Adverse Selection in the Credit Card Market

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Abstract

Adverse selection is one of the most celebrated phenomena in the economics of information. Yet despite a burgeoning economics and finance literature consisting of literally hundreds of articles exploring the implications of adverse selection in credit markets, there remains little in the way of empirical studies which convincingly document the existence of adverse selection in credit markets as a real-world phenomenon. This paper examines the results of large-scale randomized trials in preapproved credit card solicitations for direct evidence of adverse selection. Four basic conclusions are reached. First, there is clear evidence of adverse selection on observable information: respondents to solicitations are substantially worse credit risks than nonrespondents. Second, comparing the customer pools resulting from different offers, solicitations offering inferior terms (e.g., a higher introductory interest rate, a shorter duration to the introductory offer, or a higher post-introductory interest rate) yield customer pools with worse observable credit-risk characteristics than solicitations offering superior terms. Third, there is also clear evidence of adverse selection on hidden information: even after controlling for all information known by the card issuer at the time the account is opened, customers who accept inferior offers are significantly more likely to default. Fourth, recipients of credit card solicitations appear to overrespond to the introductory interest rate relative to the duration of the introductory offer and to the post-introductory interest rate, consistent with the author's "underestimation hypothesis" that consumers may systematically underestimate the extent of their current and future credit card borrowing.

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Adverse selection is one of the most celebrated phenomena in the economics of information. In trading situations where one (informed) party possesses information which is relevant to his (uninformed) trading partner, the informed party may find it advantageous to engage in trade only in states of information which are relatively unfavorable from the viewpoint of the uninformed party. Thus, a firm which offers a contract to the general population may find that the composition of the pool of customers who accept the firm's contract is inferior to the composition of the general population. The particular contractual terms offered by the firm may influence the composition of the customer pool and, in some informational environments, adverse selection may lead to a complete unraveling of the market (George A. Akerlof, 1970).

Many of the economically-richest implications of adverse selection have been drawn in credit markets. High interest rates charged to borrowers may induce adverse selection on default probability, leading banks to engage in credit rationing in high-interest environments (Joseph E. Stiglitz and Andrew Weiss, 1981). Competition along particular dimensions in credit card pricing may result in adverse selection, blunting the usual effects of competition, and contributing to sticky interest rates and extranormal profits (Lawrence M. Ausubel, 1991). And, when borrowers have the opportunity to engage in signaling behavior, the same structure of asymmetric information as in adverse selection models yields signaling stories which have important implications for corporate investment and the capital structure of firms (see, for example, Sudipto Bhattacharya, 1979, and Stewart C. Myers and Nicholas S. Majluf, 1984).

Yet despite a burgeoning economics and finance literature consisting of literally hundreds of articles exploring the implications of adverse selection in credit markets, there remains little in the way of empirical studies which convincingly document the existence of adverse selection in credit markets as a real-world phenomenon. The objective of the current paper is to present compelling direct evidence of adverse selection in one specific credit market.

The stakes in such an empirical exercise are quite considerable. It is frequently argued that virtually any conclusion may be reached from a suitably-chosen economic model of incomplete information. However, to the extent that adverse selection can be shown to be a genuine empirical phenomenon in credit markets, then we can have confidence that at least one important component of the theoretical developments of the last thirty years has true empirical grounding.

There are two other types of markets in which the empirical existence of adverse selection has already been reasonably well explored. Given the origins of the terms “adverse selection” and “moral hazard” in insurance markets, it is not surprising that there exists rather early evidence of adverse selection

in life insurance and more recent evidence for other types of insurance. And given the wide influence of Akerlof's "lemons" model, there have been a number of recent empirical studies of adverse selection in used motor vehicle markets.

For at least a century, the life insurance industry has been generating and utilizing evidence of adverse selection. This is documented in rather old insurance textbooks which compare the life expectancies of: purchasers of annuities; purchasers of life insurance; and the general population. Seventy years ago, Joseph B. Maclean (1929, p. 64) wrote: "The reasons why life insurance companies cannot offer very attractive terms for annuities at the lower ages are ... that the rate of mortality among annuitants is very low. Experience shows very clearly that those who buy life annuities are a superior class from the point of view of longevity." More recently (but still a decade before the modern economics of information), Dan M. McGill (1959, pp. 100-101) even more explicitly wrote: "The companies have found that the mortality among persons who purchase annuities tends to be lower, age for age, than that of persons who purchase life insurance. There may be several reasons for this, including the peace of mind that comes with an assured income for life; but certainly, one of the most important is the selection practiced against the company. Individuals who know themselves to have serious health impairments rarely, if ever, purchase annuities. ... On the other hand, persons who know or suspect that they have an impairment usually seek to obtain life insurance. Whatever its origin, the [difference in] mortality between life insurance policyholders and annuitants is so substantial that special annuity mortality tables must be used for the calculation of annuity premiums."[1]

Similarly, a fairly long series of economics articles have documented adverse selection in health insurance markets. For example, people who choose traditional indemnity policies generally incur greater claims than people who choose health maintenance organizations (Daniel Altman, David M. Cutler and Richard J. Zeckhauser, 1998). And, of course, in auto insurance markets, it is the compelling conventional wisdom that customers who choose policies with $50 collision deductibles incur accidents more frequently than customers who choose $500 collision deductibles.

In markets for used cars, Akerlof's "lemons" article argued that adverse selection on product quality would be severe, and bad vehicles might drive out good vehicles. This theoretical prediction has been examined in several subsequent articles. Eric W. Bond (1982) rejects adverse selection in a direct test on the market for used pickup trucks: controlling for vehicle age and mileage, there is no difference in

[1]Obviously, the reduced life expectancy of purchasers of life insurance is explained partly by *moral hazard* (hidden actions) as well as by *adverse selection* (hidden information). However, since it is generally much easier to take actions which increase one's mortality than to take actions which reduce one's mortality, the enhanced life expectancy of purchasers of annuities ought to be viewed as primarily a consequence of adverse selection, not moral hazard.

maintenance between vehicles acquired new and vehicles acquired used. David Genesove (1993) finds "weak evidence" (p. 644) for adverse selection in an indirect test on the wholesale used car market: new-car dealers, who have higher propensities to sell their trade-ins wholesale, receive higher prices than used-car dealers in some model years.

The current paper develops a new data set which is especially well suited for examining adverse selection in credit markets. A substantial portion of bank credit card marketing today is done via direct-mailed ***preapproved solicitations***, and sophisticated card issuers today decide on the terms of their solicitations by conducting large-scale ***randomized trials***. Both of these facts are critically exploited in the design of the current study.

In most market environments, it is very difficult to compare, in any controlled fashion, the characteristics of individuals who choose to become customers of a given firm with the characteristics of individuals who choose not to become customers of a given firm. The simple reason for this is that, while considerable data may become known about a firm's customers, generally little reliable information is observed about a firm's noncustomers. However, in conducting preapproved solicitations, credit card issuers are permitted broad access to detailed credit bureau information about the entire pool of individuals being solicited — nonrespondents, as well as respondents. The legal reason for this is that, while credit bureau information is not permitted to be provided to third parties without an individual's consent, a substantial exception to this rule of confidentiality is made in connection with "firm offers of credit." Thus, credit bureaus are allowed to disclose otherwise-confidential information to issuers who are making preapproved credit card solicitations.

Also in most market environments, it is very difficult to reliably answer the counterfactual question of how the characteristics of a firm's customer pool might have changed if the firm had chosen to offer a different contract to potential customers. However, sophisticated credit card issuers conduct large-scale randomized trials which enable them to precisely answer this. For example (as in Experiment I of this paper), an issuer might generate a mailing list of 600,000 individuals, and randomly assign them into six market cells of 100,000 each. One market cell might then be mailed offers for preapproved credit cards with introductory interest rates of 4.9% for a period of 6 months. Other market cells might be mailed offers with introductory interest rates of 5.9% or 6.9% and/or introductory periods of 9 months or 12 months, but which otherwise are identical (e.g., in their post-introductory interest rate and in their criteria for setting credit limits).

The current study examines the results of a series of what I shall henceforth refer to as "market experiments" conducted by a major United States issuer of bank credit cards. The market experiments consist of randomized trials on preapproved credit card solicitations, so each of the two comparisons

described in the two previous paragraphs may be done. I focus on two informational phenomena in the credit card market, each of which may usefully be termed "adverse selection":

- ADVERSE SELECTION ON OBSERVABLE INFORMATION: The pool of consumers who accept an offer displays inferior characteristics as compared to the pool of consumers who reject an offer, and the pool of consumers who accept an inferior contract exhibits inferior characteristics as compared to the pool of consumers who accept a better offer.
- ADVERSE SELECTION ON HIDDEN INFORMATION: Even after controlling for all observable characteristics, the pool of consumers who accept an inferior contract exhibits inferior characteristics as compared to the pool of consumers who accept a better offer.

While some readers may resist using "adverse selection" to describe the first phenomenon — preferring to reserve that term exclusively for situations involving hidden information — I find it useful to think of both phenomena as aspects of adverse selection. After all, there are many economically-important situations where a firm gets to fully observe the selection which is being practiced against it by customers, but nevertheless the firm is constrained to be unable to charge higher prices to the inferior customers. Even though the information is not hidden, it still adversely affects the firm in an analogous fashion as a classic (hidden information) adverse selection problem. Moreover, observable information and hidden information should frequently be thought to be correlated with one another, and so evidence of adverse selection on one should reflect on the other.

First, I compare the characteristics of respondents with those of nonrespondents. There is clear evidence of adverse selection on observable information in that the respondents are substantially worse credit risks than the nonrespondents. Second, I compare the customer pools resulting from different offers. There is again clear evidence of adverse selection on observable information in that: the customers who accept inferior offers have inferior observable characteristics; and the customers who accept inferior offers experience more defaults. More importantly, there is clear evidence of adverse selection on hidden information: *even after controlling for all information known by the card issuer at the time the account is opened*, customers who accept inferior offers are significantly more likely to default. In short, I believe that compelling empirical evidence of adverse selection in the credit card market is found.

At the same time, the data enable — and this paper briefly explores — three additional avenues of empirical research. First, since the data set includes a fairly comprehensive snapshot of customers at a given moment in time, and then tracks the account histories for up to 2¼ years, it provides a rare opportunity to explore the determinants of personal bankruptcy. Second, since the data set continues to track customers after the end of the introductory period, it allows us to examine whether low offers introduce a second type

of adverse selection: consumers who switch once are more likely to switch a second time. Third, since some of the randomized trials include the simultaneous perturbation of two different terms of the credit card contract, and since the data set tracks the actual stream of borrowing and repayment by respondents, it is possible to assess whether respondents correctly evaluated the tradeoff between, say, a lower introductory interest rate and a shorter introductory period. The results on each of these three issues are fairly tentative, but suggest interesting avenues for continuing research.

A methodological advance of the current paper is its reliance on "market experiments". While laboratory experiments are a growing area of economic research and often yield fruitful results, they are subject to the criticism that they only describe behavior in the laboratory. In particular, the experimental subjects are usually undergraduate or M.B.A. students, and the subjects are placed in situations which are at least somewhat artificial and outside their typical realm of experience. Often too, the stakes for the subjects are relatively small, and may be clouded by the entertainment value of participating in the experiment as well as the desire to please the experimenter. Thus, the results may only tell us how students behaved when placed in a laboratory situation which attempted to replicate some desired economic environment. By way of contrast, in analyzing market experiments in this paper, we gain insight into decision-making by real credit card customers who are trying to decide whether or not to accept a real credit card offer. Their stakes are exactly the real stakes which we care about. Moreover, since the subjects do not know that they are part of an experiment (or to put it differently, all customers in the credit card market are experimental subjects), there is no issue of pleasing the experimenter or otherwise behaving differently from the way they would if they were not part of an experiment.

Some (real-world) policy experiments have also yielded valuable results. Conceptually, these operate in very much the same way as the market experiments studied in this paper. Still, policy experiments suffer from at least two disadvantages avoided in this study. First, as in laboratory experiments, subjects typically know that they are participating in an experiment, and this by itself may cause a modification in their behavior. Second, experimental subjects typically need to volunteer to participate in the policy experiment. To the extent that the population of volunteers may be unrepresentative of the overall population, the policy experiment may provide an incomplete impression as to how the experimental policy would work on the entire population.

That said, there are good reasons why economic studies hardly ever rely on market experiments. Observe that the randomized trials examined in the current paper involved the mailing of 1,963,876 direct-mail solicitations and yielded 15,081 new credit card accounts. Since the cost of a direct-mail solicitation is on the order of magnitude of $1 apiece, and since respondents borrowed on average about $2,000 on their cards, these experiments would have cost about $2 million up front and required the lending of about

$30 million — orders of magnitude above the experimental research budgets available in academia. However, from the vantage point of a major issuer, this is just a part of doing business, and many of the yielded accounts are profitable. Market experiments are used in the current study since access to the results was available, but in most other economic contexts, this will not be possible.

The paper proceeds as follows. Section 1 briefly outlines a model which is useful for thinking about credit card solicitations. Section 2 provides an overview of the market experiments which are analyzed. Section 3 examines adverse selection on observable information between respondents and nonrespondents. Section 4 examines adverse selection on observable information among the customer pools resulting from offers with different prices. Section 5 studies adverse selection on hidden information among the customer pools resulting from offers with different prices. Section 6 examines adverse selection in switch costs. Section 7 reconsiders whether individuals rationally evaluate the tradeoff between introductory interest rate and duration. Section 8 explores the predictors of personal bankruptcy. Section 9 briefly concludes.

1 An Auction Model of Credit Card Solicitations

An auction model is a useful conceptual framework for thinking about credit card solicitations. Suppose that an individual decides that he would like to open a new credit card account in a given month. Then he might decide to collect all the credit card solicitations which arrive in his mailbox and, on the last day of the month, evaluate which of these offers he likes best. As such, the credit card solicitation process can be thought of as a sealed-bid auction, where the issuers assume the roles of bidders, and the consumer assumes the role of auctioneer. We will be able to adopt the standard assumptions of auction theory and easily obtain theoretical predictions concerning adverse selection.

More formally, consider a model with N credit card issuers, each of whom participate in sealed-bid auctions for winning the business of consumers. An independent auction is conducted for each consumer, and we will now describe the payoffs and information structure for each auction. In any such auction, the consumer has a probability, δ, of defaulting on his credit card. Each (risk-neutral) issuer i ($i = 1, \ldots, N$) simultaneously and independently submits a bid consisting of a price p_i. The consumer considers the bids received, and selects one (or more) winners according to a function which is nonincreasing in p_i for each i (e.g., the consumer selects the lowest price, or adopts some other arbitrary criterion). If issuer i wins the auction, her expected payoff is given by: $p_i - E\{\delta\}$, where the expectation is taken conditional on the issuer's own private signal about δ, as well as conditional on the fact that issuer i has won the auction.

The default probability is not directly observed by issuers. Instead, each issuer i ($i = 1,\ldots,N$) receives a signal s_i. As is standard in the auctions literature, we assume that $\delta, s_1,\ldots,s_N$ derive from affiliated random variables (see Paul R. Milgrom and Robert J. Weber, 1982, p. 1098). Loosely speaking, the affiliation assumption requires that the agents' signals, s_i, are positively correlated with one another and with the default probability δ. More precisely, let $x \equiv (\delta, s_1,\ldots,s_N)$ and $x' \equiv (\delta', s_1',\ldots,s_N')$ (each points in $\mathbb{R}^{n+1}$) be possible realizations of the default probability and the N issuers' signals, and let $f(\bullet)$ denote the joint density function. Let $x \vee x'$ denote the componentwise maximum of x and x', and let $x \wedge x'$ denote the componentwise minimum. We say that the random variables are *strictly affiliated* if $f(x \vee x')\, f(x \wedge x') > f(x)\, f(x')$, for all $x' \neq x$.

By reasoning standard in the auctions literature, we would expect such a model to possess an equilibrium which is monotonic in the sense that each issuer's bid, $p_i(s_i)$, is an increasing function of her own signal. (That is to say, the lower the signal s_i, the lower that issuer i believes the default probability to be, and so the lower the price p_i that she offers.)

Our first theoretical prediction is precisely the "Winner's Curse" from the auctions literature. (For a nice discussion, see the auction survey by R. Preston McAfee and John McMillan, 1987.) The fact that a consumer accepted a given firm's solicitation is indicative that other issuers received relatively unfavorable signals and, since issuers' signals are positively correlated with the truth, the winner should increase the probability that she assigns to the consumer's default. In short, winning the auction confers "bad news"; the expected probability of default conditional on any solicitation being accepted is greater than the unconditional expected probability of default. We have:

PROPOSITION 1 (THE WINNER'S CURSE). *If the default probability and issuers' signals are strictly affiliated, if the opposing issuers use monotonic bid strategies, and if consumers use monotonic acceptance rules, then adverse selection occurs between respondents and nonrespondents in the sense that:*

$$E\,\{\delta \mid p_i \textit{ wins the auction}\} > E\,\{\delta\}\,,$$

for any p_i.

Our second theoretical prediction concerns the composition of the customer pool from two different offers. A comparison of a *superior* offer p_i' and an *inferior* offer p_i'' (where $p_i'' > p_i'$) yields a

prediction of adverse selection. The superior offer p_i' may win the auction even if the other issuers received relatively favorable signals, and so the default probability may be fairly low. By contrast, the inferior offer p_i'' will win the auction only if the other bidders received unfavorable signals, and so the default probability should be expected to be quite high. We have:

PROPOSITION 2. *If the default probability and issuers' signals are strictly affiliated, if the opposing issuers use monotonic bid strategies, and if consumers use monotonic acceptance rules, then adverse selection occurs in the sense that:*

$$E\{\delta \mid p_i'' \text{ wins the auction}\} > E\{\delta \mid p_i' \text{ wins the auction}\},$$

whenever $p_i'' > p_i'$.

The reader should also observe that the same set of assumptions yields the conclusion that the probability of an inferior offer p_i'' winning the auction is less than the probability of a superior offer p_i' winning the auction. That is, better offers yield higher response rates or, equivalently, demand curves are downward sloping.

2 Description of the Market Experiments

This paper examines the results of a series of three market experiments conducted by a major United States issuer of bank credit cards in the 1990's. As detailed in Table 1, Market Experiment I was conducted by generating a mailing list of 600,000 customer names and randomly assigning them among six equal market cells. The market cells were mailed solicitations which varied in the introductory interest rate and in the duration of the introductory offer, but which were otherwise identical (and included the same post-introductory interest rate of about 16%). Market Experiment II was conducted by generating a mailing list of 863,876 customer names and randomly assigning them unequally among five market cells. Again, the market cells were mailed solicitations which varied in the introductory interest rate and in the duration of the introductory offer, but which were otherwise identical (and included the same post-introductory interest rate of about 16%). Market Experiment III was conducted by generating a mailing list of 500,000 customer names and randomly assigning them among five equal market cells. The market cells were mailed solicitations which varied in the post-introductory interest rate, but which were otherwise identical (and included the same 5.9% introductory interest rate for six months).

As already discussed in the Introduction, each of these market experiments consisted of ***preapproved*** credit card solicitations, and so the issuer possessed extensive credit-bureau information on the entire mailing list of customers. As such, we may begin the empirical study by testing whether a correct randomization was done. Tables 2A, B and C report the results for Market Experiment I, II and III, respectively. Mean values, and standard errors, are computed for the following variables: the number of months that the consumer has been on file with the credit bureau; the consumer's credit score; the number of bank credit cards known to be held; the highest credit limit known on any single bank credit card; the combined revolving (mostly bank credit card) balances; the combined revolving credit limits; the utilization rate (i.e., the ratio of balances to credit limits); the mortgage balance; and the number of 30-day-past-due delinquencies reported in the last twelve months.

In Table 2A, each market cell reports between 99,860 and 99,890 observations, out of the 100,000 consumers actually contained in the market cell. About half of the missing observations are due to the one known data problem in this sample: the approximately 5% of the individuals who responded to the preapproved solicitation but were declined (due to a deterioration of credit condition or failure to report adequate information or income) were, for unknown reasons, deleted from the data set. In any case, over 99.8% of the sample is still included.

Table 2A reports evidence of a good randomization. Most of the variables are indiscernibly different between market cells. The last line of Table 2A summarizes the results of the t-tests for each variable between all 15 pairs of market cells in the randomized trial, by reporting the ***lowest*** P-value found between market cells. We see, for example, that equality of the number of months on file can never be rejected at any less than the 18.6% level, and equality of credit scores can never be rejected at any less than the 26.0% level. The lowest P-value for any of the t-tests arises in the comparison of the number of delinquencies in the last twelve months between Market Cells E and F, and this P-value still equals 8.33%. Equality can never be rejected, for example, at the 5% level, despite the enormous sample size.

Tables 2B and C similarly report that Market Experiments II and III were properly randomized.

3 The Winner's Curse

Preapproved credit card offers enable us to directly test Proposition 1. Absent adverse selection, there should be no difference in the characteristics of respondents and nonrespondents. However, Proposition 1 predicts a “Winner's Curse”: from the viewpoint of an issuer, the conditional expected characteristics of a consumer (conditional on the consumer accepting) are worse than the unconditional expected characteristics. In turn, this immediately implies that the expected characteristics conditional on responding are worse than the expected characteristics conditional on not responding.

Table 3 reports the empirical results on the Winner's Curse for all three market experiments. We will describe the results in detail only for Market Experiment I. As already discussed in the previous section, each market cell reports between 99,860 and 99,890 observations, for a total of 599,257 out of the 600,000 consumers actually solicited. About half of the missing observations are due to the one known data problem in this sample: the approximately 5% of the individuals who responded to the preapproved solicitation but were declined (due to a deterioration of credit condition or failure to report adequate information or income) were, for unknown reasons, deleted from the data set. The reader should observe that these omitted observations could potentially bias the results, but fortunately the bias operates in the direction which only strengthens the results. That is, if the respondents had displayed ***superior*** characteristics compared to the nonrespondents, we could not be sure whether the difference was due to true differences in the respective pools, or due to the fact that possibly the worst 5% of the respondent pool had been deleted (by rejection) from the sample. However, given that the respondents display vastly ***inferior*** characteristics compared to the nonrespondents, the possibility that the worst 5% of the respondent pool had been deleted would only strengthen the conclusions being reached here about adverse selection.

As in the previous section, comparisons are done on nine credit-bureau variables: the number of months that the consumer has been on file with the credit bureau; the consumer's credit score; the number of bank credit cards known to be held; the highest credit limit known on any single bank credit card; the combined revolving (mostly bank credit card) balances; the combined revolving credit limits; the utilization rate (i.e., the ratio of balances to credit limits); the mortgage balance; and the number of 30-day-past-due delinquencies reported in the last twelve months.

Many of the comparisons are quite striking and, in the author's view, constitute overwhelming evidence of adverse selection. Respondents averaged 122 months on file, whereas nonrespondents averaged 175 months on file. That is, respondents on average had markedly shorter credit histories than nonrespondents, by a margin of more than four years. Respondents had mean credit scores of 585, whereas nonrespondents had mean credit scores of 643. A higher credit score corresponds to a better credit risk. While the magnitudes of credit scores may seem difficult to interpret, some quick regressions of delinquencies and bankruptcies on credit score suggests that this 58-point difference corresponds to more than a 40 percent increase in the probability of delinquency and bankruptcy!

The highest limit on a bankcard for respondents averaged $6,259, whereas for nonrespondents averaged $7,704. The credit limit assigned on existing cards is one measure of the creditworthiness of the consumer perceived by the existing issuers. The preliminary aggregate revolving balances for respondents averaged $3,733, whereas for nonrespondents averaged only $2,498. As we shall see, the

extent of revolving balances are one of the greatest contributors to bankruptcy, and respondents have 50% more such debt. Meanwhile, the aggregate revolving credit limits averaged $14,958 for respondents, but $17,503 for nonrespondents; and the utilization rate (revolving balances divided by revolving limits) averaged 27.1% for respondents, but only 15.5% for nonrespondents. Respondents are much more borrowed-up than nonrespondents, which is explaining why they responded, and also explaining why they pose greater default risk than nonrespondents. Finally, mortgage balances averaged $26,515 for respondents, but $32,351 for nonrespondents — suggesting that respondents are less likely to be homeowners.

Simple t-tests on each of these seven variables yielded rejection of equality, between respondents and nonrespondents, at the 0.00001% level. The differences in characteristics between respondents and nonrespondents are statistically significant and, as we have seen in the previous paragraph, should also be viewed as economically significant.

Differences in the remaining two variables are not as clear. The number of delinquencies in the past twelve months is exceedingly low for both nonrespondents and respondents, as these are all individuals who have been selected for preapproved solicitations. And the number of existing bank credit cards is exceedingly close for nonrespondents and respondents.

The results for Market Experiments II and III are qualitatively similar, with the exception that in Market Experiment III, the preliminary revolving balances of nonrespondents and respondents are essentially equal.

4 Adverse Selection Among Offers: Observable Information

The randomized trials on credit card solicitations enable us to directly test Proposition 2. Absent adverse selection, there should be no difference in the characteristics of respondents to different offers, as the respective pools who were solicited were generated by random assignment. However, Proposition 2 predicted that inferior offers would yield inferior customers (as compared to superior offers). Empirically, if the characteristics of respondents to different offers within a randomized trial are significantly different, then we can directly attribute these differences to the different terms of the solicitations. Thus, the randomized trials provide a rather direct test of adverse selection across offers.

We begin by briefly summarizing the results which are developed in detail below and in Tables 4, 5 and 6. Let us define terms of a credit card solicitation to be "inferior" if the introductory interest rate is higher, the duration of the introductory period is shorter, or the post-introductory interest rate is higher. First, and not at all surprisingly, the response rates to inferior offers are lower than the response rates to superior offers. Second, the customer characteristics exhibit statistically-significant adverse selection

according to a systematic pattern. Inferior solicitations lead to respondent pools with: lower incomes; inferior credit records; lower balances on other credit cards; lower credit limits on other credit cards; and somewhat higher utilization rates of credit lines on other credit cards. Third, tracking the subsequent account histories, inferior solicitations yield customer pools with higher delinquency, chargeoff and bankruptcy rates, but accounts with low introductory offers are also far more likely to lead to customer attrition.

A more detailed discussion follows.

4.1 Experiment I: Respondent Characteristics

In Market Experiment I, a mailing list of 600,000 customer names was randomly assigned to six equal market cells, and the credit card solicitations varied both on the introductory interest rate and on the duration of the introductory offer. All of the solicitations were for gold cards. For all of these solicitations, the post-introductory interest rate was given by a floating-rate formula which netted to approximately a 16% interest rate.

The Effective Response Rate reported in the tables is the proportion of people in the market cell who responded to the solicitation and were approved for a credit card. (Although the offers were all "preapproved", approximately 5% of the respondents did not meet the requirements for the preapproved offer, and were thus not approved.) The same approval requirements were used in all the market cells of any given experiment and, generally, the proportion of respondents who were approved is not appreciably different among cells.

The following customer characteristics were studied. Income is the annual income self-reported by respondents at the time they responded to the credit card solicitation. Gold equals one if the respondent was issued a gold card, and zero if the respondent was only issued a standard card. As such, gold is essentially a zero-one indicator of whether the respondent's income exceeded the threshold amount required for a gold card. Credit Limit is the initial credit limit granted by the bank at the time the credit card was approved. As such, credit limit embeds much of the credit bureau and other information possessed by the bank at the time the customer responded to the solicitation. Revolving Balance is the combined balances on all other credit cards, and Revolving Limit is the combined credit limit on all other credit cards, based on credit bureau reports, at the time the customer responded to the solicitation. (These numbers are substantially higher than the Preliminary Revolving Balance and Preliminary Revolving Limit reported on Tables 2 and 3, since they are based on a second and more comprehensive check with the credit bureaus.) Utilization Rate is the ratio of Revolving Balances to Revolving Limits. (Utilization

Rate is slightly higher than the Preliminary Utilization Rate reported on Tables 2 and 3, again since it is based on a second and more comprehensive check with the credit bureaus.)

The top portion of Table 4A displays the means and standard errors of these variables. The Effective Response Rate and the Gold indicator are based on the entire sample of approved respondents to the solicitations. The remaining variables are computed after deleting outlying observations, specifically by deleting the top 2.5% and the bottom 2.5% of all values, as well as all missing values.

The bottom portion of Table 4A displays the P-values resulting from a simple t-test on the equality of the variables between successive pairs of market cells. For example, the first row of the bottom portion of Table 4A compares Market Cell A (4.9% introductory rate for six months) with Market Cell B (5.9% introductory rate for six months). We find that the null hypothesis that the Effective Response Rates are equal for the two solicitations can be rejected at the 0.01% level, while the null hypothesis that the Gold indicators are equal in the two respondent pools can be rejected at the 2.91% level. The second row of the bottom portion of Table 4A makes the analogous comparisons between Market Cell B and Market Cell C (6.9% introductory rate for six months); and the third row makes the analogous comparisons between Market Cell C and Market Cell D (7.9% introductory rate for six months). The fourth row of the bottom portion of Table 4A reports the pairwise comparison between the lowest (4.9%) and highest (7.9%) introductory rates in the experiment. This comparison is much more likely than the first three comparisons to yield statistical and economic significance, since it compares differences of three percentage points — rather than just a single percentage point — in the six-month introductory offer. Indeed, this comparison yields strong evidence of adverse selection. The average income of customers was $43,019 in Market Cell A, whereas it was only $39,702 in Market Cell D. Equality can be rejected at the 0.09% level. Gold cards were awarded to 84.0% of customers in Market Cell A, but to only 76.7% of customers in Market Cell D. Equality can be rejected at the 0.09% level. An average credit limit of $6,446 was assigned to customers in Market Cell A, while an average of only $5,827 was assigned in Market Cell D. Equality can be rejected at the 0.01% level. While average revolving balances were essentially the same ($5,290 vs. $5,152), customers in Market Cell A had $19,209 in average revolving limits, while customers in Market Cell D had only $16,422 in average revolving limits. Again, equality can be rejected at the 0.01% level. Customers in Market Cell A were utilizing 32.2% of their credit limits, while those in Market Cell D were utilizing 35.1% of their credit limits. Equality can be rejected at the 3.63% level.

The last two rows of Table 4A display the P-values resulting from the two experiments on the duration of the introductory offer. The results are again quite strong for the experiment involving the

difference of greatest duration: Market Cell D (7.9% introductory rate for six months) versus Market Cell F (7.9% introductory rate for twelve months). The effective response rates, incomes, gold card indicators, credit limits, and revolving limits are all substantially different, and equality can be rejected at the 3% level. The differences in revolving balances are only borderline-significant, while the utilization rates and debt burdens are essentially the same.

4.2 Experiment II: Respondent Characteristics

In Market Experiment II, a mailing list of 863,876 customer names was randomly assigned among five unequal market cells, each consisting of 70,000 or more names, and the credit card solicitations again varied both on the introductory interest rate and on the duration of the introductory offer. Again, all of the solicitations were for gold cards, and again, the post-introductory interest rate was given by a floating-rate formula which netted to approximately a 16% interest rate.

The top portion of Table 5 displays the means and standard errors of these variables. The bottom portion of Table 5 displays the P-values resulting from a simple t-test on the equality of the variables between selected pairs of market cells. Note, in particular, the third row of the bottom portion of Table 5, which compares the two market cells with the greatest difference in the duration of the introductory offers. The comparison between Market Cells A and C yields the strongest evidence of adverse selection between offers on observable information in the entire paper. For *every* variable except Utilization Rate, the null hypothesis of equality is rejected at the 0.01% level! (For Utilization Rate, equality is rejected at "only" the 2% level.) Many of the differences are economically quite substantial. Incomes are 13% higher in Market Cell C than A, revolving balances are 46% higher, and revolving limits are 57% higher.

The last two rows of Table 5 display the P-values resulting from experiments on the introductory interest rate. The differences between the means of variables are not always significant, but they are still suggestive of adverse selection.

4.3 Experiment III: Respondent Characteristics

In Market Experiment III, a mailing list of 500,000 customer names was randomly assigned to five equal market cells, and the credit card solicitations were varied solely on the post-introductory interest rate.

In Table 6A, we see that many of the differences between consecutive market cells (post-introductory interest rates only 2% apart) are not especially great. However, it is relatively easy to obtain statistically-significant differences when cells two apart (interest rates 4% apart) are compared and, especially, when the lowest and highest rates (8% apart) are compared. In comparing Market Cells A and E (on the last line of Table 6A), we see that the equality of Income, Gold, Credit Limit, Revolving

Balance, and Revolving Limit are all rejected at the 1% level. However, equality of the Utilization Rate and Debt Burden are not rejected at the 5% level.

4.4 Experiments I and III: Experience of the Accounts

The author's data tapes for Market Experiment II lack the subsequent history of the accounts. However, for Market Experiments I and III, it is possible to examine the experience of the accounts for delinquency, default, bankruptcy, and attrition.

The top portion of Table 4B displays the delinquency rate, chargeoff rate, average charged-off balances, activity rate, and bankruptcy rate for each of the six market cells of Market Experiment I, over account histories of 27 months. The delinquency rate indicates the proportion of accounts which have gone 60 days or more past due at any time during this period. The chargeoff rate indicates the proportion of the accounts for which balances were written off at any time during the first 27 months of the life of the account. The chargeoff balances indicates the aggregate amount of balances which were written off anytime during the first 27 months of the life of the account, divided by the number of accounts in the market cell. The activity rate indicates the proportion of the accounts opened which still displayed activity (i.e., a charge balance or new charges) during the last three months of the 27-month period. The bankruptcy rate indicates the proportion of accounts for which the cardholder filed for bankruptcy at any time during this period.

The bottom portion of Table 4B displays the P-values resulting from a simple t-test on the equality of the experiential variables between selected pairs of market cells. In Market Experiment I, it is relatively difficult to obtain statistically-significant differences between cells with introductory interest rates a mere 1% apart, so instead, we perform pairwise tests between market cells where the introductory interest rates are 2% or 3% apart. Rather strong results are obtained by comparing the market cells with the greatest differences in terms: Market Cells A and D, which differ by three percentage points on the introductory interest rate; and Market Cells D and F, which differ by six months on the duration of the introductory period. Comparing Market Cells A and D, the delinquency rate jumps from 5.97% to 10.08%, the chargeoff rate jumps from 4.10% to 7.13%, the average chargeoff balances jump from $217 to $377, and the bankruptcy rate jumps from 2.80% to 4.34%. These are all jumps of more than 50% and, except for bankruptcy, these are all significant at the 3% level. Comparing Market Cells F and D, the delinquency rate jumps from 6.78% to 10.08%, the chargeoff rate jumps from 4.02% to 7.13%, the average chargeoff balances jump from $212 to $377, and the bankruptcy rate jumps from 2.22% to 4.34%. These are all jumps of more than 50%, and all are significant at the 3% level.

Qualitatively, the activity rate of the accounts after 27 months (well after the expiration of the introductory offers) appears to depend sharply on the introductory interest rate but not especially on the

duration of the introductory offer. For example, 46.4% of the accounts opened with a 7.9%/ 6-month introductory offer remained active after 27 months, whereas only 37.0% of the accounts opened with a 4.9%/ 6-month introductory offer remained active; equality can be rejected with a P-value of 0.01%. However, comparing market cells C and E (each with a 6.9% introductory rate, but for different durations), or comparing market cells D and F (each with a 7.9% introductory rate, but for different durations), yields very close activity rates. As one might expect, it seems as though the proportion of customers who use their accounts only for the introductory period depends primarily on the introductory interest rate and not on the duration.

Table 6B displays the delinquency rate, chargeoff rate, average charged-off balances, activity rate, and bankruptcy rate for each of the five market cells of Market Experiment III, over account histories of 21 months. Again, we see that all of the measures of customer default increase quite substantially as the post-introductory interest rate is increased. We obtain the clearest differences in comparing the lowest (Market Cell A) and highest (Market Cell E) post-introductory interest rates; on the last line of Table 6B, we reject equality of the Delinquency Rate, Chargeoff Rate, Average Chargeoff Balances, and the Bankruptcy Rate, all at the 5% level. Moreover, the differences in these measures are economically quite large: for example, the Bankruptcy Rate rises from 1.08% (Market Cell A) to 2.69% (Market Cell E). Qualitatively, most of the rise in the default measures occurs in the transition from Market Cells A to C; the further rise in the transition from Market Cells C to E is often negligible (or negative). The activity rate is also much lower in Market Cells C, D and E than in Market Cell A.

5 Adverse Selection Among Offers: Hidden Information

The adverse selection which we examined in Section 4 was entirely observable to a credit card issuer at the time that the consumer responded to the solicitation. Solicitations with inferior terms generated customer pools with inferior observable characteristics. The question to which we now turn is whether the adverse selection can be decomposed into observable and unobservable components. That is, after controlling for the deterioration in observable characteristics yielded by an inferior offer, does the inferior offer still yield a customer pool which is more likely to default?

The strategy pursued here is quite simple. We estimate four default measures – delinquency, chargeoff, chargeoff balances, and bankruptcy – using the customer-specific information available to the credit card issuer at the time the account was opened, and additional variables reflecting the terms of the account (i.e., the introductory interest rate, its duration, and the post-introductory interest rate). In the absence of adverse selection on hidden information, the coefficients on the variables reflecting the terms of the account ought not be significantly different from zero. Conversely, to the extent that adverse

selection is a real phenomenon, we should expect the coefficients on interest rate to be significantly positive and on duration to be significantly negative.

We address this issue by examining the actual default experience for Market Experiments I and III. (Market Experiment II is *not* examined in this section, since the default experience is unavailable.) The following discussion will focus primarily on Market Experiment I.

Tables 7A–E report estimates of delinquencies, chargeoffs, chargeoff balances, bankruptcy and activity, respectively, for the 4,908 accounts generated by Market Experiment I which have complete histories for the first 27 months of the account. An account is defined as *delinquent* if the account becomes 60 days or more past due anytime during the first 27 months of the life of the account. An account is defined as a *chargeoff* if it is written off as uncollectable at any time during the first 27 months of the life of the account. A *chargeoff balance* is defined as the amount, if any, of debt which is written off the account during its first 27 months. An account is defined as *bankrupt* if the cardholder files for bankruptcy anytime during the first 27 months of the life of the account. An account is defined as *active* if the account maintains normal open status after 27 months and it was used for charging or borrowing during any of months 25, 26 or 27 of the life of the account.

Column 1 of Tables 7A–E reports a simple OLS regression. Column 2 reports marginal effects from probit (tobit, for Table 7C) estimations with exactly the same dependent and explanatory variables. Column 3 parallels the OLS regression from Column 1, but with the dependent variables restricted to delinquencies, chargeoffs, chargeoff balances, bankruptcy and activity, respectively, *in months 16 to 27 only*. (Attention is then restricted to the 3,128 accounts that were in good standing as of month 15 and which had been used for charging or borrowing in months 13, 14 or 15.)

The explanatory variables in Columns 1, 2, and 3 of Tables 7A–E include: the number of months that the customer has been on file at a credit bureau; the bankruptcy rate of the county in which the customer resides; the assigned credit limit; the number of existing revolving and other credit accounts maintained by the customer; the amount of balance transfer; the combined balances on revolving accounts as a proportion of the combined credit limits on revolving accounts maintained by the customer; and the combined balances on revolving accounts as a proportion of the customer's (self-reported) income; as well as the introductory interest rate and the duration of the introductory offer associated with the respective market cell.

Columns 4, 5 and 6 of Tables 7A–E perform various robustness checks on the estimation. In Column 4, we modify Column 1 by removing Revolving Balances / Revolving Limits and Revolving Balances / Income as explanatory variables. In their place, we separately include Revolving Balances,

Revolving Limits, and Income. In addition, Column 4 includes the customer's credit score (at the time the account was opened) as an explanatory variable.[2] Column 5 modifies Column 1 by adding all quadratic and interaction terms of the customer-specific explanatory variables. Column 6 reports the results of nonparametric estimation in which the variables of month on file, county bankruptcy rate, credit limit, number of existing credit accounts, balance transfer, revolving balances / revolving limits and revolving balances / income are divided into a $4 \times 2 \times 4 \times 4 \times 2 \times 4 \times 4$ grid.

The regression results provide strong evidence of adverse selection on hidden information. For example, Column 1 of Table 7A reports that the coefficient on the introductory interest rate in the delinquency equation equals 0.012 (which is statistically-significant at the 5% level with a t-statistic of 2.88) and the coefficient on the duration of the introductory offer equals −0.0057 (which is statistically-significant at the 5% level with a t-statistic of 2.84). These coefficients can be interpreted as saying that, even after controlling for all information known to the card issuer at the time that the account is opened, respondents to a solicitation with an introductory interest rate 1 percent higher have a delinquency probability that is 1.2 percentage points higher, while respondents to a solicitation with an introductory offer which lasts 3 months longer have a delinquency probability that is 1.7 percentage points lower. Similarly, Column 1 of Table 7D indicates that the coefficient on the introductory interest rate in the bankruptcy equation equals 0.0043 (which is borderline statistically-significant with a t-statistic of 1.58) and the coefficient on the duration of the introductory offer equals –.0028 (which is statistically-significant at the 5% level with a t-statistic of 2.13). These coefficients can be interpreted as saying that, even after controlling for all information known to the card issuer at the time that the account is opened, respondents to a solicitation with an introductory interest rate 1 percent higher have a bankruptcy probability that is 0.4 percentage points higher, while respondents to a solicitation with an introductory offer which lasts 3 months longer have a bankruptcy probability that is 0.8 percentage points lower.

The reader should observe that the results on hidden-information adverse selection are extremely robust. For example, in Table 7A, six substantially different specifications are estimated. Nevertheless, the coefficient on introductory interest rate varies only from a low of 0.01149 to a high of 0.01277. Similarly, the coefficient on the duration of the introductory offer varies only from a low of −0.00571 to a high of −0.00416.

[2]Credit score is omitted as an explanatory variable, except in Column 4, for the following reason: revolving balances, revolving limits and several other of the included explanatory variables are important components of credit score, and we would like to know the empirical magnitudes of the coefficients on these separate explanatory variables.

Tables 8A–E report analogous estimates for the 3,794 accounts generated by Market Experiment III which have complete histories for the first 21 months of the account. The variable definitions are the same, except that in Column 3, the dependent variables are restricted to occurrences *in months 10 to 21 only*. (Attention is then restricted to the 2,469 accounts that were in good standing as of month 9 and which had been used for charging or borrowing in months 7, 8 or 9.) And the market-cell specific variable is now, of course, the post-introductory interest rate.

Tables 8A–E again provide strong evidence of adverse selection on hidden information. For example, observe that the t-statistics on the coefficient of the post-introductory interest rate in Column 1 ranges from 2.30 to 3.09 in Tables 8A–D, establishing that respondents to a solicitation with a higher post-introductory interest rate are more likely to default, even after controlling for all information known to the card issuer at the time that the account is opened.

6 Adverse Selection on Switch Costs

Table 7E provides evidence of adverse selection on hidden information related to switch cost. In particular, Columns 1 and 2 indicate that the coefficient on the introductory interest rate equals 0.026, and is statistically-significant at the 5% level with a t-statistic of 3.24. This coefficient can be interpreted as saying that, even after controlling for all observable information, respondents to a solicitation with an introductory interest rate that is 1% lower have an activity probability that is 2.6% lower (i.e., an attrition probability that is 2.6% higher). What we appear to be finding is that each consumer has an idiosyncratic, personal switch cost which is unobservable to the issuer but quite important. Respondents to very low introductory offers have lower switch costs, and thus are more apt to switch again.

Observe that the adverse selection on switch cost cuts in the opposite direction as the adverse selection on credit quality. Issuers may offer low introductory offers precisely with the intention of avoiding ruinous default probabilities. But offsetting this advantage, low introductory offers disproportionately yield customers who — having switched once — are likely to switch again.

7 Consumer Rationality

There exists an extensive experimental literature identifying environments where experimental subjects make less-than-optimal choices. However, there are relatively few studies documenting suboptimal decision-making outside the laboratory (albeit good reasons for thinking it is an important phenomenon). The market experiments on credit card solicitations provide a substantial arena for examining consumer rationality in a real market situation. The results are particularly striking in the sense that the apparent misperceptions occur in the use of a product with which virtually all of the customers were familiar: essentially all of the people solicited with these offers already held one or more

other credit cards; and during this period, an average American household received approximately two direct-mailed credit card solicitations each month.

The particular proposition being explored is an underestimation hypothesis which was advanced by this author in earlier work. I examine the hypothesis that many consumers systematically underestimate the extent of their current and future credit card borrowing and, using these underestimates, make suboptimal decisions regarding the choice and usage of credit cards. As such, the hypothesis not only suggests a quantity which customers misperceive but also a systematic direction in which they err.

To the extent that consumers are comparatively realistic about their current borrowing but overly optimistic about their future borrowing, they will misperceive the tradeoffs between the various terms of a credit card solicitation. An underestimating consumer will overrate the importance of the introductory interest rate as compared to its duration or the ensuing post-introductory interest rate. This section examines underestimation from two angles.

7.1 Overresponsiveness to the Introductory Interest Rate

Market Experiments I and III — performed at close time proximity and with similar customer pools — enable us to compare consumers' relative responsiveness to changes in the introductory interest rate, duration of the introductory offer, and post-introductory interest rate. The strategy for analysis is to determine the dollar impacts of changes in these three terms (based upon the actual balances accruing interest in the customers' account histories) and to compare the implied consumer demand curves.

The darker (upper) line in Figure 1 represents the implied demand curve for changes in the introductory interest rate in Market Experiment I. Following the curve from lower right to upper left, the four marked points represent the responses to the 4.9%, 5.9%, 6.9% and 7.9% introductory interest rates, respectively. The horizontal axis is a quantity axis: the locations of the four points simply mark the number of respondents (per 100,000 consumers solicited) for the four respective interest rates. The vertical axis is a price axis: the vertical distances between two successive points were calculated as follows. Consider the respondents to the 4.9% offer. Taking the actual balances accruing interest from the customers' account histories as given, I asked the following question: What would have been the average dollar cost (in terms of additional finance charges paid) of raising each customer's introductory interest rate from 4.9% to 5.9%? Under the assumption that the change in interest rate did not lead customers to change their amounts borrowed, the calculation yielded a dollar cost of $13.07. Similarly, consider the respondents to the 5.9% offer. Taking the actual balances accruing interest from the customers' account histories as given, I asked the following question: What would have been the average dollar benefit (in terms of reduced finance charges paid) of lowering each customer's introductory interest

rate from 5.9% to 4.9%? Under the assumption that the change in interest rate did not lead customers to change their amounts borrowed, the calculation yielded a dollar benefit of $10.21. Since $11.64 = ½($13.07 + $10.21), a good measure of the dollar impact of a change from a 4.9% to a 5.9% introductory interest rate is $11.64. Hence, the vertical distance in Figure 1 between these two respective points is sketched as $11.64.

Similarly, the average dollar impact of a change from a 5.9% to a 6.9% introductory interest rate can be calculated to be $9.92 (the average of $10.21 and $9.63), and the average dollar impact of a change from a 6.9% to a 7.9% introductory interest rate can be calculated to be $9.48 (the average of $9.63 and $9.33). Normalizing the price associated with the 7.9% introductory interest rate to equal zero, we obtain the dollar-impact demand curve for changes in the introductory interest rate, sketched in Figure 1.

By contrast, the lighter (lower) line in Figure 1 represents the implied demand curve for changes in the post-introductory interest rate in Market Experiment III. Following the curve from lower right to upper left, the five marked points represent the responses to the standard–4%, standard–2%, standard+0%, standard+2% and standard+4% post-introductory interest rates, respectively. The vertical distances between two successive points were calculated as follows. Consider the respondents to the standard–4% offer. Taking the actual balances accruing interest from the customers' account histories as given, I asked the following question: What would have been the average dollar cost (in terms of additional finance charges paid) of raising each customer's post-introductory interest rate by 2%? Similarly, consider the respondents to the standard–2% offer. Taking the actual balances accruing interest from the customers' account histories as given, I asked the following question: What would have been the average dollar benefit (in terms of reduced finance charges paid) of lowering each customer's post-introductory interest rate by 2%? Averaging the answers to these two questions yielded a dollar impact of $27.66, evaluated using 21 months of account histories. Importantly, observe that (since these accounts will continue to persist beyond month 21 at differing post-introductory interest rates) this calculation provides only a lower bound on the dollar impact of changes over the *lifetimes* of the accounts. Analogous calculations yield the locations of the remaining points on the dollar-impact demand curve for changes in the post-introductory interest rate, sketched in Figure 1.

Comparing the two dollar-impact demand curves in Figure 1, we see that consumers are at least three times as responsive to changes in the introductory interest rate as compared to dollar-equivalent changes in the post-introductory interest rate.

Figure 2 compares the dollar-impact demand curve for changes in the introductory interest rate with dollar-impact demand curves for changes in the duration of the introductory offer. Here, we reach a

similar conclusion: consumers are two to three times as responsive to changes in the introductory interest rate as compared to dollar-equivalent changes in the duration of the introductory offer.

The observed behavior is consistent with the underestimation hypothesis, and is difficult to reconcile with full consumer optimization.

7.2 Ranking Reversal

In Market Experiment I, where both the introductory interest rate and its duration are simultaneously varied, we can directly examine consumers' ranking of various offers, via the response rate. Since information is available to the researcher about the actual stream of borrowing and interest payments on the credit cards for all of the market cells, beyond the expiration date of all the introductory offers, we can also evaluate what would be the correct ranking of the offers. In short, we can examine which offers the consumers liked, as well as which offers were in the consumers' best interest.

Before proceeding, observe that casual inspection of Table 4 suggests that we may be onto something. The most popular offer, as measured by response rate, was the 4.9%/six-months offer of market cell A. However, given the post-introductory interest rate of about 16%, it would casually seem that market cells E (6.9%/nine-months) and F (7.9%/twelve-months) have got to be more favorable for consumers. The customer-level data which tracks actual account usage enables us to complete the argument.

We take two different approaches. The first, gross strategy is to calculate the actual effective interest rate paid by the entire set of respondents in the market cell. The results are displayed in Table 9. As we suspected, the offer of market cell F is the best for consumers, with an effective interest rate of 8.32%. Market cell E is second, with an effective interest rate of 9.23%; and the favorite, market cell A, is a distant third at 10.23%. (The average balance in these cells is around $2,000, so the effective difference in payments for market cell F vs. market cell A is about $40.)[3]

Second, we can take the actual flow of customer borrowing and interest payments and calculate a "what if" interest payment, asking how much more or less in interest a member of one market cell would pay if his account were repriced according to the formula of a different market cell. This approach assumes that customers do not change their borrowing behavior under the new terms, so it understates

[3]It should briefly be explained why the calculated effective interest rate for market cell F (8.32%) slightly exceeded the stated APR of 7.9%. First, the author's calculations incorporated the first 13 months of the potential life of the account, in order to deal with some timing problems in the data. Second, the APR is twelve times the monthly interest rate and, so, omits monthly compounding. Third, the introductory interest rate is conditional on the cardholder remaining current on his account; each market cell includes customers who went delinquent and lost the introductory rate.

improvements, overstates declines, and only is sensible for small changes in the terms of the account. We find the following:

Customers in Market Cell A:

Average improvement from obtaining terms of market cell E:	$10.98
Percent who would improve by more than $10:	35.6%
Percent who would worsen by more than $10:	16.2%

Customers in Market Cell E:

Average worsening from obtaining terms of market cell A:	$35.52
Percent who would improve by more than $10:	6.9%
Percent who would worsen by more than $10:	47.1%

Customers in Market Cell E:

Average improvement from obtaining terms of market cell F:	$14.52
Percent who would improve by more than $10:	33.1%
Percent who would worsen by more than $10:	10.2%

Customers in Market Cell F:

Average worsening from obtaining terms of market cell E:	$36.27
Percent who would improve by more than $10:	6.0%
Percent who would worsen by more than $10:	48.1%

Meanwhile, the sample sizes are sufficiently small that the differences in response rates between A and E, and E and F, are not statistically significant at the 5% level. However, the P-value for the comparison between market cells A and F is 0.29%. Market cells A and F provide substantial support for the underestimation hypothesis, and are difficult to reconcile with full rationality.

8 Credit Card Defaults, Personal Bankruptcy and the Household Debt Burden

Various authors have recently observed, on the basis of macro data, that the rise in both credit card defaults and personal bankruptcies over the past decade is closely correlated with the contemporaneous rise in the household debt burden. [See, for example, Ausubel (1997), Kim J. Kowalewski (1997), and Donald Morgan and Ian Toll (1997).] Figure 3, updated from Ausubel (1997),

displays the close statistical connection. However, to this author's knowledge, there has heretofore been no evidence based on micro data documenting this correlation. [But see the recent working paper of David B. Gross and Nicholas S. Souleles (1998), who argue to the contrary that the rise in bankruptcy is due not to an increase in risk, but primarily to a "stigma" effect.]

A reexamination of Tables 7A–D and 8A–D provides apparent evidence in this direction. Observe that the equations estimating delinquency, chargeoff, chargeoff balances, and bankruptcy display strongly positive coefficients on the Revolving Balances / Revolving Limits and Revolving Balances / Income variables. Let us focus in particular on the bankruptcy equations. In Column 1 of Table 7D, the coefficient on Revolving Balances / Revolving Limits is 0.0487, and the coefficient on Revolving Balances / Income is 0.1135. Compare two cardholders in this sample who differ in that one has Revolving Balances / Revolving Limits that is 25 percentage points higher than the other, but who are otherwise identical. Then the cardholder with the higher Revolving Balances / Revolving Limits has a 1.2-percentage-point higher probability of declaring bankruptcy 27 months later. This increase is quite large, given that the overall incidence of bankruptcy in this sample was 3 percent during this period. Also compare two cardholders in this sample who differ in that one has Revolving Balances / Income that is 25 percentage points higher than the other, but who are otherwise identical. Then the cardholder with the higher Revolving Balances / Income has a 2.8-percentage-point higher probability of declaring bankruptcy 27 months later. This increase is enormous, given that the overall incidence of bankruptcy in this sample was 3 percent during this period.

Table 8D paints a similar picture. In Column 1, the coefficient on Revolving Balances / Revolving Limits is 0.0587, and the coefficient on Revolving Balances / Income is 0.0663. Again compare two cardholders in this sample who differ only in that one has Revolving Balances / Revolving Limits that is 25 percentage points higher than the other. Then the cardholder with the higher Revolving Balances / Revolving Limits has a 1.5-percentage-point higher probability of declaring bankruptcy 21 months later. Also compare two cardholders in this sample who differ only in that one has Revolving Balances / Income that is 25 percentage points higher than the other. Then the cardholder with the higher Revolving Balances / Income has a 1.7-percentage-point higher probability of declaring bankruptcy 21 months later. These increases are again enormous, given that the overall incidence of bankruptcy in this sample was 2.1 percent during this period.

9 Conclusion

One question which the reader may be left with after reading this paper is whether the empirical results here can distinguish *adverse selection* from *moral hazard*. After all, given two identical consumers facing different interest rates, the consumer facing the higher interest rate may find greater

incentive to engage in risky spending practices, and so moral hazard without adverse selection might still yield the result that higher-interest-rate offers generate higher default rates.

Fortunately, the empirical exercise reported in Column 3 of Tables 7A–D enables us to exclude this possibility. Let us focus on Column 3 of Table 7D. Consumers were solicited for credit cards using six different combinations of introductory interest rate and duration, all of which reverted to the same post-introductory interest rate within 12 months after the account is opened. *Going forward from month 13*, consumers in all six of these market cells *faced identical terms on their credit cards*. Observe that the regression reported in Column 3 restricts attention to accounts that were in good standing as of month 15, and which had been used for charging or borrowing in months 13, 14 or 15. It then attempts to explain the event of bankruptcy in months 16 to 27.

The coefficient reported on the introductory interest rate in Column 3 of Table 7 is 0.0122. This means, for example, that consumers who faced a 2-percentage-point higher interest rate in at most the first 12 months had a 2.4-percentage-point higher probability of filing for bankruptcy in months 16 to 27, an increase approximately equal to the background level of bankruptcy filing. Furthermore, recall from the earlier discussion that the monetary impact of a 2-percentage-point higher interest rate in at most the first 12 months to a typical credit-card customer is only the same order of magnitude as the cost of a restaurant meal. Identical consumers would face identical moral hazard incentives going forward after month 12 — except for the effect of this one "restaurant meal" on the consumers' balance sheet. Unless we somehow believe that the cost of one restaurant meal by itself is sufficient to substantially increase the probability of bankruptcy filing, this indicates that the moral hazard explanation is implausible.

Another question which the reader may be left with after reading this paper is whether the "overresponsiveness" results constitute empirical support for theories of hyperbolic discounting (see David Laibson, 1997). The reader should observe that hyperbolic discounting (or, for that matter, high rates of discounting) cannot alone explain the tendency of consumers to overrespond to changes in the introductory interest rate. The reason, quite simply, is that hyperbolic discounting operates on *consumption* flows, not *financial* flows. An individual who discounts hyperbolically would only value a 4.9% introductory interest rate disproportionately greater than a 7.9% discount rate if it enabled him to vastly accelerate his consumption flows. However, we have seen that for a typical consumer, the reduced interest rate would only free up additional credit for one restaurant meal out of a $5,000+ credit line. It is hard to find plausible parameters under which this would justify a much higher response rate to low introductory offers. Of course, to the extent that consumers are seriously credit constrained, hyperbolic discounting (or simply high rates of discounting) *can* easily justify higher response rates to higher offers of credit limit, which is another response that we empirically observe.

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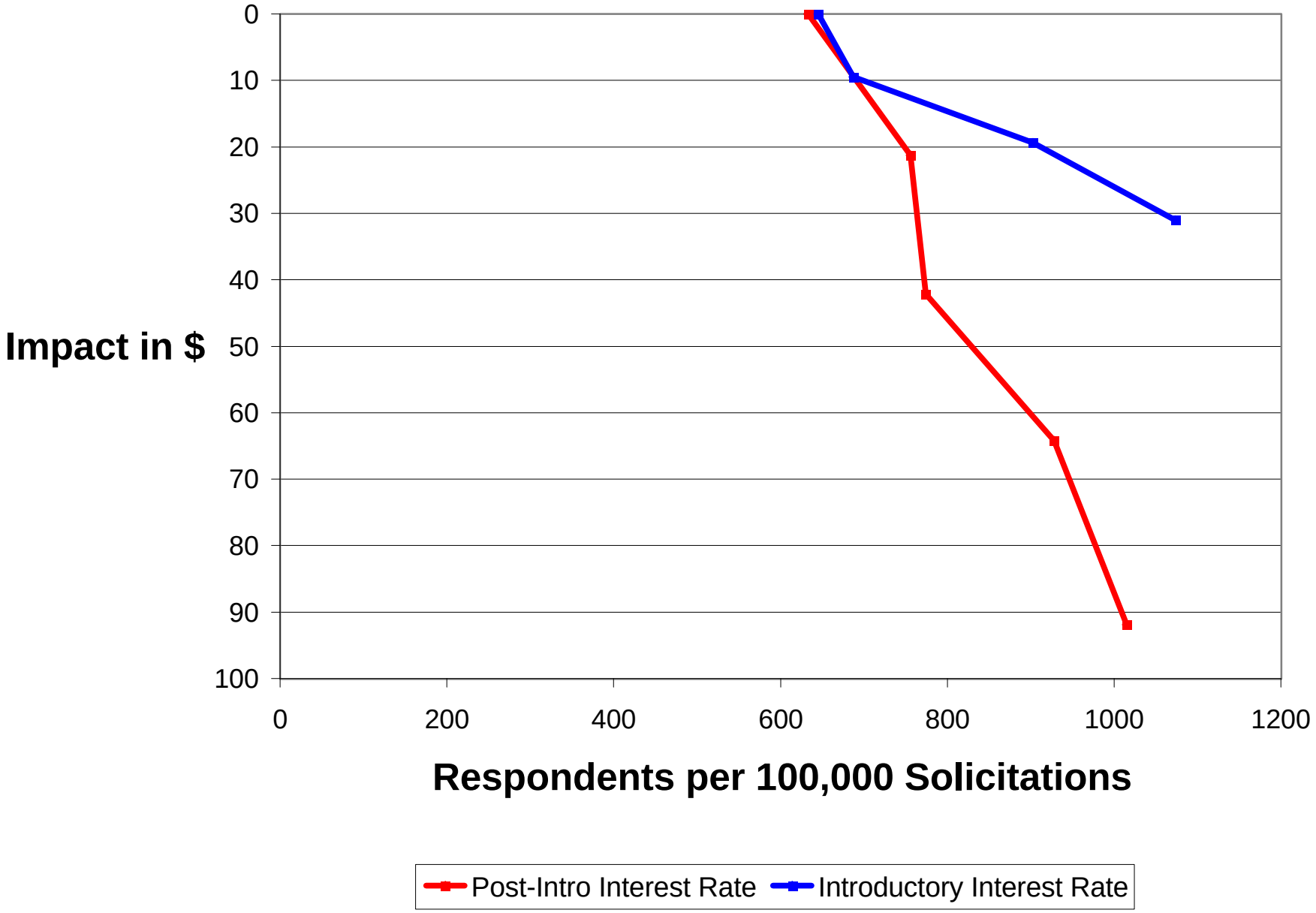
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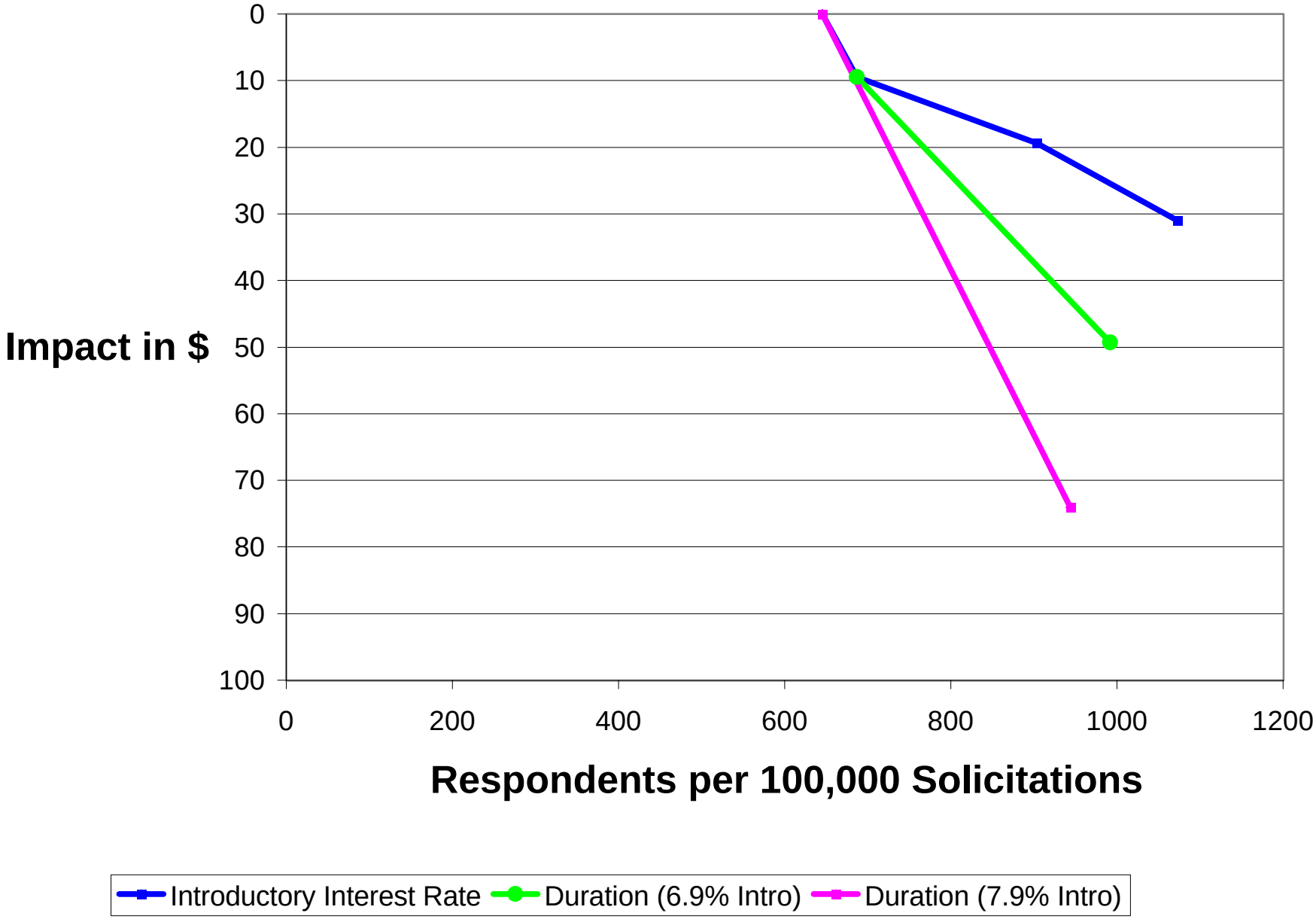
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Introductory Interest Rate
Duration (6.9% Intro)
Duration (7.9% Intro)

Household Debt Burden and Personal Bankruptcy Filings, 1984-98

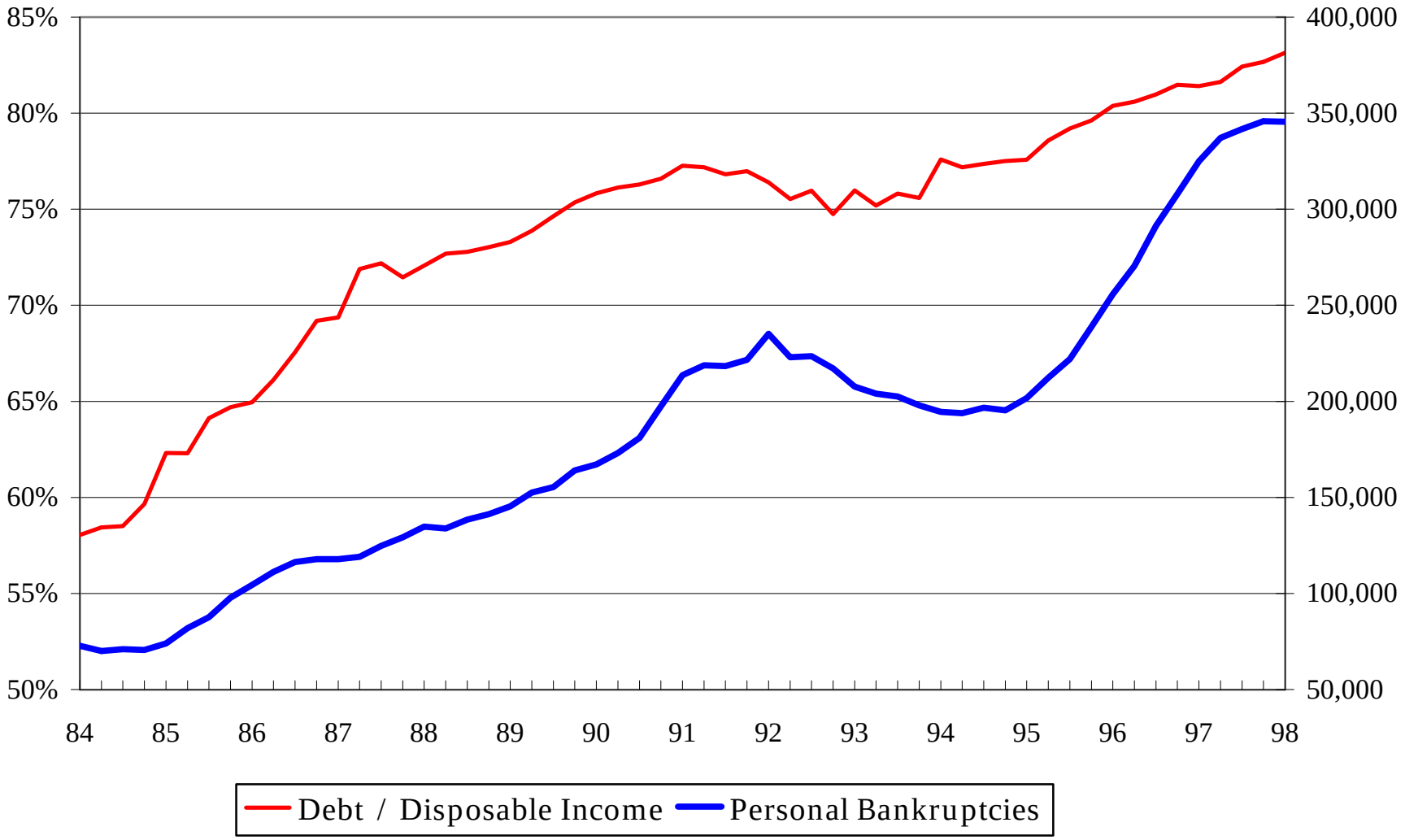

TABLE 1: SUMMARY OF MARKET EXPERIMENTS

MARKET EXPERIMENT	MARKET CELL	NUMBER OF SOLICITATIONS MAILED	EFFECTIVE RESPONSE RATE	PERCENT GOLD CARDS	AVERAGE CREDIT LIMIT
MKT EXP I	A: 4.9% Intro Rate 6 months	100,000	1.073%	83.97%	$6,446
MKT EXP I	B: 5.9% Intro Rate 6 months	100,000	0.903%	80.18%	$6,207
MKT EXP I	C: 6.9% Intro Rate 6 months	100,000	0.687%	80.06%	$5,973
MKT EXP I	D: 7.9% Intro Rate 6 months	100,000	0.645%	76.74%	$5,827
MKT EXP I	E: 6.9% Intro Rate 9 months	100,000	0.992%	81.15%	$6,279
MKT EXP I	F: 7.9% Intro Rate 12 months	100,000	0.944%	82.31%	$6,296
MKT EXP II	A: 5.9% Intro Rate 6 months	149,810	0.610%	68.82%	$4,794
MKT EXP II	B: 5.9% Intro Rate 9 months	137,332	0.760%	74.62%	$5,186
MKT EXP II	C: 5.9% Intro Rate 12 months	124,854	1.135%	76.85%	$5,495
MKT EXP II	D: 6.9% Intro Rate 12 months	72,432	0.936%	77.73%	$5,368
MKT EXP II	E: 7.9% Intro Rate 6 months	379,448	0.456%	65.82%	$4,540
MKT EXP III	A: Post-Intro Rate Standard - 4%	100,000	1.015%	82.96%	$5,666
MKT EXP III	B: Post-Intro Rate Standard - 2%	100,000	0.928%	77.69%	$5,346
MKT EXP III	C: Post-Intro Rate Standard + 0%	100,000	0.774%	76.87%	$5,167
MKT EXP III	D: Post-Intro Rate Standard + 2%	100,000	0.756%	76.98%	$5,265
MKT EXP III	E: Post-Intro Rate Standard + 4%	100,000	0.633%	73.62%	$5,095

TABLE 2A: MARKET EXPERIMENT I (RANDOMIZATION)

MARKET CELL	NUMBER OF OBSERVATIONS	MONTHS ON FILE	CREDIT SCORE	NUMBER OF BANKCARDS	HIGHEST LIMIT ON A BANKCARD	PRELIMINARY REVOLVING BALANCE	PRELIMINARY REVOLVING LIMIT	PRELIMINARY UTILIZATION RATE	MORTGAGE BALANCE	NUMBER OF DELINQUENCIES IN LAST 12 MONTHS
A: 4.9% Intro Rate 6 months	99,886	174.11	643.06	3.7717	$7,698.89	$2,515.60	$17,481.47	0.15663	$32,371.76	0.02010
		(0.2236)	(0.2798)	(0.0059)	(15.03)	(12.88)	(35.56)	(0.00061)	(196.59)	(0.00044)
B: 5.9% Intro Rate 6 months	99,872	173.99	642.92	3.7693	$7,698.26	$2,506.83	$17,471.60	0.15622	$32,199.01	0.01962
		(0.2239)	(0.2801)	(0.0060)	(14.91)	(12.85)	(36.83)	(0.00061)	(201.24)	(0.00044)
C: 6.9% Intro Rate 6 months	99,869	174.41	642.98	3.7703	$7,703.96	$2,506.68	$17,507.78	0.15622	$32,451.70	0.01980
		(0.2232)	(0.2806)	(0.0060)	(15.61)	(12.79)	(35.77)	(0.00061)	(201.25)	(0.00044)
D: 7.9% Intro Rate 6 months	99,880	174.08	642.77	3.7790	$7,693.67	$2,500.49	$17,509.64	0.15617	$32,327.72	0.01936
		(0.2236)	(0.2810)	(0.0060)	(15.22)	(12.66)	(36.97)	(0.00062)	(199.90)	(0.00044)
E: 6.9% Intro Rate 9 months	99,890	174.38	643.22	3.7703	$7,675.33	$2,510.87	$17,462.76	0.15630	$32,334.60	0.01917
		(0.2237)	(0.2801)	(0.0059)	(15.82)	(13.02)	(35.53)	(0.00061)	(199.05)	(0.00043)
F: 7.9% Intro Rate 12 months	99,860	174.02	642.85	3.7713	$7,676.28	$2,512.21	$17,450.82	0.15664	$32,114.36	0.02025
		(0.2238)	(0.2815)	(0.0060)	(15.18)	(12.85)	(35.50)	(0.00061)	(197.63)	(0.00045)
LOWEST P-VALUE IN T-TEST BETWEEN MARKET CELLS										
		18.59%	25.97%	25.38%	19.76%	40.28%	25.11%	59.11%	23.17%	8.33%
		(B vs. C)	(D vs. E)	(B vs. D)	(C vs. E)	(A vs. D)	(D vs. F)	(D vs. F)	(C vs. F)	(E vs. F)

TABLE 2B: MARKET EXPERIMENT II (RANDOMIZATION)

MARKET CELL	NUMBER OF OBSERVATIONS	MONTHS ON FILE	CREDIT SCORE	NUMBER OF BANKCARDS	HIGHEST LIMIT ON A BANKCARD	PRELIMINARY REVOLVING BALANCE	PRELIMINARY REVOLVING LIMIT	PRELIMINARY UTILIZATION RATE	MORTGAGE BALANCE	NUMBER OF DELINQUENCIES IN LAST 12 MONTHS
A: 5.9% Intro Rate 6 months	149,635	178.20	671.74	3.1057	$6,305.35	$1,159.67	$15,200.98	0.08251	$26,376.32	0.01138
		(0.1968)	(0.1942)	(0.0065)	(12.53)	(4.85)	(35.02)	(0.00034)	(151.97)	(0.00027)
B: 5.9% Intro Rate 9 months	137,192	178.16	671.95	3.1113	$6,294.29	$1,156.12	$15,169.74	0.08288	$26,350.72	0.01146
		(0.2047)	(0.2025)	(0.0068)	(12.88)	(5.05)	(35.78)	(0.00036)	(157.90)	(0.00029)
C: 5.9% Intro Rate 12 months	124,710	178.14	672.22	3.1130	$6,321.03	$1,163.35	$15,193.69	0.08307	$26,321.77	0.01192
		(0.2154)	(0.2118)	(0.0071)	(13.75)	(5.32)	(37.57)	(0.00038)	(165.11)	(0.00031)
D: 6.9% Intro Rate 12 months	72,337	178.06	671.61	3.1072	$6,292.11	$1,163.35	$15,165.74	0.08357	$26,395.93	0.01217
		(0.2826)	(0.2798)	(0.0093)	(18.05)	(6.98)	(49.54)	(0.00050)	(219.35)	(0.00041)
E: 7.9% Intro Rate 6 months	379,028	178.12	672.06	3.1038	$6,303.38	$1,159.96	$15,153.72	0.08276	$26,361.58	0.01145
		(0.1236)	(0.1216)	(0.0041)	(7.79)	(3.05)	(21.47)	(0.00022)	(96.05)	(0.00017)
LOWEST P-VALUE IN T-TEST BETWEEN MARKET CELLS										
		67.93%	8.08%	26.15%	15.59%	32.45%	24.99%	59.11%	78.71%	10.63%
		(A vs. D)	(C vs. D)	(C vs. E)	(B vs. C)	(B vs. C)	(A vs. E)	(D vs. F)	(C vs. D)	(D vs. E)

TABLE 2C: MARKET EXPERIMENT III (RANDOMIZATION)

MARKET CELL	NUMBER OF OBSERVATIONS	MONTHS ON FILE	CREDIT SCORE	NUMBER OF BANKCARDS	HIGHEST LIMIT ON A BANKCARD	PRELIMINARY REVOLVING BALANCE	PRELIMINARY REVOLVING LIMIT	PRELIMINARY UTILIZATION RATE	MORTGAGE BALANCE	NUMBER OF DELINQUENCIES IN LAST 12 MONTHS
A: Post-Intro Rate	99,837	149.433	614.59	3.9994	$7,033.48	$3,054.88	$17,017.74	0.19299	$34,504.75	0.02233
Standard - 4%		(0.2299)	(0.2627)	(0.0078)	(15.15)	(14.12)	(43.05)	(0.00067)	(213.77)	(0.00047)
B: Post-Intro Rate	99,848	149.346	613.92	3.9850	$7,014.87	$3,070.23	$16,931.51	0.19330	$34,519.73	0.02292
Standard - 2%		(0.2301)	(0.2621)	(0.0077)	(17.98)	(14.32)	(43.70)	(0.00067)	(209.57)	(0.00047)
C: Post-Intro Rate	99,855	148.94	614.01	4.0080	$7,028.64	$3,069.19	$16,994.52	0.19426	$34,448.65	0.02199
Standard + 0%		(0.2296)	(0.2622)	(0.0078)	(15.00)	(14.22)	(41.60)	(0.00067)	(213.11)	(0.00046)
D: Post-Intro Rate	99,842	149.351	614.12	3.9872	$7,006.20	$3,078.42	$16,935.79	0.19496	$34,605.18	0.02317
Standard + 2%		(0.2300)	(0.2630)	(0.0078)	(14.90)	(14.22)	(41.74)	(0.00067)	(213.86)	(0.00048)
E: Post-Intro Rate	99,841	149.151	614.43	4.0042	$7,037.05	$3,089.20	$17,018.88	0.19412	$34,675.72	0.02296
Standard + 4%		(0.2297)	(0.2628)	(0.0078)	(15.19)	(14.49)	(40.79)	(0.00067)	(213.10)	(0.00047)
LOWEST P-VALUE IN T-TEST BETWEEN MARKET CELLS										
		12.93%	7.17%	3.51%	14.71%	8.98%	14.39%	3.85%	45.12%	7.73%
		(A vs. C)	(A vs. B)	(B vs. C)	(D vs. E)	(A vs. E)	(B vs. E)	(A vs.B)	(C vs. E)	(D vs. E)

TABLE 3: WINNER'S CURSE

MARKET EXPERIMENT	NUMBER OF OBSERVATION	MONTHS ON FILE	CREDIT SCORE	NUMBER OF BANKCARDS	HIGHEST LIMIT ON A BANKCARD	PRELIMINARY REVOLVING BALANCE	PRELIMINARY REVOLVING LIMIT	PRELIMINARY UTILIZATION RATE	MORTGAGE BALANCE	NUMBER OF DELINQUENCIES IN LAST 12 MONTHS
I: NON-RESPONDENTS	594,013	174.6228	643.4799	3.7721	$7,703.71	$2,497.97	$17,502.95	0.15536	$32,350.93	0.01964
		(0.0914)	(0.1147)	(0.0024)	(6.28)	(5.25)	(14.78)	(0.00025)	(81.79)	(0.00018)
RESPONDENTS	5,244	122.1438	584.9388	3.7630	$6,258.64	$3,733.12	$14,958.30	0.27051	$26,515.24	0.02803
		(1.0650)	(1.3584)	(0.0285)	(58.87)	(69.57)	(152.85)	(0.00329)	(775.57)	(0.00228)
T-TEST (P-VALUE)		0.00001%	0.00001%	75.00691%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.02461%
II: NON-RESPONDENTS	857,120	178.6792	672.3638	3.1088	$6,316.51	$1,157.68	$15,197.89	0.08228	$26,405.07	0.01156
		(0.0818)	(0.0807)	(0.0027)	(5.20)	(2.02)	(14.36)	(0.00014)	(63.62)	(0.00012)
RESPONDENTS	5,782	98.0377	613.6802	2.8265	$4,432.24	$1,515.34	$11,222.76	0.16795	$19,609.01	0.01280
		(1.1018)	(1.1182)	(0.0377)	(55.30)	(28.88)	176.42	(0.00257)	(628.92)	(0.00148)
T-TEST (P-VALUE)		0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	40.35560%
III: NON-RESPONDENTS	495,117	149.61	614.46	3.9971	$7,034.35	$3,072.41	$17,002.08	0.19354	$34,650.43	0.02263
		(0.1030)	(0.1178)	(0.0035)	(7.05)	(6.43)	(18.95)	(0.00030)	(95.67)	(0.00021)
RESPONDENTS	4,106	105.50	583.77	3.9523	$5,781.47	$3,069.85	$14,279.18	0.23988	$22,537.46	0.02825
		(1.1653)	(1.3292)	(0.0408)	(64.91)	(66.28)	(194.30)	(0.00342)	(794.27)	(0.00259)
T-TEST (P-VALUE)		0.00001%	0.00001%	27.28536%	0.00001%	96.93844%	0.00001%	0.00001%	0.00001%	3.02424%

TABLE 4A: MARKET EXPERIMENT I (RESPONDENT CHARACTERISTICS)

MARKET CELL	EFFECTIVE RESPONSE RATE	INCOME	GOLD	CREDIT LIMIT	REVOLVING BALANCE	REVOLVING LIMIT	UTILIZATION RATE	DEBT BURDEN
A: 4.9% Intro Rate 6 months	0.01073	43019.20	0.83970	6446.00	5240.32	19209.26	0.32172	0.13371
	(0.00033)	(609.36)	(0.01121)	(92.76)	(181.68)	(452.62)	(0.00796)	(0.00446)
B: 5.9% Intro Rate 6 months	0.00903	41896.14	0.80177	6206.90	4923.39	18987.80	0.31520	0.13470
	(0.00030)	(680.94)	(0.01327)	(100.19)	(201.11)	(552.77)	(0.00900)	(0.00553)
C: 6.9% Intro Rate 6 months	0.00687	41232.76	0.80058	5972.54	4806.17	16677.68	0.33707	0.13058
	(0.00026)	(787.46)	(0.01526)	(116.98)	(213.93)	(531.08)	(0.01045)	(0.00598)
D: 7.9% Intro Rate 6 months	0.00645	39702.43	0.76744	5827.24	5152.29	16421.54	0.35056	0.14278
	(0.00025)	(788.82)	(0.01665)	(115.88)	(254.77)	(565.19)	(0.01123)	(0.00665)
E: 6.9% Intro Rate 9 months	0.00992	41781.08	0.81149	6278.99	5247.73	18161.04	0.33360	0.14185
	(0.00031)	(642.96)	(0.01242)	(95.83)	(190.90)	(462.57)	(0.00834)	(0.00511)
F: 7.9% Intro Rate 12 months	0.00944	42122.87	0.82309	6295.60	5768.35	18039.49	0.35175	0.14874
	(0.00031)	(654.78)	(0.01243)	(96.75)	(220.30)	(486.06)	(0.00873)	(0.00551)
T-TEST	P-VALUES							
A vs. B (intro rate)	0.01%	21.92%	2.91%	8.01%	24.24%	75.66%	58.76%	89.01%
B vs. C (intro rate)	0.01%	52.41%	95.31%	12.83%	68.98%	0.26%	11.31%	61.34%
C vs. D (intro rate)	22.71%	17.00%	14.24%	37.77%	29.84%	74.13%	37.94%	17.26%
A vs. D (best to worst intro rate)	0.01%	0.09%	0.09%	0.01%	77.85%	0.01%	3.63%	25.77%
C vs. E (duration)	0.01%	58.97%	57.93%	4.29%	12.38%	3.54%	79.51%	15.22%
D vs. F (duration)	0.01%	1.84%	0.75%	0.20%	6.96%	3.01%	93.37%	49.00%

TABLE 4B: MARKET EXPERIMENT I (EXPERIENCE AFTER 27 MONTHS)

MARKET CELL	EFFECTIVE RESPONSE RATE	DELINQ. RATE	CHARGEOFF RATE	CHARGEOFF BALANCES	ACTIVITY RATE	BANKRUPTCY RATE
A: 4.9% Intro Rate	0.01073	0.05965	0.04101	217.21500	0.36999	0.02796
6 months	(0.00033)	(0.00723)	(0.00606)	(37.04670)	(0.01475)	(0.00504)
B: 5.9% Intro Rate	0.00903	0.07530	0.04873	274.60900	0.39978	0.02658
6 months	(0.00030)	(0.00879)	(0.00717)	(46.48750)	(0.01631)	(0.00536)
C: 6.9% Intro Rate	0.00687	0.10917	0.06987	355.26700	0.41485	0.03202
6 months	(0.00026)	(0.01191)	(0.00973)	(57.85630)	(0.01881)	(0.00672)
D: 7.9% Intro Rate	0.00645	0.10078	0.07132	377.10900	0.46357	0.04341
6 months	(0.00025)	(0.01186)	(0.01014)	(61.01490)	(0.01965)	(0.00803)
E: 6.9% Intro Rate	0.00992	0.08468	0.06250	351.41600	0.40323	0.03528
9 months	(0.00031)	(0.00884)	(0.00769)	(49.60670)	0.01558	(0.00586)
F: 7.9% Intro Rate	0.00944	0.06780	0.04025	212.19300	0.43326	0.02225
12 months	(0.00031)	(0.00819)	(0.00640)	(37.18860)	0.01614	(0.00480)
T-TEST	P-VALUES					
A vs. C (intro rate)	0.01%	0.04%	1.19%	4.47%	6.08%	62.85%
B vs. D (intro rate)	0.01%	8.47%	6.91%	18.17%	1.26%	8.14%
A vs. D (best to worst intro rate)	0.01%	0.31%	1.04%	2.53%	0.01%	10.33%
C vs. E (duration)	0.01%	9.89%	55.26%	95.97%	63.43%	71.48%
D vs. F (duration)	0.01%	2.23%	0.97%	2.12%	23.36%	2.39%

TABLE 5: MARKET EXPERIMENT II (RESPONDENT CHARACTERISTICS)

MARKET CELL	EFFECTIVE RESPONSE RATE	INCOME	GOLD	CREDIT LIMIT	REVOLVING BALANCE	REVOLVING LIMIT	UTILIZATION RATE	DEBT BURDEN
A: 5.9% Intro Rate 6 months	0.00610	35607.28	0.68818	4794.39	2693.92	15898.95	0.23524	0.08881
	(0.00020)	(663.50)	(0.01533)	(81.20)	(127.05)	(581.18)	(0.00811)	(0.00424)
B: 5.9% Intro Rate 9 months	0.00760	37471.82	0.74617	5186.33	3130.80	19638.50	0.21377	0.09056
	(0.00023)	(599.67)	(0.01348)	(78.75)	(116.73)	(579.97)	(0.00638)	(0.00346)
C: 5.9% Intro Rate 12 months	0.01135	40462.38	0.76853	5494.68	3938.94	25037.09	0.21259	0.11214
	(0.00300)	(578.16)	(0.01121)	(69.18)	(120.55)	(570.82)	(0.00537)	(0.00366)
D: 6.9% Intro Rate 12 months	0.00936	38893.05	0.77729	5368.10	3567.96	21213.56	0.21389	0.09754
	(0.00036)	(743.79)	(0.01599)	(93.42)	(156.97)	(772.53)	(0.00753)	(0.00414)
E: 7.9% Intro Rate 6 months	0.00456	33815.54	0.65818	4540.12	2529.43	13425.76	0.24236	0.08392
	(0.00007)	(477.38)	(0.01141)	(57.65)	(97.29)	(378.10)	(0.00584)	(0.00301)
T-TEST	P-VALUES							
A vs. B (duration)	0.01%	3.72%	0.45%	0.05%	1.14%	0.01%	3.77%	74.87%
B vs. C (duration)	0.01%	0.03%	20.23%	0.33%	0.01%	0.01%	88.73%	0.01%
A vs. C (best to worst duration)	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	2.00%	0.01%
A vs. E (intro rate)	0.01%	2.85%	11.66%	1.07%	30.41%	0.04%	47.66%	34.78%
C vs. D (intro rate)	0.01%	9.60%	65.38%	27.64%	6.11%	0.01%	88.86%	0.83%

TABLE 6A: MARKET EXPERIMENT III (RESPONDENT CHARACTERISTICS)

MARKET CELL	EFFECTIVE RESPONSE RATE	INCOME	GOLD	CREDIT LIMIT	REVOLVING BALANCE	REVOLVING LIMIT	UTILIZATION RATE	DEBT BURDEN
A: Post-Intro Rate	0.01015	41406.48	0.82956	5665.71	4881.50	22906.31	0.25348	0.13721
Standard - 4%	(0.00032)	(644.42)	(0.01181)	(82.39)	(172.94)	(515.67)	(0.00708)	(0.00497)
B: Post-Intro Rate	0.00928	39444.66	0.77694	5345.86	5175.34	23684.18	0.25173	0.14905
Standard - 2%	(0.00030)	(653.47)	(0.01367)	(83.73)	(203.28)	(595.19)	(0.00728)	(0.00590)
C: Post-Intro Rate	0.00774	37718.95	0.76873	5166.80	4789.83	21790.64	0.26574	0.14630
Standard + 0%	(0.00028)	(683.80)	(0.01517)	(87.16)	(190.79)	(623.78)	(0.00835)	(0.00609)
D: Post-Intro Rate	0.00756	39840.05	0.76984	5265.06	4867.70	20971.42	0.27269	0.14725
Standard + 2%	(0.00027)	(774.26)	(0.01532)	(92.49)	(205.33)	(625.21)	(0.00879)	(0.00653)
E: Post-Intro Rate	0.00633	37464.30	0.73618	5094.84	4081.82	20649.43	0.23340	0.12687
Standard + 4%	(0.00025)	(786.26)	(0.01753)	(105.38)	(201.43)	(668.20)	(0.00872)	(0.00628)
T-TEST	P-VALUES							
A vs. C (post-intro rate)	0.01%	0.01%	0.16%	0.01%	72.19%	16.82%	26.29%	24.77%
B vs. D (post-intro rate)	0.01%	69.64%	72.96%	51.73%	28.71%	0.17%	6.66%	83.77%
C vs. E (post-intro rate)	0.01%	80.70%	16.04%	59.89%	1.08%	21.21%	0.75%	2.65%
A vs. E (best to worst post-intro rate)	0.01%	0.01%	0.01%	0.01%	0.26%	0.76%	7.41%	19.68%

TABLE 6B: MARKET EXPERIMENT III (EXPERIENCE AFTER 21 MONTHS)

MARKET CELL	EFFECTIVE RESPONSE RATE	DELINQ. RATE	CHARGEOFF RATE	CHARGEOFF BALANCES	ACTIVITY RATE	BANKRUPTCY RATE
A: Post-Intro Rate Standard - 4%	0.01015	0.05320	0.02759	106.77200	0.55074	0.01084
	(0.00032)	(0.00705)	(0.00514)	(23.22960)	(0.01562)	(0.00325)
B: Post-Intro Rate Standard - 2%	0.00928	0.05711	0.03772	157.61500	0.44073	0.02047
	(0.00030)	(0.00762)	(0.00626)	(29.61510)	(0.01631)	(0.00465)
C: Post-Intro Rate Standard + 0%	0.00774	0.07881	0.05168	222.03800	0.41602	0.02326
	(0.00028)	(0.00969)	(0.00796)	(37.85040)	(0.01773)	(0.00542)
D: Post-Intro Rate Standard + 2%	0.00756	0.10185	0.06482	256.72300	0.39947	0.02646
	(0.00027)	(0.01101)	(0.00896)	(43.75660)	(0.01783)	(0.00584)
E: Post-Intro Rate Standard + 4%	0.00633	0.08531	0.04897	202.42100	0.42654	0.02686
	(0.00025)	(0.01111)	(0.00858)	(41.06580)	(0.01967)	(0.00643)
T-TEST	P-VALUES					
A vs. C (post-intro rate)	0.01%	3.28%	1.11%	0.96%	0.01%	4.97%
B vs. D (post-intro rate)	0.01%	0.09%	1.33%	6.09%	8.78%	42.32%
C vs. E (post-intro rate)	0.02%	65.96%	81.72%	72.55%	69.13%	66.87%
A vs. E (best to worst post-intro rate)	0.01%	1.48%	3.28%	4.29%	0.01%	2.64%

TABLE 7A: ESTIMATION OF DELINQUENCY AFTER 27 MONTHS (MARKET EXPERIMENT I)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.001077267	-0.269595661	-0.030417152	0.217898527	-0.036242737	
	(0.04)	(10.14)	(1.11)	(6.25)	(0.81)	
Months on File	-0.000249072	-0.000309451	-0.000197001	-0.000212509	-0.000194622	
	(4.95)	(5.12)	(3.78)	(4.07)	(0.87)	
Co. Bankruptcy Rate	2.633959359	2.305175169	1.960272798	2.499170313	2.174887482	
	(2.75)	(2.68)	(1.96)	(2.58)	(0.59)	
Credit Limit	-0.000003042	-0.000002935	-0.000000556	-0.000007778	0.000007295	
	(2.07)	(1.92)	(0.37)	(4.16)	(1.06)	
# Existing Credit Accounts	-0.000329053	0.000085170	-0.000140934	-0.000325595	-0.000145435	
	(0.55)	(0.14)	(0.23)	(0.46)	(0.06)	
Balance Transfer	-0.000004490	-0.000002456	0.000000425	-0.000003788	-0.000016401	
	(2.24)	(1.23)	(0.20)	(1.86)	(1.70)	
Revolving Balances/ Revolving Limits	0.164589768	0.146223907	0.087568968		0.191088362	
	(10.41)	(10.51)	(5.47)		(2.42)	
Revolving Balances/ Income	0.144855245	0.105821240	0.089650425		0.135574467	
	(6.19)	(5.74)	(3.75)		(1.25)	
Revolving Balances				0.000005554		
				(10.01)		
Revolving Limits				-0.000001047		
				(3.73)		
Income				0.000000206		
				(1.16)		
Credit Score				-0.000234261		
				(5.57)		
Introductory Interest Rate (percent)	0.012203881	0.011489326	0.012242952	0.012767681	0.011520246	0.012129534
	(2.88)	(2.87)	(2.79)	(2.98)	(2.72)	(2.34)
Duration of Intro Offer (months)	-0.005682854	-0.004868424	-0.004156197	-0.005711682	-0.005255033	-0.004635531
	(2.84)	(2.60)	(2.06)	(2.83)	(2.64)	(1.90)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 16-27?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	4,908	4,908	3,128	4,908	4,908	4,908
R-squared	0.0734	0.0683	0.0394	0.0562	0.0910	0.3285

Numbers in parentheses are t-statistics (absolute values).

TABLE 7B: ESTIMATION OF CHARGEOFF AFTER 27 MONTHS (MARKET EXPERIMENT I)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.006056560	-0.210159904	-0.035788986	0.128741301	-0.021835838	
	(0.27)	(10.04)	(1.70)	(4.37)	(0.58)	
Months on File	-0.000133390	-0.000146211	-0.000070899	-0.000109575	0.000093209	
	(3.13)	(3.23)	(1.78)	(2.48)	(0.49)	
Co. Bankruptcy Rate	1.636273969	1.452219481	1.345150524	1.606822966	-0.281888173	
	(2.02)	(2.16)	(1.76)	(1.96)	(0.09)	
Credit Limit	-0.000002093	-0.000002012	-0.000000291	-0.000005610	0.000004121	
	(1.69)	(1.68)	(0.25)	(3.55)	(0.71)	
# Existing Credit Accounts	0.000175629	0.000383516	0.000029215	0.000076079	-0.000861498	
	(0.35)	(0.85)	(0.06)	(0.13)	(0.40)	
Balance Transfer	-0.000002969	-0.000001459	0.000002338	-0.000002368	-0.000014593	
	(1.75)	(0.94)	(1.47)	(1.38)	(1.79)	
Revolving Balances/ Revolving Limits	0.107595875	0.093389081	0.035779971		0.091049556	
	(8.04)	(8.51)	(2.92)		(1.36)	
Revolving Balances/ Income	0.121712618	0.073528930	0.075226142		0.147963456	
	(6.15)	(5.27)	(4.11)		(1.61)	
Revolving Balances				0.000004095		
				(8.74)		
Revolving Limits				-0.000000804		
				(3.39)		
Income				0.000000122		
				(0.81)		
Credit Score				-0.000136827		
				(3.85)		
Introductory Interest Rate (percent)	0.008702102	0.007879677	0.009562005	0.009156835	0.007997632	0.009534492
	(2.43)	(2.53)	(2.85)	(2.53)	(2.23)	(2.16)
Duration of Intro Offer (months)	-0.004667716	-0.003881207	-0.003450687	-0.004710210	-0.004304438	-0.004718111
	(2.76)	(2.64)	(2.23)	(2.76)	(2.55)	(2.27)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 16-27?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	4,908	4,908	3,128	4,908	4,908	4,908
R-squared	0.0509	0.0461	0.0243	0.0367	0.0640	0.3043

Numbers in parentheses are t-statistics (absolute values).

TABLE 7C: ESTIMATION OF CHARGEOFF BALANCES AFTER 27 MONTHS (MARKET EXPERIMENT I)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-289.8066468	-1095.5418908	-304.3589045	491.8346648	-279.0030562	
	(2.04)	(9.25)	(2.13)	(2.66)	(1.17)	
Months on File	-0.960353375	-0.733188010	-0.618261147	-0.825615840	1.964642175	
	(3.56)	(3.35)	(2.28)	(2.98)	(1.65)	
Co. Bankruptcy Rate	9070.8381459	7280.9511059	10227.169491	8786.9401750	6220.5509389	
	(1.77)	(2.21)	(1.97)	(1.71)	(0.32)	
Credit Limit	0.024404103	-0.002253525	0.014918196	0.006989196	0.060573028	
	(3.11)	(0.39)	(1.89)	(0.70)	(1.65)	
# Existing Credit Accounts	2.812382010	1.874038202	0.789374161	0.959027007	-15.459299158	
	(0.89)	(0.87)	(0.24)	(0.25)	(1.14)	
Balance Transfer	-0.002168480	-0.004834055	0.034908619	-0.002313515	-0.088315280	
	(0.20)	(0.67)	(3.23)	(0.21)	(1.71)	
Revolving Balances/ Revolving Limits	591.6661917	446.9075510	186.9454995		126.4441092	
	(6.99)	(7.63)	(2.25)		(0.30)	
Revolving Balances/ Income	646.3688959	358.5893652	398.3999778		223.0077813	
	(5.16)	(5.06)	(3.20)		(0.38)	
Revolving Balances				0.026476377		
				(8.99)		
Revolving Limits				-0.004671351		
				(3.13)		
Income				0.000452056		
				(0.48)		
Credit Score				-0.807693272		
				(3.62)		
Introductory Interest Rate (percent)	54.4558682	40.7623818	61.5911633	55.8589464	46.6000081	51.6432129
	(2.40)	(2.67)	(2.70)	(2.46)	(2.05)	(1.92)
Duration of Intro Offer (months)	-28.0415322	-18.4297899	-26.2228179	-28.3468570	-26.7108013	-24.2796286
	(2.62)	(2.58)	(2.49)	(2.64)	(2.50)	(1.92)
Linear or Tobit?	Linear	Tobit	Linear	Linear	Linear	Linear
Restricted to Months 16-27?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	4,908	4,908	3,128	4,908	4,908	4,908
R-squared	0.0366	0.0383	0.0217	0.0330	0.0509	0.3431

Numbers in parentheses are t-statistics (absolute values).

TABLE 7D: ESTIMATION OF BANKRUPTCY AFTER 27 MONTHS (MARKET EXPERIMENT I)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.021201503	-0.160566097	-0.022468875	0.065892598	-0.063970704	
	(1.23)	(9.76)	(1.33)	(2.93)	(2.21)	
Months on File	-0.000068883	-0.000072627	-0.000043068	-0.000042140	0.000216302	
	(2.11)	(2.10)	(1.35)	(1.25)	(1.49)	
Co. Bankruptcy Rate	1.298281613	1.173170450	1.137967835	1.302538965	3.090682340	
	(2.09)	(2.30)	(1.85)	(2.09)	(1.30)	
Credit Limit	-0.000001377	-0.000001580	-0.000000195	-0.000002504	0.000006877	
	(1.45)	(1.66)	(0.21)	(2.08)	(1.54)	
# Existing Credit Accounts	0.001474876	0.001325107	0.000599315	0.001539335	0.001914461	
	(3.83)	(4.28)	(1.56)	(3.34)	(1.16)	
Balance Transfer	-0.000001833	-0.000000730	0.000001271	-0.000001792	-0.000007777	
	(1.41)	(0.63)	(1.00)	(1.37)	(1.24)	
Revolving Balances/ Revolving Limits	0.048725297	0.056165889	0.014303167		0.060267521	
	(4.75)	(6.26)	(1.46)		(1.17)	
Revolving Balances/ Income	0.113542405	0.053888776	0.082753273		-0.017810817	
	(7.49)	(5.34)	(5.63)		(0.25)	
Revolving Balances				0.000002985		
				(8.34)		
Revolving Limits				-0.000000552		
				(3.04)		
Income				-0.000000160		
				(1.40)		
Credit Score				-0.000096253		
				(3.55)		
Introductory Interest Rate (percent)	0.004336627	0.003207624	0.004979116	0.004648861	0.004122710	0.007086923
	(1.58)	(1.30)	(1.85)	(1.68)	(1.50)	(2.09)
Duration of Intro Offer (months)	-0.002767648	-0.002103050	-0.002839765	-0.002830807	-0.002685357	-0.003372196
	(2.13)	(1.78)	(2.29)	(2.17)	(2.07)	(2.20)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 16-27?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	4,908	4,908	3,128	4,908	4,908	4,908
R-squared	0.0431	0.0357	0.0277	0.0357	0.0533	0.2905

Numbers in parentheses are t-statistics (absolute values).

TABLE 7E: ESTIMATION OF ACTIVITY AFTER 27 MONTHS (MARKET EXPERIMENT I)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.234417259	-0.268170935	0.673983523	0.316348001	0.238315437	
	(4.69)	(5.27)	(11.70)	(4.86)	(2.82)	
Months on File	0.000056709	0.000057319	0.000001578	0.000056964	0.000084512	
	(0.60)	(0.60)	(0.01)	(0.58)	(0.20)	
Co. Bankruptcy Rate	-1.460099263	-1.469389851	-0.280693202	-1.627958035	8.663107780	
	(0.81)	(0.80)	(0.13)	(0.90)	(1.25)	
Credit Limit	0.000008619	0.000008769	0.000008597	0.000007555	0.000020912	
	(3.12)	(3.14)	(2.71)	(2.17)	(1.61)	
# Existing Credit Accounts	-0.002787926	-0.002871675	-0.000707476	-0.001932682	-0.011204503	
	(2.49)	(2.52)	(0.54)	(1.45)	(2.33)	
Balance Transfer	-0.000010431	-0.000010707	-0.000007381	-0.000010642	-0.000023460	
	(2.76)	(2.77)	(1.70)	(2.80)	(1.29)	
Revolving Balances/ Revolving Limits	0.082526841	0.083046120	-0.016204710		0.018861898	
	(2.77)	(2.76)	(0.48)		(0.13)	
Revolving Balances/ Income	0.042006969	0.043808625	-0.023939923		-0.055614533	
	(0.95)	(0.98)	(0.48)		(0.27)	
Revolving Balances				0.000004130		
				(3.99)		
Revolving Limits				-0.000001134		
				(2.16)		
Income				0.000000036		
				(0.11)		
Credit Score				-0.000060706		
				(0.77)		
Introductory Interest Rate (percent)	0.025823108	0.026198318	0.005723859	0.025331968	0.024002587	0.021092623
	(3.24)	(3.24)	(0.62)	(3.17)	(2.99)	(2.22)
Duration of Intro Offer (months)	-0.003733588	-0.003724847	-0.002939061	-0.003769449	-0.003584790	-0.005332760
	(0.99)	(0.98)	(0.70)	(1.00)	(0.95)	(1.19)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 16-27?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	4,908	4,908	3,128	4,908	4,908	4,908
R-squared	0.0089	0.0089	0.0042	0.0103	0.0165	0.3189

Numbers in parentheses are t-statistics (absolute values).

TABLE 8A: ESTIMATION OF DELINQUENCY AFTER 21 MONTHS (MARKET EXPERIMENT III)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.017007006	-0.258614115	0.003694399	0.208378486	-0.085973922	
	(0.94)	(13.76)	(0.18)	(6.39)	(2.15)	
Months on File	-0.000059655	-0.000091347	-0.000029748	-0.000000092	0.000164753	
	(1.15)	(1.54)	(0.48)	(0.00)	(0.76)	
Co. Bankruptcy Rate	2.761277006	2.374404160	0.541414014	3.324867888	0.614509453	
	(2.68)	(2.54)	(0.47)	(3.19)	(0.16)	
Credit Limit	-0.000004591	-0.000005184	-0.000004136	-0.000011381	0.000009878	
	(2.44)	(2.44)	(1.93)	(5.09)	(1.21)	
# Existing Credit Accounts	-0.000356625	-0.000317322	-0.000338355	-0.000371696	0.003173255	
	(0.59)	(0.50)	(0.49)	(0.50)	(1.27)	
Balance Transfer	-0.000009650	-0.000020491	-0.000008162	-0.000008153	-0.000009162	
	(0.46)	(0.20)	(0.43)	(0.38)	(0.44)	
Revolving Balances/ Revolving Limits	0.201840736	0.164655501	0.112448777		0.227344362	
	(10.18)	(9.70)	(5.05)		(2.37)	
Revolving Balances/ Income	0.092982008	0.072046016	0.109462957		0.080131852	
	(3.69)	(3.54)	(3.65)		(0.71)	
Revolving Balances				0.000004466		
				(8.10)		
Revolving Limits				-0.000001425		
				(4.69)		
Income				0.000000518		
				(2.99)		
Credit Score				-0.000274942		
				(5.47)		
Post-Intro Interest Rate (percent)	0.004370640	0.004188236	0.003896645	0.003951722	0.004479338	0.004366828
	(3.09)	(2.89)	(2.45)	(2.77)	(3.18)	(2.76)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 10-21?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	3,794	3,794	2,469	3,794	3,794	3,794
R-squared	0.0725	0.0634	0.0456	0.0527	0.0874	0.2854

Numbers in parentheses are t-statistics (absolute values).

TABLE 8B: ESTIMATION OF CHARGEOFF AFTER 21 MONTHS (MARKET EXPERIMENT III)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.032489060	-0.197977947	-0.008414569	0.107247981	-0.051354378	
	(2.24)	(13.77)	(0.56)	(4.08)	(1.60)	
Months on File	-0.000041072	-0.000057785	-0.000012239	-0.000003822	0.000041139	
	(0.98)	(1.27)	(0.27)	(0.09)	(0.23)	
Co. Bankruptcy Rate	3.026773055	2.140955434	0.974907127	3.453221569	-1.475350317	
	(3.65)	(3.22)	(1.15)	(4.11)	(0.48)	
Credit Limit	-0.000002914	-0.000003240	-0.000001997	-0.000008537	0.000007889	
	(1.92)	(1.99)	(1.27)	(4.74)	(1.20)	
# Existing Credit Accounts	-0.000047479	0.000045875	-0.000114067	-0.000204524	0.002253376	
	(0.10)	(0.10)	(0.23)	(0.34)	(1.12)	
Balance Transfer	-0.000006635	-0.000012319	-0.000004672	-0.000005639	-0.000006446	
	(0.39)	(0.16)	(0.33)	(0.33)	(0.38)	
Revolving Balances/ Revolving Limits	0.142211803	0.107676656	0.056349452		0.045584771	
	(8.89)	(8.55)	(3.46)		(0.59)	
Revolving Balances/ Income	0.071480346	0.048117804	0.071939041		0.062256714	
	(3.52)	(3.29)	(3.28)		(0.68)	
Revolving Balances				0.000003199		
				(7.20)		
Revolving Limits				-0.000001038		
				(4.24)		
Income				0.000000439		
				(3.14)		
Credit Score				-0.000157488		
				(3.89)		
Post-Intro Interest Rate (percent)	0.003209412	0.002969438	0.002095631	0.002889248	0.003280751	0.003473183
	(2.82)	(2.71)	(1.80)	(2.51)	(2.89)	(2.72)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 10-21?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	3,794	3,794	2,469	3,794	3,794	3,794
R-squared	0.0596	0.0480	0.0277	0.0414	0.0774	0.2733

Numbers in parentheses are t-statistics (absolute values).

TABLE 8C: ESTIMATION OF CHARGEOFF BALANCES AFTER 21 MONTHS (MARKET EXPERIMENT III)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-262.422701	-646.932501	-123.472053	326.992971	-273.353142	
	(3.58)	(10.07)	(1.56)	(2.47)	(1.68)	
Months on File	-0.358402460	-0.213573453	-0.244359378	-0.269470907	0.322498614	
	(1.69)	(1.50)	(1.03)	(1.23)	(0.36)	
Co. Bankruptcy Rate	13048.132811	6406.852938	1937.451984	14840.126580	-10403.916084	
	(3.11)	(3.03)	(0.43)	(3.50)	(0.67)	
Credit Limit	0.010429649	-0.005314301	0.011137295	0.002876385	0.056322759	
	(1.36)	(1.04)	(1.34)	(0.32)	(1.70)	
# Existing Credit Accounts	-0.107674008	-0.030922655	0.422982751	-2.671447397	12.298807428	
	(0.04)	(0.02)	(0.16)	(0.89)	(1.21)	
Balance Transfer	-0.026468196	-0.089558407	-0.019930004	-0.027576155	-0.029029462	
	(0.31)	(0.00)	(0.27)	(0.32)	(0.34)	
Revolving Balances/ Revolving Limits	729.340427	341.236947	374.071197		-406.466992	
	(9.03)	(7.59)	(4.34)		(1.04)	
Revolving Balances/ Income	167.750229	148.581715	159.483301		-48.779755	
	(1.63)	(3.09)	(1.37)		(0.11)	
Revolving Balances				0.017301766		
				(7.73)		
Revolving Limits				-0.004605682		
				(3.73)		
Income				0.000181453		
				(0.26)		
Credit Score				-0.645757191		
				(3.16)		
Post-Intro Interest Rate (percent)	15.813262527	9.306310535	9.528380987	14.667599155	16.598976438	15.425678340
	(2.75)	(2.66)	(1.55)	(2.53)	(2.90)	(2.46)
Linear or Tobit?	Linear	Tobit	Linear	Linear	Linear	Linear
Restricted to Months 10-21?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	3,794	3,794	2,469	3,794	3,794	3,794
R-squared	0.0437	0.0610	0.0176	0.0302	0.0620	0.3000

Numbers in parentheses are t-statistics (absolute values).

TABLE 8D: ESTIMATION OF BANKRUPTCY AFTER 21 MONTHS (MARKET EXPERIMENT III)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.041513330	-0.151322664	-0.024063225	0.017730349	-0.032674464	
	(4.02)	(13.07)	(2.05)	(0.95)	(1.43)	
Months on File	-0.000020600	-0.000012552	0.000005404	0.000009111	-0.000022450	
	(0.69)	(0.38)	(0.15)	(0.30)	(0.18)	
Co. Bankruptcy Rate	2.520246952	1.647110356	1.163868584	2.622401146	-1.439429741	
	(4.26)	(3.53)	(1.74)	(4.40)	(0.66)	
Credit Limit	-0.000001492	-0.000002147	-0.000000920	-0.000002953	0.000007084	
	(1.38)	(1.71)	(0.74)	(2.31)	(1.52)	
# Existing Credit Accounts	0.001052270	0.001037468	0.000475321	0.001377586	0.001959856	
	(3.05)	(3.42)	(1.20)	(3.26)	(1.37)	
Balance Transfer	-0.000005658	-0.000009844	-0.000003811	-0.000005423	-0.000006245	
	(0.47)	(0.07)	(0.34)	(0.44)	(0.52)	
Revolving Balances/ Revolving Limits	0.058748070	0.060299968	0.027325272		-0.089710778	
	(5.16)	(5.98)	(2.13)		(1.64)	
Revolving Balances/ Income	0.066269462	0.029716058	0.056486338		0.070457367	
	(4.58)	(2.88)	(3.26)		(1.09)	
Revolving Balances				0.000002345		
				(7.45)		
Revolving Limits				-0.000000713		
				(4.11)		
Income				-0.000000040		
				(0.41)		
Credit Score				-0.000057946		
				(2.02)		
Post-Intro Interest Rate (percent)	0.001864229	0.001878004	0.001963881	0.001768562	0.001882373	0.002324284
	(2.30)	(2.20)	(2.14)	(2.17)	(2.34)	(2.55)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 10-21?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	3,794	3,794	2,469	3,794	3,794	3,794
R-squared	0.0437	0.0350	0.0219	0.0355	0.0712	0.2566

Numbers in parentheses are t-statistics (absolute values).

TABLE 8E: ESTIMATION OF ACTIVITY AFTER 21 MONTHS (MARKET EXPERIMENT III)

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.586123149	0.087537066	0.865044861	0.753641165	0.541571240	
	(16.04)	(2.35)	(22.01)	(11.56)	(6.70)	
Months on File	-0.000277609	-0.000287268	0.000100016	-0.000217053	-0.000017525	
	(2.63)	(2.64)	(0.84)	(2.02)	(0.04)	
Co. Bankruptcy Rate	-0.906505493	-0.909660722	-0.904373187	-1.293215146	5.333800722	
	(0.43)	(0.43)	(0.40)	(0.62)	(0.69)	
Credit Limit	0.000012848	0.000013231	0.000010955	0.000018727	0.000026227	
	(3.36)	(3.39)	(2.65)	(4.19)	(1.59)	
# Existing Credit Accounts	-0.005597261	-0.005764053	-0.003971786	-0.002939487	-0.013415967	
	(4.59)	(4.54)	(2.99)	(1.99)	(2.65)	
Balance Transfer	-0.000036646	-0.000084458	-0.000061337	-0.000038593	-0.000044392	
	(0.85)	(0.69)	(1.66)	(0.90)	(1.04)	
Revolving Balances/ Revolving Limits	0.193499717	0.196374216	-0.055461726		0.605110592	
	(4.81)	(4.76)	(1.29)		(3.11)	
Revolving Balances/ Income	-0.101103573	-0.102274969	-0.065783248		-0.350158970	
	(1.98)	(1.93)	(1.14)		(1.53)	
Revolving Balances				0.000004790		
				(4.34)		
Revolving Limits				-0.000001926		
				(3.17)		
Income				-0.000000293		
				(0.84)		
Credit Score				-0.000230608		
				(2.29)		
Post-Intro Interest Rate (percent)	-0.017612659	-0.017864893	-0.013993268	-0.017455867	-0.017574695	-0.019099932
	(6.14)	(6.09)	(4.57)	(6.11)	(6.16)	(5.88)
Linear or Probit?	Linear	Probit	Linear	Linear	Linear	Linear
Restricted to Months 10-21?	No	No	Yes	No	No	No
Interaction Terms Included?	No	No	No	No	Yes	No
Nonparametric Estimation?	No	No	No	No	No	Yes
N	3,794	3,794	2,469	3,794	3,794	3,794
R-squared	0.0325	0.0326	0.0218	0.0401	0.0539	0.2361

Numbers in parentheses are t-statistics (absolute values).

TABLE 9: REEXAMINATION OF MARKET EXPERIMENT I

MARKET CELL	EFFECTIVE RESPONSE RATE	RANK BY RESPONSE RATE	EFFECTIVE INTEREST RATE	RANK BY INTEREST RATE
A: 4.9% Intro Rate 6 months	0.01073 (0.00033)	1	10.23%	3
B: 5.9% Intro Rate 6 months	0.00903 (0.00030)	4	11.35%	4
C: 6.9% Intro Rate 6 months	0.00687 (0.00026)	5	11.86%	5
D: 7.9% Intro Rate 6 months	0.00645 0.00025	6	12.35%	6
E: 6.9% Intro Rate 9 months	0.00992 (0.00031)	2	9.23%	2
F: 7.9% Intro Rate 12 months	0.00944 (0.00031)	3	8.32%	1

T-TEST	P-VALUES
A vs. E (1 vs. 2)	7.37%
E vs. F (2 vs. 3)	23.55%
A vs. F (1 vs. 3)	0.29%