Subprime Lending: An Investigation of Economic Efficiency

Howard Lax
Opinion Research Corporation

Michael Manti
Freddie Mac

Paul Raca
Equitec

Peter Zorn
Freddie Mac

Abstract

Subprime lending, a fast-growing and controversial segment of the mortgage market, remains unevenly studied and poorly understood. Relying principally on a survey conducted for Freddie Mac by the Gallup Organization, we provide an overview of subprime lending, characterize the types of borrowers in this market segment, and assess the service they receive from lenders.

We find that subprime borrowers generally are higher-risk than their prime counterparts and pay higher rates and fees for their mortgages. They are disproportionately minority and lower income, older, less well educated, less financially sophisticated, and less likely to search for the best interest rate when applying for a mortgage. We use three measures to assess the efficiency of the subprime market. Although none of them is conceptually conclusive, and each has its flaws of execution, all three suggest that concerns over the relative efficiency of the subprime market may be warranted.

Keywords: Discrimination; Mortgages; Subprime and predatory lending

Introduction

Even though subprime lending is a fast-growing and controversial segment of the mortgage market, it remains unevenly studied and poorly understood. During the first quarter of 2004, the volume of subprime mortgages outstanding grew to an estimated $736.46 billion, a 25.6 percent increase over the same period last year, while the total volume of one- to four-family residential mortgages outstanding rose only 11.8 percent, to an estimated $7.43 trillion.

In October 2002, the Credit Research Center at Georgetown University hosted a conference that broadened understanding of the many issues in the subprime market. Nonetheless, there remains a need for more research, given the importance of this market and the fact that the largely anecdotal information available tends to focus either on monitoring business trends and opportunities or on chronicling alleged abusive practices by subprime lenders ("Fed Levies $70 Million Fine" 2004).[1]

This article approaches subprime lending from a broad perspective. Relying principally on a survey conducted for Freddie Mac by the Gallup Organization, we provide an overview of subprime lending, characterize the types of borrowers in this market segment, and assess the service they receive from lenders.[2]

The subprime segment of the mortgage market continues to undergo rapid change. Not only has subprime lending grown dramatically in size, but its focus has changed in recent years from primarily originating second liens to concentrating on first mortgages.[3] Many of these are purchase money mortgages rather than refinancings, and the share of first-time home buyers among subprime purchasers is roughly equivalent to that in the prime market. We find, however, that subprime borrowers are generally higher risk than their prime counterparts and pay higher rates and fees for their mortgages. We also find that relative to prime borrowers, subprime borrowers are disproportionately minority and lower income, older, less well educated, less financially sophisticated, and less likely to search for the best interest rate when applying for a mortgage.

Further, our analysis raises questions about the efficiency of subprime lending relative to prime lending. We use three measures to assess the efficiency of the subprime market. Admittedly none of these is conceptually conclusive, and each has its flaws of execution.[4] All three, however, suggest that concerns

[1] *Inside B&C Lending* is a biweekly publication that follows subprime lending trends. Examples of predatory practices by some subprime lenders are also detailed in Harvey and Nigro 2004.

[2] For other articles on the subprime market, see Bradford 2002; Courchane, Surette, and Zorn 2004; Pennington-Cross, Yezer, and Nichols 2000; and Weicher 1997.

[3] In its January 19, 1998, issue, for example, *Inside B&C Lending* estimated that the subprime share of the overall mortgage market had tripled in three years, growing from under 5 percent in 1994 to 15 percent in 1997 ("B&C Market Posts Record Year" 1998). Details on the products and terms of the subprime market can be found in Courchane, Surette, and Zorn 2004.

[4] A disproportionate frequency of predatory pricing in the subprime sector would be another indicator of its inefficiency. Focus groups composed of both borrowers and lenders presented anecdotal evidence supporting claims of predatory lending practices among subprime

about the relative efficiency of the subprime market may be warranted. In particular, we find the following.

1. Our data confirm that credit risk is the key element in explaining whether loans are originated as prime or subprime, but we find that borrowers' demographic characteristics, knowledge, and financial sophistication also play a statistically and practically significant role in determining whether they end up with subprime mortgages.
2. Relative to prime borrowers, subprime borrowers are disproportionately less satisfied with their mortgage and borrowing experience.
3. When comparing interest rates across the two market segments, the higher rates charged by subprime lenders cannot be fully explained solely as a function of the additional risks they bear.

In combination, therefore, we believe the evidence indicates that the subprime market operates less efficiently than the prime market.

Data collection

The primary data source for our analysis is a telephone survey designed and commissioned by Freddie Mac and implemented by the Gallup Organization. Our sample was drawn from a population of borrowers originating mortgages between January 1996 and June 1997.[5] We obtained loan amount, purpose, and type for the sample data from DataQuick, a firm specializing in collecting mortgage transaction data from county records.

Loan originations were initially classified as prime and subprime on the basis of the name of the lending institution provided in the public record.[6] Loans were additionally stratified by purpose—purchase, refinancing, and

lenders. We saw and heard from and about people paying exorbitant interest rates and/or excessive fees, about loan "flipping" (rapid and numerous refinancings that eat into housing equity) and equity stripping, about deceitful loan practices, and about prohibitive prepayment penalties. Our quantitative data, however, do not provide an adequate measure of predatory lending.

[5] While this original sample is somewhat dated, a more recent sample that used data from 1999 to 2001 and was conducted by Freddie Mac corroborates that many of our findings remain robust.

[6] On the basis of industry sources and information from the U.S. Department of Housing and Urban Development and the Federal Reserve Board, a list of approximately 50 lenders was created, representing those institutions that make primarily subprime loans. All banks, thrifts, and credit unions not appearing on the list were considered prime lenders. An initial sample of 35,000 prime and 26,000 subprime loans was later supplemented with an additional 23,542 subprime loans to ensure sufficient observations (on further subsampling) for modeling and comparisons.

second liens—to create six sampling strata. In total, Gallup obtained 4,342 completed surveys across these strata: 879 prime purchase borrowers, 507 prime refinancing borrowers, 585 prime second mortgage borrowers, 770 subprime purchase borrowers, 1,001 subprime refinancing borrowers, and 600 subprime second borrowers.[7] These sample sizes are sufficient to produce 95 percent confidence intervals that range from plus or minus 2 to 6 percent for each stratum.

The telephone survey asked borrowers an extended array of demographic, attitudinal, and behavioral questions. Responses were supplemented with individual credit history information compiled from a credit repository. Payment records and FICO (Fair, Isaac & Company) scores were collected for two separate calendar dates to "bookend" borrowers' circumstances at loan origination: Data from December 1995 were used to represent credit status before origination, and data from January 1998 were used to show credit standing after origination.[8] Clearly, as with any survey, self-reported answers may be subject to more error than explicit data from credit history files. Some responses, however, such as interest rate obtained, denial of application, and search process should be quite readily and accurately provided.

Separate data used in our analysis include information on a relatively limited number of subprime pools purchased by Freddie Mac over the past several years. We also extracted information from the 1996 and 1997 Home Mortgage Disclosure Act (HMDA) data using the lender-based definition of subprime referred to earlier. Finally, for background and context, we rely on qualitative information from a series of focus groups we conducted with subprime borrowers and lenders. We find that our results are robust with respect to the definition of subprime (lender name, percentiles of Freddie Mac observed rates, or FICO scores).

What is subprime lending?

Subprime lending typically has been characterized as lending at relatively costly interest rates and fees to credit-impaired or otherwise higher-risk

[7] We believe this process yields data that can be used to accurately represent the population of prime and subprime borrowers. There are, however, two minor caveats. First, DataQuick does not obtain origination data for all states. Second, finance companies that do not appear on the list of subprime lenders are excluded from the analysis.

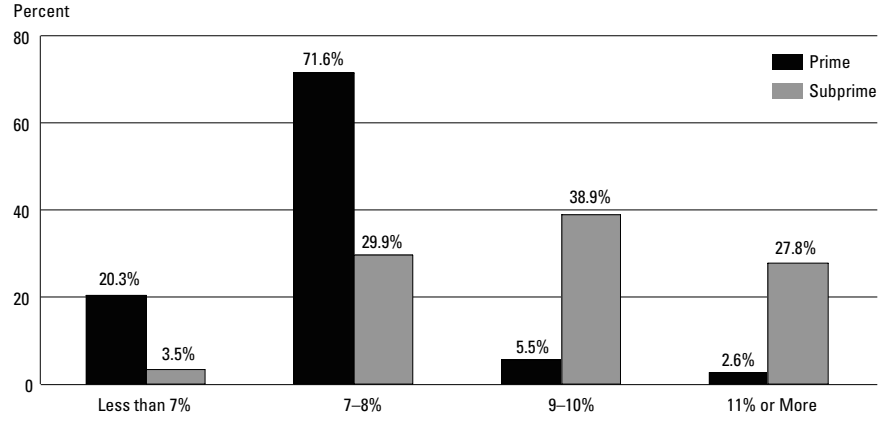
[8] FICO scores are risk statistics that summarize the information in people's credit records. Our access to credit histories was done so as to guarantee the confidentiality of borrowers' credit information and ensured that no inquiries were logged on their files. Throughout this article, we use FICO scores from December 1995 as an approximation of the score at the time of application.

borrowers. In this section, we use our survey data to explore the validity of each of these representations.

Interest rates

It is generally recognized that subprime borrowers pay higher interest rates than prime borrowers. Figure 1 presents data from our survey illustrating the difference in interest rates for first mortgages originated by the lenders we identified as prime and subprime. The distributions of first-lien and second-lien mortgage interest rates are considered separately because of their significantly different means. We present only the distribution for first liens, but the distribution of second-lien interest rates across the prime and subprime market segments shows a spread similar to that found in figure 1.

Figure 1. Mortgage Rates



Note: Numbers may not equal 100 percent because of rounding.

Clearly, borrowers obtaining mortgages from subprime lenders pay higher rates than their prime counterparts—roughly 88 percent of prime borrowers surveyed report rates below 9 percent, while 67 percent of subprime borrowers surveyed pay 9 percent or more. It is surprising, however, the extent to which these two interest rate distributions overlap. Press reports and our focus groups suggest a far greater distinction in rates.

To explore this apparent anomaly, we turn to mortgage pools that were purchased by Freddie Mac and are composed of subprime mortgages origi-

nated during the same period.[9] When we compare the interest rates on these loans with the rates of prime mortgages purchased by Freddie Mac and also originated in 1996 and the first half of 1997, we find very little overlap in prime and subprime rates and far greater differences in the means of the distributions.[10]

We take this as evidence that the U.S. Department of Housing and Urban Development's lender-based classification into prime and subprime categories is not entirely accurate. In fact, we expect some misclassification because it is unlikely that all of our identified subprime lenders deal exclusively in subprime products, and prime market lenders increasingly originate subprime loans.

To more precisely distinguish between prime and subprime loans, we use interest rates as a secondary classification criterion. A critical interest rate is determined, and if loans from prime lenders have interest rates above this value, they are excluded, as are loans from subprime lenders with interest rates below the critical value. The critical interest rate is defined as the 90th percentile of prime rates (calculated from the distribution of Freddie Mac purchases) rounded to the nearest one-half percentage point for each month, computed separately for fixed-rate and adjustable-rate mortgages (ARMs). This distills our Gallup survey sample from 1,771 to 1,157 subprime first mortgages and from 1,386 to 866 prime first mortgages. As a robustness check, we compared the major results presented in the article with those obtained using the undistilled data. The qualitative results are similar, but the differences between the prime and subprime market segments are diminished in the undistilled data. We also obtained similar results from relabeling the excluded prime loans as subprime and the excluded subprime loans as prime. All further analyses use these distilled groups.

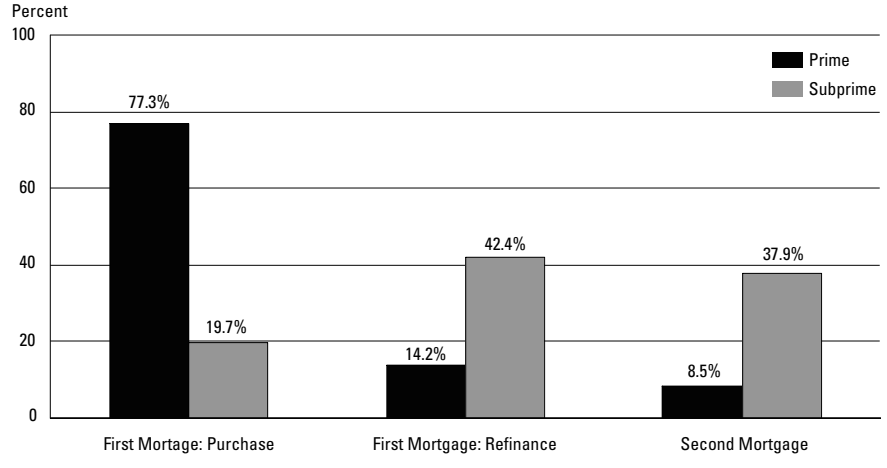
Loan purpose

The data from our survey confirm the fact that first mortgages account for a majority of subprime loans by 1996 and the first half of 1997. Figure 2 shows that among loans originated by subprime lenders, only 38 percent are second liens. This, however, is significantly higher than the 9 percent originated in the prime market as second liens during the same period.

[9] In November 1995, Freddie Mac began to purchase and resecuritize small numbers of tranches (a total of nine deals had been completed by the end of 1997) in REMIC (real estate mortgage investment conduit) securities backed, either wholly or in part, by subprime mortgages. For these transactions, Freddie Mac obtains loan-level characteristics including interest rate, despite not owning the mortgages outright or being the primary bearer of the default risk.

[10] The characteristics of these data are discussed in greater detail later.

Figure 2. Loan Purpose



Conversely, 62 percent of subprime mortgages are first mortgages. Unexpectedly, 20 percent of the subprime total consists of mortgages for home purchase, a rate representing roughly one-third of the first mortgages issued by subprime lenders. Although prime lenders issued purchase money mortgages at far greater rates—roughly 77 percent, lending money for home purchases is clearly an important and underappreciated component of the subprime market.[11]

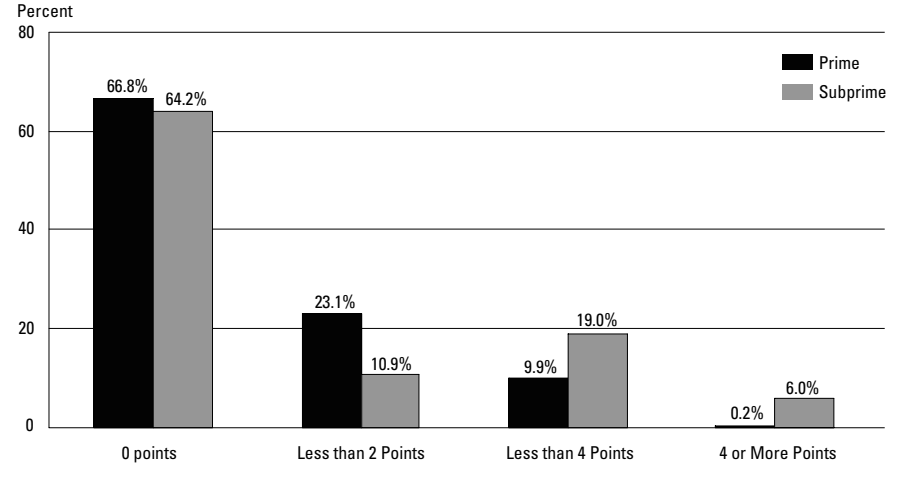
While the study of home equity loans also has considerable merit, there are likely important differences in behavior and risks between first and second mortgages. We will focus on first mortgages, both purchase and refinancing, for two reasons. First, these mortgages make up the majority of the originations in both sectors and are arguably the most critical segment of the market from a policy perspective. Second, focusing solely on first mortgages allows for a clearer bifurcation of borrowers into prime and subprime. For example, most borrowers with subprime second mortgages—more than 60 percent according to our survey data—hold a prime first mortgage. Limiting our analysis to first mortgages means that our classification is based on the same type of mortgage for all borrowers and allows for more consistent comparisons between the two segments.

[11] The purchase, refinancing, and second mortgage distinctions are based on data for each loan provided by DataQuick, which also included a fourth category labeled "other." This was a small share of the subprime mortgages (0.1 percent) but a larger share of the mortgages originated by prime lenders (18 percent). In the analyses presented here, other is reclassified as purchase.

Fees

Interest rates are not the only price dimension; borrowers often also pay up-front fees called "points" at origination. Figure 3 shows the distribution of points reported as paid by the prime and subprime borrowers in our survey. Most borrowers in both market segments report paying no points, but the 25 percent of subprime borrowers paying more than two points is two and one-half times the 10 percent of prime borrowers who pay this many points. Even at this, the reported differences in points likely understate the total difference in fees typically paid by subprime borrowers. Our subprime focus group participants, for example, disproportionately reported that significant origination fees were rolled into the principal of their mortgages. Such fees are not picked up by the data presented in figure 3.

Figure 3. Points Paid



Note: Numbers may not total 100 percent because of rounding.

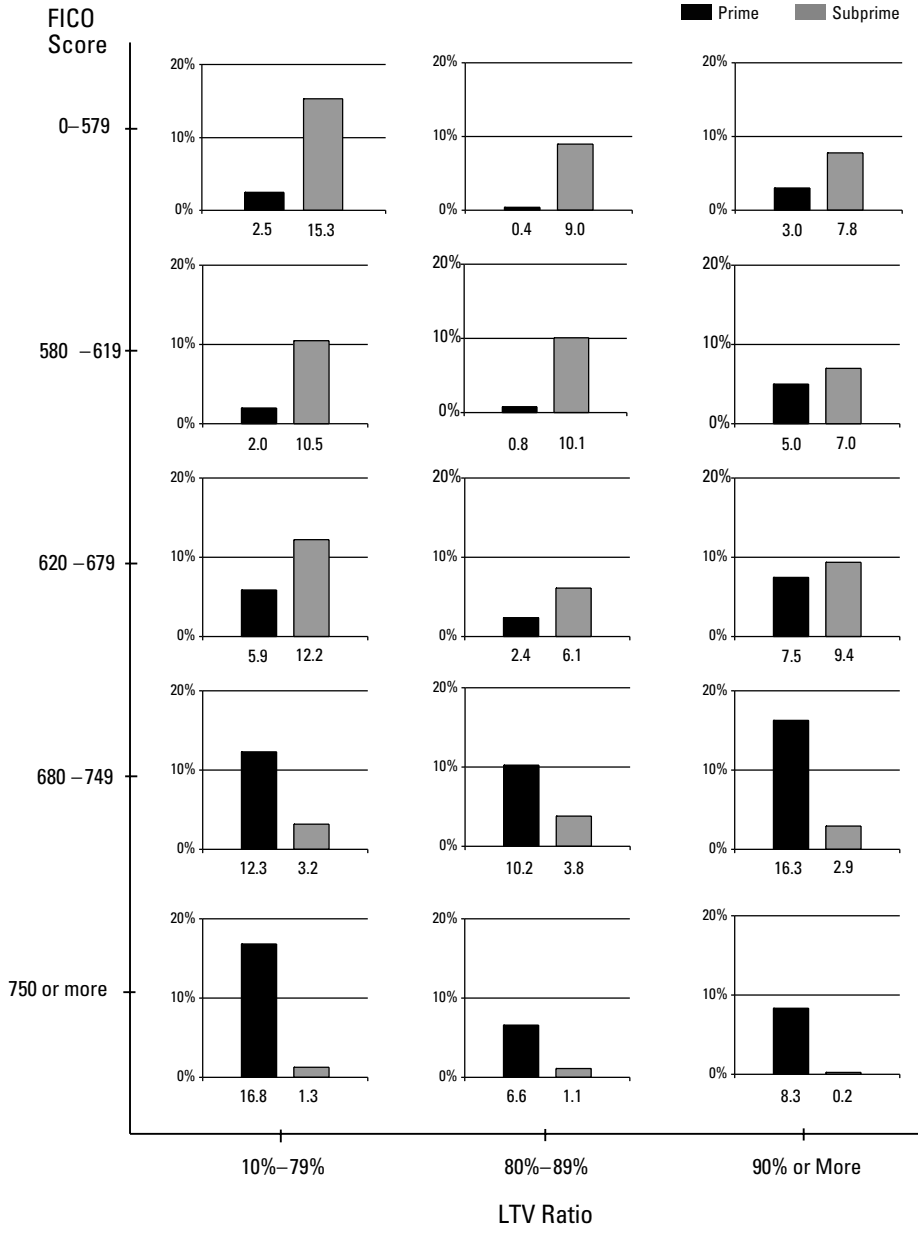
Credit risk

Our descriptive statistics confirm that borrowers in the subprime segment have both lower FICO scores and lower loan-to-value (LTV) ratios than borrowers in the prime segment do. While univariate analysis alone cannot determine the most important factors in explaining market segmentation, it does provide for increased understanding of the data. In this section, we focus on univariate analysis; later sections include multivariate approaches.

Both prepayment and default risk may differ for subprime borrowers. Here, we restrict our analysis to credit-risk issues. Our survey data generally confirm the higher overall risk of subprime lending. Figure 4 shows the

distribution of our prime and subprime samples over two key risk dimensions—LTV ratio and FICO score. LTV ratios represent the equity stake borrowers have in their properties. The survey collects LTV data in three categories: less than or equal to 79 percent, 80 to 89 percent, and 90 percent and more. The greater the borrower's equity, the lower the LTV and the lower the

Figure 4. FICO Score and LTV Ratio



risk. FICO scores summarize borrowers' credit histories, with lower scores representing higher risk: Scores lower than 620 generally signify higher credit risk, scores between 620 and 680 are usually considered marginal risk, and scores of 680 and above are considered lower risk.

There is reasonable bifurcation of borrowers across these risk dimensions. Prime borrowers are disproportionately in the lower-risk area of figure 4—the lower left-hand corner—and subprime borrowers cluster in the higher-risk area—the upper right-hand corner. The bifurcation is not perfect, however. In particular, our survey data suggest a marked tendency to treat the risks represented by LTV ratios and FICO scores separately. There is, for example, strong evidence that subprime lenders cater to credit-impaired borrowers—the preponderance of subprime borrowers have FICO scores below 680. This is true even at lower LTV ratios where, presumably, borrowers' greater equity mitigates some of the credit risk.

Figure 4 also reveals the high-equity focus of subprime lending. Prime lenders clearly dominate the first loan market for mortgages with LTV ratios of 90 percent or more.[12] Prime lenders are strong even among high-LTV ratio borrowers with lower FICO scores, a possibly potent risk combination that should favor subprime lenders.

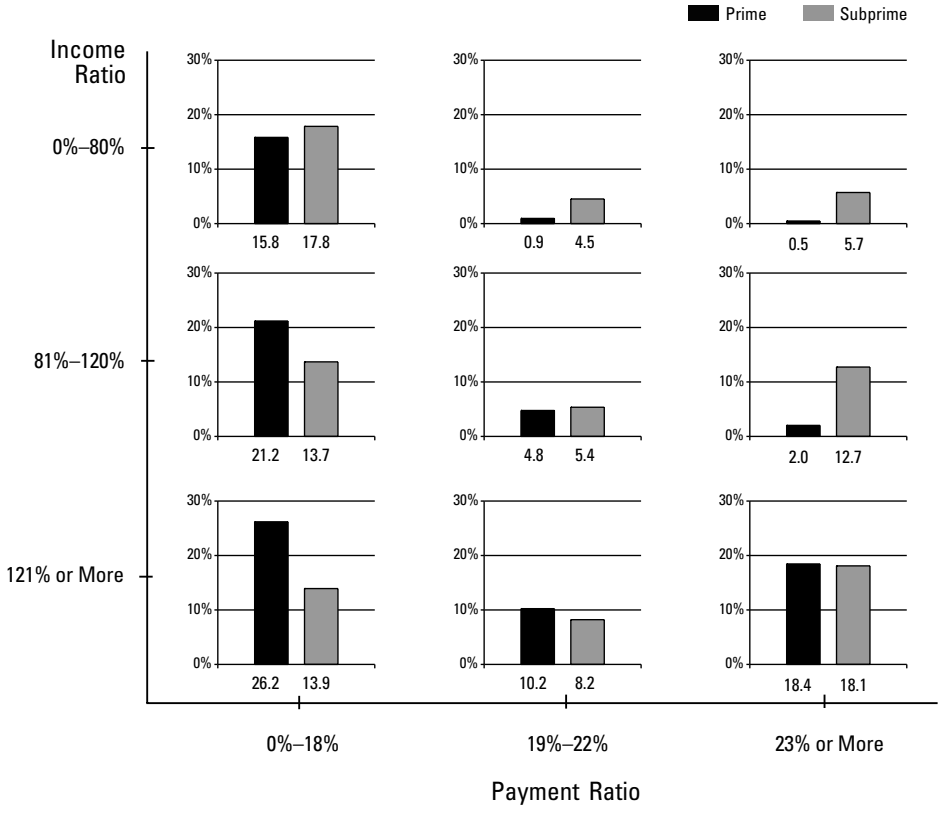
Another traditional component of risk is borrowers' payment-to-income ratios. The higher this ratio, the greater the proportion of income required to make monthly mortgage payments and the higher the presumed risk. Figure 5 shows the distribution of prime and subprime borrowers across income and payment ratios, with each expressed as a percentage of area median income.[13] Within each income strata, we expect loans with higher payment ratios to be higher risk and, therefore, to be dominated by subprime lenders. This expected relationship holds reasonably well. It is not perfect, however, and appears weakest for higher-income borrowers where the prime share is greater in all payment ratio categories.

Two other measures of risk typically considered in loan underwriting are purpose and type. Refinancing, for example, often involves borrowers who are taking equity out of their homes. This may indicate a money problem, but even

[12] Although not revealed in figure 4, subprime lenders clearly dominate the market for refinancings with super-high LTV ratios (LTV ratios exceeding 100 percent).

[13] The data to compute the payment ratio for each loan are not directly available. As a proxy, we use the loan amount recorded by DataQuick along with the term of the mortgage and interest rate obtained from the borrower in the Gallup survey to calculate a monthly payment. We then relate payments to area median income and reported income to area median income in figure 5.

Figure 5. Income and Payment Ratios

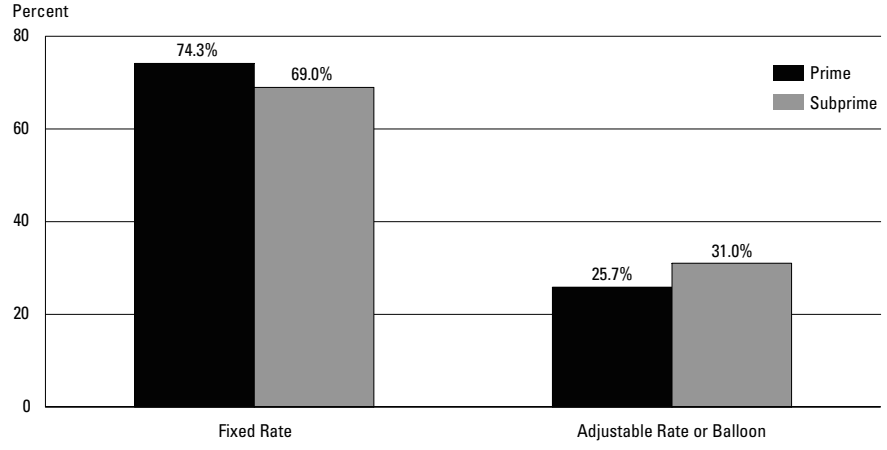


Note: We calculate the income and payment ratios relative to area median incomes.

if it does not, it increases the LTV ratio of the loan. Refinancing also depends on an appraisal, which is generally thought to be less reliable for assessing home value than purchase price. Figure 2 illustrates that subprime lenders dominate the refinancing market, which presumably is riskier.

Loan type can be a significant indicator of risk as well. ARMs, for example, present the risk of rising payments and payment ratios because of climbing interest rates, something that cannot happen with fixed-rate loans. Figure 6 shows that subprime lenders are more likely to issue the riskier ARMs. We cannot, however, determine from our data whether this result is driven by supply or demand. ARMs may appeal to borrowers in the subprime market because these instruments typically have lower monthly payments, at least in the short term.

Figure 6. Mortgage Type



Certainly, it is difficult to accurately assess whether risk alone explains the allocation of borrowers across the prime and subprime market segments; each loan can encompass a unique and widely varying array of circumstances that serve to aggravate or mitigate risk. It is apparent from figures 4 through 6, however, that the observable risk characteristics identified in our survey are unlikely to fully explain why borrowers end up taking out subprime loans. We show in figure 4 that for LTV ratios over 90 percent, for example, the percentage of prime borrowers remains essentially unchanged in comparing FICO scores of 750 or more (very low apparent risk) with scores between 580 and 680 (moderate to high apparent risk).

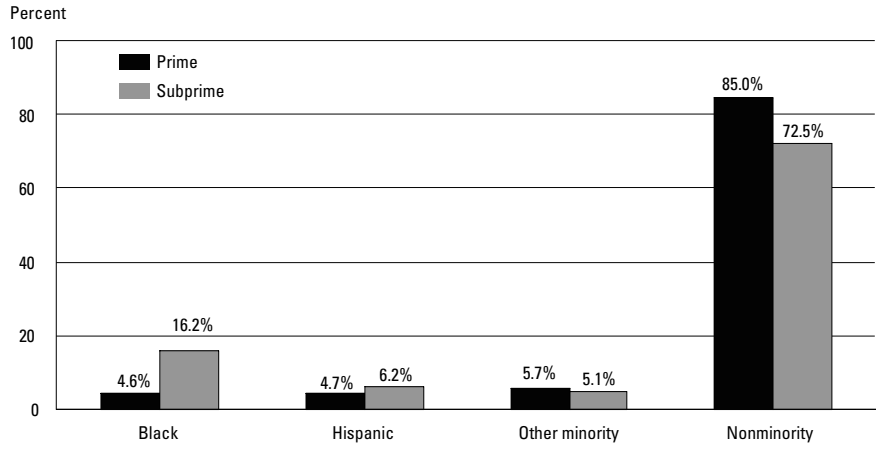
Who takes out subprime loans?

If risk alone does not seem to completely explain why borrowers end up in the subprime sector, what are the other factors that might play a role? Our survey data suggest that the demographic and behavioral characteristics of borrowers can help explain the market segment to which loans are allocated.

Borrower demographics

The Gallup survey data reveal that subprime borrowers are generally more likely to come from a protected class or underserved population. Figure 7 shows that black borrowers account for a disproportionately large share of subprime lending: The 16 percent of subprime loans taken out by blacks is

Figure 7. Race/Ethnicity of Borrower

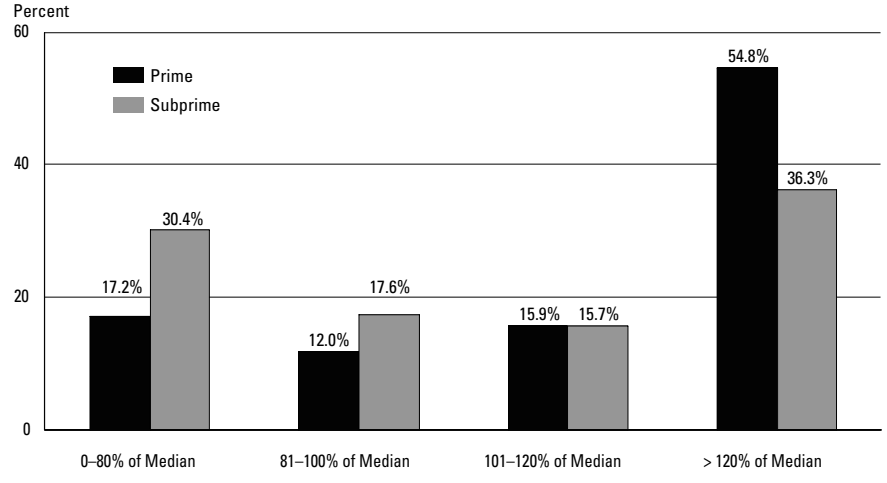


more than three times the proportion of prime mortgages going to this group. The breakdown of borrower income in the two market segments shown in figure 8 indicates that lower-income borrowers are about twice as likely to obtain mortgages in the subprime sector as in the prime sector, despite the fact that FICO scores are not strongly correlated with income.[14]

The age of the borrower presents another demographic skew. Figure 9 shows that the subprime population tends to be older than the population of prime borrowers. Only 12 percent of subprime borrowers are aged 18 to 34 in our survey, for example, while this age group accounts for more than one-quarter of the activity of prime borrowers. At the other end of the age spectrum, 30 percent of borrowers taking out subprime mortgages are aged 55 and older, while only 17 percent of prime borrowers fall into this category.

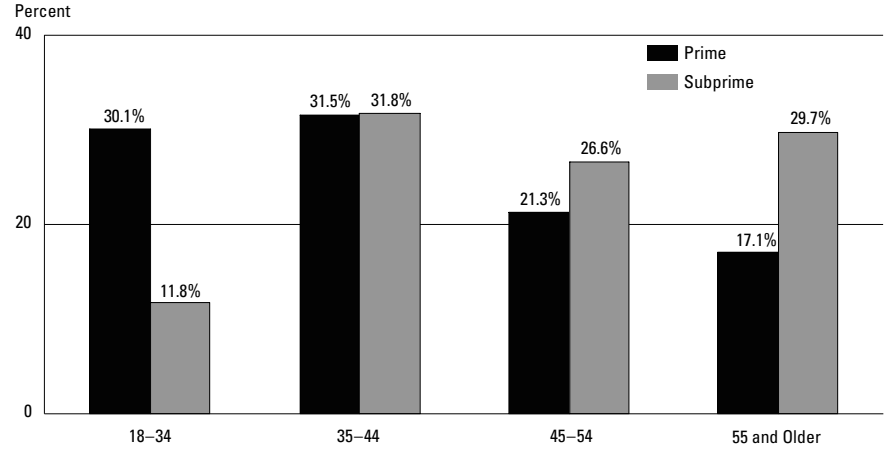
[14] An analysis of HMDA data reveals the same story with regard to both race and income (and the results may be even more pronounced). According to HMDA, a total of 18 percent of the loans classified as subprime using a lender-based definition were originated to black borrowers, compared with 5 percent of those classified as prime. The distribution of income does not match the Gallup survey, but it still represents a significant difference between the two market segments—37 percent of subprime borrowers in the HMDA data are below the 80 percent of median threshold, whereas less than one-quarter of prime borrowers fall into this category.

Figure 8. Borrower Income



Note: Borrower income is relative to area median income. Numbers may not total 100 percent because of rounding.

Figure 9. Borrower Age



Note: Numbers may not total 100 percent because of rounding.

Subprime borrowers also appear to be less educated than their prime counterparts. Figure 10 shows that 62 percent of subprime borrowers did not obtain a college degree, nearly 50 percent more than the 43 percent of prime borrowers who fall into this classification. Gender differences are also apparent: Figure 11 indicates that 46 percent of borrowers in the subprime sector are women, compared with 37 percent of borrowers in the prime sector.

Figure 10. Educational Level

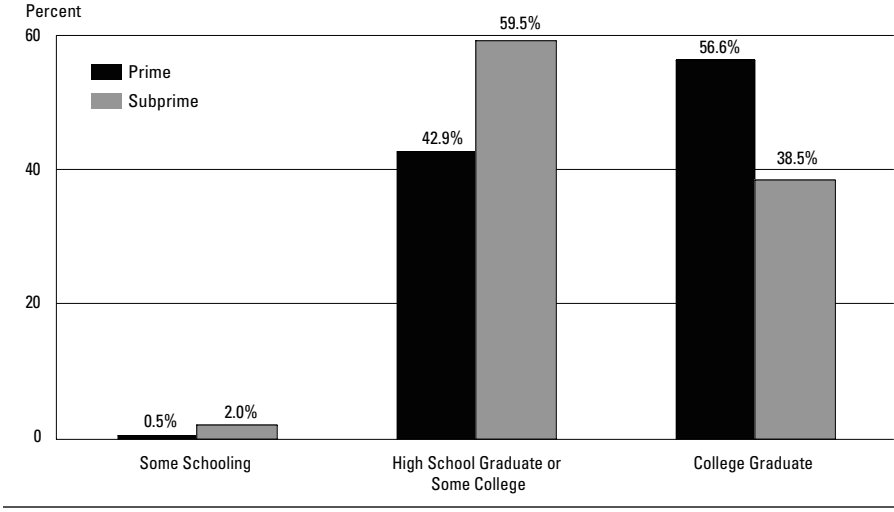


Figure 11. Borrower Gender

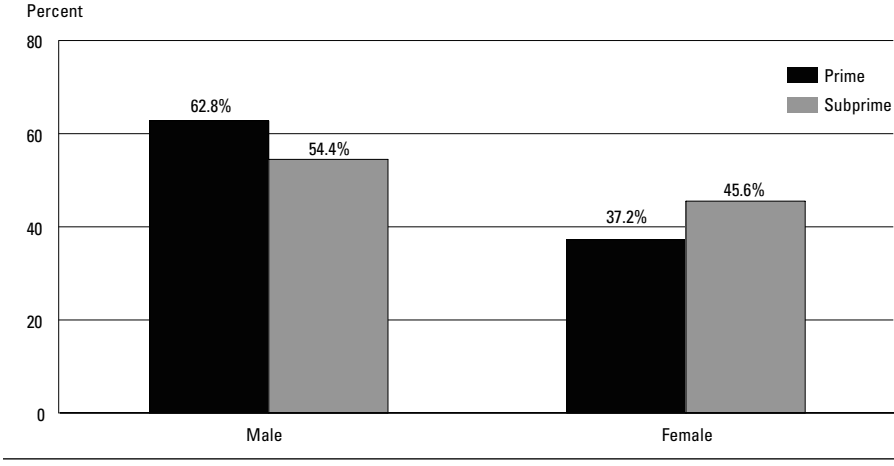
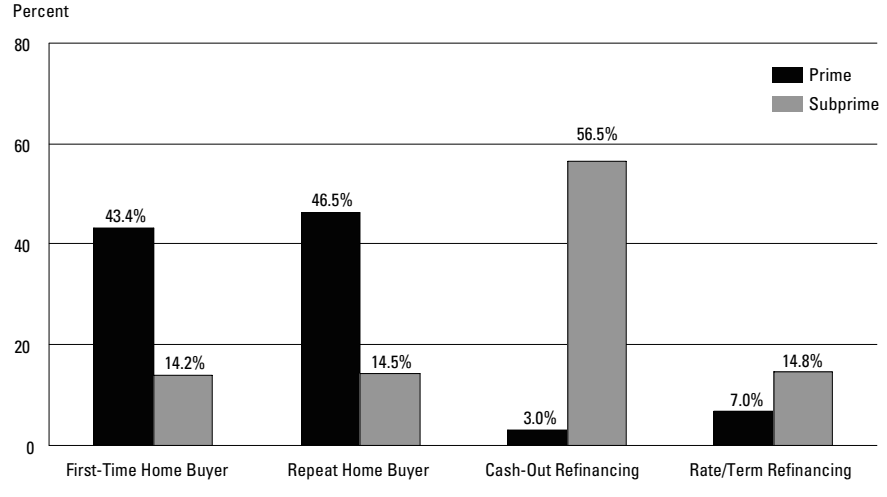


Figure 12 shows that both first-time and repeat homeowners are more likely to end up with prime rather than subprime mortgages. However, in both markets, first-time home buyers account for roughly similar shares of purchase money mortgages—49 percent and 48 percent in the subprime and prime sectors, respectively.

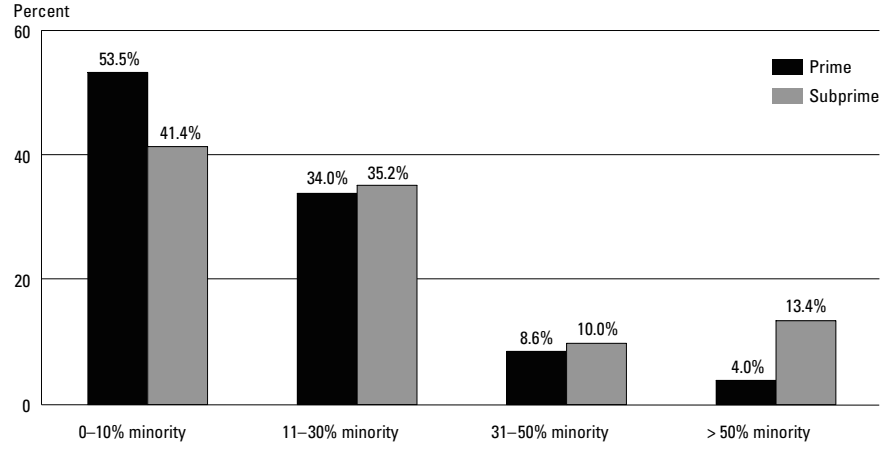
Finally, figures 13 and 14 provide information on the demographics of the neighborhoods in which the two sets of borrowers reside. We use 1990 census information in figure 13 to show that prime borrowers are disproportionately located in neighborhoods with low concentrations of minority population (less than 10 percent), while subprime borrowers tend to live in neighborhoods with high concentrations of minority population (more than 50 percent). Distinct differences exist by neighborhood income as well. Figure 14 reveals that subprime borrowers disproportionately live in low-income neighborhoods (where the census tract income is less than 80 percent of the area median) and that prime borrowers have a slight tendency to live in high-income neighborhoods (more than 120 percent of the area median income).

Figure 12. First-Time Home-Buyer Status



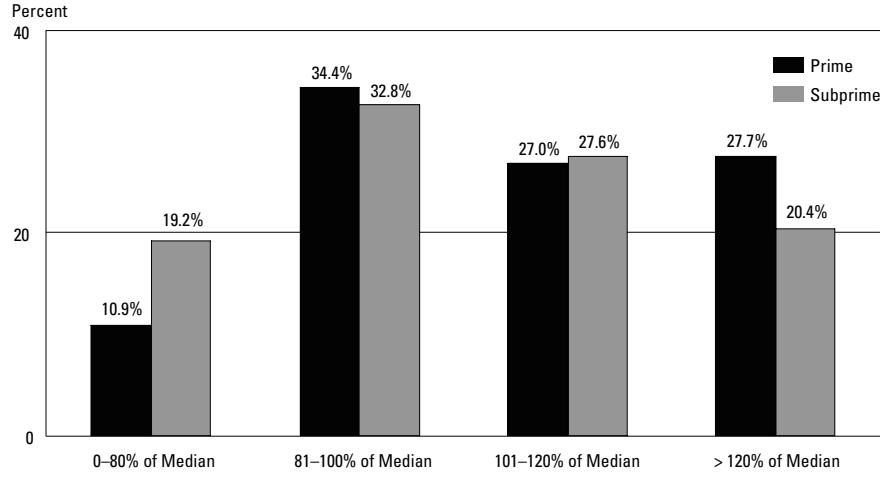
Note: Numbers may not total 100 percent because of rounding.

Figure 13. Neighborhood Percent Minority



Note: Numbers may not total 100 percent because of rounding.

Figure 14. Neighborhood Income



Experiences, perceptions, and behaviors

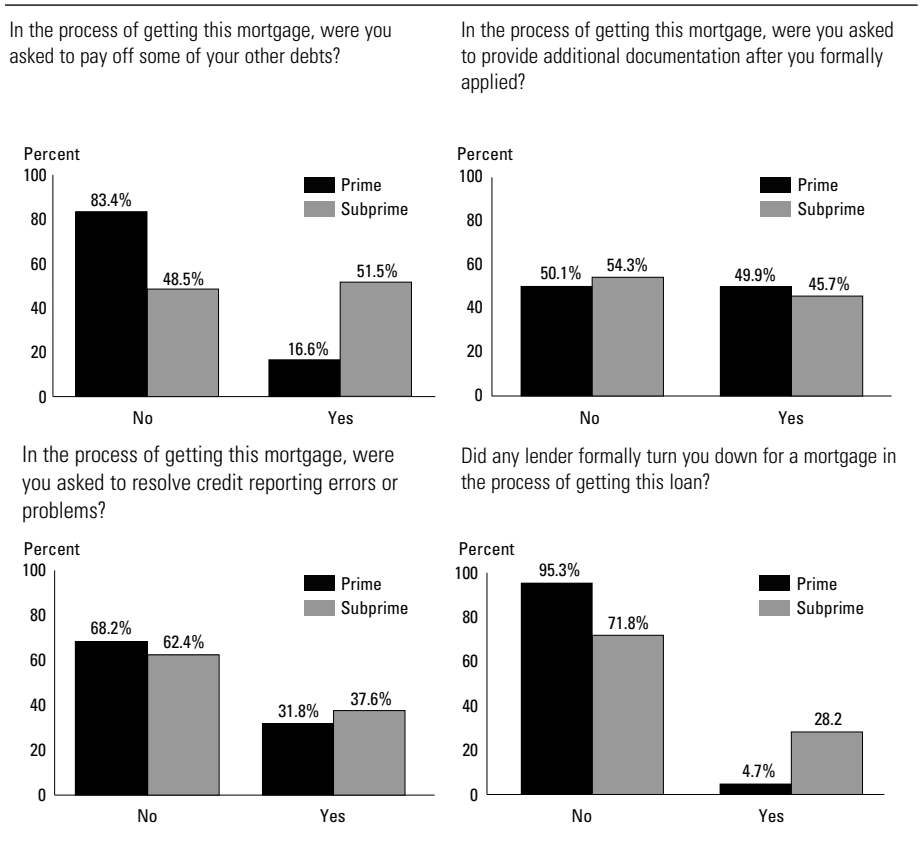
We also asked survey respondents an array of questions about their experiences, perceptions, and behaviors to see whether differences in their answers could help us understand and explain market bifurcation. We analyze the raw results of the survey with univariate analysis, as well as estimates obtained from an ordered logistic regression with the borrower demographics discussed in the previous section as explanatory variables.

Specifically, we modeled individual responses to survey questions separately for the prime and subprime market segments using an ordered logistic regression with the borrower demographics as explanatory variables. We then used the estimated prime and subprime equations separately to predict question responses for the entire sample of prime and subprime borrowers. A comparison of these predictions allowed us to control for the different demographic characteristics of the two market segments and assess the extent to which observed differences in responses are due to differences in demographics. By and large, they are not (i.e., the ordered logistic predictions are qualitatively similar to the raw results from the survey). The figures therefore present the raw results, and in the few instances where the results are driven by demographics, this fact is noted in the text.

Regardless of our method of analysis, we find that subprime borrowers generally had a harder time getting a loan, were less in control of their finances, and were more likely to experience life disruptions. One impact of the higher risk profile that subprime borrowers have is that they typically must jump over higher application hurdles, such as being approved, or clearing debts, than prime borrowers. Figure 15 shows, for example, that nearly three times as many subprime borrowers as prime borrowers—52 percent versus 17 percent, respectively, were asked to pay off some debts in the process of obtaining their mortgage. Probably the most significant hurdle overcome by subprime borrowers, however, is just getting approved for a loan for the first time. This impact might well make subprime borrowers more willing to accept less favorable terms as they become uncertain about the possibility of qualifying for a loan at all. As shown at the bottom of figure 15, 28 percent of subprime borrowers—more than five times the number of prime borrowers (5 percent)—were turned down at least once while trying to obtain their mortgage.

We also explored borrowers' perceptions of their credit situation. In general, we found that subprime borrowers felt less in control of their finances,

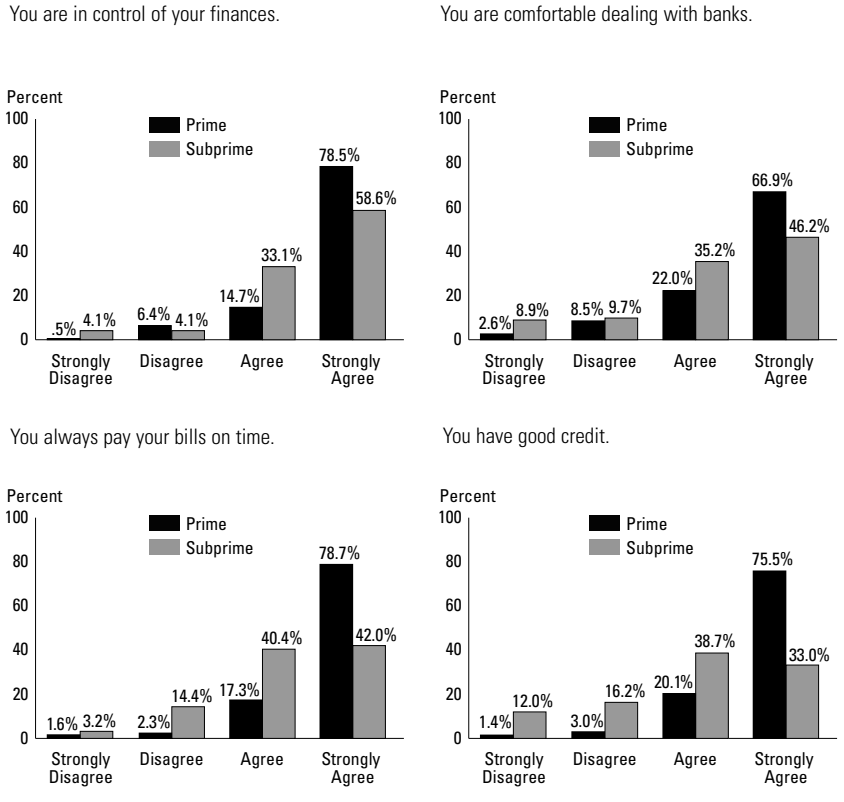
Figure 15. Application Hurdles



as would be expected given their lower FICO scores. As figure 16 indicates, when asked directly, subprime borrowers are somewhat less likely to respond affirmatively that they are in control of their finances and are comfortable dealing with banks. Most subprime borrowers report that they pay their bills on time and have good credit; however, 18 percent admit to tardy bill payments and 28 percent do not think they have good credit—some four to five times the share of prime borrowers who describe themselves this way.

Life disruptions appear to be at least one reason why subprime borrowers have worse credit records. As shown in figure 17, for instance, 30 percent of subprime respondents have incurred major medical expenses over the past few years, compared with 18 percent of prime respondents. Almost 23 percent of subprime borrowers have been through a major spell of unemployment, and nearly 32 percent have suffered a major decrease in income, some three times more than prime borrowers. Divorce is also slightly more prevalent among

Figure 16. Financial Attitudes and Perceptions



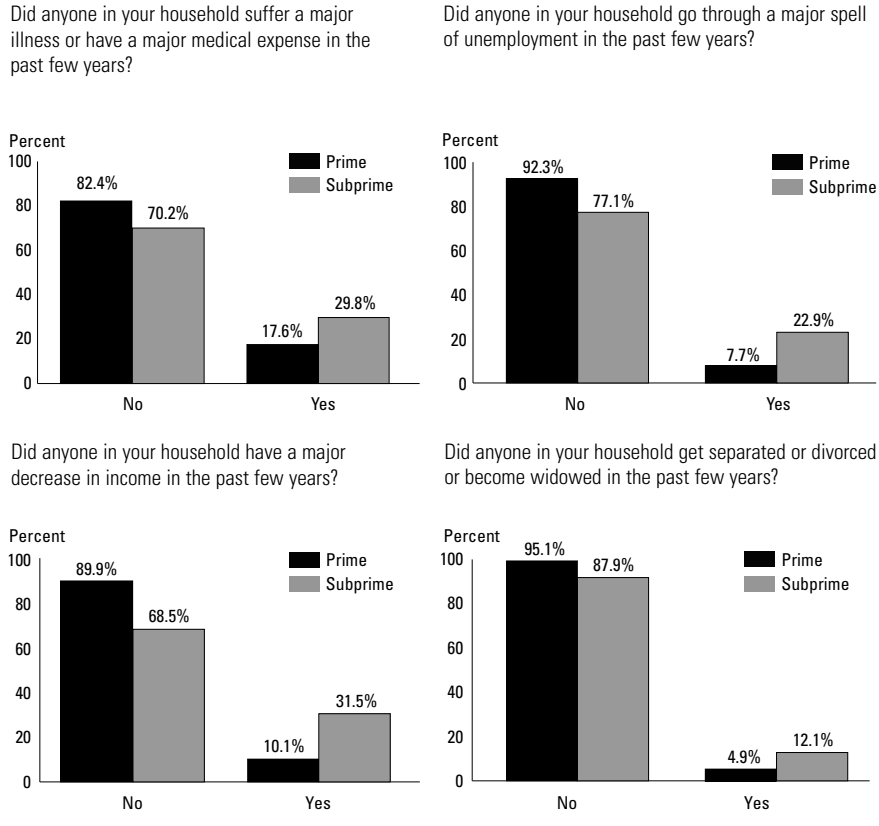
subprime borrowers—12 percent versus 5 percent—but this difference shrinks considerably after controlling for demographics.

Preparedness, search, and financial sophistication

Finally, we included several questions in our survey to assess borrowers' preparedness, search criteria, and financial sophistication. We find some significant and intriguing differences between prime and subprime respondents: Subprime borrowers tend to be less well informed about the mortgage origination process, search differently for their mortgages, and are somewhat less integrated into financial markets.

Figure 18 provides the responses to an array of questions that assess borrowers' preparedness for taking out a mortgage. On the whole, it shows that subprime borrowers tend to be somewhat less prepared than their prime counterparts. For instance, the 12 percent of subprime borrowers who admit

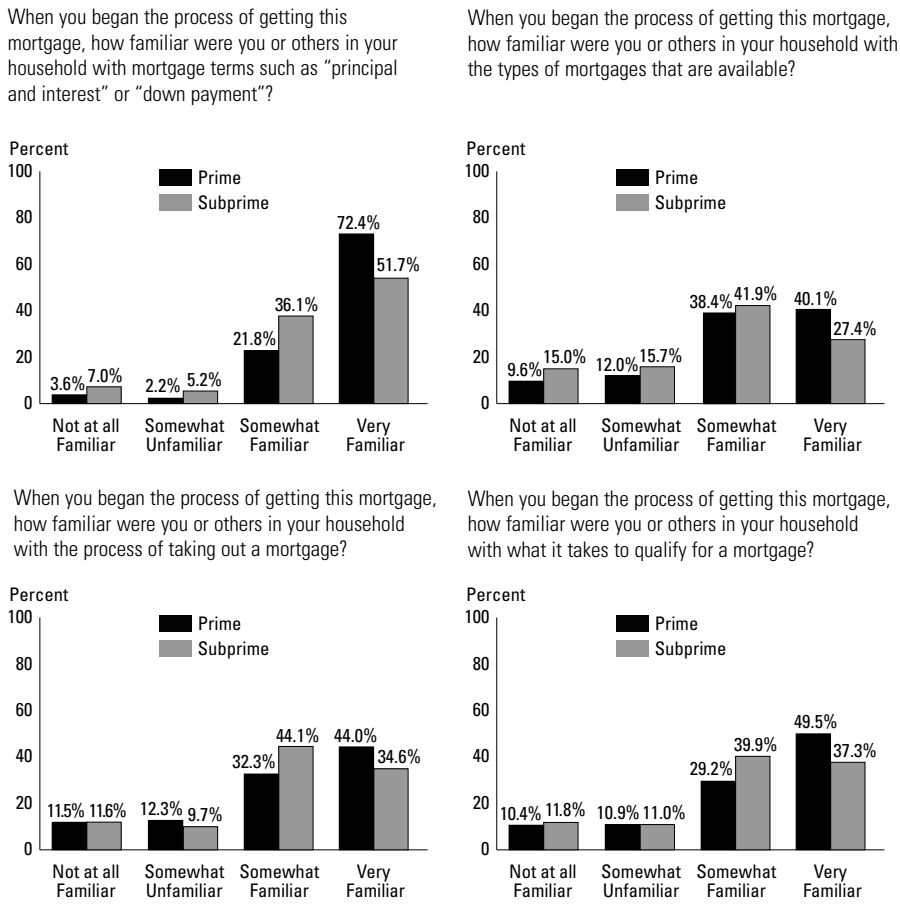
Figure 17. Life Disruptions



to being unfamiliar with common mortgage terms is double the share of prime borrowers with the same deficit. In addition, almost 31 percent of subprime borrowers say that they were unfamiliar with the types of mortgages available, compared with less than 22 percent of prime borrowers. Not all of the questions on preparedness, however, show such a gap between segments. For instance, before applying for their mortgage, 24 percent of prime borrowers report being unfamiliar with the process of taking out a mortgage, while only 21 percent of subprime borrowers respond similarly.

The differences in borrower preparedness cannot obviously be attributed to a lack of opportunity or experience because we control for those factors in our ordered logistic estimations of the responses and find that these estimations yield qualitatively the same results presented in figure 18. Moreover, as noted earlier, subprime borrowers disproportionately are refinancing a first mortgage, and less than 50 percent of subprime borrowers taking out a

Figure 18. Mortgage Preparedness

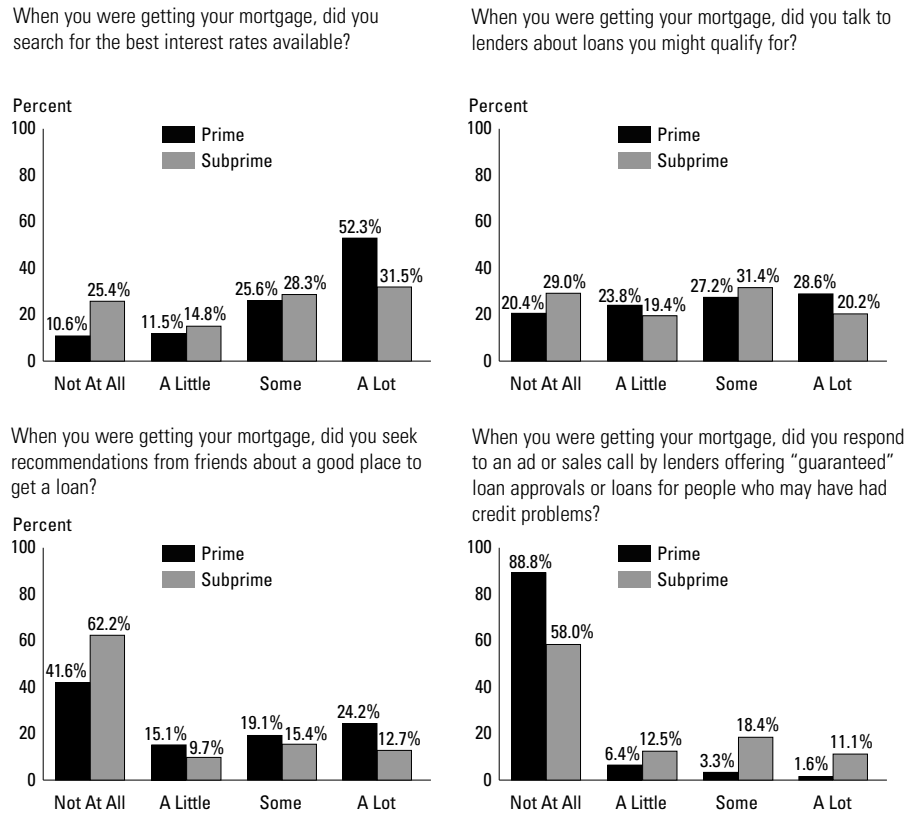


purchase money mortgage are first-time home buyers. Subprime borrowers, therefore, appear to be less prepared, despite the fact that 86 percent of them have been through the mortgage process at least once before, compared with 57 percent of prime borrowers.

Our focus groups suggested that prime and subprime borrowers use quite different search criteria in looking for a loan. Subprime borrowers search primarily for loan approval and low monthly payments, while prime borrowers focus on getting the lowest available interest rate. These distinctions are quantitatively confirmed by our survey.

Figure 19 shows the responses to four survey questions asking how borrowers searched for a lender. The striking difference is the degree to which they search for rates and the extent to which they look for guaranteed loan approvals. While 52 percent of prime borrowers say they searched "a lot" for

Figure 19. Search Behavior



the best interest rates available, only 31 percent of subprime borrowers say they searched that hard. Similarly, 11 percent of prime borrowers say they did not search for rates at all, but that number more than doubles to 25 percent for subprime borrowers. Subprime borrowers are also far more likely to respond to sales calls or ads from lenders offering guaranteed loan approvals—the percentage of subprime borrowers responding in varying degrees to these types of marketing ploys is six times the number of prime borrowers who responded (5 percent).

The differences along other search dimensions, however, are not nearly as striking. Prime and subprime borrowers appear to use roughly the same process to search; they just focus on different criteria.

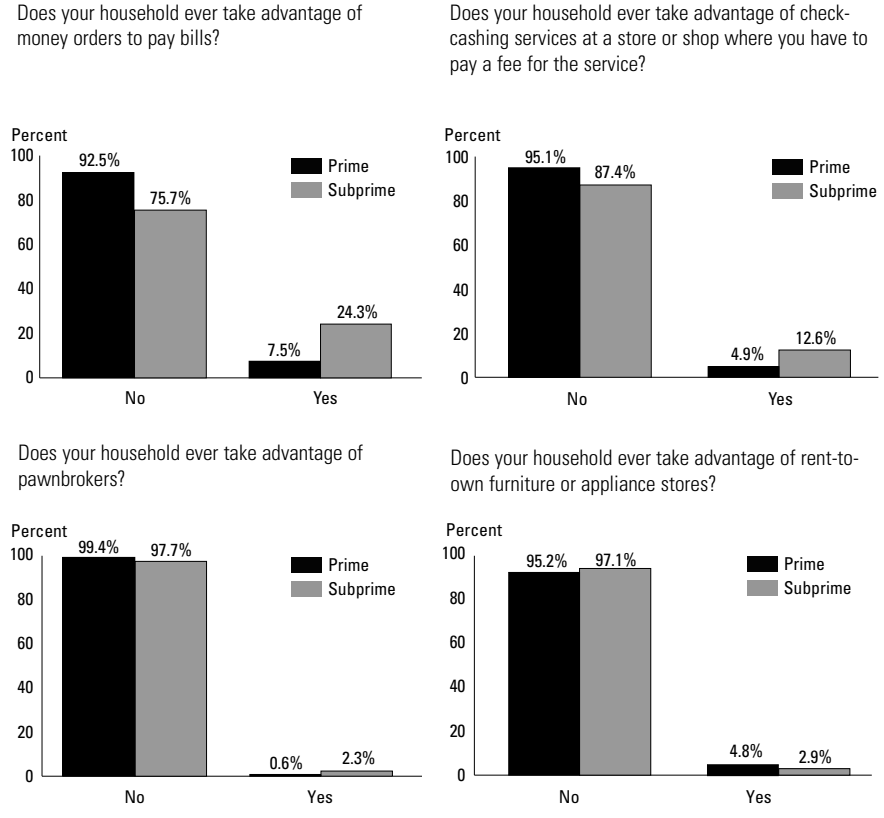
Finally, figure 20 reports on a series of questions in the survey that assess borrowers' financial sophistication and integration into financial markets. By

and large subprime borrowers appear less financially sophisticated, but the differences on this score are relatively small. The one area where a significant difference does exist is the use of money orders, which 24 percent of subprime respondents employ to pay some bills, while only 8 percent of prime respondents admit to this practice.

How well does the subprime market work?

In this section, we assess the efficiency of the subprime market sector in three ways. First, we attempt to more systematically determine the role of risk in explaining why borrowers end up in the subprime market. If the justification for this sector is to fund higher-risk mortgages, a finding that risk does not

Figure 20. Financial Sophistication



perfectly allocate borrowers between market segments is an indicator of some market inefficiency. Second, we explore whether subprime borrowers are satisfied with their mortgages and the service they receive from subprime lenders. Here we take significantly lower satisfaction on the part of subprime borrowers as an indicator of reduced efficiency relative to prime lending. Third, we consider the observed difference in interest rates across the two markets. We argue that subprime inefficiency is measured by the extent to which the price differential in interest rates cannot be explained by the costs of the higher credit risk borne by subprime lenders.

In all three instances, we find evidence supporting the view that subprime lending is inefficient relative to prime lending. Although none of these assessments is definitive by itself, to our minds the fact that all three indicators point in the same direction is relatively compelling.

Choice of market segment

The previous sections provide a range of reasons why borrowers might end up in the subprime sector. In this section, we discuss estimations designed to assess the qualitative importance of these factors. Our particular focus is on evaluating whether market bifurcation is solely determined by risk or whether there are other significant factors at play.

We estimate two logistic regression models, each predicting the probability that borrowers will end up in the subprime rather than the prime sector. The first model (the risk-only model) includes only risk measures—LTV ratio/FICO score, income ratio/payment ratio, product type, and loan purpose—as explanatory variables. This model allows us to independently assess the role that credit risk, as perceived ex ante by a typical underwriter, plays in predicting borrowers' choice of mortgage market segment. It also serves as a base case with which to compare the more inclusive second model. This model (the expanded model) adds borrower demographics and responses to key questions from the Gallup survey; many of these are factors that researchers have found ex post to affect default behavior. Comparing the two models allows us to assess the impact that factors other than the typical risk factors used by underwriters (e.g., demographics, knowledge, and education) have on predicting the choice of market segment.

The estimated coefficients of the two models are provided in figure 21.[15] The results clearly show that credit risk variables play a very significant role in

[15] To aid comparison across the models, we estimate the risk-only and expanded models on identical data, a total of 756 prime loans and 729 subprime loans, after accounting for missing variables. Both models are estimated using weighted regressions. The weights are calculated as the inverse of the sampling rates by loan purpose—with the geographic benchmarking to

explaining the allocation across market segments. Turning first to the risk-only model, all four of the variable groupings are statistically significant. Further, the structure of the coefficient estimates is largely consistent with the role of the variables in explaining risk. There are also large differences across the estimated coefficients, implying that the risk variables play an economically significant part in explaining the choice of market segment.

Within the LTV ratio/FICO score grouping, estimated coefficients increase almost perfectly monotonically with declining FICO scores after conditioning on LTV ratio. The coefficients do not increase so consistently with increasing LTV ratios, however, although there is a discernible upward trend after controlling for FICO score. The economic effects of these coefficients can also be quite large. For LTV ratios below 80 percent, moving from a FICO score above 750 to one below 580, all other things being equal, increases borrowers' odds of taking out a subprime mortgage 142 times.

The estimated coefficients for the income ratio/payment ratio grouping are quite reasonable as well. In particular, if the income ratio is held constant, there is a relatively consistent increase in the estimated coefficients as the payment ratio increases. The economic significance of these variables is not as large as it is for LTV ratio/FICO score, but they still have a large effect in explaining market bifurcation. At an income ratio of less than 80 percent of the area median, for example, increasing the payment ratio from under 19 percent to over 23 percent increases borrowers' odds of taking out a subprime mortgage by a multiple of 21.

Finally, both the product type and loan purpose variables are statistically significant and have coefficients that are consistent with a risk explanation for market bifurcation. All things being equal, the odds of obtaining subprime mortgages for borrowers taking out ARMs are one and one-half times higher than for their counterparts taking out fixed-rate mortgages. Likewise, all things being equal, borrowers refinancing for cash-out or rate and term reasons have, respectively, 64 and 10 times higher odds of taking out subprime

---

HMDA data also factored in—scaled so that the weights separately sum to the actual number of prime and subprime loans used in the estimation. We do not attempt to weight the observations to account for the "true" percentage of prime and subprime loans in the population, but rely instead on the general result that choice-based sampling of the sort employed here biases only the intercept. See, for example, Cosslet 1983. No adjustment is made to the standard errors and probabilities reported in figure 21 to account for the choice-based sampling (i.e., we use the observed rather than expected information matrix in computing the variance-covariance estimates). Moreover, we recognize that our reported coefficients are potentially biased because of problems of omitted variables, simultaneity, endogeneity, and/or self-selection. As a practical matter, there is little we can do about this except to appeal to our hope and belief that these issues are relatively benign in our application. For an analysis of the potential impact of such issues in the case of discrimination, see Yezer, Phillips, and Trost 1994.

Figure 21. Logit Model Coefficients

	Risk-Only Model			Expanded Model		
Variable	Coefficient	Standard Error	*p* Value	Coefficient	Standard Error	*p* Value
Intercept	–3.510	0.919	0.0001	–2.769	1.360	0.0417
LTV ratio/FICO score			0.0001			0.0001
LTV ≤ 79%						
FICO ≤ 579	3.695	0.931	0.0001	4.159	1.042	0.0001
FICO 580–619	3.373	0.956	0.0004	3.033	1.053	0.0040
FICO 620–679	2.337	0.940	0.0129	1.875	1.025	0.0672
FICO 680–749	0.954	0.956	0.3183	0.086	1.073	0.9363
FICO 750+	–1.261	1.047	0.2282	–0.908	1.132	0.4226
LTV 80–89%						
FICO ≤ 579	3.852	0.929	0.0001	3.457	1.043	0.0009
FICO 580–619	4.758	1.013	0.0001	4.635	1.128	0.0001
FICO 620–679	3.828	0.989	0.0001	3.211	1.089	0.0032
FICO 680–749	1.252	0.962	0.1931	1.403	1.068	0.1891
FICO 750+	1.335	1.009	0.1858	1.461	1.082	0.1767
LTV 90%+						
FICO ≤ 579	3.669	0.914	0.0001	3.021	1.004	0.0026
FICO 580–619	3.247	0.943	0.0006	2.400	1.033	0.0202
FICO 620–679	2.935	0.926	0.0015	2.248	1.017	0.0271
FICO 680–749	1.422	0.945	0.1324	1.491	1.033	0.1488
FICO 750+	0	0		0	0	
Income/Payment ratios			0.0001			0.0061
Income ratio 0–80%						
Payment 0–18%	0.107	0.272	0.6939	–1.189	0.423	0.0049
Payment 19–22%	0.557	0.640	0.3844	–0.572	0.800	0.4743
Payment ≥ 23%	3.146	0.689	0.0001	1.546	0.804	0.0547
Income 81–120%						
Payment 0–18%	–0.376	0.275	0.1713	–1.054	0.383	0.0059
Payment 19–22%	–0.172	0.356	0.6295	–0.637	0.501	0.2039
Payment ≥ 23%	0.863	0.433	0.0462	0.401	0.520	0.4410
Income ≥ 121%						
Payment 0–18%	–0.287	0.276	0.2983	–0.410	0.353	0.2451
Payment 19–22%	–0.601	0.368	0.1023	–0.536	0.448	0.2316
Payment ≥ 23%	0	0		0	0	
Product type			0.0361			0.0041
Fixed rate	–0.394	0.188	0.0361	–0.716	0.249	0.0041
Adjustable rate	0	0		0	0	
Loan purpose			0.0001			0.0001
Cash-out refinance	4.164	0.290	0.0001	3.741	0.367	0.0001
Rate/Term refinance	2.270	0.267	0.0001	1.976	0.345	0.0001
Purchase mortgage	0	0		0	0	
Race/Ethnicity						0.2350
Black				0.549	0.425	0.1958
Asian/Pacific Islander				–1.009	0.893	0.2581
Hispanic				–0.308	0.443	0.4864
American Indian				–0.901	0.745	0.2268
Other minority				1.437	1.241	0.2468
White				0	0	
Age of borrower						0.0002
18–34				–1.613	0.605	0.0077
35–44				–0.043	0.538	0.9361
45–54				–0.006	0.528	0.9906
55–64				0.172	0.549	0.7540
65 and older				0	0	
Gender						0.1942
Male				–0.301	0.231	0.1942
Female				0	0	
Level of education						0.0464
Some schooling				1.597	1.113	0.1511
High school graduate				0.502	0.229	0.0285
College graduate				0	0	

Figure 21. Logit Model Coefficients *continued*

	Risk-Only Model			Expanded Model		
Variable	Coefficient	Standard Error	*p* Value	Coefficient	Standard Error	*p* Value
Home-buyer status						0.4430
First-time home-buyer				0.247	0.322	0.4430
Repeat or refinance				0	0	
Neighborhood percent minority						0.9326
= 10%				−0.057	0.501	0.9086
11–30%				−0.020	0.475	0.9659
31–50%				−0.293	0.551	0.5944
51–100%				0	0	
Neighborhood income						0.1310
= 80% of median				0.915	0.422	0.0301
81–100% of median				0.154	0.299	0.6058
101–120% of median				0.420	0.301	0.1634
> 120% of median				0	0	
Asked to pay off debts?						0.0291
Yes				0.415	0.190	0.0291
No				0	0	
Any lender turn you down?						0.0001
Yes				1.414	0.259	0.0001
No				0	0	
In control of finances?						0.5162
Strongly disagree				0.447	0.670	0.5051
Disagree				−0.570	0.444	0.1989
Agree				0.008	0.204	0.9678
Strongly agree				0	0	
Comfortable w/banks?						0.9151
Strongly disagree				−0.023	0.352	0.9471
Disagree				0.173	0.332	0.6024
Agree				0.113	0.204	0.5800
Strongly agree				0	0	
Major medical expenses?						0.0586
Yes				0.405	0.214	0.0586
No				0	0	
Major decrease in income?						0.1421
Yes				0.319	0.217	0.1421
No				0	0	
Familiar w/mortgage types?						0.0359
Not familiar				0.539	0.319	0.0905
Somewhat unfamiliar				0.526	0.288	0.0679
Somewhat familiar				−0.117	0.217	0.5909
Very familiar				0	0	
Search for best rates?						0.0172
Not at all				0.780	0.246	0.0015
A little				0.333	0.267	0.2115
Some				0.324	0.216	0.1326
A lot				0	0	
Respond to ad or sales call for guaranteed approval?						0.0001
Not at all				−1.340	0.430	0.0018
A little				−0.460	0.521	0.3772
Some				−0.214	0.488	0.6602
A lot				0	0	
Use money orders for bills?						0.3673
Yes				0.218	0.242	0.3673
No				0	0	

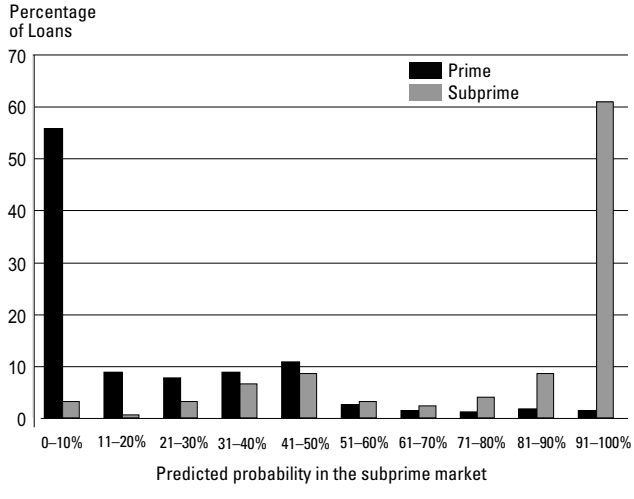
mortgages than those getting a purchase money mortgage.

The top panel of figure 22 provides four goodness-of-fit statistics for the risk-only model—the log-likelihood from the estimation and three methods of comparing the model's predicted probabilities with the market segment from

Figure 22. Fit of Logit Models

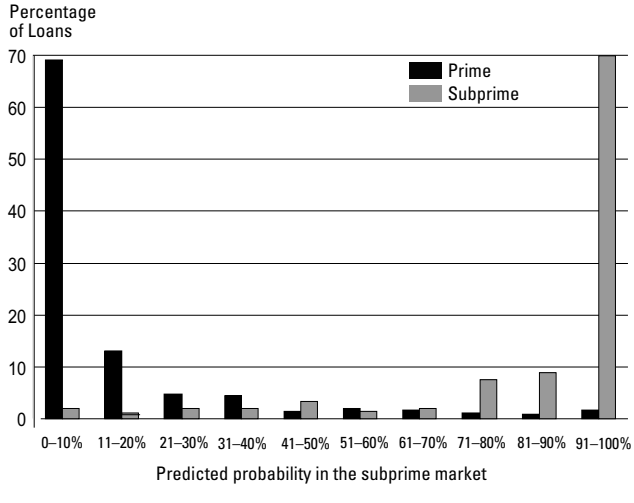
Risk-Only Model

Log likelihood statistic	–475.49
KS statistic	72.13
Mean predicted probabilities	
prime loans in prime market	80.30
subprime loans in subprime market	79.57



Expanded Model

Log likelihood statistic	–330.93
KS statistic	84.61
Mean predicted probabilities	
prime loans in prime market	87.37
subprime loans in subprime market	86.90



which the loans actually came.[16] All three methods show that the risk-only model does a good job distinguishing between prime and subprime borrowers.

The Kolmogorov-Smirnov (KS) statistic, for example, is a measure of the difference in the cumulative density functions (CDFs) of the predicted probabilities for prime and subprime borrowers. A well-fitting model will assign subprime borrowers high probabilities of being in the subprime market segment and prime borrowers low probabilities of being in the subprime market segment. The prime and subprime CDFs, therefore, will have little overlap, resulting in a large KS statistic. A value of 72.13 indicates that the CDFs are quite distinct and that the predicted probabilities of the risk-only model are very good at separating prime and subprime borrowers.[17]

A more direct way of comparing the risk-only model with actual outcomes is to see how consistently it predicts that subprime loans come from the subprime segment and prime loans come from the prime segment. This metric, too, suggests that the risk-only model does a good job of predicting. For example, it predicts on average that prime loans have an 80 percent probability of being in the prime segment and that subprime loans also have nearly an 80 percent probability of being in the subprime segment.

Histograms accompanying the statistics in the top panel illustrate this point more graphically. Clearly, the risk-only model recognizes prime loans and correctly assigns them low probabilities of coming from the subprime segment, while simultaneously assigning subprime loans high probabilities. For example, more than one-half—55.7 percent—of the prime loans in the sample are predicted to have less than a 10 percent probability of coming from subprime lenders or, alternatively, a greater than 90 percent probability of being prime loans. Likewise, more than three-fifths—60.8 percent—of the subprime loans are given a greater than 90 percent probability of being in the subprime market segment.[18]

---

[16] While other goodness-of-fit measures are sometimes used in the literature, the measures provided are, at least in our view, the most intuitive and revealing for analyzing how well the estimation performs.

[17] At the extremes, a model providing no predictive power has a KS statistic of 0, and a model that perfectly predicts the data has a KS statistic of 100. In the scoring literature, where KS statistics are used extensively in a relatively similar manner, "acceptable" models will typically have values above 30, and "good" models will have values greater than 50.

[18] The histograms are discrete representations of the probability density functions (PDFs) of the predicted probabilities from the model (i.e., representations of the PDFs underlying the CDFs used to compute the KS statistic). If the risk-only model perfectly fit the data, it would predict that 100 percent of the prime loans had a 0 to 10 percent probability of being subprime and that 100 percent of the subprime loans had a 91 to 100 percent probability of being subprime. Alternatively, if predictions of the model were entirely unrelated to how loans were

The risk-only model presented here, of course, does not perfectly capture the role that risk plays in allocating borrowers between the prime and subprime segments, and two caveats are worthy of particular note. First, our model focuses on default risk. Prepayment speeds among prime and subprime borrowers, however, may differ in either direction, potentially affecting the risks borne by lenders/investors. To the extent that prepayment risk is not fully captured by the variables in the model, its impact on the allocation of borrowers across the two markets is overlooked.

Second, although the risk-only model includes the key variables used by underwriters in assessing risk, it does not include a risk assessment measure per se. This has two implications. From one perspective, the model is specified as a relatively simplistic function of LTV ratio, FICO score, income and payment ratios, loan type, and loan purpose. Underwriters and underwriting models almost certainly look at more variables and more complicated relationships among the variables when assessing risk. From this perspective, our model is likely to imperfectly measure risk and underestimate its role in allocating borrowers to submarkets.

On the other hand, however, the coefficients on the risk variables included in the model are adjusted by the estimation process to best fit the allocation of borrowers, rather than being set by the underwriting process (i.e., outside the estimation) in a way that best explains ex ante perceptions of risk. From this second perspective, our model may provide too many degrees of freedom to the risk variables and may give too much weight to their role in assigning borrowers to particular segments.

Despite these concerns, we believe that our model reasonably and accurately captures the role of risk as perceived ex ante by typical underwriters. We have included the key variables typically used in the underwriting process, and the estimated coefficients are by and large consistent with each variable's commonly held role in risk assessment. Moreover, as expected, the model does a good job of explaining why some borrowers get prime loans and others end up in the subprime sector.

We now turn to the role of variables other than those directly associated with risk as assessed by underwriters. The expanded model adds to the risk-only model variables accounting for borrowers' demographics, preparedness, search behavior, and financial integration. Many of these additional variables have a significant role in explaining market bifurcation.

---

actually distributed across the market segments (i.e., the risk-only model did not explain anything), then prime and subprime borrowers would both be distributed uniformly at 10 percent across the probability deciles.

The estimated coefficients of the expanded model are shown in the three right-hand columns of figure 21. Comparing the two models shows that including additional variables in the estimation does not significantly diminish the statistical importance of the risk variables. Their practical importance in explaining the allocation of borrowers, however, is somewhat reduced. For example, for income ratios below 80 percent, increasing the payment ratio from under 19 percent to over 23 percent increases borrowers' odds of taking out subprime mortgages by 15 times, all other things being equal, rather than the 21 times estimated in the risk-only model. Similar reductions in impact hold true for most of the other risk variables.[19]

We also find evidence that factors other than risk are significant in explaining why borrowers end up with subprime mortgages. In particular, we find that age and level of education, as well as being asked to pay off debts, being turned down by a lender, being less familiar with mortgage types, searching little for the best rates, and responding to an offer of guaranteed loan approval, all statistically increased the probability of getting a subprime mortgage. On the whole, however, the contribution of these additional factors to the probability of receiving a subprime loan is smaller than the role played by the risk variables. For example, age has one of the largest impacts of all the nonrisk variables, and all things being equal, borrowers 65 or older have five times the odds of taking out a subprime mortgage as those under 35. A similar-sized impact is obtained from not graduating from high school rather than attaining a college degree. Being turned down by a lender or responding to offers of guaranteed approval "a lot" rather than "not at all" are also important; all other things being equal, each of these would quadruple the odds of taking out a subprime mortgage.

Of perhaps equal interest are the variables that do not have any statistical impact. For example, despite the relatively strong bivariate relationship illustrated in figure 7, borrower race/ethnicity is not significant in a multivariate framework that controls for other factors. Neither is gender, first-time homeowner status, or any neighborhood characteristics. Likewise, none of the variables representing financial attitudes or control appear to significantly affect the probability of entering the subprime sector.

[19] This occurs, presumably, because at least a few of the additional variables in the expanded model are somewhat, although not entirely, correlated with the risk variables. Excluding from the estimation the variables most likely correlated with risk—asked to pay off debts, turned down by a lender, and responding to an offer of guaranteed loan approval—moves the estimated coefficients on the risk variables closer to those found in the risk-only model but does not affect the qualitative results.

The total picture presented by the expanded model is rather complex. Overall, a lack of financial preparedness seems to increase the probability of ending up with a subprime mortgage. But not all the measures of this characteristic have a statistically significant impact. Nor do related variables measuring financial sophistication and experience seem to matter much.

Despite this somewhat mixed message, the lower panel of figure 22 shows that adding the demographic and other variables significantly improves the model fit. The KS statistic of the expanded model increases to 84.61. The expanded model is also clearly better able to correctly assign probabilities. On average, it predicts that prime loans have an 87 percent probability of being in the prime sector and that subprime loans also have nearly an 87 percent probability of being in the subprime sector. And as illustrated by the histograms, more than two-thirds of the prime loans in the sample—69.0 percent—are predicted to have more than a 90 percent probability of being in the prime sector, and a similar percentage of the subprime loans—70.0 percent—are given a 90 percent or greater probability of being correctly placed.

In summary, we draw two main conclusions from our estimations of the risk-only and expanded models. First, risk is clearly the single most important determinant of why borrowers end up with subprime loans. The good fit of the risk-only model and the continued high importance of the risk variables in the expanded model illustrate this point. Second, variables other than those that appear directly related to risk as perceived ex ante by typical underwriters have an impact in explaining the allocation of borrowers between the two market segments. This is illustrated by the improved fit of the expanded model.

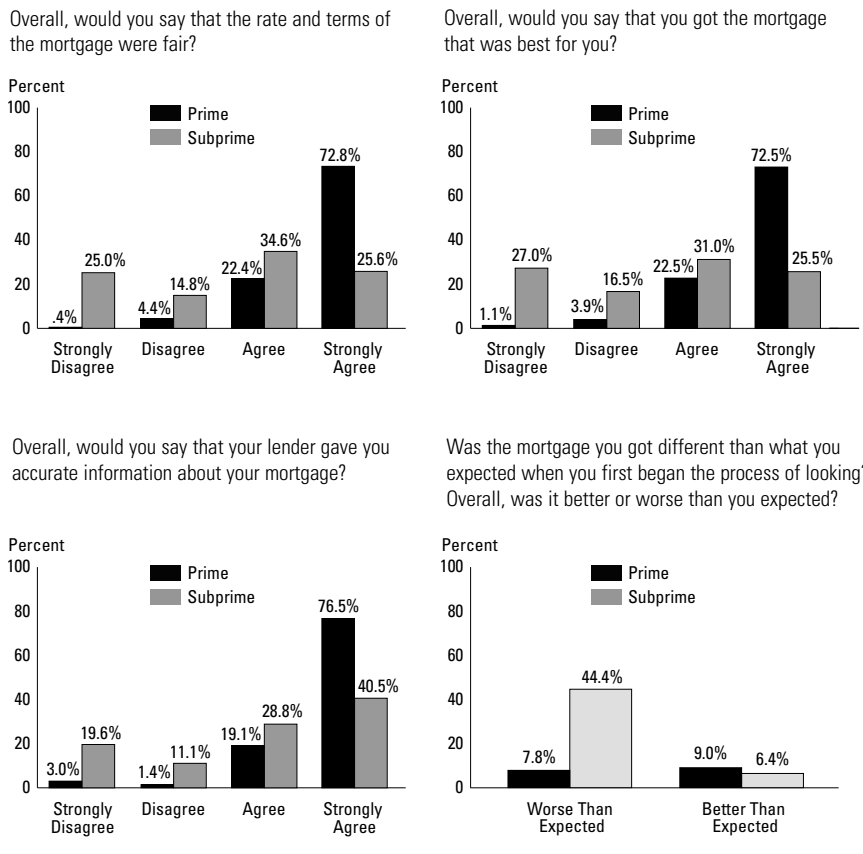
Our second conclusion in particular raises questions about the efficiency of the allocation of borrowers. If subprime lending and its higher interest rates and fees are to be justified on the basis of serving higher-risk borrowers, a finding that some borrowers end up with subprime loans for reasons other than risk as perceived ex ante by underwriters is disturbing. Admittedly, there is not always a clear distinction between risk-related and non-risk-related variables, and our results, therefore, are by no means conclusive. Nonetheless, our estimates raise concerns about the efficient bifurcation of the market.

Borrower satisfaction

In this section, we address the level of service received by borrowers from lenders in the prime and subprime segments. Efficient markets serve their customers well, and the high quality of service should manifest itself in high levels of customer satisfaction. A different finding provides some evidence of inefficiency.

Our survey asked borrowers an array of questions about how satisfied they are with their mortgage and the mortgage origination process. Figure 23 shows that subprime borrowers are dramatically less satisfied with the service they received from lenders than prime borrowers are. For instance, 40 percent of subprime borrowers disagree that the rate and terms of their mortgages are fair; this is some eight times the number of prime borrowers who feel this way. More than two-fifths of subprime borrowers do not think they got the mortgage that was best for them, nearly nine times more than prime borrowers who express this kind of discontent. Some 31 percent of subprime borrowers do not think that lenders gave them accurate information about their mortgage, nearly seven times more than prime borrowers who feel this way.

Figure 23. Borrower Satisfaction



Note: Responses of "not different" or "neither better nor worse" are accounted for in the percentages but are not included in the bars of the graph.

A standard measure of satisfaction is to gauge the product or service people receive against their expectations. On this dimension as well, the subprime sector dramatically underperforms. More than 40 percent of subprime borrowers indicate that the mortgage they got is worse than they expected, almost six times the number of prime borrowers who feel this way (8 percent).

Subprime borrowers are clearly less satisfied with their experiences with lenders than prime borrowers are. If both segments were operating well, we would expect lenders in each sector to serve their customers similarly well. Indirect evidence that subprime borrowers are far less satisfied is another indication of the relative inefficiency of subprime lending.

Efficient pricing

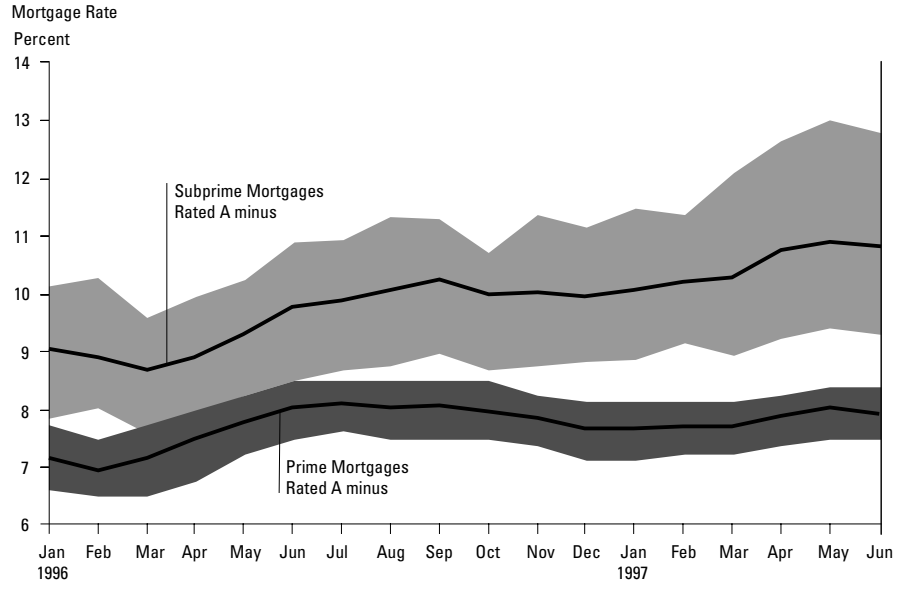
Efficiency of pricing in subprime lending can be gauged in terms of the relative gap between the two sectors in price and the costs of risk. If the market is efficient, the differential between prime and subprime interest rates should be explained by differences in the cost of credit risk. In this section, we hold as many such factors as possible "constant" and see whether we can fully explain the differential.

Figure 24 compares prime and subprime monthly mortgage rates between January 1996 and June 1997. The prime loans included in the analysis are mortgages purchased by Freddie Mac and scored as A– by an internal underwriting model.[20] The subprime loans are mortgages included in subprime pools purchased by Freddie Mac and scored as A– by the subprime lenders originating them. All loans in both sets consist of first-lien, 15-year, fixed-rate refinancings. For each set of mortgages, three lines are plotted, representing the 10th percentile, mean, and 90th percentile of interest rates for originations in that month.

The difference in the mean mortgage rates for these apparently similar products averages more than two percentage points (215 basis points) over the period studied, and the 80 percent range in values (the range between the 10th and 90th percentiles) for the two markets is quite distinct. It is also worth

[20] This underwriting model could not be used to create a summary risk measure for our logistic regressions because it is not designed to finely differentiate among the various grades of subprime mortgages. Clearly, however, differences in underwriting methods (by lenders or through Freddie Mac's Loan Prospector model) may result in variations of what is defined to be an A– loan. We attempt to address this heterogeneity directly by adjusting for observed differential default costs between these two groups of loans.

Figure 24. Comparison of Mortgage Rates



Note: Solid, bold lines are mean origination rates. Shaded areas indicate the range encompassing 80 percent of the rates. Origination rates are for mortgages of equivalent characteristics and risks.

noting that the range is greater for the subprime mortgages, indicating more variability in pricing.

Despite these attempts to control for factors affecting risk, part of this 215 basis point difference in rates may still be explained by credit risk heterogeneity among these A– loans. Unlike A loans, which all have relatively similar credit risk, there appear to be widely varying risk characteristics among A– mortgages. Internal and proprietary Freddie Mac research has found, for example, that among similarly graded loans from prime and subprime lenders, loans from subprime lenders often default at rates three to four times those from prime lenders. Assuming that this is the case here can account for up to roughly 90 basis points of the 215 basis point rate difference.[21]

Servicing subprime loans is also thought to be more costly. Conversations with industry experts suggest that this could account for up to an additional 25 basis points. Summing these two factors explains slightly more than one

[21] This number is obtained by tripling the estimated default costs obtained from Freddie Mac's internal costing model for a typical A– product. These costs include estimates for capital.

percentage point (115 basis points) of the rate differential, but leaves unexplained an additional one percentage point (100 basis points). It appears, therefore, that roughly one-half of the interest rate premium paid by subprime borrowers—100 basis points—cannot easily be explained by the higher levels of risk associated with these types of loans.

Moreover, this analysis does not make any attempt to account for or measure the higher average origination points and fees paid by subprime borrowers (see figure 3 and the related discussion). These are costs paid by subprime borrowers that will add to the amount and proportion of the pricing differential that is not risk based. The total prices charged to subprime borrowers (rates, points, and fees) are, therefore, likely in excess of the amounts that can be justified by their differentially higher credit risk. This finding again suggests possible inefficiency in the subprime sector.

Conclusions and implications

Subprime lenders are actively engaged in what is arguably the most vital component of America's housing finance system—first-lien mortgages. Our data clearly demonstrate that subprime borrowers are accurately characterized as having higher credit risk. We also find, however, that subprime borrowers are more likely to come from a protected class or underserved population, are less familiar with the mortgage process, and are less likely to search for the best interest rate when seeking a mortgage. Subprime borrowers, in short, are borrowers for whom there is a concern and presumption that market outcomes may not be the most desirable (i.e., in addition to having higher credit risk, subprime borrowers are at risk from a public policy perspective).

Our assessment of the empirical evidence is that this concern has some validity. All three of our measures of relative efficiency suggest that subprime lending may not perfectly assess or price risk. As noted above, these measures are by no means perfect. We find it compelling, however, that they offer a common implication that current market outcomes may not be serving subprime borrowers well.

It is difficult, if not impossible, to accurately assess the competitive nature of an industry solely on the basis of focus groups and surveys. Casual observation suggests that there is aggressive competition in the prime and subprime sectors of the market. Both subprime borrowers and lenders, however, say in focus groups that competition in this segment is more for customers than over rates and fees. It is also readily apparent that subprime lenders are willing to spend a great deal of money originating mortgages (e.g., on sales calls, direct mail, advertising, and brokers' fees). This, combined with the recent history of

market entry and consolidation, provides additional circumstantial indications that, at least in 1997, the subprime sector generated economic rents for either the lenders or brokers who originated the loans.

Subprime lending has a far more heterogeneous market structure than prime lending. Certainly, many subprime lenders match their prime counterparts in sophistication and integrity, while others have been charged with abusive and predatory practices. Nor is there the overall standardization of products, underwriting, and delivery systems in subprime markets that is found among prime lenders. Increasing price competition in the subprime sector, enhanced by the recently more aggressive entry of prime market participants, may change this.[22] We see the possibility, therefore, that future subprime borrowers will benefit from better service and lower rates and fees.

Authors

Howard Lax is vice president at Opinion Research Corporation. Michael Manti is a senior economist at Freddie Mac. Paul Raca is a statistician at Equitec. Peter Zorn is vice president of Housing Economics at Freddie Mac.

We owe an important debt to Mary Bilinski and Susan Gates for their valuable contributions to this project. We also benefited from the helpful comments of Vijay Bhasin, Marsha Courchane, Thomas Holloway, Faith Schwartz, John Straka, and Michael Robar. Any remaining errors are, of course, ours alone. Moreover, the views expressed in this article are ours and in particular do not necessarily represent the views of Freddie Mac or its Board of Directors.

References

B&C Market Posts Record Year in '97 as Originations Hit $125B. 1998. *Inside B&C Lending* 3(1):1.

Bradford, Calvin. 2002. *Risk or Race? Racial Disparities and the Subprime Refinance Market*. Washington, DC: Center for Community Change.

Cosslet, Stephen. 1983. Efficient Estimation in Discrete-Choice Models. In *Structural Analysis of Discrete Data with Econometric Applications*, ed. Charles Manski and Daniel McFadden, 51–111. Cambridge, MA: MIT Press.

Courchane, Marsha J., Brian J. Surette, and Peter M. Zorn. 2004. Subprime Borrowers: Mortgage Transitions and Outcomes. *Journal of Real Estate Finance and Economics* 29(4), forthcoming.

[22] In fact, the January 31, 2000, issue of *Inside B&C Lending* quotes Prudential Securities as suggesting that the "increased participation by Fannie Mae and Freddie Mac in the [home equity] market will help compress spreads" ("HEL ABS Market Set to Grow" 2000, 2).

Fed Levies $70 Million Fine against Citi Supreme Unit. 2004. *Inside B&C Lending* 9(11):6–7.

Harvey, Keith, and Peter Nigro. 2004. Do Predatory Lending Laws Influence Mortgage Lending? An Analysis of the North Carolina Predatory Lending Law. *Journal of Real Estate Finance and Economics* 29(4), forthcoming.

HEL ABS Market Set to Grow in 2000, Up to $75 Billion Projected. 2000. *Inside B&C Lending* 5(2):2.

Pennington-Cross, Anthony, Anthony Yezer, and Joseph Nichols. 2000. Credit Risk and Mortgage Lending: Who Uses Subprime and Why? Working Paper No. 00–03. Research Institute for Housing America.

Weicher, John. 1997. *The Home Equity Lending Industry: Refinancing Mortgages for Borrowers with Impaired Credit*. Indianapolis: Hudson Institute.

Yezer, Anthony, Robert Phillips, and Robert Trost. 1994. Bias in Estimates of Discrimination and Default in Mortgage Lending: The Effects of Simultaneity and Self-Selection. *Journal of Real Estate Finance and Economics* 9(3):197–216.