# Consumer Misunderstanding of Credit Card Use, Payments, and Debt: Causes and Solutions

Jack B. Soll, Ralph L. Keeney, and Richard P. Larrick

*The authors identify several judgmental biases related to paying off credit card debt. Participants with stronger numerical skills made fewer errors, as did those who used the new statement format mandated by Congress in the CARD Act of 2009. Study 1 shows that people underestimate how long it takes to eliminate a debt when payments barely cover interest owed. Study 2 shows that less numerate people tend to underestimate the monthly payment required to pay off a debt in three years, whereas more numerate people tend to overestimate the payment. The newly revised statement required by the CARD Act substantially reduced these biases. However, even with the new statement, many people still underestimate required payments when still using the credit card. Study 3 identifies ambiguities in the revised statement that can lead to misjudgments about how much to pay on monthly bills. The authors recommend additional public policy actions to help cardholders understand the relationship between payments and debt elimination.*

*Keywords*: credit card debt, compound interest, consumer financial decisions, heuristics, biases, information disclosure

Consumers find credit cards attractive because of the many benefits they offer when used and managed well. Credit cards are widely accepted for purchases, alleviate the need to carry much cash, provide an accurate record of purchases, facilitate reimbursement for returned merchandise, build a history of creditworthiness, and offer desirable rewards through affinity programs. The majority of adults in the United States use credit cards, and the average consumer has 3.5 cards (Foster et al. 2010). In 2011, there were 22.2 billion transactions on credit cards with a total purchase volume of $2.05 trillion (*The Nilson Report* 2012).

Unfortunately, many consumers misuse and mismanage their cards. They engage in impulsive buying, end up with items they do not need or perhaps even want, and spend more than they can afford. All of this can lead to serious debt problems, which are exacerbated by high interest rates and late fees associated with carrying a balance. In the worst cases, credit card debt can precipitate years or even decades of financial hardship. According to the Federal Reserve Board's *2010 Survey of Consumer Finances*, 39.4% of families carry credit debt, with an average debt of $7,100 (Bricker et al. 2012). People are likely to underreport their debt in such surveys, so the figure could be substantially higher (Zinman 2009). One consequence of debt is personal bankruptcy, filings of which numbered more than 1.5 million in 2010 (American Bankruptcy Institute 2011). College students are especially vulnerable because credit card debt adds on to student loans (Palmer, Pinto, and Parente 2001).

Researchers have documented that people spend more money when they use credit cards instead of cash (Feinberg 1986; Hirschman 1979; Prelec and Simester 2001). One reason for this is that signing a credit card receipt is less memorable than writing a check or counting out cash (Soman 2001). It is easier to spend in the present when past purchase amounts are forgotten or foggy. In addition, the bundling of charges into a single monthly credit card payment is psychologically less aversive than making a series of smaller payments as items are purchased, which increases the attractiveness of spending (Soman 2001; Thaler 1999). Credit card companies may also contribute to excess spending by granting higher credit limits, which cause people to feel wealthier (Soman and Cheema 2002). Finally, whether intended by credit issuers or not, people tend to anchor on the minimum amount due (Navarro-Martinez et al. 2011), leading them to pay off their debt more slowly.

An important source of difficulty in managing debt is a lack of basic financial literacy (Lusardi and Tufano 2009).

*Jack B. Soll* is Associate Professor of Management and Organizations (e-mail: jsoll@duke.edu), *Ralph L. Keeney* is Research Professor of Business Administration (e-mail: keeney@duke.edu), and *Richard P. Larrick* is the Michael W. Krzyzewski University Professor in Leadership (e-mail: larrick@duke.edu), Fuqua School of Business, Duke University. The authors thank Paul Bloom, Eric Johnson, John Lynch, Craig McKenzie, Linda Salisbury, Dilip Soman, Victor Stango, and Jeremy Tobacman for their helpful feedback. The authors also benefited from comments received during presentations at the Boulder Summer Conference on Financial Decision Making, the FDIC Consumer Research Symposium, the Rotman School of Management at the University of Toronto, and the Center for Community Capital at the University of North Carolina, Chapel Hill. Stacey Baker served as associate editor for this article.


ISSN: 0743-9156 (print), 1547-7207 (electronic)

Especially confounding to many people are the cumulative effects of compound interest. Although both savings and debt generally grow exponentially when left untouched, people often severely underestimate growth because they assume linear changes over time (Eisenstein and Hoch 2007; McKenzie and Liersch 2011). A related psychological phenomenon is the payment–interest bias, in which people underestimate the implied interest rate for a given payment stream (Stango and Zinman 2009). For example, suppose that a consumer purchases $1,000 of furniture on credit and repays the store $100 per month over 12 months. What is the annual interest rate on the loan? Although it is tempting to say 20%, this answer ignores the fact that the principal declines over the course of the year. The correct answer is 35%. For problems similar to this one, Stango and Zinman (2009) find that more than 98% of people exhibit the bias.

In this article, we examine people's intuitions for basic questions that may arise as they decide how much to pay on a credit card bill. For example, a consumer may want to know how long it will take to pay off a card with monthly payments of a certain amount, or the constant monthly payment that is needed to pay the card off in three years. Most people do not know the correct formulas for solving these problems, so instead we hypothesize that they apply relatively simple algorithms, or heuristics, that capitalize on the math they do know (Fischbein 1989). A large body of literature shows that people often use heuristics to make choices and form judgments. Generally speaking, heuristics are advantageous because they provide satisfactory outcomes in exchange for little cognitive effort in a range of everyday decisions (Gigerenzer and Goldstein 1996; Newell and Simon 1972; Payne, Bettman, and Johnson 1993). However, these must be weighed against other situations in which heuristics produce large systematic errors (Hogarth and Karelaia 2007; Kahneman, Slovic, and Tversky 1982). In this spirit, we show that the heuristics people use to answer questions about paying off credit card debt often work well but also lead to large and predictable errors in certain situations.

As an illustration, consider a consumer who owes $10,000 on a credit card with an annual interest rate of 12%. The consumer wants to know how long it would take to pay off the card at different levels of a constant monthly payment. One heuristic approach would be to divide the $10,000 by the monthly payment and then adjust upward to account for interest. For example, for a monthly payment of $310, the consumer might first round to $300, then calculate $10,000/300 to get 33 months, and finally adjust this upward several months to account for interest charges. Such an approach is likely to come close to the correct answer of 40 months, even though it bears little resemblance to the formal mathematical rule (Dawes 1979).[1] Suppose instead that the consumer wants to know the payoff time for monthly payments of $110. The same heuristic would lead to an initial estimate of 100 months. Adjusting upward from this value would likely fall well short of the correct answer of 241. Thus, a heuristic that performs well in one situation can perform poorly in another.

The correct answers to this problem for different monthly payments appear on the curve in Figure 1, which gives payoff time as a function of the constant monthly payment. A critical feature of Figure 1 is the vertical asymptote at $100. For payments at $100 and below, the debt will never be paid off because payments do not exceed interest charges. The graph also plots the heuristic answers before adjustment (i.e., $10,000 divided by the monthly payment). Notably, these values come quite close to the correct answers when the payments are more than twice the interest charges.

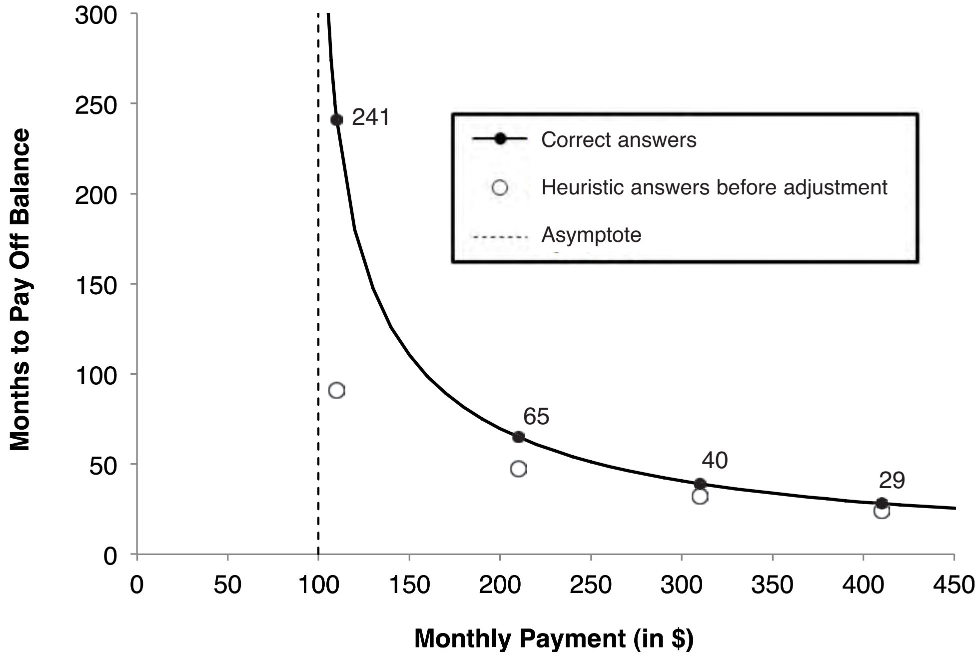
There are different versions of the heuristic, which we call "principal-plus-adjustment," depending on when the adjustment is made. For the previous $110 example, a person might initially estimate 100 months and then add months to account for the accumulated interest. Alternatively, a person might first add an interest amount to the principal and then divide by $100. Either way, the heuristic neglects two implications of the vertical asymptote at $100. First, people who use the heuristic will fail to realize that small increases in the monthly payment can result in a big drop in the payoff time when the interest-to-principal ratio is high. This happens just to the right of the asymptote, where the portion of a $110 payment going toward interest ($100) is ten times higher than the portion going toward principal ($10). In this region, a $20 increase in monthly payment from $110 to $130 reduces the payoff time by nearly eight years, whereas an identical $20 increase at $310 saves only a few months. Second, the heuristic may lead some people to estimate seemingly plausible payoff times to the left of the asymptote. However, in this region, the balance grows rather than shrinks, and the debt will never be paid off.

In the following studies, we examine the degree to which people misunderstand the relationship between payments and debt reduction and find that people are insufficiently sensitive to the interest-to-principal ratio. In addition, we examine two factors that influence how well consumers understand the effect of payment on debt. One factor, numeracy, is inherent to the consumer. A growing body of research has shown that people differ widely in their ability to process numerical information and that people lower in numeracy tend to make poorer decisions (Peters et al. 2006). The other factor, disclosure requirements, is a property of the decision environment. In 2009, the U.S. government enacted the Credit Card Accountability Responsibility and Disclosure (CARD) Act (Pub. L. 111-24), which required a redesign of the monthly statement sent to every cardholder. The new statement provides more detailed information about how different payment levels affect payoff time for a given debt. We briefly review numeracy and the new CARD Act requirements before turning to the design of our studies.

Numeracy plays a large role in how well people reason about financial problems. Less numerate people have difficulty working with percentages and fractions (Lipkus, Samsa, and Rimer 2001) and fail to apply the most basic financial principles in reasoning about savings and debt

[1]The basic formula for the questions in this paper is $B = A(1 + i)^N - (P/i)[(1 + i)^N - 1]$, where the remaining balance B after N monthly payments depends on N, the starting debt A, the constant monthly payment P, and the monthly interest rate i (e.g., if the annual interest rate is 12%, the monthly rate is $i = .01$). Setting $B = 0$ and solving for N gives the formula for the payoff time: $N = -\log(1 - iA/P)/\log(1 + i)$. To solve for the required monthly payment to pay a debt off in three years, set $N = 36$ and solve for P.

**Figure 1. Time to Pay Off a $10,000 Credit Card Balance with an Annual Interest Rate of 12%, as a Function of the Monthly Payment**




Notes: Interest charges on the initial statement are $100. The debt cannot be paid off if monthly payments do not exceed $100.

(Lusardi and Tufano 2009). We expect most people to take a heuristic approach to our questions. However, more numerate people may be more likely to account for multiple years' worth of interest and also to recognize situations in which the heuristic fails, such as when monthly payments do not exceed interest charges. Moreover, greater numerical ability has been associated with higher levels of income, education, and wealth (Banks and Oldfield 2007; Smith, McArdle, and Willis 2010). This suggests that less numerate people, who we hypothesize will underestimate payoff times and required payments the most, are also the ones who can least afford the consequences of their erroneous financial judgments.

The second factor likely to influence consumers' understanding of debt is how information is reported on their monthly statements. The 2009 CARD Act required that monthly statements include a table that informs consumers how long it will take to pay off the balance, if they pay only the minimum amount due each month, and how much they need to pay per month to eliminate the balance in three years. The degree to which the new statement improves consumer understanding, however, is an open question. For example, the table clearly states that the payment needed to eliminate the balance in three years *assumes that no additional charges will be placed on the card*. Many people who carry a balance continue to use the card and thus may draw incorrect conclusions from the table. To illustrate this problem, consider again the consumer who owes $10,000 with a 12% interest rate. The statement would show that monthly payments of $332 are needed to pay the card off in three years. Suppose that the consumer charges $500 to the card each month. Because this is a recurring expense, the consumer would need to pay $832 each month, $332 of which goes toward paying down the original principal and $500 to keep new purchases from adding to the debt. This is an accumulation problem, in which a stock amount of debt (the carryover balance) must be combined with an inflow of new purchases and an outflow of payments. People often reason poorly about accumulation problems (Cronin, Gonzalez, and Sterman 2009), so there is no guarantee that they will know how to combine the numbers in the statement when they are still using the card (we test this in Study 2).

We conducted three studies to test people's intuitions for credit card debt. We measured numeracy in each study, which allowed us to identify situations in which numerical ability affects the size and direction of judgmental biases. Study 1a examines judgments of payoff time for a debt at several levels of the monthly payment. We hypothesized that people would underestimate payoff time the most when payments barely cover interest charges (i.e., payments have a high interest-to-principal ratio); this is where the curve in Figure 1 is steepest. Study 1b tests whether people know that the balance grows when payments fail to cover the interest charges (to the left of the asymptote). We expected that more numerate people would recognize that a principal-plus-adjustment heuristic does not apply in this situation and therefore would be more likely to estimate that the balance on the card will grow rather than shrink.

Study 2 tests the efficacy of the CARD Act with a scenario in which participants estimated the required monthly payment to pay off a credit card debt in three years. We found that the degree to which the new statement helps depends on two factors: consumer numeracy and whether the card is still being used. To preview the results, less numerate people have a greater tendency to underestimate required payments, the new statement helps consumers tremendously when the card is not being used, but improvement is more modest when the card remains in use. Finally, Study 3 examines new sources of confusion that may arise in interpreting the new statement.

Taken together, our studies show that people tend to be systematically biased in their judgments about credit card debt. Specifically, people do not fully understand the harmful consequences of small monthly payments that barely cover interest charges, nor are they aware of the benefits of modest increases over these small payments. We identify two factors that can alleviate this misunderstanding: greater numeracy at the individual level (Peters et al. 2006) and improved disclosure requirements in the decision environment (Thaler and Sunstein 2008). The new design for credit card statements helps people recognize the value of covering interest charges but can lead to confusion if they are still using the card. The results suggest that the cost of judgmental bias falls hardest on the least numerate—they are the ones most likely to underestimate the payments needed to pay down debt. Our research highlights the need for additional changes to the credit card statement to improve consumer understanding, and we conclude the article with a set of policy recommendations.

## Study 1a: Intuitions About Monthly Payments and Payoff Time

### Method

#### *Participants*

To recruit participants, we followed the same general procedure in all our studies. We contracted with a market research firm that maintains a large national panel. A random subgroup of panel members received an e-mail invitation from the market research firm to participate in a 20-minute online research study. The panel members who accepted the invitation were redirected to a separate website that hosted our survey. Along with the data, our survey also recorded a unique identification number assigned by the market research firm to each participant. This allowed us to ensure that no one took the survey more than once and to maintain anonymity. The market research firm compensated participants with small cash awards. Five hundred eighty-two adults (66% female, median age = 48) participated in the online survey. Of these, 45 participants gave nonsensical responses, such as indicating it would take zero months to pay off a debt. Our main analyses include the remaining 543 participants, though the results are similar with the entire sample.

#### *Procedure*

After providing basic demographic data (gender was coded as 1 if female and 0 if male), participants indicated how often they used credit cards (on a scale from 1 = "never" to 5 = "nearly all the time"), how many credit cards they owned, and whether they carried a balance on the single card they used the most (coded as 1 if the participant carried a balance on the card and 0 if otherwise). They were then told to "imagine that you have decided to pay off your debt on a credit card and then close the account. You have cut the card into pieces and plan to use only cash and a debit card from here on out to pay for future purchases." They were further instructed to respond to a series of four questions using their best judgment. The questions were presented sequentially in a random order and varied only in the amount of the monthly payment, which included values of $110, $210, $310, and $410. For example (emphasis appeared in the stimuli):

> You owe $10,000 on the card and the interest rate is 12% annually. You have destroyed the card and will not use it any more. Suppose that you plan to pay a fixed amount of **$110 per month** until the card is completely paid off. What is your best estimate of how many months it will take to totally pay off the card?

Following this task, participants responded to a numeracy quiz and a frugality scale. We adapted the 11-item numeracy quiz from Lipkus, Samsa, and Rimer (2001). Although we modified the numeracy quiz for online use by making it multiple choice, the distribution of scores in our study was similar to results reported in the literature. For frugality, we used the scale developed by Lastovicka et al. (1999), which consists of eight six-point items. This yielded a mean frugality score for each participant on a six-point scale, which measures the extent to which one gains pleasure from saving (Rick, Cryder, and Loewenstein 2008). We conjectured that frugality might be associated with a better appreciation of compound interest.

At the conclusion of the study, participants were asked for additional demographic data, including highest level of education completed and annual household income. Responses to these questions were categorical. For education, 1 equals "less than high school," 2 equals "high school/GED," 3 equals "some college," 4 equals "2-year college degree," 5 equals "4-year college degree," 6 equals "master's degree," and 7 equals "doctoral or professional degree." For income, 1 equals "less than $20,000," 2 equals "$20,000–$40,000," 3 equals "$40,001–$60,000," ... and 9 equals "more than $160,000."

### Results

Table 1 provides a correlation matrix of all variables. Numeracy scores were higher for men, as well as for the younger, more educated, and higher-income people in our sample. Higher-income, more educated people possessed more credit cards and used them more frequently, but they were also less likely to carry a balance over to the following month.

We conducted both between-subjects and within-subject analyses of responses to the $110–$410 conditions. The two approaches yielded similar results, so we present only the between-subjects analysis here. This analysis considered only the first question of the four encountered (N = 131, 136, 142, and 134 for the $110–$410 conditions, respectively). These answers are untainted by a desire to be con-

**Table 1. Correlation Matrix for Variables in Study 1**

| | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Numeracy | 8.47 | 1.96 | 1.00 | | | | | | | |
| 2. Frugality | 5.09 | .65 | –.01 | 1.00 | | | | | | |
| 3. Female | .66 | .48 | –.24*** | .06 | 1.00 | | | | | |
| 4. Age | 46.25 | 14.04 | –.15*** | .11* | –.04 | 1.00 | | | | |
| 5. Education | 3.99 | 1.49 | .24*** | .01 | –.08 | –.10* | 1.00 | | | |
| 6. Income | 3.48 | 1.86 | .12** | –.01 | –.07 | –.05 | .30*** | 1.00 | | |
| 7. Carry balance | .48 | .50 | –.02 | –.13** | .15*** | –.08 | –.10* | –.12** | 1.00 | |
| 8. Card frequency | 3.35 | 1.15 | .06 | .02 | –.07 | .03 | .25*** | .26*** | –.20*** | 1.00 |
| 9. Card quantity | 3.56 | 2.73 | .04 | –.04 | .08 | .14*** | .13** | .20*** | .06 | .35*** |

*$p < .05$.
**$p < .01$.
***$p < .001$.
Notes: N = 543.

sistent across the four questions and best represent participants' initial impressions.

Figure 2 shows the median response and interquartile range for each condition, along with the correct answers. The median responses are consistent with the principal-plus-adjustment heuristic that we proposed—large underestimation at $110 payments, in which the ratio of interest charges to principal was very high, and accurate estimates at higher payments. Of those who saw $110 first, 115 of 131 (88%) underestimated how long it would take to pay off the card. In contrast, the percentage of participants underestimating at monthly payments of $210, $310, and $410 was 56%, 34%, and 37%, respectively.

To test the numeracy hypothesis, we first logged the estimates of payoff time to correct for skewness and then regressed the logged estimates against dummy variables for whether the participant was in the $210, $310, or $410 condition (e.g., the variable D$210 is coded as 1 if the participant is in the $210 condition and 0 if otherwise), the participant's score on the numeracy quiz (mean-centered), and the interaction between each dummy and numeracy. The resulting equation appears in the first column of Table 2. The

**Figure 2. Participants' Estimates of Time to Pay Off a $10,000 Credit Card Balance with an Annual Interest Rate of 12%, as a Function of the Monthly Payment**

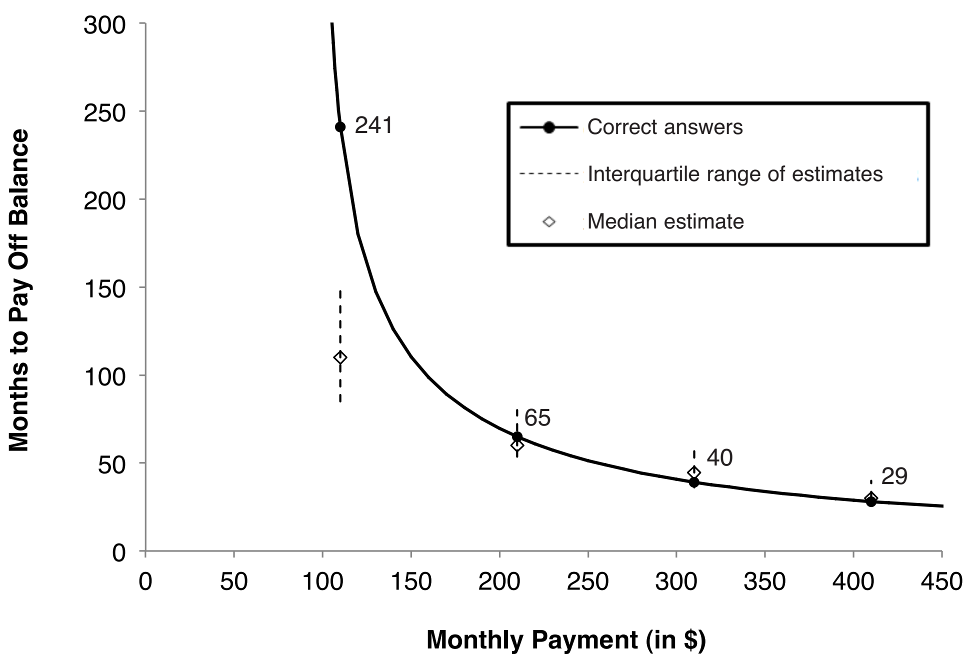


**Table 2. Logged Payoff Time Estimates Regressed Against Predictors in Study 1a**

| | | Models for Each Condition Separately | | | |
|---|---|---|---|---|---|
| | **All Conditions** | **\$110** | **\$210** | **\$310** | **\$410** |
| Intercept | 4.742*** | 4.781*** | 4.083*** | 3.719*** | 3.540*** |
| | .064 | (.127) | (.100) | (.108) | (.118) |
| Numeracy | .154*** | .140** | .023 | .036 | .016 |
| | .031 | (.044) | (.031) | (.033) | (.034) |
| D\$210 | –.608*** | | | | |
| | .090 | | | | |
| D\$310 | –.975*** | | | | |
| | .089 | | | | |
| D\$410 | –1.233*** | | | | |
| | .090 | | | | |
| Numeracy × D\$210 | –.111* | | | | |
| | .046 | | | | |
| Numeracy × D\$310 | –.117** | | | | |
| | .043 | | | | |
| Numeracy × D\$410 | –.151** | | | | |
| | .046 | | | | |
| Female | | –.029 | .047 | .069 | –.090 |
| | | (.167) | (.122) | (.139) | (.140) |
| Age | | .007 | .000 | .006 | .005 |
| | | (.006) | (.004) | (.004) | (.004) |
| Education | | –.016 | .067 | .117* | –.031 |
| | | (.055) | (.043) | (.052) | (.043) |
| Income | | .154** | –.054† | .009 | .003 |
| | | (.046) | (.031) | (.037) | (.034) |
| Other covariates included | No | Yes | Yes | Yes | Yes |
| N | 543 | 127 | 129 | 137 | 123 |
| $R^2$ | .305*** | .273*** | .070 | .107† | .037 |

†$p < .1$.
*$p < .05$.
**$p < .01$.
***$p < .001$.
Notes: Standard errors are in parentheses. D\$210, D\$310, and D\$410 are dummies for each condition. Female = 1, and 0 = male. All other variables are mean-centered. “Other covariates” include frugality, carry balance, card frequency, and card quantity. The 27 participants who did not provide income information were included in the “all participants” model only.

coefficient on numeracy tests the effect of numeracy in the \$110 condition (Irwin and McClelland 2001), which shows that more numerate participants gave higher estimates of the payoff time in that condition. Because the interaction terms for the \$210–\$410 conditions are negative, we ran the model separately for each payment condition to examine the effect of numeracy more closely (columns 2–5). These models reveal a significant effect of numeracy for payments of \$110 but no effect of numeracy at \$210 or above. Participants underestimated the payoff time at the \$110 payment (see Figure 2), in which the payment barely covers the interest charges, and this effect was exacerbated among less numerate people. The pattern held regardless of whether the demographic covariates were included in the models.

To illustrate the effect of numeracy on payoff estimates, we consider three participants who answered 6, 9, and 11 questions correctly on the numeracy quiz, which correspond to the 10th, 50th, and 90th percentiles in our sample. From the “all conditions” model in Table 2, we predict that these people would respond to the \$110 question with answers of 78, 124, and 169 months, respectively. Finally, of the demographic covariates, only income was significant in the \$110 condition, a result we discuss after Study 1b.

## Study 1b: Intuitions About Failing to Cover Interest Charges

Study 1a demonstrated that numeracy predicted a better understanding of how payments affect payoff period when payments barely cover interest charges. We designed Study 1b to test people’s understanding using a different problem: How does the level of monthly payments influence changes in the balance over time? Monthly payments that do not cover interest charges will cause balances to increase over time (leading to the infinite payoff period to the left of the asymptote in Figure 1). We predicted that participants higher in numeracy would be more likely to recognize that low payments can increase a balance. Participants were the same as those in Study 1a (N = 543).

## Procedure

Immediately after answering the four payoff time questions in Study 1a, participants were presented with the following question (emphases appeared in the stimuli):

> Imagine that **you owe $10,000** on a credit card with **an interest rate of 24%** annually. Since the interest rate is so high, you plan to cut up this card and not use this card. You plan to pay a fixed amount of **[$X] per month** until the card is completely paid off. Assuming that you follow through with this plan, what is your best estimate of how much money you will still owe on this card after **one year** of making payments?

We varied X between participants to be $100 (N = 181), $250 (N = 188), or $500 (N = 174). Although the balance decreases when monthly payments are $250 or $500, it grows when monthly payments are $100. A heuristic approach to this problem might be to multiply the payment by 12, subtract from $10,000, and then adjust for interest. For $100 payments, this approach is likely to lead to an answer of $10,000 or less.

The median answers for the $250 and $500 conditions were $9,000 and $6,000, respectively, which closely approximate the correct answers of $9,329 and $5,976. Few participants estimated that the balance would increase above $10,000 in these two conditions (5.9% for the $250 problem, and 2.3% for the $500 problem). The median estimate in the $100 condition was $10,000, compared with the correct answer of $11,341. Although the median is roughly correct, only 43% of participants in the $100 condition correctly estimated that the balance would grow to more than $10,000.

We expected that participants higher in numeracy would better understand the consequences of paying only $100 per month. To test this, we used logistic regression to predict the chances that a participant would estimate a balance over $10,000. We first ran a model that interacted numeracy (mean-centered) with a dummy variable for condition (D$100 = 1 for participants in the $100 condition and 0 otherwise). The coefficient on numeracy in this model (first column of Table 3) represents the effect of numeracy in the $250 and $500 conditions (in which D$100 = 0). The coefficient is nonsignificant, which replicates the finding in Study 1a that numeracy does not play a role when payments are more than double the interest charges. The significant effect of D$100 indicates that participants who were average in numeracy were more likely to provide estimates in excess of $10,000 in the $100 condition than in the other conditions. As we hypothesized, a significant numeracy × D$100 interaction occurred; in the $100 condition, more numerate participants were more likely to correctly estimate that the balance would increase. If we apply the "all participants" logit model from Table 3, participants who answered six questions correctly on the numeracy quiz (the 10th percentile) had a 29% chance of providing a correct estimate, those who answered nine correctly (50th percentile) had a 46% chance, and those who answered them all correctly (90th percentile) had a 59% chance.

**Table 3. Logit Model Predicting the Chances of Giving an Estimate Above $10,000 in Study 1b**

| | All Participants | $100 | $250 | $500 |
|---|---|---|---|---|
| Intercept | –3.205** | –.393 | –2.687** | –3.420** |
| | (.128) | (.297) | (.529) | (.826) |
| Numeracy | –.206 | .305* | –.226 | –.167 |
| | (.128) | (.099) | (.151) | (.308) |
| D$100 | 2.921** | | | |
| | (.319) | | | |
| Numeracy × D$100 | .459* | | | |
| | (.152) | | | |
| Female | | .037 | –.228 | –.975 |
| | | (.355) | (.696) | (1.092) |
| Age | | .011 | –.016 | .026 |
| | | (.012) | (.024) | (.043) |
| Education | | .135 | –.064 | –.533 |
| | | (.116) | (.049) | (.463) |
| Income | | .016 | –.066 | .328 |
| | | (.087) | (.182) | (.335) |
| N | 543 | 171 | 177 | 168 |
| Generalized $R^2$ | .225** | .090* | .016 | .019 |

*$p < .01$.
**$p < .001$.
Notes: Standard errors are in parentheses. The dependent variable equals 1 if the estimate is over $10,000 and 0 if otherwise. D$100 = 1 if a participant is in the $100 payment condition and 0 if otherwise. 1 = female, and 0 = male. Numeracy and the other covariates are mean-centered. Coefficients were tested with a Wald chi-square test. The generalized R-square is based on the likelihood ratio test and is significant if the hypothesis that all coefficients (except the intercept) are zero is rejected. The 27 participants who did not provide income information were included in the "all participants" model only.

The last three columns of Table 3 provide a model for each condition separately. Numeracy only has a significant effect in the $100 condition, and none of the covariates are significant.

## Discussion

People misunderstand the relationship between monthly payments and payoff time when payments barely cover or fall short of interest charges. Study 1a showed that people underestimate the steepness of the payoff time curve near the asymptote, where monthly payments barely cover the interest charges. Study 1b demonstrated that some people fail to recognize that the balance on the card will increase when payments fall short of interest charges. The pattern of error in both studies is consistent with a simple principal-plus-adjustment heuristic that relies on familiar, everyday math. The heuristic performs poorly with smaller payments in which the interest-to-principal ratio is high but can lead to good approximations when payments are at least double the interest charges. In situations in which the heuristics fails, less numerate participants underestimated payoff times and balances by larger amounts than those more numerate. Of the covariates, only income predicted bias beyond the effect of numeracy, and only in Study 1a. It might be that higher-income people have more accurate intuitions about the effects of compound interest by virtue of their greater experience in managing money. Moving forward, we leave the effects of income for further research and focus on numeracy, a factor for which we have concrete predictions based on the results of Studies 1a and 1b and prior research.

## Study 2: Testing the Benefits of Credit Card Reform

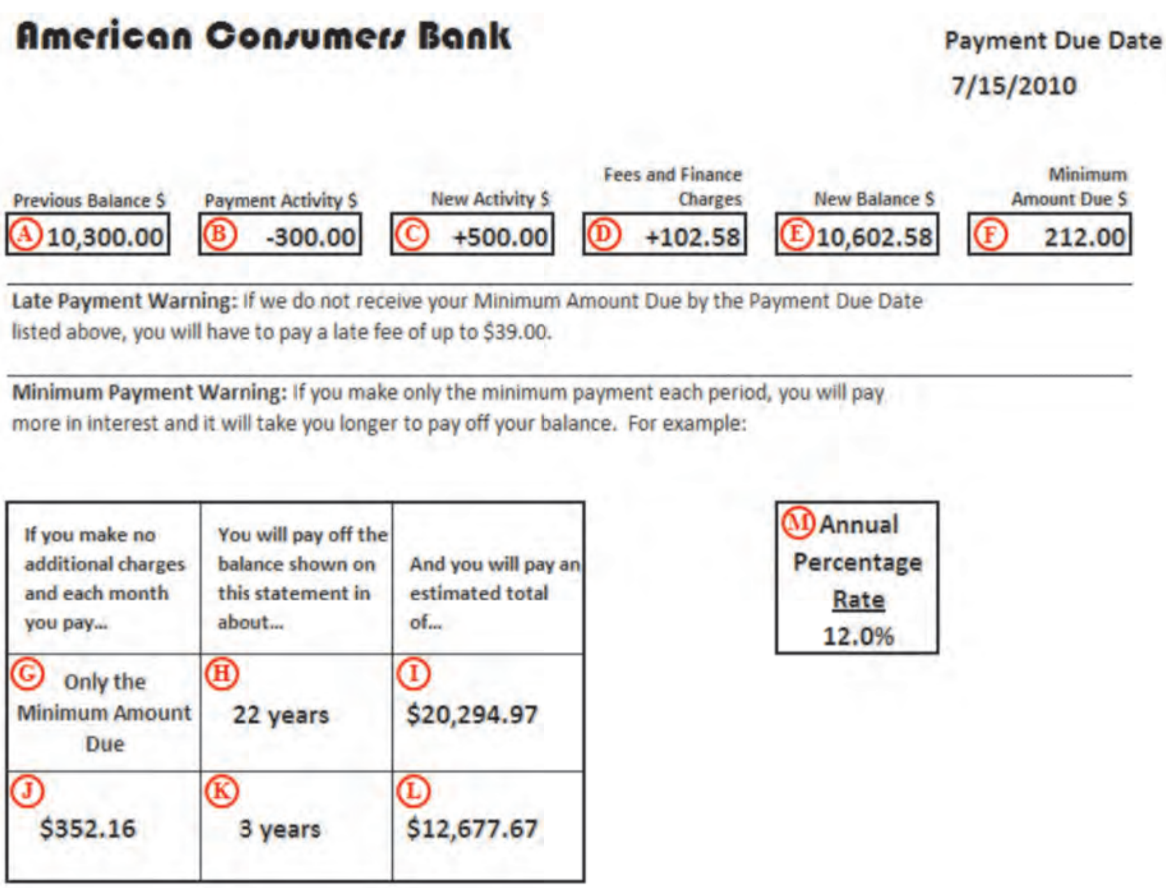
To aid consumers in making decisions about credit card payments, the 2009 CARD Act requires that a specific table appear on all credit card statements (see example in Figure 3). The table must report how long it would take to pay off the balance if only the minimum is paid and what monthly payments must be to pay off the balance in three years. The cardholder is informed that these amounts assume that no additional charges are placed on the card.

The task in Study 2 was to estimate the constant monthly payment needed to eliminate the balance in three years. At first glance, this task seems trivial because the new statement appears to give the answer. Indeed, we expected that people would be good at estimating the payment amount correctly when the main assumption of "no additional charges" holds. In practice, this assumption is unrealistic because many people with credit card debt continue to use their cards. We wanted to test whether the new statement is helpful when the credit card is still being used. For some participants, therefore, we changed the scenario such that the cardholder expects to continue spending $500 on the card each month. In this case, the required monthly payment is approximately $850, which represents the sum of the amount in box J and the new expenses.[2] Although all these numbers are on the statement and no complex calculations are required, we suspected that the math would still be confusing to some people, especially the less numerate.

To test the efficacy of the new statement under different conditions, we varied whether participants saw a scenario with a new or old statement and whether they were still using the card. In addition, the CARD Act does not com-

[2]Assuming that the consumer spends exactly $500 each month, the required payment amount is slightly less than $850 because the $352.16 already includes the repayment of a small fraction of the $500 in new activity from the current month. In addition, the actual payoff time may differ from three years if monthly spending fluctuates. These deviations will be small unless there are large changes in month-to-month spending.

**Figure 3. Illustrative Monthly Credit Card Statement Indicating Information Required by the CARD Act of 2009**


American Consumers Bank

Payment Due Date
7/15/2010

| Previous Balance $ | Payment Activity $ | New Activity $ | Fees and Finance Charges | New Balance $ | Minimum Amount Due $ |
|---|---|---|---|---|---|
| A 10,300.00 | B -300.00 | C +500.00 | D +102.58 | E 10,602.58 | F 212.00 |

**Late Payment Warning:** If we do not receive your Minimum Amount Due by the Payment Due Date listed above, you will have to pay a late fee of up to $39.00.

**Minimum Payment Warning:** If you make only the minimum payment each period, you will pay more in interest and it will take you longer to pay off your balance. For example:

| If you make no additional charges and each month you pay… | You will pay off the balance shown on this statement in about… | And you will pay an estimated total of… |
|---|---|---|
| G Only the Minimum Amount Due | H 22 years | I $20,294.97 |
| J $352.16 | K 3 years | L $12,677.67 |

M Annual Percentage Rate 12.0%

pletely constrain the format in which banks present information. Some banks separate new activity and interest charges into separate boxes (as in Figure 3), whereas others combine them into a single box. Separation of new activity (Box C) and interest charges (Box D) makes it easier to add the dollar amount of new activity to the three-year payoff amount (Box J). It is paying this sum that allows a consumer to eliminate the debt in three years. We varied whether new activity and interest charges were combined or separated as an exploratory variable.

## Method

### *Participants*

Five hundred two adult participants (67% female, median age = 52) were recruited through a national panel to participate in a 20-minute online research study.

### *Procedure*

We randomly assigned participants to one of eight conditions comprising a 2 (statement: new vs. old)×2 (use: card is used vs. not used)×2 (format: new expenses and interest are aggregated vs. segregated) design. After answering several demographic questions, participants saw a credit card statement designed for their respective condition (see example in Figure 3). For the old statement, the minimum payment warning and table were omitted, as these did not typically exist before the CARD Act. For the aggregated format, Boxes C and D were combined into a single box labeled "New activity $ including fees and finance charges if any." In all cases, the new balance was $10,602.58, the annual interest rate was 12%, and the minimum amount due was $212.00 (2% of the balance). When the card was not being used, there was no new activity, and the previous balance was $10,794.63 instead of $10,300.00.

To familiarize participants with the statement and confirm a basic level of understanding, we asked them to identify which box contained each of the following pieces of information: interest rate, new purchases, total debt, minimum amount due, and new interest charges. Solution rates for these questions ranged between 89% and 97%. Most participants did well on the statement quiz: 82% answered all five questions correctly, and an additional 11% missed only one question. We decided to focus only on people who could read and understand the numbers in the statement. Therefore, we dropped the 33 participants who scored less than 4 on the statement quiz from the analysis. We also omitted 6 participants who gave absurd answers to the estimation question (e.g., answer of zero, answers above the balance on the card), which left 463 participants.

In the final part of the survey, participants completed an eight-item numeracy quiz, based on a recently developed scale (Weller et al. 2012; we did not learn about this scale until after completing Study 1). The new scale includes items with a wider range of difficulty and discriminates more finely between different levels of numeracy. The scale includes five items from the original Lipkus, Samsa, and Rimer (2001) scale, two from Frederick's (2005) three-item cognitive reflection task, and one from the expanded numeracy scale of Peters et al. (2007). We modified the quiz in two ways. First, we replaced the Peters et al. question (which is lengthier than the others) with the third item from the cognitive reflection task (which has a similar solution rate in published data). Second, we made all the questions multiple choice. Even with these changes, the distribution of numeracy on our quiz (M = 3.71, SD = 1.87) was similar to the distribution that Weller et al. (2012) report.

## Results

Because the distribution of participants' estimates was skewed, we focused on whether participants underestimated, overestimated, or correctly estimated the required monthly payment. We counted an answer as correct if it was between $325 and $375 when the card was not being used and between $825 and $875 when it was being used (the correct answers are roughly $350 and $850, respectively). We analyzed the data with a multinomial logit model. We dummy-coded the manipulated factors and gender (use card: 1 = yes, 0 = no; statement: 1 = new, 0 = old; format: 1 = aggregated, 0 = segregated; 1 = female, 0 = male), and we entered age and numeracy quiz score as mean-centered continuous variables. We found effects of continued card use (Wald $\chi^2(2) = 60.77$, $p < .001$), statement ($\chi^2(2) = 104.75$, $p < .001$), and numeracy ($\chi^2(2)$ 20.75, $p < .001$), as well as a numeracy × statement interaction ($\chi^2(2) = 6.23$, $p = .044$). There was no effect of format ($\chi^2(2) = 2.93$, $p = .231$), though the numeracy × format interaction was marginally significant ($\chi^2(2) = 4.65$, $p = .098$). There were also no effects of gender and age. We also compared the fit of this model with an expanded model that included all interactions among the manipulated factors and found no significant difference between models ($\chi^2(8) = 2.68$, $p = .953$).

We next investigated the effects of each variable on the probability of underestimating or overestimating the amount needed to pay off the debt in three years. Multinomial logit simultaneously estimates several equations (one fewer than the number of categories of the dependent variable), each of which estimates the relative odds for a pair of categories. In Table 4, the first equation estimates the relative log odds of being correct versus underestimating, and the second equation estimates the relative log odds of being correct versus overestimating. We derive the third equation, which compares underestimation and overestimation, by simply taking the difference between the first two equations (we recoded the categories and reran the model to obtain significance levels for this equation).

We highlight three results from Table 4 and Figure 4 (we used a median split of numeracy in the figure for illustrative purposes). First, the new statement greatly increased the chances of being correct. This was true when the card was still being used (Panels C and D) and when it was not (Panels A and B). Statistically, these improvements in accuracy are captured by the significant statement effects in the equations shown in Table 4. The coefficients on *statement* represent the effect of the new statement at the mean level of numeracy. We also tested the statement effect separately at each level of numeracy and found that the new statement significantly increased the odds of being correct as opposed

**Table 4. Multinomial Logit Model for Study 2**

| | (1) Correct vs. Underestimate | (2) Correct vs. Overestimate | (3) Underestimate vs. Overestimate |
|---|---|---|---|
| Intercept | .083<br>(.376) | –.892**<br>(.340) | –.975**<br>(.335) |
| Use | –2.676***<br>(.343) | –1.681*<br>(.334) | .995***<br>(.293) |
| Statement | 2.777***<br>(.341) | 3.450***<br>(.353) | .673*<br>(.318) |
| Format | .445<br>(.290) | .446<br>(.295) | .001<br>(.267) |
| Numeracy | .217<br>(.166) | –.111<br>(.147) | –.327*<br>(.147) |
| Female | –.315<br>(.326) | .057<br>(.326) | .372<br>(.299) |
| Age | .004<br>(.011) | –.005<br>(.011) | –.009<br>(.010) |
| Numeracy × use | –.059<br>(.199) | .027<br>(.190) | .086<br>(.165) |
| Numeracy × statement | .143<br>(.195) | .480*<br>(.202) | .338†<br>(.183) |
| Numeracy × format | .337*<br>(.171) | .074<br>(.169) | –.262†<br>(.154) |

†$p < .1$.
*$p < .05$.
**$p < .01$.
***$p < .001$.
Notes: Standard errors are in parentheses. Numeracy and age are mean-centered.

to underestimating (first equation) or overestimating (second equation) at all levels (Spiller et al. 2013).[3] Participants at all levels of numeracy benefited from the new statement.

Second, using the card reduces the chances of being correct. This can be observed by comparing the top and bottom panels of Figure 4. The effect holds for both the old (left panels) and the new (right panels) statements. The corresponding result in the model is the significant effect of *use* in the first and second equations. Follow-up tests showed that using the card led to a significantly reduced chance of being correct (first and second equations) across the numeracy spectrum (except $p = .08$ in the second equation for a numeracy score of 8). The significant effect of *use* in the third equation indicates that using the card not only reduced the chances of being correct but also tipped the bias in the direction of underestimating as opposed to overestimating (this effect was positive and significant for numeracy scores between 2 and 6).

Third, compared with more numerate people, those less numerate are more likely to err by underestimating than by overestimating. This is reflected in the significant effect of numeracy in the third equation. The impact of statement type, card use, and numeracy has important consequences for specific combinations of these factors. For example, when receiving the old statement and not using the card, more numerate people actually tend to overestimate the required payment (upper-left panel of Figure 4). With the old statement and using the card, less numerate people underestimated 70% of the time. Even with the new statement, about half of less numerate people underestimated the monthly payment needed to pay off the debt in three years when still using the card.[4]

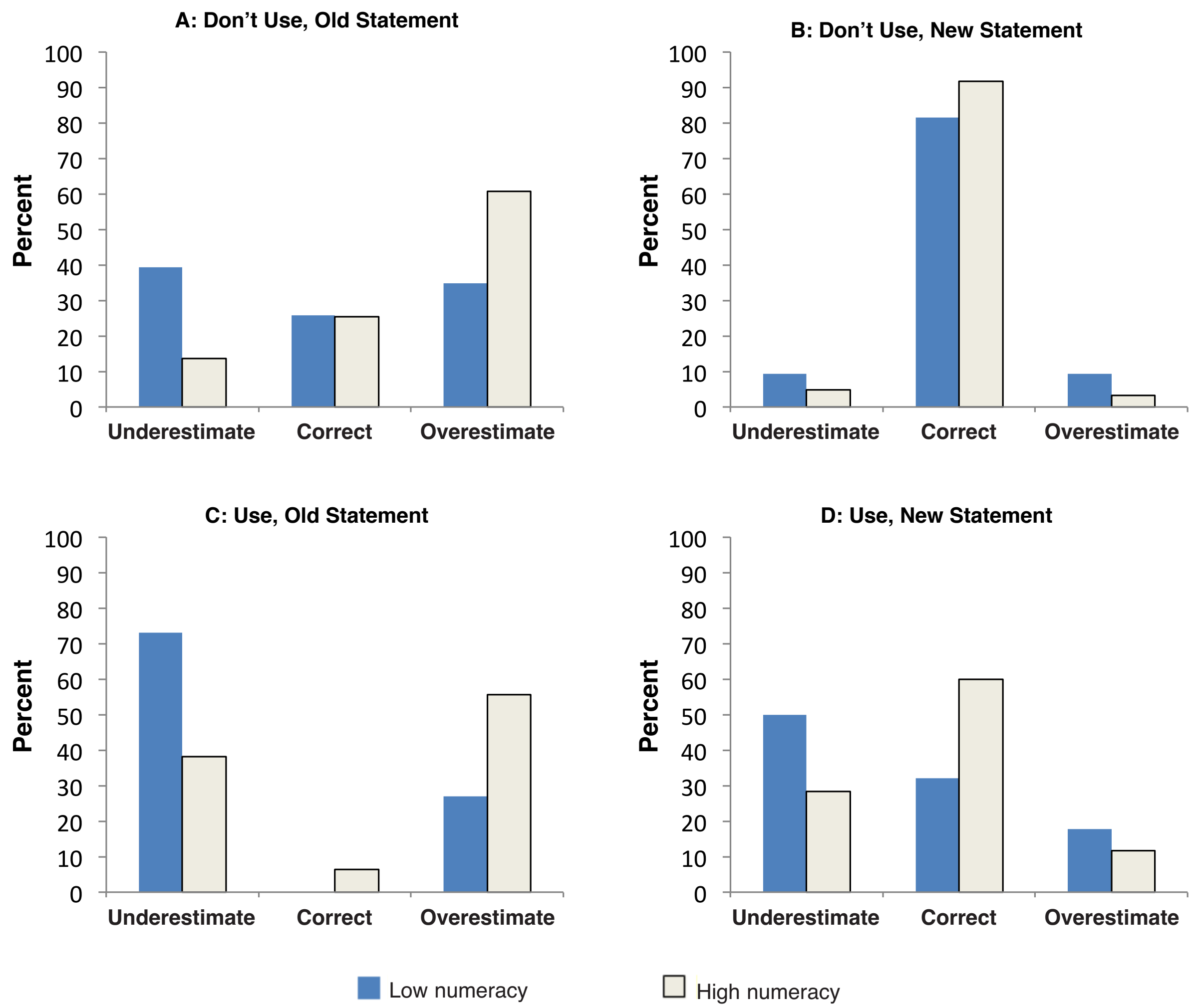
## Discussion

When estimating required monthly payments, there was no general trend toward underestimation as there was in Study 1a. Rather, people lower in numeracy tended to underestimate the amount they needed to pay (especially when they were still using the card), and those higher in numeracy tended to overestimate. The pattern is consistent with less numerate people tending to account too little for interest

[3]We rescaled numeracy by subtracting x from the raw score on the numeracy quiz, where x = 0, 1, 2, …, 8. We then recomputed the three equations from Table 4 for each x. The coefficient on statement then indicates the simple effect when the raw numeracy score equals x. We tested all effects at $p < .05$.

[4]Readers may also be interested in the numeracy × format interaction. The aggregated format seems to have led more numerate people to report higher estimates. It may be that numerate people are more cognizant of the need to include new activity in their payment and therefore might be anchored by a higher number when Boxes C and D in Figure 3 are combined into a single box.

**Figure 4. Summary of Estimates to Pay Off Loan Balance in Three Years Under Different Circumstances**




charges and those more numerate tending to add in too much interest. The latter happens if people fail to take into account the effects of declining principal. Although greater numeracy does not guarantee getting the right answer, more numerate people seem to be more cognizant of the effects of interest.

A striking result in Study 2 is that the new statement facilitated a much better appreciation for what monthly payments must be to pay off a loan in three years. The new statement reduced both underestimation and overestimation, regardless of whether the card was still being used and the numeracy level of the consumer. In addition to helping consumers plan their payments, the new statement may protect against certain scams. For example, a known scam is to offer a service in which the consumer pays off debt more quickly by paying slightly more per month. To illustrate how such a deal might appear attractive, we asked 74 undergraduate students to imagine that they charged $300 per month to a card on which they already owed $10,000 (with 17.9% annual interest). We told them that they paid $450 per month and that "At that rate it will take you 29 years to pay off the $10,000." The majority of participants (72%) said that they would be more likely than not to pay $700 per month to an intermediary company so that they would be debt-free in three years. Ostensibly, the intermediary would negotiate a better rate with the credit card company. However, in this situation, the three-year monthly payoff amount is $661, which nets the intermediary a profit of $1,404 for doing little except for figuring out the math. The new statement protects against this scam by showing consumers more clearly what they can accomplish on their own.

The new statement, however, does not completely eliminate mistaken judgments. Although the statement is clear that the amount needed to pay off the card in three years assumes no further activity, it offers little guidance on what to do if one continues to charge new expenses to the card. Less numerate people in particular frequently underestimate the size of the required payment when still using the card. A simple fix to this problem would be to include a brief sentence on the statement informing consumers that if they plan to continue using the card, they need to add new expenses to the three-year payoff amount.

## Study 3: Testing Confusion Caused by Credit Card Reform

In working with the new statement, we discovered two additional sources of confusion that arise when interpreting the information presented for minimum payments and for payments required to eliminate the debt in three years. Consider the following two questions about the statement in Figure 3. (1) How long would it take to pay off the card if one were to pay $212 each month, assuming no further charges on the card? and (2) How long would it take to pay off the card if each month one were to pay the amount that appears in Box J that month? We suspect that many readers would answer 22 years to the first question and 3 years to the second question. Both answers are incorrect. The answer to the first question is approximately 6 years. The 22 years in Box H refers to how long it would take if one always paid the amount in Box F, which declines with the balance. For the second question, to pay the card off in three years, one must pay $352.16 each month, not the changing amount that appears in Box J from month to month. The amount printed in Box J declines as the balance is paid off; it would take substantially longer than 3 years to pay off the card if one always paid the amount shown in that box.

The table in the new statement presents two scenarios that are contradictory in their assumptions. The "pay the minimum amount due" scenario assumes that one pays a changing amount (the amount appearing in Box F over time), trapping the consumer into a long payoff period. In contrast, the three-year payoff scenario assumes that one pays a stable amount (e.g., always paying the $352.16 from *this month's* statement), even as the amount in Box J declines over time. The distinction is subtle and likely to be missed by many consumers.

We tested whether people understand the implications of paying on a monthly basis (1) the minimum amount due from the current statement and (2) the three-year payoff amount printed on each statement, which declines as the balance is paid off. Participants for Problem 1 were the same 463 participants from Study 2, who answered this question after completing those from Study 2. A new set of 107 online participants (60% female) were recruited for Problem 2. They went through the same procedure as in Study 2, except that the experimental questions in that study were replaced with the three-year payoff amount problem.

### Minimum Amount Due Problem

Participants saw the same statement (old or new) as in Study 2, except they were told to "imagine that you cut up your credit card and <u>plan to no longer use it</u>" (emphasis appeared in the stimuli). Participants were asked, "If you pay exactly $212 each month (see box F), how long will it take you to pay off the entire balance on the card?" The multiple choice answers were "less than 22 years," "22 years," and "more than 22 years." Forty-nine percent of participants correctly answered less than 22 years with the old statement, compared with 7% correct responses with the new statement. The global test of statement was significant in a multinomial model ($\chi^2(2) = 168.00$, $p < .001$). There were no effects of format or numeracy.

### Three-Year Payoff Amount Problem

Participants saw a new statement from Study 2 in which new activity and interest charges were aggregated and the card was no longer being used. One group received the following instructions (emphases appeared in the stimuli):

> Imagine that you would like to pay off the entire balance on the card in three years. You have cut the card up into pieces and <u>will no longer be using this card</u>. Suppose that each month you always pay exactly the amount indicated in Box J for that month. <u>This will be a lower amount each month</u>. What is your best estimate of the total balance on this credit card at each time indicated below, given that you will not be using the card?

Participants responded on four sliders that ranged from $0 to $10,000 for 12, 24, 36, and 48 months from now. For the second group, the third and fourth sentences were replaced with the following:

> Suppose that each month you always pay exactly $352.16, the amount indicated in Box J for this month. <u>You will pay this same amount each month</u>.

We excluded 6 participants who did not answer at least 4 of 5 questions correctly on the statement quiz and an additional 15 who estimated a larger balance after 48 months than after 12 months. This left 39 participants in the "Pay box J" condition and 47 in the "Pay $352.16" condition. The correct answers and interquartile ranges of responses appear in Figure 5. Median estimates closely approximated the correct values when paying a constant amount of $352.16 but fell far short when paying the amount in box J for time horizons greater than 12 months. In the latter condition, the proportion who underestimated was significantly greater than 50% at 24, 36, and 48 months (binomial tests, all $p < .001$).

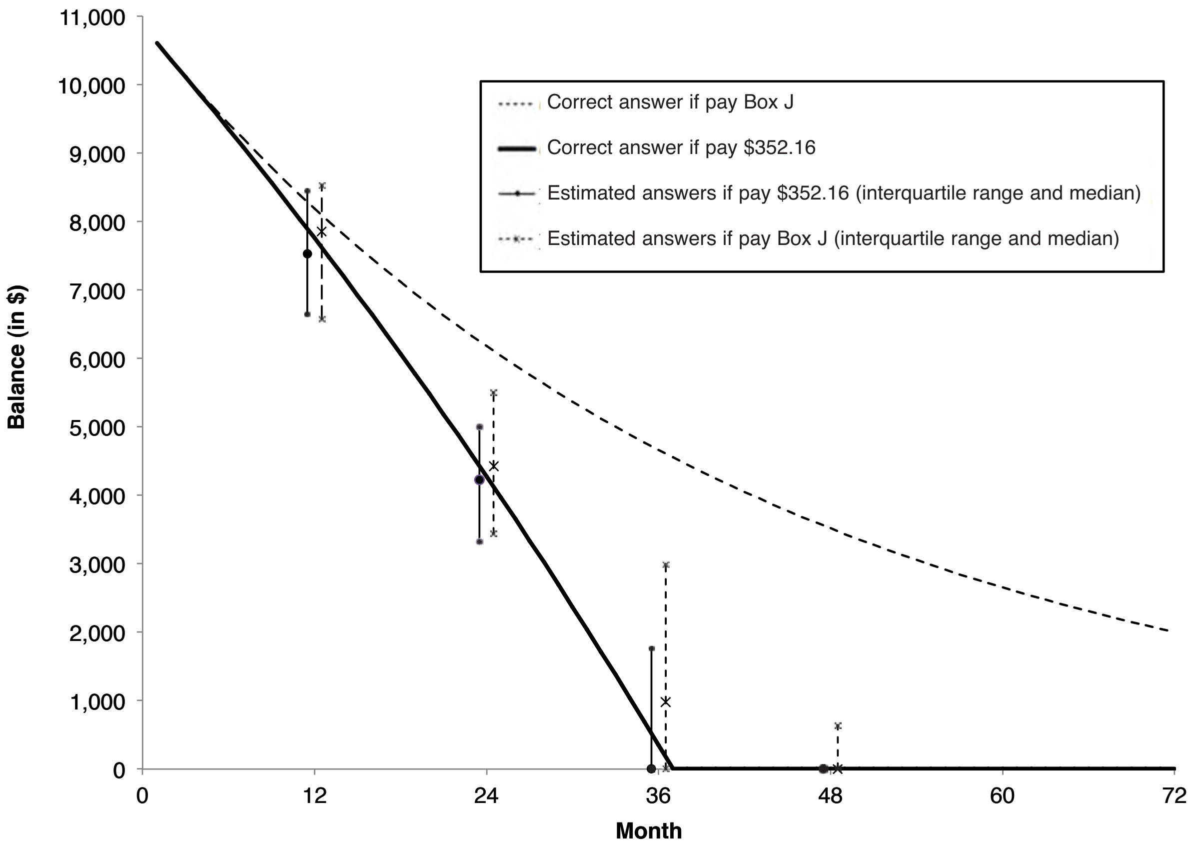
### Discussion

The majority of people do not have a clear understanding of some of the critical numbers in the new statement. They overestimate how long it would take to pay off the card if they regularly pay the amount in this month's minimum payment box, and they underestimate the time if they regularly pay the three-year payoff amount that appears on each statement. Neither error is related to numeracy, so we interpret these results as revealing ambiguities in the disclosure information itself. The confusion can probably be addressed by changing some of the wording in the existing statement. We offer specific policy recommendations in the next section.

## Summary of Findings and Policy Recommendations

People systematically misjudge critical values related to credit card debt, such as payoff time, remaining balance, and the monthly payments needed to eliminate debt in three

**Figure 5. Time to Pay Off a $10,000 Credit Card Debt if the Card Will No Longer Be Used**




Notes: Amounts shown are for two interpretations of the table in the new credit card statement.

years. They greatly underestimate the time needed to pay off a debt when payments barely cover interest charges, sometimes predict a declining balance even when payments fall short of interest, and provide inaccurate estimates of the monthly payment required to pay off a debt in three years. The magnitude and direction of these errors depend on numeracy. For example, less numerate people often underestimate required monthly payments, whereas those more numerate tend to overestimate.

The new statement mandated by the CARD Act leads to better judgment and therefore benefits consumers. We found that the new statement was extremely effective when the card was no longer being used but only somewhat effective when participants understood that they were adding $500 monthly in new charges. Many innumerate people continued to underestimate the needed monthly payments in this situation. Moreover, Study 3 demonstrated additional misperceptions, suggesting at a minimum that some minor changes to the wording of the statement could lead to a better informed consumer.

One avenue for further research would be to investigate the extent to which people understand the terms of credit, in addition to the monthly statement. For example, some retailers are currently offering store cards that waive interest charges if regular payments are made on a purchase and the debt is paid off by a given deadline. If the consumer fails to meet the conditions, interest charges (which tend to be high) are imposed retroactively from the date of purchase. It is easy to imagine a consumer misunderstanding the terms of the deal and consequently being surprised by and saddled with very high credit card bills.

On the basis of our findings, we can offer several suggestions to improve consumer financial decision making. Some of our recommendations are mutually exclusive (e.g., policy makers cannot both revise and replace the current statement), whereas others can be implemented together (e.g., policy makers can replace the current statement and educate consumers).

## Revise the Existing Statement

Minimally, the statement implemented by the CARD Act should be altered to clear up any confusion about the three-year payoff amount and the need to add new charges to this amount. This might be accomplished with a brief note on the statement, such as “To pay off the balance within three years from today, each month you should pay at least

\$352.16, *plus* any new charges that you have added to the card that month." New charges should then be listed separately from interest charges to facilitate this math. Although such a sentence would likely help, it assumes that the consumer can remember the monthly payment amount from a previous month and ignore the amount printed on the current month's statement. A more drastic alteration to the statement might remind consumers to write down the three-year payoff amount and put it in a visible location. However, we are doubtful that this is a practical solution for all but the most conscientious consumers.

## Replace the Existing Statement

The existing statement could potentially be replaced to help consumers plan their payments over time. We suggest a statement that replaces the three-year payoff amount with several target dates. For example, the statement might include a table with three columns: The first column would be a series of target dates (e.g., June 2013, June 2014, June 2015, June 2016, June 2017, and the year 2034), the second column would include the constant monthly payments needed to pay off the debt by each date (with "only the minimum amount due" for the distant final year shown), and a third column would show the total payments for each target date. Such a table would have several advantages. First, it would give consumers a choice among several different payoff deadlines. Second, the consumer would not need to remember an amount from a previous statement—all the necessary information is on the current month's statement. Finally, the statement would automatically adjust for new purchases, so the consumer does not need to do any math when the card is still being used. For example, if the consumer charges \$500 to the card each month and wants to pay off the balance by June 2015, the required payment for June 2015 would automatically adjust so that debt is eliminated by the target date. Note that this could result in an increasing principal in the short term if spending is high enough because new charges are amortized over the remainder of the selected payoff term.

A potential disadvantage of this proposal is that it would literally take an act of Congress to implement because the features of the existing statement that we propose replacing were specified explicitly in the CARD Act. An alternative approach would be to use a version of our proposed table to supplement the existing statement, either in print or online.

## Provide Online Tools

The statement could be supplemented with online tools that allow for greater customization. Such tools would give the consumer complete freedom to select target payoff dates or to experiment with different scenarios. For example, with a few clicks the consumer could learn the monthly payments required to eliminate debt within four years while charging \$750 in new expenses monthly to the card. The online tools might also assist the consumer in managing payments and spending across multiple cards that vary in interest rates and limits. A risk with "informational" online tools is that they can potentially be manipulated to extract additional profits from the consumer. Ideally, the tools would be available from a trusted source (e.g., a university or government agency) that has no vested interest in the consumer's decisions.

## Teach Consumers Heuristics That Work

Sometimes a simple rule can go a long way toward sound financial judgment. For example, although the math behind compound interest is complicated, an investor can simply apply the "rule of 72" to compare the effects of different returns. In the same spirit, we suggest two rules of thumb that might help cardholders better manage their debt.

The first rule can be summarized as "pay 3 to make 3": To pay off a debt in about three years, the consumer would always pay off new charges plus triple the *initial* monthly interest owed. For example, with \$300 in new charges and \$50 in monthly interest charges, paying \$450 each month puts the consumer on a path toward being debt-free relatively quickly. "Pay 3 to make 3" can be applied across a range of situations and can help facilitate an intuition for the need to cover interest charges by a comfortable margin. We note two caveats in applying "pay 3 to make 3." First, it is only an approximation. For example, the heuristic is nearly perfect when the interest rate is 14%, but it actually takes four years to pay off the card when the rate is 10% and approximately two years when the rate is 20%. Second, the heuristic requires the cardholder to remember the starting interest charges and always to pay triple that amount. It would take much longer to pay off the card if the consumer always paid triple the interest charges on each successive statement.

The second rule of thumb is for someone who definitely wants to pay off credit card debt by a given date. The cardholder would need to keep track of the months remaining until the target date. For example, suppose that the target date is 24 months from now. In the first month, the cardholder would pay 1/24 times the balance remaining on the card from the previous month, plus the monthly interest charges, plus any new purchases on the card. In the second month, the consumer would pay 1/23 (because there are now 23 months remaining) times the remaining balance, plus interest charges and new purchase charges. The pattern continues until the card is paid off. This payment schedule is somewhat frontloaded if followed rigorously because the interest charges will decline each month as the balance decreases. It has a few additional benefits. First, the rule can be applied to current statements without tracking information on previous statements. Second, the rule is relatively forgiving if a cardholder occasionally misses the required payment because shortfalls get redistributed across the remainder of the payment period. Finally, if followed, the rule ensures elimination of debt on a specific date.

## Develop Alternatives and Test Them Experimentally

Although the new statement is a substantial improvement, there are still some critical misunderstandings. This suggests two important steps moving forward. First, multiple alternatives to the new statement should be developed, incorporating variations on both the substance and the display of the information provided. Second, these alternatives should be experimentally evaluated against each other to provide insight into how each alternative influences consumer behavior. The results of such tests might also suggest new ideas, which in follow-up testing might prove superior to the original alternatives. Experimental testing should also extend to proposed online tools and educational methods. These recommendations are consistent with recent guidelines for the regulation of disclosure at the Office of Information and Regulatory Affairs (Sunstein 2010).

## Conclusion

We have demonstrated several systematic errors in reasoning about credit card debt and have shown that the recent update to credit card statements does help. Our results also suggest that additional improvements to the statement are warranted. Improved disclosure of financial information is by no means a panacea for the age-old psychological problems of impulsiveness and overspending. However, we believe that appropriate disclosure and education can help consumers better understand the consequences of their spending and credit card payments and better plan for their financial futures.

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