RESEARCH BRIEF

How Do Individuals Repay Their Debt? The Balance-Matching Heuristic

Based on BFI Working Paper No. 2018-07 by Neale Mahoney, associate professor of economics at UChicago's Booth School of Business and co-faculty director of BFI's Health Care Initiative, and John Gathergood of the University of Nottingham, Neil Stewart of the University of Warwick, and Jorg Weber of the University of Nottingham

KEY TAKEAWAYS

- ✓ Many people carry credit cards that charge varying amounts of interest
- ✓ People do not put most of their repayments toward the higher-interest card
- ✓ Instead, they most often match the share of repayments on each card to the share of balances on each card
- ✓ Encouraging optimal repayment strategies would greatly benefit most consumers

Imagine a scenario where you have two credit cards, and you are carrying equal amounts of debt on both, say, $1,000. Card A charges 18 percent interest and Card B charges 12 percent. You have $500 to allocate to the cards at the end of the month. How much should you apply to each card?

The answer may seem obvious: You should apply the minimum amount necessary to Card B, because it charges the lowest interest rate, and then apply the rest of your payment to Card A. The sooner you pay off Card A, the better, since that higher interest rate means an increasing accumulation of debt. However, most people do not employ this interest-cost-minimizing approach; rather, in this case, they would apply roughly $250 to each card. This balance-matching heuristic (a problem-solving technique that is often suboptimal), whereby people apportion payments based on how much they owe, occurs no matter how many credits cards people carry, or how much they owe on each one.

This phenomenon was recently described by Neale Mahoney, associate professor of economics at UChicago's Booth School of Business and co-faculty director of BFI's Health Care Initiative, and his co-authors John Gathergood and Jorg Weber of the University of Nottingham, and Neil Stewart of the University of Warwick, in "How Do Individuals Repay Their Debt? The Balance-Matching Heuristic." Their research builds on existing literature that broadly describes people's suboptimal repayment behavior and reveals how people repay their debt. The paper's insights, which are the first compiled from actual repayment data, reveal the large gap that exists between how people repay their credit card debt, and how they should repay their debt.

Table 1 · Actual and Optimal Payments on the High APR Card

	Mean	Std. Dev.	Percentiles				
As % Total Monthly Payment			10th	25th	50th	75th	90th
Actual Payment (%)	51.22	24.21	16.86	33.33	50.00	67.99	84.78
Optimal Payment (%)	70.74	22.17	38.10	55.92	75.23	89.48	95.83
Difference (%)	19.52	23.75	0.00	0.72	9.91	32.40	54.55

This is no trivial matter. Revolving debt, including those loans taken out on credit cards, exceeds $1 trillion in the United States, according to the Federal Reserve. Understanding how consumers repay their revolving debt can help policymakers develop methods to encourage techniques that will reduce consumers' overall debt burden more quickly. The work of Mahoney and his colleagues offer some suggestions in this regard, including credit card statements that better highlight interest rates, and technology that can help consumers make better choices.

First, a note about data

In the past, researchers interested in how consumers pay off credit card debt have been hampered by a lack of data, which often limited them to payment records from just one financial institution. Consumers, though, often hold credit cards from a number of issuers, so data from a single issuer told only part of the story.

Mahoney and his colleagues, though, were able to access the Argus Information and Advisory Services' "Credit Card Payments Study" (CPPS), which includes detailed information on contract terms and billing records from five major credit card issuers in the U.K. These issuers have a combined market share of over 40 percent and represent a broad range of credit card products and market segments. In the U.K. market, 46.1 percent of credit card holders have two or more cards, and individuals with two or more cards account for 72.2 percent of outstanding balances.

The authors obtained monthly data from January 2013 to December 2014 for a 10 percent representative sample of individuals in the CCPS who held a credit card with at least one of the five issuers. Unlike other leading credit card datasets, the CCPS included anonymized individual-level identifiers that allowed the researchers to link together multiple accounts held by the same individual.

Optimal repayments

The authors are clear in their assessment of the best strategy for consumers to repay their credit card debt: "We refer to the interest-cost-minimizing allocation as the 'optimal' allocation because it is hard to think of a (reasonable) scenario where minimizing interest costs would not be optimal." Restated from above: regardless of the number of debts, consumers should apply minimum payments to those debts with lower interest rates and put their remaining payments toward the credit card with the highest interest rate. After that card is paid in full, the consumer should focus attention on the card with the next-highest interest rate.

Mahoney and his colleagues focus on repayments rather than on, for example, which cards are selected for use, which may be influenced by such factors as reward programs. That is, consumers may choose to use a higher interest rate card if it offers rewards that they value above relative levels of debt. However, even in cases where consumers choose to use a higher-interest rate card (assuming they are making those decisions with awareness of a card's interest rate), the key question is still how they repay those debts.

Returning to the two-card consumer, as shown in the accompanying Table, data for actual and optimal repayments show that individuals should allocate 70.7 percent of repayments to the high interest-rate card. If individuals were completely unresponsive to interest rates, we might expect them to place 50 percent of payments on the high interest rate card, equivalent to flipping a coin as a repayment strategy. A striking finding from these data reveals that is almost precisely what occurs: On average, individuals allocate just 51.2

Figure 1 · Three Cards

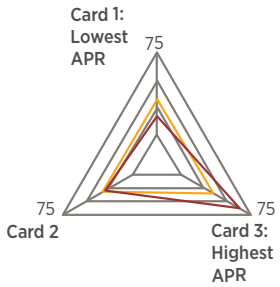


Figure 2 · Four Cards

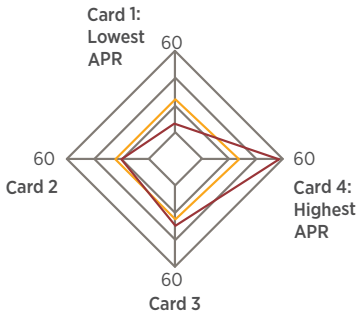
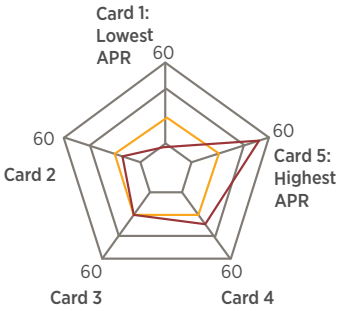


Figure 3 · Five Cards



Actual Optimal

percent to the high interest rate card. Individuals, thus, misallocate 19.5 percent of their total monthly payment, on average. Month to month, these misallocations add up and lengthen a consumer's debt burden.

How do consumers allocate repayment when they carry more than two cards? Figures 1, 2 and 3, which represent repayment strategies of consumers with three, four, and five cards, respectively, reveal that consumers make symmetric or balanced payments among their various cards (yellow lines), as opposed to paying the minimum on lower-interest cards and dedicating the rest to the high-interest card (red lines).

> The authors refer to interest-cost-minimizing allocation as the 'optimal' allocation because it is hard to think of a (reasonable) scenario where minimizing interest costs would not be optimal.

The balance-matching phenomenon and other heuristics

The authors' investigation of balance-matching leads them to consider other research that helps explain such behavior. For example, the psychological theory of anchoring suggests that individuals might make payments in response to how information is displayed on their credit card statements, which prominently display balance amounts as opposed to interest rates. Also, a proclivity for "matching" has been observed in other areas of human behavior (and even other species). For example, if people are given the choice to put money into a lottery with a 60 percent pay-out versus one that pays out at 40 percent, they will split their bet between the two at 60 and 40 percent, respectively, even though it makes most sense to put all the bet on the lottery with the highest payout.

To be clear, the authors do not suggest that individuals grab their calculators and perform long division to determine how to apportion payments among multiple debts. Instead, they propose that individuals approximate balance matching in their repayment behavior. Indeed, since credit card balances are fairly stable over time, an individual could approximate a balance matching rule without knowing the exact balance on each card that month.

Balance-matching captures more than half of the predictable variation in repayments and is highly persistent with individuals over time. Balance-matching also performs better than other heuristic models in explanatory power. The most prominent alternative heuristics include the following:

- Heuristic 1: Repay the card with the lowest capacity. Consumers focus payments on the card or cards where they are near their lending limit, for fear that they may exceed those limits and acquire a fee and a black mark on their credit report.

- Heuristic 2: Repay the card with highest capacity. The strategy here would be to "clear space" on a card with the highest lending capacity, which would then free that card for a large purchase, like a television, or preserve that card's lending capacity for a possible funding emergency.

- Heuristic 3: Repay the card with the highest balance. In this case, consumers would make increased payments to the card with higher balances until they are roughly equalized across cards, after which payments would be allocated equally.

- Heuristic 4: Repay the card with the lowest balance. Finally, consumers may employ what is known as the "debt snowball method," whereby they make the bulk of their payments to the lowest balance card, while paying just the minimum on any others. Once that lowest-balance card is paid off, they then move to the next lowest balance until all cards are paid. This repayment method has advocates among some financial advisors, who argue that paying off a card with a low balance generates a "win" that motivates further repayment behavior. Additionally, if an individual fully pays off a card, this heuristic has the additional benefit of "simplifying" the individual's debt portfolio. Despite the seeming popularity of this heuristic, though, there is no evidence in the data to suggest that people are employing it.

CLOSING TAKEAWAY

Regardless of what is optimal, individuals tend to match the share of repayments on each card to the share of balances on each card.

Conclusions and Implications

While the authors' work is focused on consumers in the U.K., the premise of their research—that people do not pay off their credit card debts in an optimal way—is reinforced by a similar finding of consumers in Mexico ("Borrowing on the Wrong Credit Card: Evidence from Mexico," by A. Ponce, E. Seira, and G. Zamarripa, 2017

The important contribution of this paper is to show that actual repayment behavior can be explained by a balance-matching heuristic under which individuals match the share of repayments on each card to the share of balances on each card. In particular, they reveal that balance matching captures more than half of the predictable variation in repayments, performs substantially better than other models, and is highly persistent within individuals over time. (The full paper describes the authors' employment of machine learning models to reinforce their findings.)

By answering some questions this paper raises others, including: Is balance-matching behavior present in other markets, such as the decision of how to allocate payments across student loans with different interest rates? What are the psychological underpinnings of balance matching? For instance, does balance matching, in part, reflect a moral preference to repay more to the creditor to whom more is owed?

Finally, from a policy perspective, this work suggests two possible responses, contingent on appropriate study. First, it may make sense to give more prominence to a credit card's interest rate on the card statement. Running experiments that test alternative ways of presenting interest rates on credit card statements and online repayment portals could prove valuable. And second, there is increasing interest in creating open data sets that would allow for the development of, say, computer- or app-based budgetary tools that could help people manage their budgets and more optimally pay off their debts.

READ THE WORKING PAPER

NO. 2018-07 · JANUARY 2018

How Do Individuals Repay Their Debt? The Balance-Matching Heuristic

bfi.uchicago.edu/Mahoney-WP-201807

ABOUT THE AUTHOR

Neale Mahoney
Associate Professor in Economics
Booth School of Business, University of Chicago
chicagobooth.edu/faculty/directory/m/neale-mahoney