, but to access equity. Thus, these loans would be originated as the need arose rather than being concentrated in periods in which interest rates are low and refinancing occurs purely to lower the cost of debt. Single men and women exhibit higher rates in the refinancing market, but not in the purchase market. Finally, first-time homeowners do not have higher interest rates in either market.

As we might expect, fixed-payment (and fixed-rate) loans have significantly higher APRs for both refinancing and purchase. Also as anticipated, for purchase loans, a higher payment-to-income ratio is correlated with higher APR values. However, several results for loan characteristics are counterintuitive. In particular, it is odd that in the conventional market several shorter-term loans have significantly higher APRs than 30-year loans for both loan types. Also, higher loan-to-value ratios are associated with significantly lower APRs. Perhaps these results are a function of an omitted variables problem. That is, these variables could be correlated with particular loan programs whose specific characteristics cannot be included in the model.

Regression results stratified by race

To more fully explore the results, we stratify each of the separate samples by race. This second analysis allows us to observe any effects that might differ across black, Hispanic, and white households. The tables presented next, although more complex, parallel the earlier methodology. First, the mean values for each sample (by market, type of loan, and individual racial category)

¹⁸ The issue of pre-purchase homeownership counseling has been investigated by authors such as Hira and Zorn (2001, 2002) and Mallach (2001).

are presented in tables 6 and 7. This information is then followed by the four separate regression analyses in subsequent tables.

In terms of sample means, most of the information in table 6 (for conventional loans) and table 7 (for FHA/VA loans) is consistent with both the existing literature and our earlier discussion. However, several interesting points emerge:

1. The property values for all categories are lower for the FHA/VA market than for the conventional market.
2. Particularly for white borrowers, the FHA/VA market has a higher percentage of loans within central cities.
3. First-time homeowners are not predominant in the FHA/VA market compared with the conventional market.
4. Not surprisingly, such characteristics as loan to value are in the expected direction when values are compared by race in the FHA/VA and conventional markets.

Tables 8 and 9 examine mortgage APR by race for conventional and FHA/VA loans, respectively, while tables 10 and 11 present the results for the refinancing market. While many results are consistent across racial groups and with our earlier analyses, there are some interesting differences.

In particular, high-income, more educated borrowers were previously observed to pay significantly lower APRs. This result for the aggregate sample is being driven by white households, not Hispanics or blacks, and in addition occurs in the conventional market. It is not clear why these results are obtained. Similarly, the previous observation of obtaining a lower APR with higher income also appears to be associated with white households in the conventional market. Another difference is that APRs in the conventional market appear to be significantly lower for blacks and whites—but not for Hispanics—living in MSAs. Perhaps blacks and whites have generally better access to financial networks in urban areas. This difference does not appear to be a minority issue per se. Another intriguing spatial difference between Hispanics and others is that their APR is significantly lower in the FHA/VA purchase loan market in the West. Certainly this is a geographic area in which this group has been established in relatively large numbers for a longer period. Therefore, their understanding of local financial markets and their ability to effectively negotiate loan terms may be more highly developed than is the case for their counterparts in other parts of the country.

Finally, also evident from the preceding regressions (table 5) is that older borrowers (those 45 to 61 and 62 and older) pay higher APRs in the conven-

Table 6. Sample Means for Conventional Loans Stratified by Purchase/Refinancing and Race

Variable	Purchase			Refinancing		
	White	Black	Hispanic	White	Black	Hispanic
APR	7.9661	8.0588	8.0172	7.8278	8.9265	7.8830
Years						
1990 origination	0.0531	0.0233	0.0337	0.0224	0.0122	0.0183
1991 origination	0.0643	0.0286	0.0566	0.0653	0.0488	0.0579
1992 origination	0.0618	0.0447	0.0404	0.1229	0.0549	0.0823
1993 origination	0.0900	0.0841	0.0916	0.2115	0.1342	0.1982
1994 origination	0.0809	0.1073	0.0916	0.0743	0.0457	0.0701
1995 origination	0.1018	0.1199	0.1024	0.0375	0.0793	0.0305
1996 origination	0.0703	0.0716	0.0593	0.0112	0.0122	0.0061
1997 origination	0.0915	0.1109	0.1038	0.0644	0.0915	0.0671
1998 origination	0.0681	0.0769	0.0876	0.1127	0.1006	0.1250
1999 origination	0.0964	0.1199	0.1146	0.1375	0.2348	0.1768
2000 origination	0.0754	0.0805	0.0903	0.0388	0.0671	0.0610
2001 origination	0.0906	0.0895	0.1024	0.0758	0.0915	0.1006
Borrower						
Single woman	0.1484	0.2988	0.1631	0.1329	0.3262	0.1372
Single man	0.1478	0.1485	0.1321	0.0980	0.0854	0.0762
High school graduate	0.2426	0.2880	0.2399	0.2626	0.2043	0.2896
Post high school	0.2830	0.2952	0.2507	0.2818	0.2957	0.2805
College graduate	0.4280	0.3095	0.2480	0.4058	0.3476	0.2317
Family size	2.8286	2.9875	3.6038	3.1538	2.9878	3.4970
Low income	0.2819	0.4222	0.4205	0.2323	0.3781	0.2713
Moderate income	0.2686	0.2326	0.2224	0.2591	0.2439	0.2927
Middle income	0.2264	0.1843	0.2049	0.2512	0.1890	0.2073
Age less than 25	0.0230	0.0140	0.0390	0.0010	0.0030	0.0030
Age 45 to 61	0.2270	0.2610	0.1970	0.4110	0.4970	0.3930
Age more than 61	0.0550	0.0570	0.0390	0.0920	0.2260	0.0980
First-time owner	0.3960	0.3060	0.3360	0.2990	0.2590	0.2440
Property						
Midwest	0.3211	0.2200	0.1361	0.3429	0.2652	0.1189
South	0.2979	0.4705	0.3262	0.2100	0.4116	0.1646
West	0.1903	0.1109	0.4178	0.2402	0.1799	0.5854
MSA central city	0.1969	0.4365	0.4003	0.1864	0.5671	0.3384
MSA suburban	0.4184	0.3828	0.4286	0.4413	0.2896	0.5244
MSA rural	0.1863	0.1038	0.0916	0.1861	0.0579	0.0549
Property value	159.1810	131.4550	149.8770	165.2210	130.9810	177.8840
Condominium	0.0840	0.0810	0.0840	0.0380	0.0240	0.0580
Loan						
Fixed payment	0.7072	0.7174	0.7197	0.8156	0.8354	0.8537
Private insurance	0.9425	0.8533	0.9164	0.9897	0.9909	0.9787
10-year term	0.0197	0.0107	0.0189	0.0856	0.0976	0.0823
15-year term	0.1540	0.1127	0.1105	0.3875	0.3720	0.3232
20-year term	0.0491	0.0447	0.0324	0.0609	0.0762	0.0366
25-year term	0.0195	0.0215	0.0135	0.0208	0.0213	0.0213
Loan to value	0.6850	0.7260	0.7370	0.5620	0.5720	0.6100
Payment to income	0.2320	0.2610	0.2960	0.2100	0.2290	0.2760
Observations	9,292	559	741	6,728	328	328

Note: Property values are in thousands of dollars.

MSA = metropolitan statistical area.

Table 7. Sample Means for FHA/VA Loans Stratified by Purchase/Refinancing and Race

Variable	Purchase			Refinancing		
	White	Black	Hispanic	White	Black	Hispanic
APR	7.9560	8.0835	7.8796	7.6598	8.4773	7.6397
Years						
1990 origination	0.0663	0.0525	0.0281	NA	NA	0.0441
1991 origination	0.0810	0.0546	0.0541	0.0460	0.0202	0.0147
1992 origination	0.0845	0.0462	0.0390	0.1157	0.0707	0.0882
1993 origination	0.0896	0.0966	0.0801	0.2898	0.1919	0.2059
1994 origination	0.0756	0.0777	0.0693	0.0846	0.1111	0.0588
1995 origination	0.0800	0.0987	0.0887	0.0398	0.0606	0.0147
1996 origination	0.0704	0.0714	0.0758	0.0100	0.0101	NA
1997 origination	0.0793	0.1156	0.1061	0.0498	0.0808	0.0735
1998 origination	0.0522	0.0693	0.0628	0.1082	0.1212	0.1471
1999 origination	0.0992	0.1429	0.1429	0.1256	0.2222	0.1471
2000 origination	0.0707	0.0693	0.0952	0.0211	0.0404	0.0588
2001 origination	0.0804	0.0609	0.1169	0.0858	0.0505	NA
Borrower						
Single woman	0.1508	0.2941	0.1450	0.1343	0.4040	0.1029
Single man	0.1453	0.1408	0.1082	0.1169	0.0808	0.1618
High school graduate	0.2730	0.2668	0.2359	0.2811	0.2828	0.1618
Post high school	0.3537	0.3866	0.3312	0.3383	0.3030	0.3824
College graduate	0.3177	0.2668	0.1753	0.3396	0.2525	0.2206
Family size	2.8812	3.1029	3.7056	3.1455	3.2929	3.4559
Low income	0.3417	0.3824	0.4632	0.2587	0.4040	0.2941
Moderate income	0.3640	0.3340	0.2922	0.3197	0.1818	0.3235
Middle income	0.1982	0.1891	0.1407	0.2512	0.3030	0.3088
Age less than 25	0.0498	0.0126	0.0584	NA	NA	NA
Age 45 to 61	0.1466	0.1933	0.1537	0.3085	0.3838	0.3529
Age more than 61	0.0230	0.0250	0.0220	0.0622	0.2222	0.0147
First-time owner	0.3300	0.2390	0.2340	0.3160	0.2320	0.2940
Property						
Midwest	0.2655	0.1954	0.1385	0.2363	0.2727	0.1177
South	0.3781	0.5840	0.3485	0.3246	0.4647	0.2353
West	0.2500	0.1198	0.4567	0.3383	0.2020	0.6324
MSA central city	0.2658	0.4244	0.4156	0.2923	0.5152	0.3088
MSA suburban	0.4248	0.4433	0.4394	0.4627	0.3131	0.5882
MSA rural	0.1745	0.0819	0.0931	0.1480	0.0909	0.0735
Property value	110.0250	102.2490	119.5860	132.0060	111.4130	152.5590
Condominium	0.0620	0.0610	0.0780	0.0440	0.0300	0.0590
Loan						
Fixed payment	0.6810	0.7542	0.7511	0.7711	0.8182	0.8235
Private insurance	NA	NA	NA	NA	NA	NA
10-year term	NA	NA	NA	NA	NA	NA
15-year term	0.0481	0.0336	0.0325	0.2450	0.2828	0.1912
20-year term	0.0141	0.0147	0.0065	0.0510	0.0606	0.0147
25-year term	0.0072	0.0084	0.0087	0.0162	0.0303	0.0294
Loan to value	0.8240	0.8340	0.8290	0.7084	0.6148	0.7172
Payment to income	0.2320	0.2650	0.2830	0.2130	0.1980	0.2663
Observations	2,912	476	462	804	99	68

Note: NA indicates that these variables were not included in the subsequent regression analysis. Property values are in thousands of dollars.

MSA = metropolitan statistical area.

Table 8. Determinants of Mortgage APRs for Conventional Purchases Stratified by Race, 1989 to 2001

Variable	White		Black		Hispanic	
	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics
Intercept	10.1981***	89.31	10.6750***	17.92	9.7346***	19.25
Borrower						
Single woman	-0.0710*	-1.91	-0.0392	-0.25	-0.2242	-1.59
Single man	0.0330	0.91	0.0044	0.02	-0.0560	-0.38
High school graduate	-0.2693***	-4.69	0.0892	0.39	0.2511*	1.81
Post high school	-0.3105***	-5.44	0.2729	1.19	0.1248	0.87
College graduate	-0.3623***	-6.37	0.0552	0.23	-0.1100	-0.72
Family size	0.0415***	4.13	0.0517	1.18	0.0138	0.44
Low income	0.1654***	3.91	-0.2713	-1.10	0.0872	0.47
Moderate income	0.1358***	3.74	-0.2392	-1.06	0.0386	0.23
Middle income	0.0713**	2.03	-0.1676	-0.74	0.2062	1.24
Age less than 25	-0.1332*	-1.74	-1.3017	-2.39	0.0753	0.30
Age 45 to 61	-0.0209	-0.73	-0.0890	-0.60	0.1048	0.86
Age more than 61	-0.0056	-0.10	-0.4846*	-1.72	-0.1902	-0.74
First-time owner	-0.0311	-1.24	-0.0150	-0.10	-0.0186	-0.17
Property						
Midwest	-0.0702**	-2.14	0.0679	0.35	-0.1741	-0.92
South	-0.0370	-1.11	-0.1273	-0.75	0.1979	1.20
West	-0.0170	-0.45	-0.0376	-0.16	-0.2163	-1.37
MSA central city	-0.1342***	-3.59	-0.5137**	-2.02	-0.0018	-0.01
MSA suburban	-0.1485***	-4.51	-0.6671*	-2.60	-0.1907	-1.02
MSA rural	-0.1162***	-3.11	-0.7363**	-2.46	-0.3524	-1.52
Property value	-0.0009***	-6.72	-0.0004	-0.50	-0.0006	-1.08
Condominium	-0.0765*	-1.78	-0.1622	-0.69	-0.1871	-1.07
Loan						
Fixed payment	0.2486***	9.28	0.1020	0.64	0.1591	1.42
Private insurance	0.0238	0.46	-0.2928	-1.40	-0.0684	-0.37
10-year term	0.4796***	5.80	1.7571***	2.85	1.4351***	4.11
15-year term	0.0139	0.42	0.5497***	2.72	-0.0313	-0.19
20-year term	0.0375	0.71	0.6611**	2.15	0.3945	1.44
25-year term	0.1101	1.34	0.1266	0.30	0.2263	0.56
Loan to value	-0.1958***	-3.23	-0.3166	-1.13	0.0330	0.14
Payment to income	0.0195	0.38	0.2690	1.08	0.4382**	2.15
Observations	9,292		559		741	
Adjusted R ²	0.3567		0.1663		0.2444	

Note: All models include indicators for the year the mortgage was originated; coefficients are not reported.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

MSA = metropolitan statistical area.

Table 9. Determinants of Mortgage APRs for FHA/VA Purchases Stratified by Race, 1989 to 2001

Variable	White		Black		Hispanic	
	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics
Intercept	10.1942***	57.39	10.7221***	17.33	10.8471***	17.36
Borrower						
Single woman	-0.1556***	-2.77	-0.1721	-1.08	0.0831	0.47
Single man	-0.1092**	-1.96	-0.1192	-0.61	-0.1615	-0.81
High school graduate	-0.0381	-0.47	0.1758	0.71	-0.1143	-0.66
Post high school	0.0359	0.45	0.0926	0.38	-0.1174	-0.71
College graduate	-0.0535	-0.66	-0.0317	-0.12	-0.4648**	-2.27
Family size	0.0132	0.87	-0.0369	-0.79	0.0330	0.96
Low income	-0.0967	-1.24	-0.1591	-0.60	-0.2816	-1.15
Moderate income	-0.0461	-0.66	-0.1169	-0.49	-0.3237	-1.44
Middle income	-0.0353	-0.50	-0.2278	-0.94	0.0029	0.01
Age less than 25	-0.2412***	-2.94	-1.2458**	-2.34	0.1266	0.50
Age 45 to 61	0.0914*	1.75	0.0010	0.01	-0.1304	-0.79
Age more than 61	0.0190	0.16	-0.4768	-1.16	-0.3429	-0.84
First-time owner	0.0215	0.54	-0.1043	-0.73	0.0117	0.08
Property						
Midwest	-0.0883	-1.40	0.4705**	2.01	-0.6464**	-2.20
South	-0.1150*	-1.89	-0.0156	-0.07	-0.4406	-1.62
West	-0.1024	-1.59	0.0174	0.07	-0.6557**	-2.48
MSA central city	0.0261	0.44	-0.0380	-0.13	-0.3540	-1.31
MSA suburban	0.0318	0.57	0.0078	0.03	-0.4281	-1.57
MSA rural	0.0840	1.30	0.1265	0.36	-0.2541	-0.79
Property value	-0.0017***	-5.09	-0.0014	-1.08	0.0003	0.25
Condominium	-0.1375*	-1.83	0.0786	0.30	0.2054	0.90
Loan						
Fixed payment	0.3707***	9.70	-0.0730	-0.53	0.0894	0.63
Private insurance	NA	NA	NA	NA	NA	NA
10-year term	NA	NA	NA	NA	NA	NA
15-year term	-0.1963**	-2.37	1.6105***	4.70	0.4298	1.30
20-year term	0.4860***	3.29	0.3955	0.81	-0.2984	-0.40
25-year term	0.3083	1.51	0.0843	0.13	0.0147	0.02
Loan to value	-0.5321***	-5.15	-0.5171	-1.56	-0.1819	-0.55
Payment to income	0.1131	1.25	-0.0691	-0.29	0.3949	1.32
Observations	2,912		476		462	
Adjusted R ²	0.4464		0.2622		0.1777	

Note: All models include indicators for the year the mortgage was originated; coefficients are not reported.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.010$.

MSA = metropolitan statistical area. NA = not applicable.

Table 10. Determinants of Mortgage APRs for Conventional Refinancing Stratified by Race, 1989 to 2001

Variable	White		Black		Hispanic	
	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics
Intercept	10.3440***	48.85	9.4491***	3.96	11.0340***	7.68
Borrower						
Single woman	0.0535	1.08	0.4535	1.25	-0.1422	-0.52
Single man	0.1515***	2.81	-0.0631	-0.11	-0.3674	-1.14
High school graduate	-0.3330***	-4.62	-0.0372	-0.08	0.0328	0.13
Post high school	-0.5114***	-7.04	-0.0029	-0.01	-0.2356	-0.86
College graduate	-0.6128***	-8.39	-0.2764	-0.57	-0.2569	-0.85
Family size	0.0827***	6.62	0.0845	0.72	-0.0019	-0.03
Low income	0.4133***	7.48	0.5224	0.86	0.5147	1.65
Moderate income	0.1908***	4.09	-0.1892	-0.35	0.4124	1.56
Middle income	0.0556	1.28	0.3303	0.67	0.0741	0.29
Age less than 25	0.1802	0.37	-0.5295	-0.17	-1.9108	-1.31
Age 45 to 61	0.1386***	4.18	0.5489	1.59	0.1438	0.78
Age more than 61	0.2580***	4.39	-0.0805	-0.17	0.2665	0.83
First-time owner	-0.0378	-1.12	-0.2147	-0.66	-0.1611	-0.82
Property						
Midwest	-0.0465	-1.12	-0.2377	-0.50	-0.2965	-0.89
South	0.0371	0.80	-0.1612	-0.35	0.0296	0.09
West	-0.0499	-1.08	-0.3887	-0.74	0.0529	0.21
MSA central city	-0.0294	-0.59	-0.6534	-1.18	-0.1661	-0.49
MSA suburban	-0.1039**	-2.41	-1.0177*	-1.71	-0.0647	-0.20
MSA rural	-0.0691	-1.41	-1.4526*	-1.85	-0.2306	-0.48
Property value	-0.0009***	-5.47	-0.0036**	-2.01	-0.0018*	-1.90
Condominium	-0.1495*	-1.89	-0.5740	-0.64	0.5568	1.53
Loan						
Fixed payment	0.2546***	6.53	0.1132	0.29	0.5080**	2.09
Private insurance	-0.0109	-0.08	1.7392	0.96	0.0253	0.04
10-year term	0.1661***	2.81	0.0741	0.13	0.3390	0.98
15-year term	-0.1495***	-4.36	0.2903	0.86	-0.4308**	-2.21
20-year term	0.0464	0.72	-0.1401	-0.26	-0.4945	-1.06
25-year term	0.1467	1.41	0.7457	0.74	-0.2897	-0.46
Loan to value	-0.1227	-1.61	0.3544	0.63	-0.4825	-1.24
Payment to income	0.0695	1.11	0.8635	1.38	-0.0028	-0.01
Observations	6,728		328		328	
Adjusted R ²	0.3297		0.1364		0.1922	

Note: All models include indicators for the year the mortgage was originated; coefficients are not reported.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

MSA = metropolitan statistical area.

Table 11. Determinants of Mortgage APRs for FHA/VA Refinancing Loans Stratified by Race, 1989 to 2001

Variable	White		Black		Hispanic	
	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics	Regression Coefficients	t-Statistics
Intercept	10.2126***	28.17	12.7628***	4.94	5.6157***	3.80
Borrower						
Single woman	0.0458	0.43	0.2863	0.52	1.5554***	3.14
Single man	-0.0921	-0.84	1.4321	1.49	1.0930**	2.39
High school graduate	-0.2873	-1.70	0.1892	0.25	0.2362	0.48
Post high school	-0.2086	-1.24	-0.0977	-0.12	-0.0507	-0.12
College graduate	-0.3192*	-1.87	0.4412	0.49	-0.2947	-0.59
Family size	0.0462*	1.65	0.1022	0.61	0.2823***	3.01
Low income	0.0374	0.30	0.5399	0.57	-0.7927	-1.45
Moderate income	0.0398	0.37	0.8934	0.92	-0.5549	-1.15
Middle income	-0.1023	-0.98	0.8659	1.07	0.1855	0.38
Age less than 25	NA	NA	NA	NA	NA	NA
Age 45 to 61	0.0915	1.20	1.2395**	2.26	0.9446***	3.29
Age more than 61	0.2384	1.61	0.3166	0.45	0.6646	0.56
First-time owner	0.0669	0.92	0.0238	0.04	0.0673	0.24
Property						
Midwest	0.2141*	1.77	-1.0622	-1.00	1.1769	1.12
South	0.0721	0.62	-1.5567	-1.51	0.0632	0.07
West	0.1491	1.28	-0.8571	-0.74	0.5079	0.56
MSA central city	0.1065	0.90	-0.7010	-0.82	-0.6298	-0.87
MSA suburban	0.1439	1.25	-1.2138	-1.31	-0.2255	-0.35
MSA rural	0.1060	0.79	-1.0956	-1.03	-0.7113	-0.98
Property value	-0.0012***	-2.63	-0.0045	-0.96	-0.0013	-0.99
Condominium	-0.0005	0.00	1.2649	0.97	-0.2270	-0.43
Loan						
Fixed payment	0.2537***	3.26	-1.1047*	-1.77	0.3179	1.03
Private insurance	NA	NA	NA	NA	NA	NA
10-year term	NA	NA	NA	NA	NA	NA
15-year term	-0.3400***	-4.34	-0.1269	-0.25	0.3933	1.12
20-year term	0.1198	0.81	1.2395	1.19	-0.7378	-0.78
25-year term	-0.1174	-0.47	0.0091	0.01	-0.7559	-0.77
Loan to value	-0.5336***	-3.39	0.0932	0.09	0.5228	0.89
Payment to income	0.0549	0.35	0.5679	0.39	0.0400	0.07
Observations	804		99		68	
Adjusted R ²	0.3004		0.0017		0.5028	

Note: All models include indicators for the year the mortgage was originated; coefficients are not reported.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

MSA = metropolitan statistical area. NA = not applicable.

tional market than other age groups when refinancing, but not when purchasing. As with other results (see table 10), this particular outcome is driven by white households. Why might this be the case? As discussed previously, refinancing is done for two fundamental reasons—to lower costs and to borrow against equity. While the first is done when interest rates are low or when borrowers have improved their credit profile, the second may occur randomly when the need arises and would be expected to produce higher rates on average. Thus, this result would be observed if white households in these age brackets are more prone to borrow against equity for consumption purposes (45- to 61-year-olds may be paying for their children’s college education, and those 62 and older may require supplemental income during retirement). If and when more detailed mortgage pricing information becomes generally available, researchers should substantiate these racial differences and explore them in greater depth to understand exactly why they occur.

Decompositions: Differences in characteristics or differences in pricing?

In this section, we use the Blinder (1973) decomposition to analyze the effects of differences in characteristics and differences in how those characteristics affect mortgage rates across different ethnic groups.

Decompositions

The focus of the regression analysis is to determine whether there are systematic differences in the rates paid by different groups. As noted earlier, the approach taken in much of the literature on discrimination in mortgage lending is simply to include a dummy variable indicating membership in the minority group. The problem with this approach is that it forces all right-hand-side variables to have the same effect on the rate for both majority and minority groups. Clearly, this is most likely untrue.

We use the Blinder (1973) decomposition to determine the effects of demographic characteristics on mortgage rates. Let subscripts 1 and 2 denote the majority and minority groups. We estimate a separate regression for each group:

$$r_g = \alpha_g + \mathbf{X}_g \boldsymbol{\beta}_g + \varepsilon_g, \quad g = 1, 2, \quad (1)$$

where α_1 , α_2 , $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ are the parameters to be estimated.¹⁹

¹⁹ Statistically, the use of a single regression is based on the implicit assumption that $\boldsymbol{\beta}_1 = \boldsymbol{\beta}_2$, so that the two populations can be pooled.

The difference in the average mortgage rates can be decomposed as

$$\bar{r}_1 - \bar{r}_2 = (\bar{X}_1 - \bar{X}_2)\beta_1 + \bar{X}_2(\beta_1 - \beta_2) + (\alpha_1 - \alpha_2) \quad (2)$$

Average mortgage rates for majority and minority groups may differ either because they have different characteristics or because borrowers with the same characteristics are treated differently. The first term on the right-hand side, the “characteristic effect,” captures the effects of differences in the mean characteristics of the two groups. The second term on the right-hand side captures the effects of the differences in the coefficients, that is, the differences in how characteristics affect the average mortgage rate. The difference in the intercepts is included to ensure that the adding-up constraint holds. The second and third terms are the “coefficient effect.” An important advantage of this sort of decomposition is that it allows a more detailed analysis of the possible sources of differences in mortgage interest rates.

It is tempting to conclude that, if the minority group pays higher rates, then the coefficient effect, $\bar{X}_2(\beta_1 - \beta_2) + (\alpha_1 - \alpha_2)$, measures discrimination. This requires two strong conditions. First, the regressions must be completely and correctly specified. That is, all variables relevant to determining the mortgage rate must be included in the regression. Second, discrimination must have no effect on borrower characteristics. For example, suppose that minority borrowers expect, as a result of discrimination, to encounter more difficulty in obtaining loans with low down payments, with the result that fewer of them apply for such loans. Then part of the effect of discrimination is likely to be captured by the difference in the average loan-to-value ratio—that is, by the characteristic effect.

The advantage of using the Blinder (1973) decomposition is that it provides both a measure of the differential impact of the pricing of specific characteristics on interest rates (the coefficient effect) and a measure of the impact of interracial differences in average characteristic values on interest rates (the characteristic effect). Because key variables such as household credit score, net wealth, the financial institution that made the loan, and its underwriting criteria cannot be included in the analysis, the calculated effects cannot be construed to be pure measures of discrimination. However, this information can provide relevant insights into what policies could best reduce the observed interracial differentials in interest rates.

Decompositions of APR by race for purchase and refinancing

Tables 12 and 13 present Blinder (1973) decompositions for all of the individual borrower and property characteristics for loans from the conventional home purchase market. Additional tables were constructed for both racial

Table 12. Blinder Decomposition of Average Difference in APR, Conventional Purchase Loans, White and Black Borrowers, 1989 to 2001

Variable	Characteristic		Coefficient	
	Effect	t-Statistic	Effect	t-Statistic
Intercept	NA	NA	-0.4768	-0.79
Years ^a	0.1446***	47.60	-0.3337	-1.14
Single woman	0.0107*	1.91	-0.0095	-0.19
Single man	0.0000	-0.93	0.0042	0.14
High school graduate	0.0122***	4.70	-0.1032	-1.53
Post high school	0.0038***	5.44	-0.1722***	-2.47
College graduate	-0.0429***	-6.37	-0.1292*	-1.71
Family size	-0.0066***	-4.13	-0.0304	-0.23
Low income	-0.0232***	-28.54	0.1844***	53.22
Moderate income	0.0049***	18.38	0.0872***	20.79
Middle income	0.0030***	6.74	0.0440**	2.28
Age less than 25	-0.0012*	-1.74	0.0167**	2.13
Age 45 to 61	0.0007	0.73	0.0178	0.45
Age more than 61	0.0000	0.11	0.0274*	1.67
First-time owner	-0.0028	-1.24	-0.0049	-0.11
Borrower ^b	-0.0415***	-5.46	-0.0678	-0.25
Midwest	-0.0071**	-2.14	-0.0304	-0.71
South	0.0064	1.11	0.0425	0.52
West	-0.0013	-0.45	0.0023	0.09
MSA central city	0.0321***	3.59	0.1657	1.47
MSA suburban	-0.0053***	-4.51	0.1986**	2.00
MSA rural	-0.0096***	-3.11	0.0643**	2.05
Property value	-0.0247***	-6.72	-0.0651	-0.61
Condominium	-0.0002*	-1.79	0.0069	0.36
Property ^b	-0.0097	-1.00	0.3847	1.34
Loan ^a	0.0119***	5.15	0.2956	1.16
Total	0.1052***	8.16	0.2788***	4.51
Percentage of total	27.4		72.6	
Difference	0.3841			

^aRepresents the sum of the effects for the dummies not presented here individually.

^bRepresents the sum of the effects for the preceding group of individual variables.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

MSA = metropolitan statistical area; NA = not applicable.

Table 13. Blinder Decomposition of Average Difference in APR, Conventional Purchase Loans, White and Hispanic Borrowers, 1989 to 2001

Variable	Characteristic		Coefficient	
	Effect	t-Statistic	Effect	t-Statistic
Intercept	NA	NA	0.4635	0.89
Years ^a	0.1366***	50.82	-0.1856	-0.63
Single woman	0.0010*	1.91	0.0250	1.05
Single man	0.0005	0.91	0.0118	0.58
High school graduate	-0.0007***	-4.66	-0.1248***	-3.47
Post high school	-0.0101***	-5.44	-0.1091***	-2.82
College graduate	-0.0652***	-6.37	-0.0626	-1.54
Family size	-0.0322***	-4.13	0.1000	0.85
Low income	-0.0229***	-28.55	0.0329***	3.67
Moderate income	0.0063***	18.36	0.0216***	4.24
Middle income	0.0015***	6.75	-0.0276*	-1.97
Age less than 25	0.0021*	1.74	-0.0082	-0.80
Age 45 to 61	-0.0006	-0.73	-0.0247	-1.00
Age more than 61	-0.0001	-0.10	0.0072	0.70
First-time owner	-0.0019	-1.24	-0.0042	-0.11
Borrower ^b	-0.1222***	-8.82	-0.1628	-0.84
Midwest	-0.0130**	-2.14	0.0141	0.54
South	0.0010	1.11	-0.0766	-1.40
West	0.0039	0.45	0.0833	1.23
MSA central city	0.0273***	3.59	-0.0530	-0.70
MSA suburban	0.0015***	4.50	0.0181	0.22
MSA rural	-0.0110***	-3.11	0.0216	1.00
Property value	-0.0083***	-6.72	-0.0380	-0.42
Condominium	0.0000*	-1.78	0.0092	0.61
Property ^b	0.0014	0.14	-0.2138	-0.96
Loan ^a	0.0087**	2.26	-0.1696	-0.80
Total	0.0245	1.40	-0.7317***	-14.74
Percentage of total	-3.5		103.5	
Difference	-0.7073			

^aRepresents the sum of the effects for the dummies not presented here individually.

^bRepresents the sum of the effects for the preceding group of individual variables.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

MSA = metropolitan statistical area; NA = not applicable.

comparisons for conventional refinancing loans, and FHA/VA home purchase and refinancing loans. For the sake of brevity and ease of comparison, aggregate total borrower property and loan characteristic and coefficient effects are summarized in table 14.²⁰

Because these results can be difficult to interpret, it is helpful to consider the calculations for a specific example—the college graduate variable in table 12. The first step in calculating the characteristic effect is to compute the difference between the share of white and black households with a college degree (0.4280 – 0.3095 from table 6). The positive sign on the difference reflects the higher proportion of white household heads who have a college degree (approximately 11.85 percent). This differential is then multiplied by the beta coefficient for the white sample, –0.3623 (table 8) to yield the characteristic effect, –0.0429, presented in table 12. The interpretation is that if black households had the same proportion of heads with a college education as whites do, one would expect their loan rates to be 4.29 basis points lower, assuming that the effect of a change in education had the same impact for blacks and whites (using the white coefficient). In all cases, a negative sign for the characteristic effect suggests that the results for the minority group are less favorable than the results for whites, and a positive sign suggests the reverse.²¹ Since the variance of these characteristic effects can be computed, their statistical significance can be determined, $t = -6.37$.

Similarly, the coefficient effects for college education represent the difference between the white coefficient, –0.3623 (table 8), and the black coefficient, 0.0552 (table 8), multiplied by the mean value for black households, 0.3095 (table 6). Given the percentage of blacks in the sample who are college graduates, the resulting value, –0.1292 (table 12), suggests that if a college education had the same impact for blacks as it does for whites, interest rates for blacks would decrease by 12.92 basis points. As is true for the characteristic effect, a negative sign for the coefficient effect suggests that if minority characteristics were priced the same as they are for whites, the minorities would be better off and vice versa.

The discussion of these results will focus on property and borrower characteristics because they are of primary concern from a policy perspective. To facilitate that discussion, table 14 presents racial comparisons of the total borrower and property characteristics from all of the regressions. One general

²⁰ Tables including the disaggregated effects for the six categories other than conventional home purchase are available from the authors upon request.

²¹ If $X_w > X_b$ and $\beta_w < 0$ and $X_w < X_b$ and $\beta_w > 0$, both imply lower rates for white means compared with black means.

Table 14. Blinder Decomposition Summary Table

Loan Markets	Black versus White				Hispanic versus White			
	Characteristic		Coefficient		Characteristic		Coefficient	
	Effect	t-Statistic	Effect	t-Statistic	Effect	t-Statistic	Effect	t-Statistic
Conventional purchase								
Total—borrower	-0.0415***	-5.46	-0.0678	-0.25	-0.1222***	-8.82	-0.1628	-0.84
Total—property	-0.0097	-1.00	0.3847	1.34	0.0014	0.14	-0.2138	-0.96
Total—loan	0.0119***	5.15	0.2956	1.16	0.0087***	2.26	-0.1696	-0.80
Total—all variables ^a	0.1052***	8.16	0.2788***	4.51	0.0245	1.40	-0.7317***	-14.74
FHA/VA purchase								
Total—borrower	0.0057	0.50	0.2334	0.74	-0.0141	-0.73	0.0513	0.22
Total—property	-0.0064	-0.53	-0.1974	-0.54	0.0135	1.21	0.6426*	1.69
Total—loan	-0.0295***	-8.12	0.3379	1.07	-0.0292***	-5.54	-0.1715	-0.55
Total—all variables ^a	0.1069***	6.17	0.3187***	5.14	0.1799***	7.49	0.4377***	7.02
Conventional refinancing								
Total—borrower	-0.1450***	-10.62	-0.5253	-0.73	-0.1453***	-12.42	0.0340	0.09
Total—property	-0.0613***	-3.51	1.2492*	1.83	0.0273*	1.89	0.1787	0.47
Total—loan	-0.0102***	-7.59	-2.2238***	-3.69	-0.0166***	-3.49	0.0934	0.34
Total—all variables ^a	-0.1594***	-7.15	-1.8342***	-13.70	-0.0231	-1.17	0.7255***	8.78
FHA/VA refinancing								
Total—borrower	-0.0912**	-1.98	-1.8645*	-1.65	-0.0339	-0.93	-1.2768**	-2.04
Total—property	-0.0189	-0.86	2.5814*	1.81	0.0107	0.42	-1.5082	-1.42
Total—loan	-0.0477***	-6.27	0.4925	0.80	-0.0263**	-2.08	-1.0392*	-1.90
Total—all variables ^a	-0.0508	-0.97	1.7836***	9.00	-0.0404	-0.84	-4.0393***	-37.55

^a In addition to borrower, property, and loan characteristics, each equation has a group of categorical variables that correspond to the year in which the loan was originated. For conciseness, these results are not presented in this table.

* $p < 0.10$. ** $p < 0.05$. *** $p < 0.01$.

observation is that there are many statistically significant differences between minority borrower and property characteristics compared with whites. In addition, it is interesting to note that the borrower characteristic effect for APRs is significantly larger for refinancing than for purchases, irrespective of the type of market (conventional or FHA/VA). As a specific example, the characteristics effect for black borrowers in the conventional market is -0.1450 in table 14 for refinancing versus -0.0415 for purchases. This disparity is part of the reason why blacks have such a substantial difference in their APR between refinancing and purchase loans (as explored earlier in table 3). That is, in the conventional refinancing market, the borrower characteristics of blacks compared with whites increase their APR over 3.5 times their impact in the purchase market (14.50 versus 4.15 basis points). A similar differential does not exist for Hispanic borrowers.

Another general result from the characteristic effects presented in table 14 for both refinancing and purchase loans is that if both the personal and property characteristics of minority borrowers were transformed to be identical to those of their white counterparts, the APR for refinancing and purchase loans would be significantly reduced by the following amounts:

1. 20.63 basis points (14.50 + 6.13, per the borrower and property characteristic effects in the first column of table 14) for blacks who refinance in conventional markets
2. 11.80 basis points for Hispanics who refinance in conventional markets
3. 5.12 basis points for black purchasers
4. 12.08 basis points for Hispanic purchasers

Finally, it is important to point out that in table 14, the significant differences in characteristics are found almost exclusively in the conventional market, not in the FHA/VA market. In particular, total borrower characteristic effects are highly significant with a negative sign across minority groups for both purchase and refinancing loans. The main exception is for blacks who are refinancing under FHA/VA programs, where there is a significantly different borrower characteristic effect. Thus, the conventional and FHA/VA market segments appear to be quite different, with the latter having much more uniformity across race in the characteristics of its borrowers.

These results represent, of course, overall averages for borrower and property characteristic effects. In tables 12 and 13, individual characteristic and coefficient effects are presented for conventional purchase loans. This detail allows us to consider several variables that have traditionally been the subject

of policy initiatives designed to improve the socioeconomic situation of minorities. Specifically, if the likelihood of minorities receiving a college education were increased to that of whites, they would be expected to obtain significantly lower interest rates. From our earlier example, increasing the proportion of college graduates to that of whites would reduce interest rates by 4.29 basis points for blacks (table 12) and by 6.52 basis points for Hispanics (table 13). Similarly, if the average property value for minority households were increased to that of whites and if the likelihood that those properties were located in the suburbs of an MSA were also the same as for whites, then interest rates for blacks would be expected to decrease by 3.0 basis points ($-2.47 + -0.53$ from table 12) and the impact for Hispanics would be a reduction of approximately 0.68 basis points ($-0.83 + 0.15$ from table 13).

While many of these individual effects are small, taken together they can add up to a substantial change in mortgage rates. Thus, this decomposition suggests that the average APR for minorities could be reduced significantly by continuing to promote policies that give these individuals the same access to education, to jobs, and to housing location as their white counterparts have. If we assume that underwriters would treat these attributes for minority applicants the same way they are treated for white applicants, the net impact would be to decrease the average APR for black and Hispanic households by 7.3 and 7.2 basis points, respectively.

The coefficient effects are an important focus for us because they represent mortgage pricing policy. In general, the coefficient effects found here are quite large, with significant variation between the conventional and FHA/VA markets and the refinancing and purchase markets. It is interesting to note that the coefficient effects do not suggest a uniform pattern of negative results for minority borrowers. For example, the total coefficient effect for conventional refinancing loans for Hispanic borrowers is statistically significant and implies that the APR for whites is approximately 72.55 basis points higher (table 14), a differential that is reduced, but still in favor of Hispanics (by 43.77 basis points) in the FHA/VA purchase market.²² However, in the conventional purchase market, the differential is almost exactly the opposite of the conventional refinancing market. In this case, rates are higher for Hispanic borrowers by 73.17 basis points. For black households, the total coefficient effects are actually favorable, except for conventional refinancing loans.

²² In general, the key to the changing results between markets in comparisons between white and black borrowers and between white and Hispanic borrowers lies in the implicit pricing of property characteristics. The property pricing coefficient either switches sign (although it is often insignificant) or, alternatively, doubles in estimated size.

The relatively large coefficient effects and resulting switching could be due in part to the exclusion of variables relating to lender type, credit history, and detailed property characteristics. For example, even after controlling for income, credit history, and other variables (Bradford 2002; Nichols, Pennington-Cross, and Yezer 2003), black borrowers are considerably more likely than white borrowers to use subprime lenders. While the propensity to use subprime lenders falls as income rises, it falls more slowly for blacks than for whites. In addition, credit risk is negatively correlated with income and education, although blacks tend to have less favorable credit histories than whites even after controlling for income and education. Taken together, these facts suggest that the exclusion of lender type, credit history, and so on, bias the coefficients for income, education, and loan terms toward finding relatively higher interest rates for blacks and Hispanics relative to whites. That is, the omitted variables bias the coefficient effects toward finding more discrimination—not less. Hence, the estimated coefficient effects are overstated as a measure of the effect of discrimination on mortgage rates.

These results for total borrower coefficients suggest an interesting pattern that is consistent with our earlier observations of pricing. The total borrower coefficients between white and black households or white and Hispanic households are significant only for refinancing within the FHA/VA market (table 14).²³ In both cases, the APR differential favors white households.

In terms of the individual coefficient effects presented in tables 12 and 13, the results for the individual education variables have consistently negative (although not generally significant) coefficient effects. For both refinancing and purchase loans, the signs all suggest that interest rates are lowered less for minorities than for whites as education improves (except for the single case of FHA/VA purchases by Hispanic college graduates). The effects seem to be more important statistically for purchase compared with refinancing loans. Determining exactly why this is the case is beyond the scope of this article, but the decomposition of APR differentials into specific coefficient and characteristic components provides a focus for future research that would otherwise not be apparent.

²³ Within the factors that comprise the total borrower coefficient in each type of loan, the two individual variables that generally suggest significant differences in pricing for minority and white borrowers relate to income and education. However, these results are again mixed, suggesting both positive and negative impacts on APR. These results are worthy of further examination as more detailed pricing data become available to see whether they could be better understood and possibly eliminated.

Summary and conclusions

We analyze the determinants of mortgage rates, focusing on the differences in the rates paid by white, black, and Hispanic borrowers across type of loan and market. We use data from the 1989–2001 AHS to develop and analyze a series of empirical models of mortgage rates. The AHS is a representative national sample and contains detailed information on borrower, property, and loan characteristics. Initially, we consider regressions for APR stratified by the loan's origination in conventional or FHA/VA markets and by whether the borrower refinanced an existing loan or purchased a house. Subsequently, we stratify each of these analyses by race to observe differences in coefficients between white, black, and Hispanic borrowers. Finally, we introduce the Blinder (1973) decomposition as a technique to analyze the differences in average mortgage rates paid by different groups. This decomposition allows us to distinguish between the effects of differences in borrower, property, and loan characteristics per se and to see how those characteristics are priced into mortgage rates.

While the limitations on the information available from the AHS (in particular, credit history and net wealth) do not allow us to say definitively whether discrimination is the reason for the differences we see, we can learn a great deal about the nature of pricing differentials from the AHS. Before running the regressions, we observe that there is a very large difference—1.01 percentage points—in the average APR paid by white and black borrowers for refinancing loans (see table 3). From the initial regressions (tables 7 and 8), we find that after controlling for borrower, property, and loan characteristics, the coefficient estimates for blacks suggest that these households pay a significantly higher APR than whites do. Alternatively, Hispanics pay higher rates for purchase but not for refinancing loans. This raises the question of why refinancing should be different.

The regressions stratified by race across market and loan type raise a number of additional questions. In general, borrowers with lower incomes and less education are observed to have a higher APR. However, it is intriguing to note that when the analysis is stratified by race, it is clear that this result is driven by white, not minority, households. In addition, blacks and whites are observed to obtain better APRs in MSAs, but Hispanics do not. Alternatively, Hispanics do better in the West for FHA/VA purchases. Finally, middle-aged and elderly whites (ages 45 to 61 and 62 and older) pay significantly higher rates when obtaining conventional refinancing loans. For each of these results, a plausible explanation can be constructed. However, the real importance of these findings is that they suggest a focal point for future research if and when more detailed mortgage pricing data become available.

Finally, several policy conclusions can be drawn from the decomposition of APR differentials into characteristic and coefficient effects. First, the significant characteristic effects suggest that continuing to pursue government policies that will put minorities on an equal footing with regard to educational achievement and income and also enable them to purchase more expensive houses in better neighborhoods should also put them in a position to obtain better mortgage rates.

Turning to the coefficient effects, in general we observe a great deal of variability in the signs and significance of the effects. It is not clear why these differences arise. Part of it may be due to omitted variables and part to fundamental differences in the nature of pricing decisions in these submarkets. Of particular interest for this analysis is the pricing of borrower characteristics. The results for total borrower coefficients suggest significant effects only between white and black households or white and Hispanic households for refinancing within the FHA/VA market. In both cases, the APR differential favors white households.

In terms of individual factors, the results for education are disappointing. The individual education variables have consistently negative (although not generally significant) coefficient effects. For both refinancing and purchase loans, all of the signs suggest that interest rates are lowered less for minorities as education improves than they are for whites (except for the single case of FHA/VA purchases by Hispanic college graduates). The effects seem to be more important statistically for purchase loans than for refinancing loans.

While the reasons for many of these pricing differentials cannot be determined definitively with the AHS, it is one of the few data sets that has any information on mortgage pricing and is generally available to researchers. In this context, the significance of this article is threefold.

1. It demonstrates what the AHS can and cannot tell us.
2. It presents an empirical approach to evaluating the causes of differential mortgage pricing by separating the effects of independent variables into characteristic and pricing effects. In addition, this technique could be effectively used in the future to refine this analysis as databases with more detailed information on the factors affecting mortgage pricing become generally available.
3. It reveals that a number of interesting rate differentials across racial groups have potential policy significance and merit further investigation.

Although it is customary for authors to suggest that better data would lead to additional insights, in this case it is genuinely intriguing to suggest that this is indeed the case.

*Appendix***Table A.1.** Means for Mortgage APR Samples, Stratified by Purchase/Refinancing and Conventional or FHA/VA, 1989 to 2001

Variable	Purchase— Conventional	Purchase— FHA/VA	Refinancing— Conventional	Refinancing— FHA/VA
APR	7.9685	7.9615	7.8729	7.7465
Years				
1990 origination	0.0503	0.0607	0.0216	0.0100
1991 origination	0.0608	0.0738	0.0642	0.0420
1992 origination	0.0597	0.0736	0.1184	0.1099
1993 origination	0.0895	0.0904	0.2087	0.2757
1994 origination	0.0830	0.0748	0.0730	0.0849
1995 origination	0.1024	0.0824	0.0391	0.0410
1996 origination	0.0687	0.0713	0.0111	0.0090
1997 origination	0.0935	0.0872	0.0654	0.0529
1998 origination	0.0711	0.0562	0.1112	0.1109
1999 origination	0.0997	0.1108	0.1433	0.1369
2000 origination	0.0779	0.0738	0.0413	0.0270
2001 origination	0.0911	0.0824	0.0780	0.0859
Property				
Midwest	0.2951	0.2380	0.3243	0.2298
South	0.3047	0.3967	0.2134	0.3287
West	0.2145	0.2645	0.2624	0.3516
MSA central city	0.2273	0.3043	0.2126	0.3147
MSA suburban	0.4233	0.4292	0.4425	0.4595
MSA rural	0.1729	0.1542	0.1721	0.1369
Property value	159.4412	111.3062	166.7891	131.7270
Condominium	0.0864	0.0642	0.0384	0.0440
Borrower				
Black	0.0503	0.1199	0.0432	0.0989
Hispanic	0.0667	0.1164	0.0432	0.0679
Other	0.0476	0.0302	0.0284	0.0300
Single woman	0.1548	0.1662	0.1397	0.1608
Single man	0.1456	0.1398	0.0963	0.1159
Age under 25	0.0236	0.0451	0.0011	0.0020
Age 45 to 61	0.2263	0.1544	0.4147	0.3167
Age over 61	0.0530	0.0234	0.0976	0.0739
High school graduate	0.2410	0.2652	0.2579	0.2727
Post high school	0.2774	0.3539	0.2801	0.3377
College graduate	0.4171	0.2977	0.4011	0.3237
Family size	2.9188	3.0249	3.1812	3.1998
Low income	0.2957	0.3625	0.2378	0.2777
Moderate income	0.2630	0.3494	0.2597	0.3047
Middle income	0.2243	0.1902	0.2462	0.2557
First-time owner	0.3833	0.3086	0.2957	0.3017

Table A.1. Means for Mortgage APR Samples, Stratified by Purchase/Refinancing and Conventional or FHA/VA, 1989 to 2001 *Continued*

Variable	Purchase— Conventional	Purchase— FHA/VA	Refinancing— Conventional	Refinancing— FHA/VA
Loan				
Fixed payment	0.9355	0.6972	0.8182	0.7832
Private insurance	0.7096	NA	0.9893	NA
10-year term	0.0187	0.0015	0.0841	0.0240
15-year term	0.1503	0.0458	0.3850	0.2498
20-year term	0.0468	0.0128	0.0603	0.0490
25-year term	0.0186	0.0076	0.0204	0.0180
Loan to value	0.6908	0.8254	0.5653	0.6993
Payment to income	0.2402	0.2432	0.2151	0.2162
Observations	11,123	3,970	7,600	1,001

Note: The property value is in thousands of dollars.

NA = not applicable.

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