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# Consumer Credit Risk and Pricing

**Previous academic studies viewed borrower rejection as a sign of market imperfections in the consumer credit markets, but this view was based upon the assumption that differences in the levels of borrower creditworthiness could not be accurately identified. Today, it is possible to differentiate between types of borrowers, and riskier borrowers can participate in credit markets if they are willing to pay relatively higher borrowing costs. Hence, a more critical issue concerning the performance of these markets should be whether loan prices correctly reflect the level of borrower credit risk. This paper reexamines consumer participation in credit markets looking specifically at issues related to the pricing of borrowers of different credit risk.**

While an extensive academic literature examines the problem of limited household credit access, consumer credit use has increased significantly for almost two decades. During the late 1980s, researchers such as Luckett (1986) and Canner, Fergus, and Luckett (1988) were already discussing the various innovations in consumer credit markets that made it easier for consumers to finance their expenditures with credit. Automated credit scoring, the growth of asset securitization, and more flexible underwriting standards have encouraged greater competition among lenders to supply credit during the 1990s. Several years of robust economic growth have also stimulated the demand for all forms of credit. Although both supply and demand factors have led to rising mortgage, automobile, and revolving debts, substantially more research has been conducted on consumer credit constraints, while surprisingly very little attention has been given to the increase in credit access.

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This paper reexamines issues related to consumer credit market participation. Due to the lack of available repayment information, previous empirical studies could not distinguish between high- and low-risk borrowers and treated all rejected borrowers as "credit constrained." Moreover, the conventional wisdom view suggested that borrowers faced credit constraints because lenders did not have enough information to correctly assess credit risk. However, lenders do have information concerning borrower repayment history that can be used to price credit risk. The 1998 and 2001 Surveys of Consumer Finances (SCFs) also now include questions that can distinguish between differences in household credit quality.[1] Therefore, the first objective of this research is to investigate whether high–credit risk households do in fact account for most credit denials. If borrowers who traditionally would have been considered credit constrained are shown to lack creditworthiness based upon their observable loan repayment histories, then these rejections are not indicative of credit market inefficiencies.

A second objective of this research is to gain more insight into the pricing patterns of loans in consumer credit markets. Rather than face rejection, high-risk households can participate in credit markets if they are willing to pay higher rates to compensate lenders for the additional risk. However, some borrowers having *different* levels of credit risk pay *similar* costs, and vice versa. If borrowers of high and low credit quality pay similar prices for credit or, conversely, borrowers with very similar credit quality characteristics obtain a wide range of credit prices and terms, then such findings may serve as better indicators of consumer credit market failures possibly arising from discrimination and/or predatory lending. For this reason, credit pricing is a more relevant issue today than credit rejection.

## LITERATURE REVIEW

A large literature has tested for capital market imperfections by seeking evidence that households face liquidity or credit constraints. Research studies, such as Jappelli (1990), Canner, Gabriel, and Woolley (1991), Cox and Jappelli (1993), and Duca and Rosenthal (1993), have relied on questions from the 1983 SCF.[2] All these studies find the presence of consumer credit market imperfections. Jappelli (1990) specifically found that black and Hispanic, single, renter, and young households are more likely to be denied credit and should be considered credit constrained. This literature presumes that market imperfections arise because the future income prospects of some borrowers are unobservable by creditors. In fact, the theoretical credit-rationing literature models lenders as being apprehensive about granting credit to applicants willing to pay relatively higher loan rates

because this serves as an admission of greater credit risk. Therefore, credit supply curves bent backward after loan rates climbed above market equilibrium because rational lenders would not make such risky loans at abnormally high rates.[3] By relying upon this theoretical framework, researchers treated all rejected applicants as if they were credit constrained. Furthermore, the 1983 SCF did not contain questions about loan repayment behavior. Hence, academic researchers could not distinguish between borrowers denied credit because they lacked creditworthiness from those who were denied as a result of an asymmetric information problem.

Cutts, Van Order, and Zorn (2000) developed a theoretical framework in which lending markets expand as more information about borrowers becomes available. Recent improvements in credit scoring that provide lenders with information to distinguish between high– and low–credit quality borrowers make this framework relevant for today's modern credit markets. This model predicts that *fewer* borrowers should be denied credit access since lenders can segment them into different markets and charge riskier groups higher rates to compensate for the possibility of poor payment performance.[4] Under this framework, different treatment of borrowers in terms of credit availability and rates charged should be viewed as evidence of *well-functioning* consumer credit markets since borrowers do not exhibit homogeneous loan repayment behavior.

Economists have shown interest in finding evidence of risk-based pricing. For example, Duca and Rosenthal (1994) investigated whether mortgage rates were influenced by observable differences in household default characteristics. They concluded that lenders do not vary rates across borrowers on the basis of differences in credit risk. Of course, the authors, using the 1983 SCF data, were limited to a question that asked households if their loan payments in the past year were paid as scheduled or "sometimes made later or missed." Because this question does not adequately distinguish respondents with severe repayment problems from those who may have simply forgotten to mail the regular payment on time, it was difficult to find empirical evidence for risk-based pricing. Consequently, very little research on risk-based pricing in consumer credit markets exists since credit history information was (and still is) largely proprietary and unavailable to academics.

The more recent SCFs contain better questions for identifying high–credit risk households, so this source of publicly available data is more useful for studying credit pricing. Edelberg (2003) uses the SCFs from 1989 through 1998 to construct interest rate risk premiums paid on mortgage and automobile loans over time. She demonstrates that both interest rate premiums and debt levels have risen since the 1995 SCF, which is consistent

with the Cutts, Van Order, and Zorn theoretical framework and the emerging practice of risk-based pricing. However, her research does not directly address whether the lack of borrower information or lack of creditworthiness is important for explaining credit rejections.

Hogarth and Hilgert (2002) use the 1995 and 1998 SCFs to look at the profile of borrowers who pay mortgages with very high rates of interest. They found that older, minority, low-income, and limited-educated respondents were more likely to hold high–interest rate home loans; and many of these consumers used high-rate loans for debt consolidation. However, this study was limited to home loans, and the authors also admitted to having problems with low sample size.

This study contributes to the literature in several ways. First, this study illustrates the usefulness of combining *two* SCF data sets to obtain larger sample sizes. Information from both 1998 and 2001 SCFs is used to observe loan-pricing patterns in the collateralized credit (mortgage and automobile) and credit card markets. The larger sample sizes will increase the reliability of descriptive and multivariate tests. Second, this study takes advantage of questions in the recent SCF to identify households with more severe delinquency problems and proxy for poor credit history. With this proxy, credit rejections are reexamined to see if creditworthy borrowers face binding credit constraints or if these rejections are justified given the information on borrower creditworthiness (or lack thereof). Third, after demonstrating that most credit denials can be justified on the basis of credit quality, consumer participation in various credit markets will be evaluated by observing credit pricing patterns and anomalies. Certain pricing anomalies may now serve as better indicators of credit market inefficiencies.

## ARE REJECTED HOUSEHOLDS GENERALLY LESS CREDITWORTHY?

Are rejected applicants really credit constrained or simply less creditworthy? A study on credit market accessibility and rejection must incorporate information about borrower repayment history and whether increases in payment obligations will add financial stress on the borrower. Previous delinquency problems and/or greater financial stress justify credit rejections. Hence, rejected borrowers of lower credit quality should not be described as credit constrained.

The 1998 and 2001 SCFs have been combined in this study to obtain an adequate sample size. Fewer than 200 households in either the 1998 or the 2001 SCF reported having severe delinquency problems (which will be defined below). When separated by credit type, the number of observations

drops considerably. Therefore, combining the surveys will increase the reliability of the empirical findings and should pose no problems since the economic environment over 1996–2000 was characterized by steady growth. According to the National Bureau of Economic Research, the recession following the historic 10-year expansion did not start until March 2001 and only lasted until November 2001. Since the SCF is conducted primarily to see how households choose to hold wealth, this brief downturn would have little impact on the variables of interest in this study. Interviews conducted in 2001 would contain information about income in 2000 (converted to 2001 dollars), and one would not expect a mild recession to generate dramatic shifts in household portfolio decisions. Credit prices will also be normalized by year of origination (the methodology is explained in further detail below). All income, wealth, and debt variables in the 1998 SCF have been converted to 2001 dollars.

In both the 1998 and 2001 SCFs, respondents were initially asked if they applied for credit. Only those respondents who answered affirmatively to applying for credit were then asked if they got as much as requested, completely turned down, or were unable to get as much credit as desired within the past five years. This rejection question, asked in the 1983 SCF and used by economists to identify borrowers facing credit constraints, is also used in this study for the same purpose.[5] The definition of credit refers to any type of mortgage, home equity, automobile, credit card, or any type of personal loan.

In past studies, economists included both completely rejected applicants and those not getting as much as requested in the definition of credit-constrained households. It certainly made sense to include as many observations as possible given the low sample size problems that arise when only one SCF data set is used for analysis. Of course, the partially rejected group may indeed have spending and credit risk patterns that closely resemble the completely rejected group, but an argument can still be made that these groups are distinctly different. If borrowers requested more credit than their income, wealth, and indebtedness would allow but still received an amount consistent with their level of credit risk, then this outcome should not be viewed in the same manner as an outright credit rejection. Therefore, only households turned down completely will serve as the preferred indicator of credit risk especially since recent SCF data sets are combined in this study to obtain a sufficient sample size.[6] Furthermore, the number of respondents reporting not getting as much credit as requested is very small and does not significantly alter the overall descriptive or multivariate results.

In the combined sample of 1998 and 2001 SCF households, 28.2% were rejected completely. Unfortunately, the 1983 SCF did not ask borrowers if

they had ever been more than 30 days late paying bills or filed for bankruptcy; however, these questions were asked in 1998 and 2001. Table 1 presents the percentage of these households having poor credit risk characteristics. A household of low or poor credit quality is defined as having been "two months or more behind in repaying any loans during the past year," "ever filing for bankruptcy," or both. Approximately 18% of the rejected households were at least 60 days delinquent paying back one of their loan obligations, and 22% reported ever having filed for bankruptcy. The percentage of households having either a serious delinquency in the past year or filed for bankruptcy was 34.6%. Hence, it is inaccurate to regard the entire group of rejected households as credit constrained since they are generally less creditworthy than the group of households that were not denied credit.

Since 34.6% of rejected households did have poor credit characteristics described in Table 1, Table 2 examines the remaining 65.4% of rejected households to possibly gain some insight on why their credit requests were denied. Over 40% of these households were rejected for revolving credit and approximately 21% for an automobile loan. However, more than one-third of the respondents in this group reported having previous payment problems. While these households did not fall into the poor–credit quality group as defined above (in particular if they were not behind making loan payments in the *last* year), a substantial number of these borrowers must have had payment problems occurring in *previous* years. In addition, almost 26% of these households listed financial stress due to either amount of income or size of debt. Both responses suggest these applicants had large front-end (monthly mortgage payment to monthly income) or back-end

TABLE 1
*Percent of Rejected Households Described as Having Poor Credit Quality*

| | Percent of Household Applicants | |
|---|---|---|
| | Rejected (turned down completely) | Not rejected |
| All households | | |
| 5,568 applicants for credit from 1998 and 2001 SCF samples | 28.2 | 71.8 |
| Poor credit categories | | |
| 2 months or more behind making loan payments in current year (recent delinquency) | 18.4 | 3.5 |
| Has ever filed for bankruptcy | 22.2 | 7.0 |
| All credit categories | | |
| Combined poor credit categories | | |
| Recent delinquency and/or filed for bankruptcy | 34.6 | 9.8 |
| No recent delinquency or bankruptcy | 65.4 | 90.3 |

TABLE 2
*Information on Rejected Households Not Described by Poor Credit Quality Categories in Table 1*

| | |
|---|---|
| Percent of rejected households not described by poor credit quality categories in Table 1 | 65.4 |
| Type of credit applied for when rejected | Percentage of households |
| Credit card | 40.5 |
| Car loan | 20.7 |
| Mortgage | 12.2 |
| Other installment loan | 10.3 |
| Line of credit | 6.2 |
| Various other types of credit | 10.1 |
| Reason given for rejection | Percentage of households |
| Previous payment problems/bad credit | 34.8 |
| Have not established credit history | 15.6 |
| Amount of debt/size of other loans | 15.3 |
| Amount of income | 10.6 |
| Credit bureau reports | 7.1 |
| Various other reasons | 16.7 |
| Other information | |
| Percent currently unemployed | 2.37 |
| Percent currently 1 month behind making loan payments | 22.1 |
| Percent financial assets totaling less than 2 months income | 46.0 |
| Median income (in 2001 dollars) | $37,517 |
| Percent African American or Hispanic | 27.1 |

(total monthly debt obligations to monthly income) ratios indicating a sizable amount of financial stress and the inability to service additional amounts of debt. Consequently, it would be more accurate to classify these households as being income constrained rather than credit constrained. Households truly facing credit constraints are those for which lenders have either misinformation or no information about them. According to Table 2, approximately 16% of the rejected households had not established a credit history and 7.1% may have encountered inaccuracies or contestable entries that appeared on their credit reports.

By separate calculation, 46% of the households in Table 2 are liquidity constrained, which may signal an inability to service future loan obligations should these households experience some unanticipated negative shock to income and wealth. Wealth or financial assets include checking, savings, money market accounts, certificates of deposit, directly held stock, and quasi-liquid retirement accounts. Zeldes (1989) defines households with financial assets totaling less than two months of income as being liquidity constrained, and this definition is adopted in Table 2. Although having financial assets totaling less than two months of income does not necessarily make a household ineligible to receive certain types of credit, lenders

may still view these households as being unable to comfortably service any additional payment obligations and refuse to extend them more credit. Finally, 27% of the households in Table 2 had a black or Hispanic family head, but this finding alone is not enough to establish that these households suffered discrimination.

To quickly summarize, approximately 28% of the combined sample of 1998 and 2001 SCF credit applicants had their credit requests completely denied. One-third of the rejected households had severe payment problems in the past year or filed for bankruptcy; approximately one-third had payment problems in previous years. The remaining rejected borrowers reported being under much financial stress and lacking the financial capacity to take on additional debt. However, approximately 14.8% of households (22.7% of the remaining two-thirds of the sample not described as having poor credit quality) can truly be considered credit constrained resulting from an asymmetric information problem since they had either no credit history or inaccurate credit history information. The percentage of credit-constrained households is even lower since 38.6% of those applicants reported that they later reapplied and received all the credit they wanted. Hence, after distinguishing between rejected applicants having difficulties repaying loan obligations and lacking creditworthiness from those who are truly credit constrained because they lack credit histories, the evidence overwhelmingly shows that higher–credit risk households experience the most rejections. Consumer credit markets, therefore, were functioning properly when the majority of these credit requests were denied.

## RISK-BASED PRICING IN CONSUMER CREDIT MARKETS: DESCRIPTIVE ANALYSIS

### The Relationship between Risk and Price

This section presents descriptive evidence of the relationship between borrower risk and credit pricing. Table 3 reports the percentage of households with poor credit characteristics for each specified loan rate percentile. Based upon the findings in Table 2, the definition of poor credit has been modified to include those households reporting a 60-day delinquency in the past year, ever filing for bankruptcy, or who have been completely rejected in the past 5 years. Rejected households will now be included into the poor credit risk definition since these households most likely had payment problems in previous years (as opposed to last year) and/or reached the upper limits of what lenders consider to be acceptable financial front- and back-end ratios. Of course, this definition captures less-risky households that

TABLE 3
*Loan Rates Paid by Households Having Poor Credit Quality and Rejected Completely*

| Percentiles | Variable Ranges (in Basis Points) | Percent Poor Credit and Rejected Completely |
|---|---|---|
| First fixed mortgage rates 1996–2001 | | |
| 1–49 | 600–724 | 22.8 |
| 50–74 | 725–799 | 25.8 |
| 75–89 | 800–899 | 36.2 |
| 90–100 | 900–2,100 | 63.6 |
| Loan rates on primary car (new) 1996–2001 | | |
| 1–49 | 190–799 | 22.1 |
| 50–74 | 800–899 | 23.9 |
| 75–89 | 900–1,199 | 36.1 |
| 90–100 | 1,200–2,700 | 51.0 |
| Loan rates on primary car (used) 1996–2001 | | |
| 1–49 | 290–899 | 21.1 |
| 50–74 | 900–1,199 | 35.7 |
| 75–89 | 1,200–1,799 | 39.2 |
| 90–100 | 1,800–3,500 | 64.4 |
| Rates on primary credit card | | |
| 1–49 | 190–1,499 | 18.7 |
| 50–74 | 1,500–1,799 | 20.1 |
| 75–89 | 1,800–1,998 | 24.9 |
| 90–100 | 1,999–3,900 | 43.6 |
| Rates on primary credit card for revolvers (or households reporting "hardly ever" paying off credit card balances) | | |
| 1–49 | 190–1,499 | 31.3 |
| 50–74 | 1,500–1,799 | 39.7 |
| 75–89 | 1,800–1,998 | 49.6 |
| 90–100 | 1,999–3,900 | 63.5 |

have not established a credit history or have inaccuracies on their credit reports; yet, these problems may still influence the loan rates they receive.

All fixed-rate conventional mortgages with origination dates from 1996 to 2001 were pulled from the 1998 and 2001 SCFs, and a distribution of the rates by various percentiles was constructed. The number of first liens originated by subprime lenders grew significantly between 1996 and the first half of 1997, making this an ideal time period for analysis. Lax et al (2004), in a study on first mortgage (both purchases and refinance) originations, define the "critical" interest rates that distinguish subprime from prime mortgage loans as those falling in the 90th percentile of all mortgage rates calculated from the distribution of Freddie Mac purchases. This study follows that convention. The evidence shows that almost two-thirds or

63.6% of all borrowers paying rates in the highest (90–100) percentile of the mortgage rate distribution were of low credit quality (while the remaining 36.4 % of households in this decile were of high credit quality). The loan rates in this top decile start at 9%, but prime mortgage rates did not reach 9% over the 1996–2001 period. Hence, these high-risk households obtained mortgage loans at market rates above prime.

A similar pattern is also observed looking at all the loan rates for both new and used five-year automobile loans that were originated over the 1996–2001 period. Low–credit quality borrowers are still concentrated in the top rate categories. Of all borrowers paying rates on new automobiles in the top decile of the distribution, 51.0% were of low credit quality. In the credit market for used automobiles, 64.4% of those borrowers in the top decile posed a higher risk to lenders.

The SCF defines the household's primary credit card as the one with the largest outstanding balance. Since the SCF does not ask respondents to remember the year in which they obtained their credit cards, the loan rate distribution had to be constructed based upon the reported loan rates without taking into account the year of origination. A loan rate distribution is also constructed for those respondents who report hardly ever paying off the entire balance on the card and using it primarily as a means to borrow. The patterns are similar. Almost half of the people paying credit card rates in the top deciles of the distributions have current or past payment problems. Two-thirds of credit card users who carry credit card balances from month to month in the top decile are of low credit quality. It is quite apparent from Table 3 that households posing the greatest credit risk pay more for credit.

Additional information obtained from the SCF is consistent with the practice of risk-based pricing in mortgage markets. The SCF asks homeowners why they chose their particular type of mortgage loan. Table 4 compares the top five responses of borrowers paying mortgage rates in the upper 90th percentile as well as those paying lower rates. The most popular answer for all groups was "best available rate." For those respondents paying mortgage rates at or above the 90th percentile, this answer is surprising since mortgage rates generally were very low over that time period. These applicants decided either it was not in their best interest to search for lower rates or this was the best rate they could get given their credit profile.

The second most popular response as to why borrowers in the top decile chose their loans was that it was easier to get credit due to less information, collateral requirements, or rules. The willingness to accept such abnormally high mortgage rates may indicate that borrowers did not think they could obtain better offers given their credit and collateral situations. The third most popular response for this set of borrowers is "recommended." While

TABLE 4
*Why Did You Choose This Type of (Mortgage) Loan?*

| | 30-Year Fixed Conventional Mortgages | |
|---|---|---|
| Reasons (as Stated in the SCF Codebook) | 0–89 percentile | 90–100 percentile |
| Interest rate low(er)/reasonable, best available rate | 28.2 | 33.0 |
| Easier to get credit—require less information/collateral, less stringent rules for giving credit, get credit approval faster, no red tape | 15.6 | 27.1 |
| Amount of the down payment | 17.8 | 0.0 |
| Recommended | 10.1 | 18.3 |
| No choice | 8.2 | 0.0 |
| Credit terms/arrangements, "affordable terms" | 7.6 | 12.0 |
| Finance charges lower | 0.0 | 7.6 |
| Various other reasons* | 12.5 | 2.0 |

* Various other reasons represent the sum of all remaining possible reasons that SCF respondents could choose. Only a handful of respondents chose answers in each of the individual categories, and the percentage of respondents in each category were then summed to get the total percentages.

high– and low–credit quality borrowers may rely on recommendations when choosing a lender, low–credit quality borrowers may rely more heavily on referrals to locate lenders specializing in low credit quality or subprime loans. On the other hand, some high–credit quality borrowers are likely to pay loan rates in the top percentile because they relied solely on recommendations and did not shop around for better terms. Credit terms and lower financing charges were the next popular responses for borrowers in the highest decile. It is highly unlikely that borrowers concerned about financing charges would be unaware that the quoted mortgage rates were above prime market rates. Again, this finding suggests that these borrowers probably anticipated having to pay higher mortgage rates especially if they experienced past payment problems.

## Credit Risk and Pricing Inconsistencies

Concern should arise over the performance of consumer credit markets when borrowers pay loan rates inconsistent with their levels of credit risk. Table 5 reports on high–credit quality borrowers who pay less than optimal credit terms. These households do not report any current or past payment problems (not rejected in the past five years); yet, they pay similar prices for credit as households of lower credit quality. The first column lists the overall percentage of high–credit quality households paying loan rates in the highest decile for each type of credit market discussed in Table 3. The second column reports the percentage of households in Column 1 that are liquidity constrained. The SCFs ask respondents if, when making major

TABLE 5
*High-Credit Quality Borrowers Paying Loan Rates in Top Deciles*

| | | Households in Top Deciles Not Described by Poor Credit Categories and Not Rejected | | |
|---|---|---|---|---|
| Type of Consumer Credit Market | Total percent high credit quality in top decile | Percent of total liquidity constrained | Percent of total report not aggressively shopping for best credit terms | Percent of total black or Hispanic head of household |
| First mortgage | 32.5 | 27.2 | 86.0 | 38.9 |
| Primary new automobile | 49.0 | 25.1 | 56.9 | 44.0 |
| Primary used automobile | 35.6 | 37.7 | 85.9 | 18.1 |
| Main credit card | 56.5 | 25.6 | 77.0 | 25.9 |

decisions about credit or borrowing, they shop around for the very best terms; the third column reports the percentage of households in Column 1 that do NOT aggressively shop for the best credit terms. The last column reports the percentage of high–credit quality households in Column 1 that have minority heads of households.

For all credit categories, a large percentage of these high–credit quality household heads in Table 5 report not shopping around for the best credit terms and pay much higher loan rates relative to other high–credit quality borrowers. This group of borrowers made decisions without attempting to acquire all available information. It is difficult to argue that credit markets failed when borrowers may have acted "irrationally." From an economist's point of view, these borrowers did not appear motivated enough to act in their own best interest and find better loan prices and/or terms. Of course, before accepting irrationality as an explanation for these outcomes, there may be legitimate reasons not reported in the SCF why these households chose not to shop around for better prices and terms.

Despite the fact 56.5% of high–credit quality borrowers have credit card rates in the top decile, this rate may not matter to these borrowers if they never carry a balance and use credit cards primarily for transactions convenience. In addition, approximately 38% of high–credit quality households in the used automobile credit market were liquidity constrained and may have been willing to pay a premium to obtain immediate financing. If households have an immediate need for credit and accept excessive terms relative to their level of risk simply to accelerate the processing of the loan, then a liquidity constraint rather than a credit market failure may exist.

Racial discrimination may explain pricing differentials. Approximately 40% of high–credit quality households with minority heads pay excessively

high rates in the mortgage and new automobile credit markets. However, the findings in Table 5 should be interpreted cautiously since descriptive evidence of market outcomes can only provide clues but does not sufficiently explain why market outcomes occur.

Another issue related to the "mispricing" of consumer credit has to do with overcharging borrowers of poor credit quality. While it is justifiable for low–credit quality borrowers to pay above-average market rates to compensate lenders for assuming additional risks, rates that overcompensate for risk can lead to excessive financial stress and trigger subsequent repayment problems. Perhaps, one could argue that denying some borrowers credit may leave them financially better off than granting it at an extremely high cost. Nevertheless, there is no information in the SCFs such as actual credit scores or available alternatives at the time these loans were obtained to address whether rates in the top percentiles overcompensate lenders for taking on higher-risk borrowers.

To recap, the credit-rationing literature maintains that credit supply curves bend backward due to the unwillingness of lenders to make loans at relatively higher loan rates. However, the evidence suggests that lenders do extend consumer credit to borrowers at higher rates to compensate for the risk. Increased competition among lenders has led to greater accessibility even for high-risk borrowers. As Edelberg (2003) finds, *more* credit rejections would occur resulting in less accessibility to consumer credit if loans were not priced according to risk. To detect inefficiencies in today's sophisticated consumer credit markets, it is necessary to investigate why certain borrowers pay prices inconsistent with their credit risk levels. Anomalous pricing outcomes can result from liquidity constraints or discrimination, or simply be attributed to households that do not search for less costly borrowing terms. Multivariate evidence may be able to provide better information on what influences relative consumer credit costs.

## RISK-BASED PRICING IN CONSUMER CREDIT MARKETS: MULTIVARIATE ANALYSIS

### Methodology

This section provides multivariate evidence on the major determinants or influences that affect the differences in loan rates offered to consumer borrowers. Because the traditional binary accept/reject model inadequately describes consumer credit market outcomes, ordinary least squares (OLS) will be used so that credit acceptance can now be modeled along a continuum

of prices. The four models estimated—30-year fixed conventional mortgage market, 5-year new automobile loan market, 5-year used automobile loan market, and the credit card market—will take the following form:

$$R = \alpha + \beta \mathbf{X} + \varepsilon$$

where $R$ is the ratio of the borrower's loan rate over the average loan rate, $\mathbf{X}$ is a vector of economic and demographic characteristics, $\alpha$ is a constant, $\beta$ represents a vector of the estimated coefficients, and $\varepsilon$ is a white noise error term.

In the mortgage credit model, the dependent variable will be a ratio of the borrower's mortgage rate over the average conventional mortgage rate for the year of origination. For example, someone who obtained a 30-year fixed mortgage at 7.5% in 2000 would receive a ratio of 7.5/7.43 or a value of 1.0094 (where 7.43% is the average annual conventional mortgage rate for 2000 according to the interest rate data provided by Freddie Mac). This scales interest rates and helps identify mortgage rates that are unusually high relative to the market average. Ratios above 1.0 are indicative of credit prices relatively higher than the average for the year. This same strategy is applied to the model for new and used automobile loan rates. The denominator of the ratio is the average annual prime rate for the year of origination according to the Federal Reserve Economic Data.[7] Again, the SCFs do not ask survey participants to recall the year in which they obtained their primary credit cards. As a result, there is no feasible way to normalize the interest rate in the revolving credit market by year, so the recorded interest rate will simply be used as the dependent variable for the credit card model.

The independent variables chosen for the model fit in one of the following categories. In a perfect world of full information and rational decision makers, pricing differences should only be related to differences in credit risk; therefore, economic characteristics and payment history variables observable to lenders should influence the price of credit since they relate directly to credit risk. The second category of independent variables provides information about rational or wealth-maximizing behavior on the part of borrowers. The final category, demographic variables, should not be related to credit risk or rationality and, therefore, should not affect credit prices. If any demographic variables are found to have a great deal of explanatory power, then perhaps a market failure exists. Variables related to credit risk, rational behavior, and demographics are discussed in greater detail below.

In evaluating credit risk, lenders observe credit history and various economic characteristics of the borrower. To capture repayment risk, a dummy variable is included that takes on a value of one if the borrower is of poor

credit risk. Poor credit risk will be defined as it was in the previous section—60 days late in the past year, filed for bankruptcy, and/or completely rejected for credit. A dummy variable for borrowers who were only 30 days late repaying loans in the past year is also included. Relevant economic characteristics include financial assets as defined in the previous section, household income (both variables in logarithms), and a measure of financial burden. To get a true measure of the financial burden households carry, the ratio of monthly payment obligations to monthly income includes all the monthly debt obligations of the household, monthly rent for those who are not homeowners, and monthly alimony and/or child support payments. A dummy variable that identifies whether the household has financial assets or liquid wealth totaling more than two months of income will give some indication on the extent to which liquidity constraints influence the cost borrowers are willing to pay for credit.

The credit prices borrowers receive are also related to rational decision making. Some borrowers are not aggressive when it comes to shopping for the best loan rates and terms, causing them to enter into more expensive loan agreements. Only 23.8% of the sample of households with first mortgages, 27.0% of the sample with new automobile loans, 21.8% of the sample with used automobile loans, and 21.3% of households that use their primary credit card to borrow report shopping around for the best credit terms. Therefore, a dummy variable that captures those who reported doing a great deal of shopping for the best terms is included to see if these households do obtain significant better credit prices. A dummy variable for college education is also included since having relatively more education could influence the wealth-maximizing choices these borrowers make.

Demographic characteristics such as age, family size, and dummies for whether the household head is married and is black or Hispanic are also included in the model. Because these variables theoretically have nothing to do with credit risk or rational decision making, they should not have any significant influence on credit prices.

Each consumer credit model includes some unique variables that are relevant to market particulars. For example, the mortgage market model includes a dummy variable to capture whether the observed loan rates are attached to government-insured mortgage loans, which are typically 1/8% higher than conventional loan rates. The automobile and credit card models include dummies to pick up whether or not the borrower is a homeowner. Homeowners have the ability to use home equity wealth to finance expenditures, and this status may affect the rates they pay. Rather than incorporate a dummy variable to distinguish between convenience users and borrowers, the credit card model will simply include only those respondents

who reported that they hardly ever pay off credit card balances. The interest rate only matters for households that borrow with credit cards and not for those using them to facilitate transactions.

Finally, each credit model will include a dummy variable to capture survey-specific effects. Combining the 1998 and 2001 SCF data is a reasonable way to increase the sample size since any data observed over the 1996–98 period theoretically should not be affected by the year in which they were reported. However, Table 6 reveals that the mean mortgage rate for all 1996–98 originations reported in the 2001 SCF was lower than the 1996–98 originations reported in the 1998 SCF. Since these loans "survived" until 2001, maybe these loans differ somehow from the other loans originating at that time but have since prepaid. Perhaps these particular households paid additional points up front to buy down the rate and avoid paying additional refinance charges later. Regardless what plausible explanation exists, a dummy variable that takes on a value of one for all SCF 2001 observations and zero for all 1998 SCF observations has been created and incorporated into all the credit models. This dummy variable should capture any unanticipated or survey-specific effects that might influence the multivariate results.

## RESULTS

The findings in Table 7 indicate that consumer credit markets price borrowers for risk. In all markets, the coefficients associated with 60-day delinquencies were all significant at the 1% level. In the mortgage market, even the 30-day delinquency coefficient was significant at the 5% level. These

TABLE 6
*Survey-Specific Effects*

| | First Fixed Mortgage Rates 1996–98 (in Basis Points) | | |
|---|---|---|---|
| | High credit quality | Poor credit quality | Total borrowers |
| SCF 1998 | | | |
| Mean | 753.20 | 853.69 | 789.95 |
| SD | 8,276 | 12,885 | 10,721 |
| No. of households | 157 | 75 | 232 |
| SCF 2001 | | | |
| Mean | 726.39 | 768.70 | 736.78 |
| SD | 5,930 | 8,736 | 6,813 |
| No. of households | 168 | 49 | 217 |
| SCF 1998 and 2001 (combined) | | | |
| Mean | 739.52 | 822.20 | 765.12 |
| SD | 7,230 | 11,916 | 9,280 |
| No. of households | 325 | 125 | 450 |

TABLE 7

*Household Characteristics Associated with Paying Higher Loan Rates (Consumer Loans Originating 1996–2001)*

| Dependent Variables | Ratio 30-Year Fixed Rate/Average Annual Conventional Mortgage Rate | | Ratio 5-Year Auto Rate/Average Annual Prime Rate | | Ratio 5-Year Auto Rate/Average Annual Prime Rate | | Reported Credit Card Rate | |
|---|---|---|---|---|---|---|---|---|
| | First mortgage loans | | Primary car (new) loans | | Primary car (used) loans | | Main credit card (revolvers only) | |
| | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE |
| Independent variables | | | | | | | | |
| 60 or more days late, bankrupt, and/or past request rejected completely | 0.0498*** | 0.0123 | 0.1095*** | 0.0417 | 0.2233*** | 0.0570 | 196.1329*** | 29.7325 |
| 30 days late | 0.0538** | 0.0185 | 0.0850 | 0.0539 | 0.0190 | 0.0792 | 55.0238 | 36.5832 |
| Financial assets (in logarithms) | −0.0010** | 0.0042 | −0.0201 | 0.0155 | −0.0025 | 0.0176 | −24.1542** | 10.9012 |
| Income (in logarithms) | −0.0100 | 0.0101 | 0.0394 | 0.0290 | 0.0302 | 0.0555 | −0.8223 | 26.6224 |
| Cash flow (not liquidity constrained) | 0.0078 | 0.0189 | 0.0109 | 0.0620 | −0.0560 | 0.0834 | 0.7243 | 45.4543 |
| Ratio of monthly payment obligations to monthly income | 0.0116 | 0.0237 | 0.0519 | 0.0598 | 0.9914 | 0.1084 | 29.4434 | 52.0438 |
| Homeowner | — | — | −0.0879* | 0.0479 | −0.2296*** | 0.0634 | −87.8432*** | 33.3107 |
| Great deal of shopping for best terms | −0.0329*** | 0.0121 | 0.0471 | 0.0407 | 0.0200 | 0.0640 | −98.9270*** | 34.9546 |
| College | −0.0042 | 0.0117 | −0.0022 | 0.0390 | −0.1683*** | 0.0626 | −82.8074** | 33.7336 |
| Age | −0.0001 | 0.0005 | 0.0015 | 0.0016 | −0.0004 | 0.0024 | 1.5854 | 1.1550 |
| Married | 0.0168 | 0.0147 | 0.0021 | 0.0488 | −0.0644 | 0.0711 | −21.3019 | 36.8133 |
| Family size | −0.0014 | 0.0040 | 0.0108 | 0.0147 | −0.0167 | 0.2138 | 9.0847 | 11.3551 |
| Black or Hispanic | 0.0058 | 0.0151 | 0.1437*** | 0.0508 | −0.0360 | 0.0702 | 72.4753** | 35.1134 |
| FHA/VA loan | −0.0354*** | 0.0117 | — | — | — | — | — | — |
| Survey-specific effects | −0.0497*** | 0.0111 | −0.0245 | 0.0358 | −0.0070 | 0.0557 | 21.6524 | 28.4882 |
| Constant | 1.2571*** | 0.1009 | 0.6375** | 0.2782** | 1.0469* | 0.5634 | 1622.90*** | 249.7373 |
| $R^2$ | 0.14 | | 0.08 | | 0.17 | | 0.11 | |
| No. of households | 714 | | 514 | | 366 | | 1,270 | |

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level.

results clearly show that severe delinquency problems result in higher credit fix widow.

Financial assets or wealth is significant at the 5% level in the mortgage market, but its marginal effect is lower than the marginal effects associated with having delinquency problems and shopping for best credit terms. The amount of wealth also matters in the revolving credit market. Although the wealth variable drops in significance in the markets for automobile loans, the homeownership variable is significant in these markets. Homeownership status can be interpreted as a proxy for wealth in the automobile and even in the revolving credit markets. By simply owning a home (especially in 1996 and afterward when home prices appreciated at a brisk pace), homeowners may have accumulated wealth at a faster rate than renters. Therefore, if high–credit quality homeowners are offered better nonmortgage credit terms than high–credit quality renters, this outcome is not necessarily indicative of some inefficient loan pricing that adversely affects renters. Instead, this outcome may reflect the advantage homeowners gained over renters as a result of rapidly increasing wealth and ensuing rise in relative creditworthiness.

In addition to credit and financial risk characteristics, the price of credit is affected by wealth-maximizing or rational decisions of the consumer. The relationship between mortgage rates and the amount of household shopping for best credit terms is significant at the 1% level in the mortgage market. Only the marginal effects associated with the repayment history variables are larger in size. This finding could indicate the existence of a large amount of borrower irrationality, but reasons such as search costs incurred by the borrower or loyalty toward a preferred lending institution may explain this behavior. In addition, some of these households may have been first-time homebuyers who faced steep learning curves and agreed to pay higher rates than more experienced homebuyers. (Of course, some of these borrowers may have been identified by the Federal Housing Administration/Veterans Administration (FHA/VA) dummy variable since many FHA borrowers are typically first-time homebuyers. However, this variable has a negative sign and its interpretation will be discussed in more detail below.) Because economists are never satisfied relying upon irrationality to explain market outcomes, the first-time buyer hypothesis as an explanation for the significance of the shopping variable would certainly have been worth investigating if the SCF had directly asked respondents if they were first-time homebuyers.

Although wealth-maximizing behavior is found to significantly reduce credit prices in the mortgage market, shopping for the best terms does not appear to be significant in either the new or the used car market. Having a college education does significantly reduce the rate a borrower pays for

a used car. Perhaps educated used car buyers, who are already shopping for lower cost transportation relative to new automobiles, tend to factor finance charges into the overall cost savings of buying used and simultaneously shop around for the best available financing terms.

The findings show that revolvers who aggressively shop for the best terms and have a college education will significantly reduce their borrowing costs. Suppose the average annual percentage rate charged for revolving credit is approximately 11.9%, but someone who shops around pays approximately 100 less basis points to get a rate of 10.9%. Because the total finance charges are proportional in size to the outstanding balance, this rate difference would have a substantial financial impact on borrowers who make only the minimum payment each month. This finding coincides with the Calem and Mester (1995) result, which relies on SCF data to show that cardholders with larger outstanding balances are more likely to shop around for better pricing terms.

The remaining demographic variables have been included in the model to see if some borrowers pay more than others for reasons that have nothing to do with credit or financial risk or the failure to make more optimal economic choices. If substantially lower minority homeownership rates translate into lower rates of wealth accumulation and perceived creditworthiness, then it follows that disparities in loan pricing will result from having fewer available financing options and facing an inelastic credit demand curve. If more minorities choose not to shop for better rates and/or are less likely to have established financial relationships with reputable banking institutions, then more borrowers in this group may choose to obtain expensive financing from fringe-banking institutions as discussed by Caskey (1994) and Carr and Schuetz (2001). However, race theoretically should not have any influence on consumer credit prices after accounting for the risk and the unwillingness to shop for better terms.

The race variable is not statistically significant in the mortgage market model. After controlling for bad credit risk factors and the degree of shopping for best credit terms, high–credit quality black and Hispanic households are not significantly more likely to pay higher rates for mortgage credit. Although additional research is necessary to understand this result, possible reasons may have to do with legislation such as the Community Reinvestment Act, automated underwriting, and increased lender competition in the mortgage markets. Of course, the annual percentage rate, which factors in closing costs, would be a better measure of mortgage price differentials. Some households with low mortgage rates may have paid substantially more in closing cost fees. On the other hand, households inclined to shop for the lowest mortgage rates may also be inclined to shop for the best

deals in closing fees. Closing cost information would be extremely useful for this analysis, but the SCF does not collect annual percentage rate nor closing cost fee information.[8]

The results show that black or Hispanic borrowers are significantly more likely to pay higher rates for new car loans after controlling for credit history and financial wealth variables, and this finding is consistent with evidence on discriminatory automobile loan markups. M. Cohen, in an unpublished report prepared in 2004 for the Consumer Federation of America, finds that auto dealer finance markups charged to African Americans and Hispanics are significantly higher than markups charged to whites; he has prepared a series of five reports that all support this disparity. In addition, there is evidence of recent discrimination patterns in revolving credit markets particularly against Hispanic credit card users.[9] Hence, the significance of the race variables in automobile and credit markets in this study concurs with price differentials observed by other researchers.

Finally, the significance of the FHA/VA loan variable indicates that government-insured loans can significantly reduce the rates higher risk borrowers would pay. This negative coefficient seems counterintuitive since government-insured mortgages tend to carry rates 1/8% higher than conventional mortgages. Government-insured mortgages are slightly more expensive since borrowers satisfy less stringent underwriting criteria than borrowers in the conventional mortgage market. However, mortgage rates falling into the top decile of the sample are likely to be subprime mortgage loans, and the rates on government-insured mortgage loans are still much lower by comparison. Hence, the significant and negative coefficient may simply indicate that lower–credit quality borrowers pay lower rates if they obtain government-insured rather than subprime mortgage loans.

## CONCLUSION

This paper has shown that analyzing credit rejection patterns without accounting for risk does not provide an accurate depiction of household accessibility to consumer credit markets. Consumer credit is priced according to risk, and credit is granted along a continuum of prices. Households that pose greater credit risks are more likely to pay higher rates for credit, and borrowers of the highest risk face credit rejections. Credit markets are indeed functioning properly if (1) borrowers with poor repayment histories experience credit rejection and/or face higher loan prices and (2) any repayment problems experienced by high–credit quality borrowers occur largely as a result of random negative shocks (e.g., divorce, an unexpected drop in income, illness) that neither the lender nor the borrower could anticipate.[10]

In addition to credit and financial risk characteristics, this paper has shown that credit prices are also influenced by the wealth-maximizing behavior of consumers. Some borrowers pay loan rates in excess of their credit risk levels because they do not act competitively to seek the best credit terms. Households, particularly those in the mortgage market (many of whom may be first-time homebuyers, although other plausible explanations for the lack of wealth-maximizing behavior may also exist), would certainly benefit by increasing the amount of shopping they do when applying for mortgage credit. Shopping for better terms is also important for borrowers who never pay down their balances in the revolving credit market. Determining the optimal amount of regulation in the consumer credit markets may be problematic from a public policy standpoint. Intervention is not warranted simply because some households willingly accept more costly loan terms. However, policy designed to encourage lenders to provide useful information to credit applicants who do shop and discourage predatory behavior, which coaxes borrowers to enter into bad loan agreements, is essential.

The results show that black and Hispanic heads of households are not more likely to pay higher rates for mortgage and used automobile loans after controlling for credit risk. However, minorities pay higher rates for new automobile loans and for revolving credit (if they carry an outstanding balance) even after controlling for payment history and financial wealth. While it is good news that participation in all consumer credit markets by low-income and minority groups has increased over the past two decades, it is unfortunate to observe pricing gaps that may reflect a more sophisticated form of discrimination rather than an accurate pricing of credit risk.

## ENDNOTES

1. The SCFs, compiled every three years by the Federal Reserve Board, provide information on the assets, liabilities, and demographic characteristics of more than 4,000 U.S. families. For more information about the 1998 SCF, see Kennickell, Starr-McCluer, and Surette (2000). For more information about the 2001 SCF, see Aizcorbe, Kennickell, and Moore (2003).

2. For more information about the 1983 SCF, see Avery and Elliehausen (1983).

3. For more information about the theoretical models of credit rationing, see Bernanke and Gertler (1989, 1990); Jaffee and Russell (1976); and Stiglitz and Weiss (1981, 1983).

4. For example, see Harney, Kenneth, "An e-loan rebel discloses secret mortgage ratings," *Baltimore Sun*, April 9, 2000, pp. 1L. This article concurs that borrowers with FICO scores 700 and above are quoted lower loan rates than borrowers with lower FICO scores. (A FICO score is a credit score developed by Fair Issac & Company.) In addition, Black and Morgan (1999) show that credit cards have been going to borrowers of lower credit quality, and these households are more likely to rely on credit card borrowing and pay higher rates if they are unable to obtain credit elsewhere.

5. Studies that used the 1983 SCF did not have the "apply" question. In 1983, the respondents were only asked if they had "been rejected for credit in the last *few* years and got turned down." In addition to

asking the apply question, the 1998 SCF was more specific about the time period, what type of credit they were rejected for, and the reason given for being turned down.

6. Some economists have also included in the definition of rejection those respondents who answered affirmatively to the SCF question "[over] the past few years, did you think about applying for credit ... but changed your mind because you thought you might be turned down?" as being credit constrained. While the perceptions these households have about their creditworthiness may be correct, this study will use verifiable credit rejections for the analysis rather than perceived or ambiguous credit denials.

7. Data limitations make it impossible to use monthly or quarterly ratios for this analysis. There would not be enough observations in each period to get the necessary range or variability if the dependent variable were computed using smaller time intervals. In addition, there are missing data and/or fuzzy recalls of the specific month respondents acquired their mortgages and would further reduce the sample size.

8. Beginning with the 2005 release, the data collected under the Home Mortgage Disclosure Act will include more loan price information—specifically the annual percentage rate borrowers received on their mortgage loans. The purpose of this is to provide more robust information about mortgage-lending patterns, particularly in the subprime market, and facilitate fair lending and other lending law enforcement.

9. See *The Attorney General's 2001 Annual Report to Congress Pursuant to the Equal Credit Opportunity Act Amendments of 1976* submitted March 2002 by Ralph F. Boyd, Jr., Assistant Attorney General, Civil Rights Division. The July 2002 issue of *US Department of Justice* also features an article entitled "Justice Department Settles Lending Discrimination Suit" that discusses how a lending institution was forced to compensate victims of discrimination, establish a consumer education program, and take steps to ensure that all applicants and borrowers seeking credit cards receive fair and nondiscriminatory treatment.

10. See Getter (2003) for empirical evidence on the determinants of borrower delinquency.

## REFERENCES

Aizcorbe, Ana M., Arthur B. Kennickell, and Kevin B. Moore. 2003. Recent Changes in US Family Finances: Evidence from the 1998 and 2001 Survey of Consumer Finances. *Federal Reserve Bulletin*, 89 (January): 1–32.

Avery, Robert B. and Gregory Elliehausen. 1983. *1983 Survey of Consumer Finances: Technical Manual and Codebook.* Washington, DC: Board of Governors of the Federal Reserve System.

Bernanke, Ben and Mark Gertler. 1989. Agency Costs, Collateral, and Business Fluctuations. *American Economic Review*, 79 (March): 14–31.

———. 1990. Financial Fragility and Economic Performance. *Quarterly Journal of Economics*, 105(February): 87–114.

Black, Sandra E. and Donald P. Morgan. 1999. *Meet the New Borrowers. Current Issues in Economics and Finance*, vol. 5 (3). New York: Federal Reserve Bank of New York.

Calem, Paul and Loretta Mester. 1995. Consumer Behavior and the Stickiness of Credit Card Interest Rates. *American Economic Review*, 85 (5): 1327–1336.

Canner, Glenn B., James T. Fergus, and Charles A. Luckett. 1988. Home Equity Lines of Credit. *Federal Reserve Bulletin*, 74 (June): 333–344.

Canner, Glenn B., Stuart A. Gabriel, and J. Michael Woolley. 1991. Race, Default Risk and Mortgage Lending: A Study of the FHA and Conventional Loan Markets. *Southern Economic Journal*, 58 (1): 249–262.

Carr, James H. and Jenny Schuetz. 2001. *Financial Services in Distressed Communities: Issues and Answers.* Fannie Mae Foundation working paper (August).

Caskey, John P. 1994. *Fringe Banking: Check-Cashing Outlets, Pawnshops, and the Poor.* New York: Russel Sage Foundation.

Cox, Donald and Tullio Jappelli. 1993. The Effect of Borrowing Constraints on Consumer Liabilities. *Journal of Money, Credit, and Banking*, 25 (2): 197–213.

Cutts, Amy C., Robert A. Van Order, and Peter M. Zorn. 2000. Lemons with a Twist: The Role of the Secondary Market in Market Evolution. Paper presented at the 2000 annual ASSA/AREUEA Meetings, Boston, MA, January.

Duca, John V. and Stuart S. Rosenthal. 1993. Borrowing Constraints, Household Debt, and Racial Discrimination in Loan Markets. *Journal of Financial Intermediation*, 3 (1): 77–103.

———. 1994. Do Mortgage Rates Vary on Household Default Characteristics? Evidence on Rate Sorting and Credit Rationing. *Journal of Real Estate Finance and Economics*, 8 (March): 99–113.

Edelberg, Wendy. 2003. *Risk-Based Pricing of Interest Rates in Consumer Loan Markets*. Federal Reserve Board working paper.

Getter, Darryl E. 2003. Contributing to the Delinquency of Borrowers. *Journal of Consumer Affairs*, 37 (Summer): 86–100.

Hogarth, Jeanne and Marianne A. Hilgert. 2002. A Profile of Consumers with High-Rate Home Loans. *Financial Counseling and Planning*, 13 (1): 15–34.

Jaffee, D.M. and Russell, T. 1976. Imperfect Information, Uncertainty, and Credit Rationing. *Quarterly Journal of Economics*, 90 (4): 651–666.

Jappelli, Tullio. 1990. Who Is Credit Constrained in the U.S. Economy? *The Quarterly Journal of Economics*, 105 (February): 219–234.

Kennickell, Arthur B., Martha Starr-McCluer, and Brian J. Surette. 2000. Recent Changes in U.S. Family Finances: Results from the 1998 Survey of Consumer Finances. *Federal Reserve Bulletin*, 86 (January): 1–29.

Lax, Howard, Michael Manti, Paul Raca, and Peter Zorn. 2004. Subprime Lending: An Investigating of Economic Efficiency. *Housing Policy Debate*, 15 (3): 533–572.

Luckett, Charles A. 1986. Recent Developments in Automobile Finance. *Federal Reserve Bulletin*, 72 (6): 355–365.

Stiglitz, Joseph E. and Andrew Weiss. 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review*, 71 (3): 393–410.

———. 1983. Incentive Effects and Terminations. *American Economic Review*, 73 (5): 912–927.

Zeldes, Stephen P. 1989. Consumption and Liquidity Constraints: An Empirical Investigation. *Journal of Political Economy*, 97 (21): 305–346.