Credit card policies for allocating payments: its impact on risk-based pricing and comprehension by consumers

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Abstract

Credit card borrowers can have balances on the same card at several different rates at once. By choosing a favorable method of allocating payments to balances, issuers can substantially raise the interest rates paid by borrowers. The impact of this policy on risk-based pricing is examined using computer-simulated accounts. It is found that the prevailing policy used by issuers causes inverse risk-based pricing. In addition, a survey shows that few credit card users understand the impact of payment allocation. The impact of recent legislation on payment allocation policy is also examined. © 2009 Academy of Financial Services. All rights reserved.

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1. Introduction

Credit cards are very unusual among loan products in that consumers pay one amount that is then applied to several balances at different rates. A consumer can have multiple loan balances outside of a credit card with a single lender such as mortgage, a home equity line, and a car loan with a single bank. However, that consumer will typically make a separate payment for each loan product. If they pay above the minimum amount, that consumer can then easily choose which balance to pay down first, often choosing to pay the highest interest rate loan first. However, a credit card borrower with a separate cash advance, purchase and low-rate short-term promotion balance does not get to choose how their payment is applied.

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The credit card company chooses. Credit card issuers almost universally choose to apply payments to the lowest interest rate balance first (from here on out this policy will be referred to as "LRF" for lowest rate first). In fact, a United States Government Accountability Office study (2006) found that 23 of 28 issuers in the survey explicitly had this policy. The other five issuers applied payments "subject to their discretion," suggesting it is possible that all of these remaining issuers used the same methodology without explicitly stating the policy. In fact, after an extensive search, we were only able to find three issuers that explicitly apply payments using a method other than LRF. One is State Employee's Credit Union in North Carolina, another is a bankcard offered by Nordstrom's, and the third is an issuer in the United Kingdom named Nationwide.[1]

Although the use of a payment allocation policy that maximizes interest rates may seem like an obvious choice by issuers, if markets are efficient, the prevalence of this policy is by no means a given. With perfect market efficiency, rational borrowers would see that the LRF policy is equivalent to an indirect rate increase, and would be indifferent between low stated rates with an unfavorable payment allocation policy and higher stated rates combined with a more favorable payment allocation policy. Therefore, there is no compelling reason for issuers in an efficient market to universally favor this policy. In fact, if all policies are equally efficient, given that the impact of payment allocation policy depends on the details of account dynamics, one may expect a heterogeneous market that includes a variety of policies to satisfy consumer preferences. However, all payment policies may not be equally efficient, because the dynamics of account charges and payments are closely related to risk. If different policies had different implications for the risk-price relationship, in an efficient market issuers would choose the policy that produces the strongest risk-based pricing. This research is the first to test the nature of the risk-price relationship under various policies, with important implications for the efficiency of the credit card market.

Depending on the dynamics of a particular customer, payment allocation can be very powerful at indirectly increasing the interest rate. If a borrower uses both cash advances and purchases, LRF over time converts all their balance to the cash advance rate and the faster they make payments, the quicker their balance moves to the higher rate. For example, assume one has a $1,000 purchase balance and makes $100 in new purchases and $100 in new cash advances each month. Assume one also pays 20% of the balance each month. In the first month (if we ignore interest and the timing of new charges for the moment), the payment exactly equals the purchases and cash advances, leaving the total balance unchanged. However, the purchase balance goes down to $900 because all $200 goes to pay this balance, whereas only $100 of new purchases is made. Instead, there is now a $100 cash advance balance. In the next month, the cash advance balance again rises by $100 whereas the purchase balance declines by $100. In under a year, almost all the balance goes to the cash advance rate, even though all the initial balances were at the purchase rate and only 50% of the account activity is cash advances. We can more precisely estimate the impact in this scenario by adding in the impact of interest and using average regular bank purchase and cash advance rates. The rates used here are 12% for purchases and 19% for cash advances and come from a survey of bank rates conducted by the Woodstock Institute (2005), one of the few rate surveys to separately track the cash advance and the purchase interest rate. This seemingly minor payment allocation rule causes the blended interest rate in this example to

rise from 12% to 18.35% in under a year.[2] The impact is even larger if there is a 0% or other promotional rate involved.

The impact of payment allocation policy on consumers varies greatly based on the way credit cards are used. Approximately half of households do not carry credit card debt (Bucks, Kennickell, Mach, and Moore, 2009). These consumers are unaffected. In addition, many card users utilize only one type of activity on a credit card (e.g., making only purchases). Although public data on how many consumers use each type of balance is scarce, our own survey results discussed later find that 17% of card users utilize cash advances, and 56% use teaser rates. Because not all borrowers use multiple rates, the impact on the average customer will be smaller than the numbers shown in the example. In fact, the impact of payment allocation is so complex and opaque that the aggregate impact is impossible to determine without knowing the dynamics of activity for each individual accountholder.[3] Averages of account activity will not suffice because payment allocation policy can affect individual accounts with different activity patterns in idiosyncratic ways.

Some users may segregate their card use to minimize or eliminate the impact of payment allocation. As long as different categories of balances are kept on different cards, consumers can control where payments above the minimum go. There is little data on how many people use this strategy. Our simulation does not address this strategy. However, the results of our survey does provide insight into whether most consumers understand enough about payment allocation to utilize such a strategy.

The cash advance rates used in this analysis ignore cash advance fees. Although most credit cards charge an up-front cash advance fee, this is a one-time fee that does not directly influence the ongoing interest rate. Whereas it does influence the total cost of credit as well as the consumer's decision to take a cash advance, the interest rate paid during later months remains independent of the cash advance.[4] It is possible for some borrowers to avoid cash advances fees and rates by creating a "synthetic cash advance" by purchasing items on a credit card that they would normally purchase using other means, and then not paying the balance off. Why more people do not choose this seemingly more rational option is an interesting question. Part of the reason may simply be a lack of consumer knowledge regarding rate and fee differences. Other deviations from rationality may also have a role here, such as not understanding the magnitude of the long-term impact of the rate or fee difference, satisficing, and force of habit. In addition, borrowers may not anticipate their need for a cash advance, and may find themselves in a situation where cash is needed immediately. Borrowers with adequate liquidity can also sometimes theoretically counter bad allocation schemes by doing a balance transfer or by over time rapidly paying down the card in question and spending on a different card. Besides being limited by liquidity issues, the use of these techniques are also limited by cardholder knowledge regarding the impact of the payment allocation practice, which is the subject of the survey conducted as part of this study.

In December 2008, the Federal Reserve enacted rules changing payment allocation practices. This was followed by rules written into the Credit CARD Act passed by congress in May, 2009 that further limited payment allocation practices. In particular, issuers must use the HRF (highest rate first) method. The exception to this limitation is for the minimum payment, where issuers can still use the LRF or other allocation method of choice. Currently

issuers can still use any method they choose for allocating the entire payment, with the new limitations not taking effect until February, 2010.

Although some methods of allocating payments discussed here will be phased out, the research is still important for a number of reasons. First, understanding the nature of credit card payment allocation and the options selected by issuers historically still has very important ongoing implications regarding the nature of competition in this market. Second, it is possible that the allowed payment allocation policies will become legal again at some time in the future. Third, financial innovations may occur that create synthetic versions of the practice. Fourth, other allocation options are still available in other countries. Finally, the results may have applications to other products.

This study consists of two components with different methodologies. A simulation was run to analyze the relationship between payment allocation policy and risk-based pricing. In addition, a survey was conducted to assess the ability of consumers to make informed, rational decisions regarding payment allocation. In the next section, we review the relevant literature. Section 3 describes the simulation methodology. Section 4 provides simulation results, with this section being divided into subsections focusing on each of three different risk measures, and a fourth subsection focusing on a combined risk measure. Section 5 describes the survey methodology. Section 6 provides survey results and is further subdivided into subsections on each of three key questions measuring different aspects of consumer knowledge, with a fourth subsection combining these measures. Section 7 concludes.

2. Literature review

Credit card pricing has become highly complex and at times difficult to follow for consumers. A product that at one time charged a single fixed interest rate to all consumers now charges several different varying interest rates at once, with some rates expiring after a short time period, and some rates suddenly changing to "penalty rates" under certain conditions. The number and importance of fees charged to consumers has also grown dramatically (Furletti, 2003).

Prior evidence on payment allocation policy suggests that its impact on the price of credit is poorly understood by consumers. The Federal Reserve found that despite testing a variety of disclosure statements, many consumers still did not understand the implications of the payment allocation disclosure (Federal Reserve, 2008). In addition, there are anecdotal reports that even educated consumers often do not understand how payment allocation reduces the length of their promotional rate (Consumer Reports, 2008).

There has been an ongoing debate regarding the nature of credit card pricing and the efficiency of the market for credit cards. Some researchers see the market as competitive and efficient and view growing price complexity in the market as risk-based (e.g., Edelberg 2003; Getter, 2006; Massoud, Saunders, and Scholnick, 2006). From this point of view, growing price complexity is a positive development, because it allows issuers to price each customer based on their individual risk. According to this perspective, flexible pricing allows credit

card companies to provide products to a wider range of consumers rather than just the least risky.

The alternative perspective is that price complexity is designed to take advantage of consumer information shortfalls and behavioral biases (Bar-Gill, 2004; Levitin, 2008; Mann, 2007; Porter, 2008; Stein, 2007). From this point of view, there may still be heavy competition for customers and balances in credit card markets, but consumers are unable to accurately assess all dimensions of pricing. Therefore, inefficient pricing can persist in the market despite competition among the larger issuers. Pricing is systematically designed to take into consideration information asymmetries and biases consumers are known to have, such as tending to focus on short-term rates, and tending to assume they will not be late on their bills.

There is ample evidence that consumers have biases in the way they respond to credit card pricing. Shui and Ausubel (2004) look at consumer preferences in card pricing over time, and find evidence that is consistent with hyperbolic time preferences and self-control problems. Their evidence is also consistent with issuers incorporating these biases in their pricing. Della Vigna and Malmendier (2004) also model use a model with time inconsistent consumer preferences and are able to explain some aspects of price complexity in the credit card market using this model. Ausubel (1999) finds evidence from an experiment consistent with borrowers underestimating their future credit card borrowing, something he had previously argued may be partially driving pricing in the market (Ausubel, 1991). Yang, Markoczy, and Qi (2007) also find evidence from a survey and experiment of consumer unrealistic optimism, and issuers using pricing that exploits these biases. Ponce, Seira, and Zamarripa (2008) find that borrowers are not rational in their response to price signals when deciding where to direct payments. Consumers may also be aware of the possible pitfalls of purchasing on credit, and may at times avoid using credit cards even when it is the most rational choice (King and King, 2005).

Agarwal, Driscoll, Gabaix, and Laibson (2007) look at financial behavior in ten different contexts, including many related to credit cards. They find that mistakes are more common among the youngest and oldest card users. They utilize a proprietary database from a major credit card issuer in their analysis. The authors also specifically study one issue related to payment allocation; whether users of balance transfers experience what they call a "Eureka Moment" when they realize that because of the allocation of payments, making further purchases on that card is to their disadvantage. They find the same trend that they observe in other contexts; that some consumers learn over time the optimal behavior while some do not appear to learn at all, and that these patterns are systematically related to the age of the consumer.

Other studies have found evidence consistent with risk-based pricing. Primarily using data from the Survey of Consumer Finances, Edelberg (2003) and Getter (2006) find evidence that is consistent with risk-based pricing of APR. Massoud, Saunders, and Scholnick (2006) similarly find evidence consistent with risk-based pricing of late fees. However, although their results are consistent with risk-based pricing, they would also be consistent with pricing that is primarily designed to take advantage of consumer biases and information shortfalls. Pricing that is based on maximizing returns from imperfectly informed or systematically biased consumers will also tend to vary somewhat with risk, even if this is not the primary

goal of issuers. This occurs for a number of reasons. First, the poorest and least educated people may be the most susceptible to this type of pricing both because of a lower average level of knowledge regarding financial issues and because of more limitations on their access to credit. These people will also tend to have higher average risk. Second, it has been theorized elsewhere that issuers use higher prices for riskier consumers (such as very high penalty interest rates when a consumer is late with a payment or has an increase in their credit score) not to account for risk, but because these consumers no longer have the option to shop around and find credit elsewhere (Mann, 2007). While Kidane and Mukherji (2004) found that issuers do in fact target low credit risk consumers, this is not necessarily inconsistent with Mann's model of pricing behavior. In fact, Kidane and Mukherji's results also show that issuers targeted consumers with higher levels of debt, which arguably is more consistent with seeking profitable borrowers rather than solely targeting based on risk. In addition, fees and rates that are based on risk or alleged bad consumer behavior also reduce any ill will from those consumers after the fee is imposed. It also makes consumers more likely to take such an offer of credit in the first place since an optimistic bias found in prior studies of the credit card market (Ausubel, 1999; Yang, Markoczy, and Qi, 2007) would suggest borrowers believe they can control any negative outcome.

Studying payment allocation provides an opportunity to differentiate between various motives for a relationship between risk and price in other contexts. It also provides insight into market efficiency, the effectiveness of competition, and how to design policy to compensate for consumer information and cognitive limits.

Although maximizing APR is a possible explanation for issuers choosing a particular payment allocation method, Jalbert, Stewart, and Jalbert (2008) implies a possible alternative explanation for why credit card issuers may select the LRF payment allocation method. They show that there are opportunities for consumers to engage in credit card arbitrage by borrowing at a promotional rate and investing the money borrowed elsewhere. The LRF payment allocation methodology can reduce or eliminate the arbitrage opportunities for consumers who have multiple balances at different rates. However, these arbitrage opportunities would most likely be adopted by consumers who are financially perceptive, who attend closely to interest rate differences, and who have strong enough credit histories to have excess liquidity. Therefore, these are likely to be the exact same consumer who would segregate their card use anyway, and who would therefore be unaffected by payment allocation methodology.

3. Simulation methodology

A Monte Carlo method simulation was used to estimate the impact of payment allocation policies on a broad range of consumers. The simulation takes predefined probability distributions for key consumer behavioral parameters and randomly assigns value for each, allowing analysis of trends across payment allocation rules when payments, cash advances, purchases, and balance transfers change from month to month in a variety of patterns.

Statistical results are reported for 3,240 random accounts simulated for five years each that resulted in 194,400 total simulated random months of data. Most of the analysis has been

conducted based on data summed into account years, with year-to-year change and averages within the year being examined. The same random parameters were used for each of the payment allocation policy options analyzed. The policy options used include the current prevailing issuer policy (LRF), and three other options that the Federal Reserve considered in their original draft rules (equal payment [EP], proportional payment [PP], and HRF). In addition, because the Credit CARD Act will allow issuers (starting in February, 2010) to treat the minimum payment any way they want, the policy options were all also considered with and without the minimum payment exclusion.[5]

Little public information on the distribution of account activity is available that breaks down the various types of activity. One study that does give means and standard deviations for a large sample of credit card account data broken down by type of activity is Agarwal et al. (2007). Means and standard deviations for payments, purchases, and cash advances from this source were used as a basis for creating probability distributions. Specifically, the distributions used are from Appendix, Table A2 in Agarwal et al. (2007). The data from this paper may not perfectly represent the entire market because they are from one large U.S. bank. However, the averages are generally consistent with available industry statistics. Creating probability distributions for the simulation is further complicated by the fact that the most commonly used distribution, the "normal distribution" is inappropriate for this scenario. First, the correct distributions are truncated at zero, with means less than a single standard deviation from zero. Furthermore, the most common value (mode) is zero for purchases and cash advances and around the minimum for payments, with no particular peaks at higher values. Therefore, for purchases and cash advances, a continuous uniform distribution was used with probability p with a 1-p probability of the value being equal to zero. The range of the uniform distribution and the value of p were created to approximate the mean and standard deviation Agarwal et al. (2007). For payments, the distribution selected was:

Payment = (2% × balance) + a random variable with a gamma distribution

The (2% × balance) is intended to represent the minimum payment. The gamma distribution (with the parameters used) generally has a very high likelihood of a value close to zero, with a long tail going in the positive direction only (i.e., no values below zero). Once again, the parameter selected approximated the distribution from Agarwal et al. (2007).

It is important to include balance transfers at a promotional rate in the simulation since they can have a large impact on payment allocation results. The mean and standard deviation for this distribution are not available. They were assumed to have a similar distribution to cash advances, with a very high probability of a 0 value in a given month, and then otherwise a uniform distribution with a large range. The balance transfer distribution was assumed similar to cash advances because its dynamics are similar in that balance transfers occur infrequently and are typically for large dollar amounts, unlike purchase activity that tends to be more regular and evenly distributed over time. Table 1 gives the values selected for all key simulation variables.

The APRs, introductory APR period, and the minimum payment were kept fixed throughout the simulation and are based on data from two surveys, with the introductory rate/ minimum payment coming from Consumer Action Network (2008) and all other rates

Table 1 Simulation parameter summary

| | Simulation parameters | | | |
	p Value	Uniform distribution	APR	Introductory APR period
Purchases	38%	$0 to $1,650	12.11%	n/a
Cash advances	8%	$0 to $4,000	19.10%	n/a
Balance transfers	8%	$0 to $4,000	0.00%	8 months
	Gamma distribution parameters			
	Kappa (alpha)	Theta (beta)		
Payments	0.1111	3,138		

coming from the average of banks in Woodstock Institute (2005). Based on these same surveys, balance transfers were assumed to receive the introductory rate for 8 months and after that the remaining balance shifted to the purchase rate.

The results shown are for a set of simulations with parameters after lowering activity levels and raising payments to create a roughly stable balance level.[6] Regression results are weighted by balance. As with shifting simulation parameters, the general conclusions of the study are the same regardless of whether weighted statistics are used.

In addition to the above variations, a number of additional alternative simulations were attempted to see how sensitive the results are to the input parameters. The relationship between payment policy and risk-based pricing, was found to be very robust to changing simulation parameters. In all of these alternative scenarios, the LRF method resulted in significant inverse risk-based pricing, and it was less efficient as risk-based pricing than alternative payment allocation methods. More detailed results from the alternative scenarios are summarized in Appendix A. One aspect of standard random simulation parameters that may be unrealistic is the assumption that the various inputs are uncorrelated. Parameters may be correlated over time (e.g., somebody with high purchases one month may make high purchases the next month), or they may be correlated across categories (e.g., somebody with higher purchases may make higher payments). Appendix A includes some scenarios where parameters are correlated. The first two scenarios (with the term "autoregressive parameters") are scenarios where each month's parameter was in part a function of the same parameter last month, leading to correlation over time, whereas the last two scenarios allow payments to be correlated with other variables. These correlations are not included in the main regressions because there is no public data that can be used to determine exactly how parameters are correlated in reality. However, the key results do not change when parameters are correlated.

Three risk factors were analyzed to study their relationship with price under different payment allocation policies. These risk factors include cash advances taken per year, payments made per year, and yearly average balance change.

One possible measure of risk that credit card issuers may be interested in is the size of payments made. If two consumers have the same level of activity, one that consistently makes large payments is probably less risky than a customer who only makes minimum payments. This is because the consumer making the large payments has demonstrated the capacity to pay off the debt. Therefore, all other things being equal, the consumer making

large payments should pay a lower interest rate on their debt (in addition to having a lower balance).

A second important measure of risk is change in balance. In fact, FICO scores (a common measure of credit risk used by lenders, with the name being an acronym for the Fair Isaac Corporation that invented the scoring model) use indicators of new account activity as a measure of risk in part to spot consumers who are likely to have rising debt levels. A rising level of debt may be an indicator that a customer is losing control of their financial situation and may soon become unable to make their loan payments. FICO scores also utilize indicators of current debt level and utilization as indicators of credit risk.

The premise issuers use for a higher interest rate on cash advances is that cash advances are more risky, and that large, recent cash advance activity in particular may be a sign of high risk. When a consumer uses cash advances, they will pay a higher interest rate for some time, regardless of the order in which payments are applied. The question is how payment allocation policy affects the relationship between interest rate and recent cash advance activity.

Besides testing each risk factor individually, to test the combined impact of the three risk factors discussed, a pseudo-credit score was constructed for the simulation data. Because it is unknown how important each of the three factors are in contributing to total risk, the credit score gives an equal weight to each of the three variables after transforming each factor to create a variable with a mean of 0 and a standard deviation of 1 for each factor. Like standard credit scores (such as a FICO score), the scale was defined such that a higher score implies lower risk.

4. Simulation results

4.1. Size of payments

Intuitively, it is not difficult to see that the prevailing issuer policy of LRF may lead to distortions of risk-based pricing if we view the LRF policy as a method of converting low rate balances to high rate balances using payments as its vehicle. The higher the payment made, the faster the balance can be converted from purchase to cash advance, and the higher the effective APR paid by the consumer. The card user is in effect punished with a higher APR for making larger payments.

In fact, using the scenario from the introduction of a $1,000 purchase balance, $100 in purchases and $100 cash advances each month and now varying the payment rate. It becomes clear that the speed at which the balances shift is proportional to the size of the payment. Fig. 1 shows the percentage of balance at the cash advance rate over time for various payment rates. As indicated, by month 18 with a 10% payment rate the blended APR will be 18.67% (using the average rates from survey data) whereas for a consumer who just makes the minimum payment, their blended APR is 15.35%.

Fig. 2 looks at the same scenario, this time comparing various payment policies. For the LRF policy, APR rises as the payment rate rises, inconsistent with customer risk. For the HRF and EP policies, APRs fall (at least at low payment rates for HRF) as payment rate rises.
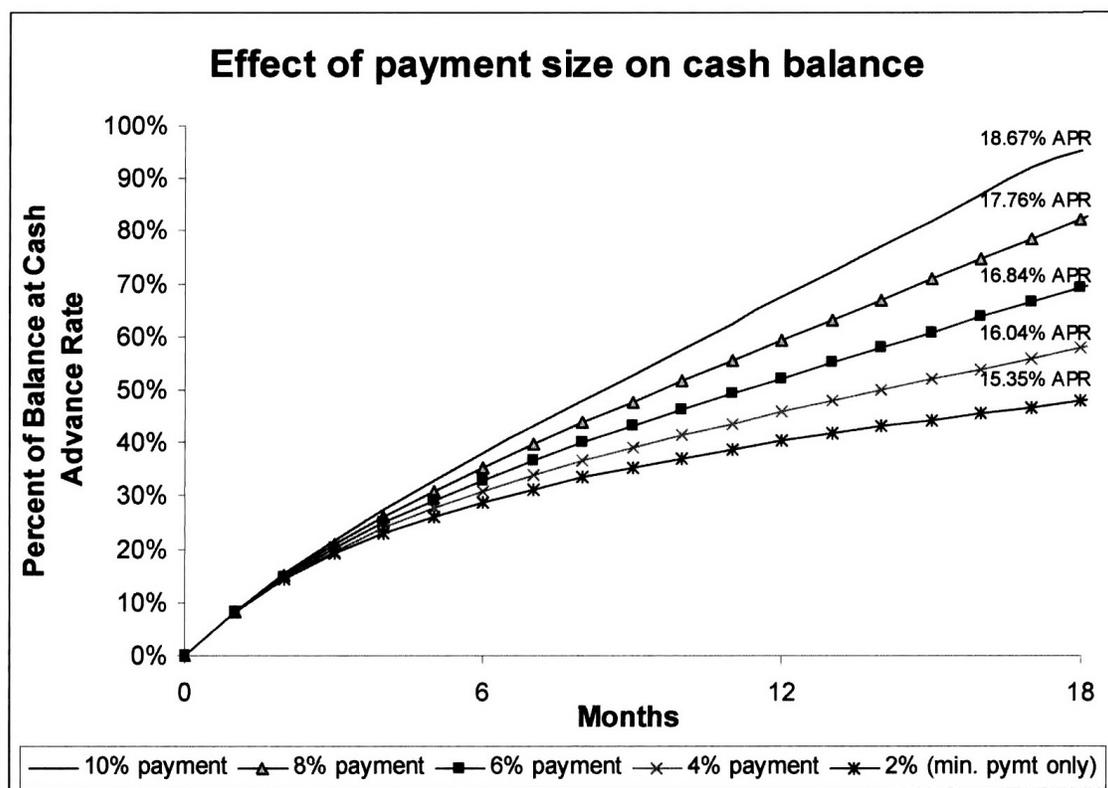
Fig. 1.   Effect of payment size on cash balance.

For PP, APR is relatively flat (but rising slightly) in relation to payment rate. It is also noteworthy that HRF results in the lowest APR and LRF the highest APR regardless of the payment rate.

Of course, the dynamics of payment allocation policy are complex, and this scenario is presented to gain a better intuitive understanding of the dynamics of payment allocation policy. A more rigorous approach to addressing the relationship between payment sizes and pricing under different allocation policies is to utilize the simulation results. The simulation results confirm the expected relationship.

Simple correlation co-efficients indicate that the LRF policy has an inverse relationship to what one would see with risk-based pricing, with higher payments (i.e., lower risk) correlated with higher APRs (see Table 2). This is also true for the PP and EP policies. However, this inverse relationship was by far the strongest for the LRF policy. The HRF method was the only one that showed the correct risk/price relationship, with higher payments (lower risk) being associated with a lower APR. Examination of residual plots did not show any evidence of a nonlinear relationship.

Table 3 shows a multiple regression with all the risk factors as well as a variable to account for the simulation year because the APR level tended to increase over time. The exact same relationship is found for the size of payments variable. LRF, PP, and EP policies all show a statistically significant relationship that is in the opposite of risk-based pricing. However, the LRF policy is still by far the worst policy, with the difference in co-efficients
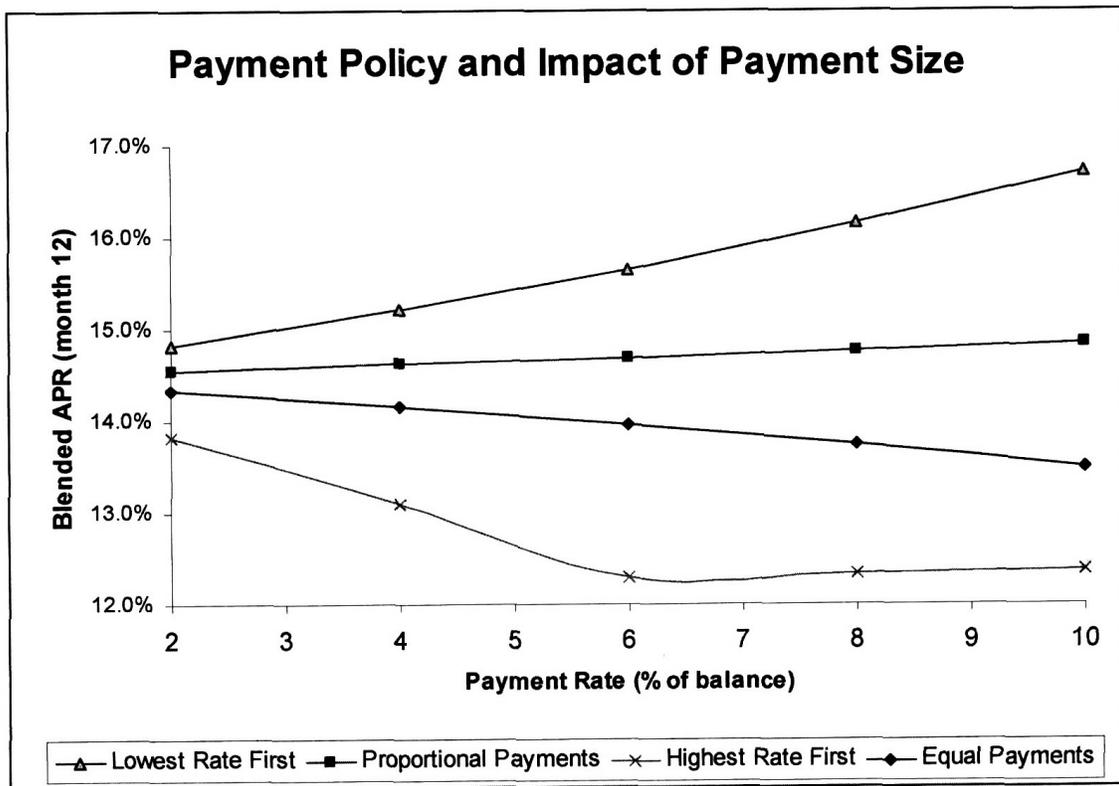
Fig. 2. Payment Policy and Impact of Payment Size.

between LRF and EP (the closest policy in terms of co-efficient) being statistically significant. A higher payment causes about five times as much of an APR increase under an LRF policy compared to the PP and EP policy. Once again, the HRF policy is the only one to show proper risk-based pricing.

The three risk variables examined here are far from the only measures of credit risk relevant to issuers. For example, FICOs consumer site (www.fico.com) cites five factors used to calculate risk including payment history, amounts owed, length of credit history, new credit, and types of credit used. Although this clearly shows there are other dimensions to credit risk not covered here, these other dimensions are generally independent of payment allocation methodology and its impact on pricing. Instead, they are related to external dimensions of cardholder behavior.

Table 2 Correlation between APR and Risk measures under different Payment Allocation Policies

Policy	Expected sign for risk-based pricing	LRF	PP	EP	HRF
Size of payments	Negative	0.253	0.118	0.097	−0.005
Change in balance	Positive	−0.083	0.038	0.080	0.073
Cash advance activity	Positive	0.247	0.362	0.361	0.375

All variables are yearly totals (or yearly differences for balance change). LRF, lowest rate first; PP, proportional payment; EP, equal payment; HRF, highest rate first.

Table 3   Multiple regression results with APR as the dependent variable (from simulation results)

	LRF	PP	EP	HRF
Size of payments	12.39 (0.01)	2.65 (0.01)	2.75 (0.01)	−4.73 (0.01)
Sign consistent w/risk-based pricing (y/n)	no	no	no	yes
Change in balance	−8.95 (0.01)	−3.57 (0.01)	−0.59 (0.01)	−3.86 (0.01)
Sign consistent w/risk-based pricing (y/n)	no	no	no	no
Cash advance activity	39.76 (0.02)	46.13 (0.02)	47.37 (0.02)	46.95 (0.02)
Sign consistent w/risk-based pricing (y/n)	yes	yes	yes	yes
Year	54.82 (0.03)	18.13 (0.02)	9.53 (0.03)	5.86 (0.02)

Note: All coefficients have been converted into basis points per $1,000 change in balance/activity/payments for ease of interpretation of small coefficients except year that is in basis points per year. Numbers in parentheses are standard errors. Payments and cash advances are yearly totals, APR is yearly average and change in balance is yearly difference. All coefficients are significant at 0.1% level. LRF, lowest rate first; PP, proportional payment; EP, equal payment; HRF, highest rate first.

4.2. Change in balance

When risk is defined by the change in balance, the LRF order of applying payments one again causes pricing to move in the opposite direction of risk. To get an intuitive understanding of why this would be the case, consider the change in debt to be a reflection of the difference between new account activity (i.e., new purchases, cash advances, and balance transfers) and payments. When payments are large relative to new account activity, balances are declining. When new account activity is large relative to payments, balances rise. Although credit card accounts normally require a minimum payment, consider a hypothetical credit card account with no payment being made on it. In that case, the order in which payments are applied obviously does not matter. The ratio of cash advance and purchase balances will reflect the ratio of cash advance to purchase activity.[7] However, as payments grow large relative to activity, the ratio of balances increasingly reflects payment policy. In other words, when account activity dominates (i.e., balances rising), the APR reflects that activity. However when payments dominate (i.e., balances falling), the APR will be increased because of LRF policies that consistently distort rates upward.

The simulation results once again confirm the expected relationship. Using simple correlations (shown in Table 2), the LRF policy shows an inverse relationship between risk as measured by change in balance and APR (with APR being higher for lower risk accounts). All alternative policies (PP, EP, and HRF) show proper risk-based pricing for this variable.

The multiple regression results (Table 3) show a slightly different result. After accounting for the impact of other explanatory variables, all policies show some degree of inverse risk-based pricing with riskier accounts (based on balance change) receiving lower APRs. However, once again, the worst policy in terms of risk-based pricing was the LRF policy. The LRF policy had the strongest inverse risk-based pricing, with a co-efficient more than twice the value of any other policy (this difference was statistically significant). Unlike for the other risk factors, for this particular variable HRF were not the best policy. Instead, EP was the best policy here (i.e., the one that had the least inverse risk-based pricing).

It is important to note that the risk-defining variables "size of payments" and "change in balance" are quite distinct in the simulation. They are of course related by an identity, where:

Change in balance = new account activity + fees and finance charges − payments.

However, the correlation co-efficient between these two variables was −0.195. Not only does this imply the two variables are primarily measuring something quite distinct, it also is low enough to allay concerns over a multi-collinearity problem. For example, Kahane (2001) suggests that an absolute value of the correlation co-efficient of around 0.8 signals a multi-collinearity problem.

4.3. Cash advance activity

Credit card issuers charge a higher interest rate on cash advances, arguing that cash advances are more risky. Large, recent cash advance activity in particular may be a sign of high risk. Recent cash advances may be a possible sign that a borrower is having cash flow problems, possibly borrowing to pay minimum payments on other loans and other expenses that cannot be sustainably are paid through credit card borrowing. Because cash advances are almost universally charged a higher interest rate that generally will incur some amount of interest, when a consumer uses cash advances, they will pay a higher interest rate for some time, regardless of the order in which payments are applied. The question is how the prevailing issuer policy of LRF affects the relationship between interest rate and cash advance activity compared to other possible payment policies.

LRF distorts the relationship between cash advance activity and interest rate for two reasons. First, LRF maximizes interest rates by tending to convert all balances to cash advances, regardless of the level of cash advance activity, weakening the correlation between the level of cash advance activity and interest rates. Fig. 3 shows the percentage of an account balance that is at the cash advance rate over time for consumers who have different mixes of activity, when payments are assumed to be 10% of balances and the purchase balance is assumed to start at $1,000. The account activity is assumed to be fixed at $200 a month, with only the mix of cash advances versus purchases in that monthly total shifting.

For each level of activity, an equilibrium point is reached. The transition to a 100% cash advance balance is prevented by new purchase activity every month. Therefore, this equilibrium point is defined by the amount of new purchase activity, which is the only balance not converted to the cash advance rate. As Fig. 3 indicates, the mix of balances at equilibrium is highly insensitive to the mix of account activity. Regardless of whether a consumer has 25% cash advance activity every month (75% purchases) or 75% cash advance activity (25% purchases), with LRF over 90% of the balance eventually moves to the cash advance rate. The only question is how long it takes to convert the balances from a purchase rate to a cash advance rate. Obviously, if over 90% of the balance eventually is at the cash advance rate regardless of how much cash advance activity takes place, the long-term relationship between pricing and risk (as defined by the level of cash advance activity) is distorted.

The second way the risk-price relationship using cash advance activity as a risk factor is distorted is that it fails to account for when a cash advance took place. In a sense, the LRF policy is intended to be unforgiving. No matter when a cash advance (or other high rate activity) took place, it stays on the balance sheet the longest, as long as a customer does not pay their entire balance in full, that cash advance balance will still be there, even if the only

Impact of changing percentage of account activity that comes from cash advances
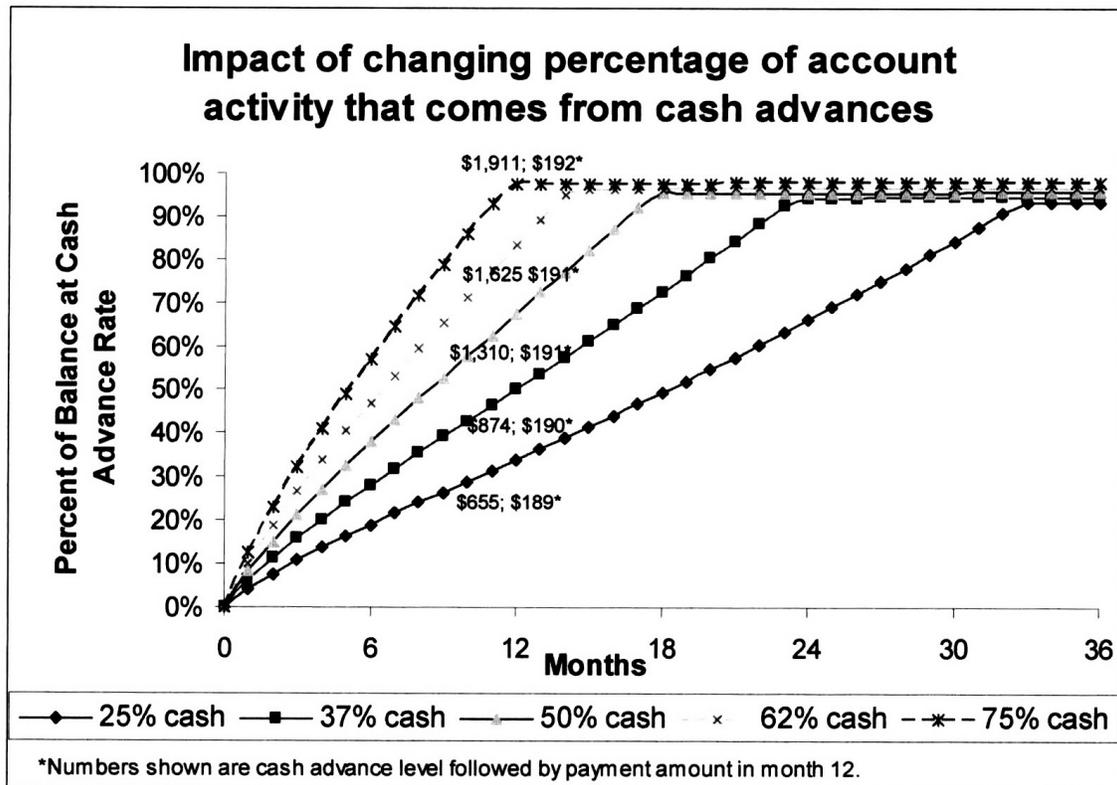

Fig. 3.   Impact of changing account activity mix.

cash advance took place 10 years ago. This raises the revenue for issuers, but it distorts risk because it is hard to imagine how the fact that a borrower took one cash advance a decade ago has anything to do with their riskiness today.

Fig. 4 shows the unforgiving nature of the LRF policy for a customer who takes a single $1,000 cash advance and then makes purchases only every month thereafter (in the amount of $100), with payments assumed to be 10% of balances.[8] With the LRF policy, the single cash advance taken still determines the interest rate for over 90% of the balance even five years later (the same would be true 10 or 20 years out). With an HRF policy, on the other hand, the cash advance balance disappears in slightly under a year, which is more consistent with when the risk of that cash advance should no longer be relevant. The EP policy eliminates the cash advance balance as well, but it takes about twice as long as the HRF policy. With a PP policy, the cash advance balance goes down quickly, but does not disappear completely, instead showing an asymptotic curve that approaches 0 (after 5 years it is 0.5% of the balance).

For the simulation results, using simple correlations (shown in Table 2), all four policies show a relationship between cash advance activity and risk consistent with risk-based pricing, with more cash advance activity associated with a higher APR. However, as previously stated this is inevitable because the cash advance APR is always higher in the simulation than the other APRs, so more cash advances will lead to a higher APR to some extent. The real question is whether a particular payment policy distorts the relationship

How long a single cash advance taken persists as a balance under different policies
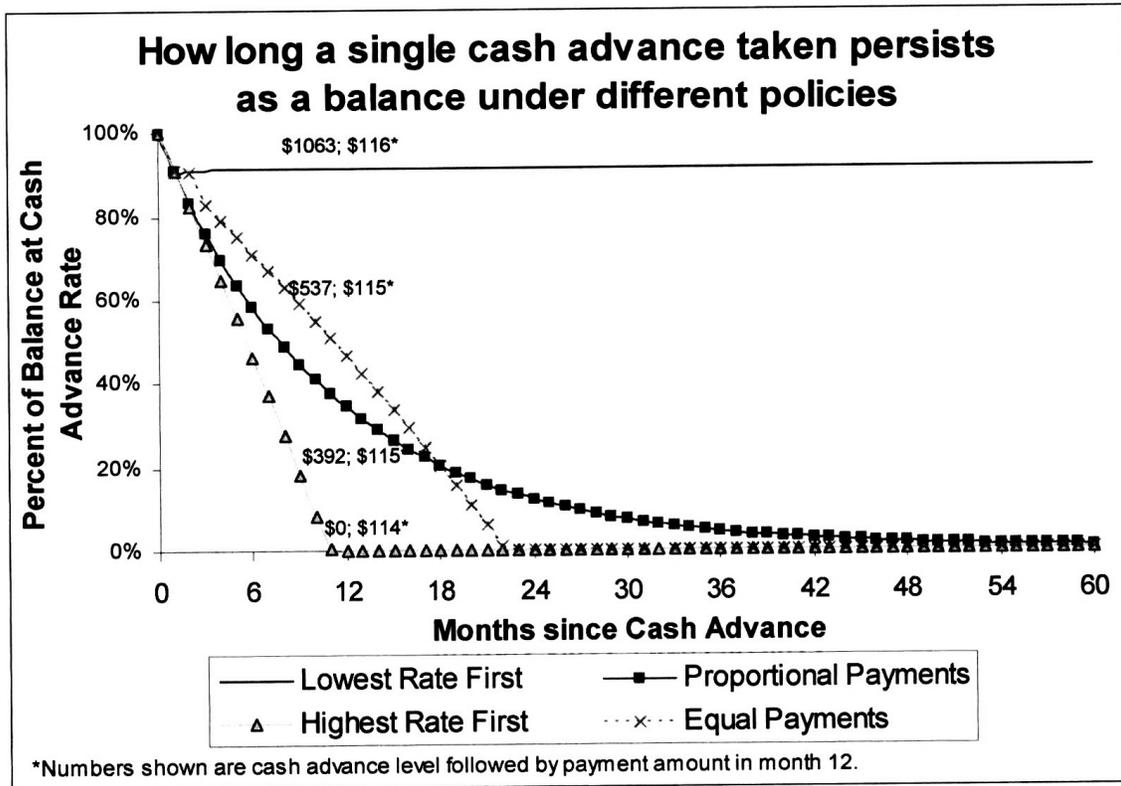
Fig. 4. How long a simple cash advance persists.

between cash advance activity and APR. As the correlation co-efficients indicate, the LRF policy shows the weakest correlation between cash advance activity and APR, suggesting that it is once again the worst policy for risk-based pricing. HRF shows the strongest relationship.

As shown in Table 3, the multiple regression results for cash advances are consistent with the correlation co-efficients. LRF shows the weakest relationship between risk and cash advance (as measured by the regression co-efficient). Although these regression co-efficients do not differ as dramatically as the simple correlations, the difference between the LRF co-efficient and the other three policies are statistically significant, and in the expected direction (i.e., LRF shows the weakest risk-based pricing for cash advances). The important point is that LRF once again the worst possible policy for risk-based pricing to an extent that is *economically* significant. The other three policies have co-efficients that are similar in magnitude, with EP having a slightly higher co-efficient than HRF, followed by PP.

4.4. Combining the risk factors: results for a pseudo-credit score

As discussed in the methodology, to more fully understand the aggregate influence of these risk factors, they were combined into a single measure, a pseudo-credit score was constructed. This pseudo-credit score gave equal weight to each of the three risk factors and approximated the structure of a FICO score, with a higher score representing lower risk.

Table 4   Regression results of APR vs. pseudo-credit score (from simulation results)

	LRF	PP	EP	HRF
Change (basis points) in APR for a 100 point increase in risk score	32.0	−83.6	−107.1	−127.2
Standard Error (same scale as coefficient)	0.1	0.1	0.1	0.1

All coefficients are significant at 0.1% level. Higher risk score indicates lower level of risk. LRF, lowest rate first; PP, proportional payment; EP, equal payment; HRF, highest rate first.

As indicated in Table 4, the LRF policy showed a highly significant relationship with pseudo-credit score, but it was in the opposite direction of risk-based pricing. If the credit score increased by 100 points (making the customer less risky), the APR rose by 32 basis points (or 0.32% points). While drastically changing the weighting of the components of the credit score might change the co-efficient found or even its sign, it will always be the case that LRF shows the worst relationship with risk-based pricing, regardless of the weights used. Because the standard deviation of the pseudo-credit score was 37.8, another way of looking at the score is that an increase of one standard deviation in score (in other words, a decrease of one standard deviation in risk) led to an increase of 12 basis points in APR. Alternatively, perhaps more importantly the difference in the APR between LRF and HRF from a change of one standard deviation in the credit score was 60 basis points (0.6% points), with LRF pricing low-risk accounts higher, and HRF pricing low-risk accounts lower.

All three of the alternative payment allocation policies also show a significant relationship between risk and APR, but for each of these policies, higher risk accounts receive a higher APR, consistent with risk-based pricing. HRF showed the strongest risk-based pricing, with a 100 basis point increase in pseudo-credit score leading to a 127 basis point (1.27% point) decline in APR. The relationships were robust over a variety of changes to the regression specification such as adding the years since opening to the regression, eliminating the balance weighting, or using alternative simulation parameters as described in the methodology section. When comparing any pair of payment allocation policies, the risk co-efficients for the policies are significantly different from each other.

As noted previously, new rules included in the Credit CARD Act that go in effect in February 2010 require issuers to use the HRF payment allocation policy, with the minimum payment excluded from this requirement. The final Federal Reserve rules from December 2008 (that were superseded by the Credit CARD Act) also gave issuers the option of using the PP method, with the minimum payment excluded. Table 5 gives a comparison of payment policy options that are theoretical possible if issuers treat the minimum payment differently (assuming that they would use their current preference of the LRF method with the minimum payment). All of the policy options outside of LRF have proper risk-based pricing unlike current issuer policy. However, the effectiveness of that risk-based pricing can still vary considerably across policy choices.

The four shaded policy options indicate those that issuers would have been free to select from under the Federal Reserve rules. Assuming that, like now, they choose from the available choices the policy that maximizes APR issuers would have selected a proportional payment policy while treating the minimum payment with the old LRF policy. This would

Table 5   Summary of policy option impact (from simulation results)

		LRF	EP	PP	HRF
Minimum	Risk score correlation	0.045	−0.149	−0.177	−0.235
Payment	Risk score regression coefficient	32.0	−83.6	−107.1	−127.2
Same	APR gain over LRF as percent of HRF*	0.00	58%	62%	100%
Minimum	Risk score correlation		−0.096	**−0.096**	−0.251
Payment	Risk score regression coefficient		−59.4	**−25.1**	−148.8
Different	APR gain over LRF as percent of HRF*		37%	**37%**	73%

*Percentage is the net APR benefit to consumers (i.e., APR reduction from the LRF method) compared to the best possible method for consumers (HRF). Bold options are those that will be allowed after July, 2010. LRF, lowest rate first; PP, proportional payment; EP, equal payment; HRF, highest rate first.

have resulted in much weaker risk-based pricing than the HRF method required by the Credit CARD Act. Furthermore, at only 37% of the benefit, the gains to consumers of changing payment allocation policy is much reduced compared to the HRF policy.

5. Survey methodology

A telephone survey was conducted among a national probability sample of 1,006 adults comprising 503 men and 503 women 18 years of age and older, living in private households in the continental United States. Interviewing for the survey was completed during the period September 12–15, 2008, a period when financial news was quite prominent in the headlines. Additionally, ongoing coverage of a "Credit Card Bill of Rights" that was under consideration in Congress and proposed credit card rule changes from regulators were in the news. Both of these proposed policy changes specifically discussed payment allocation in the rule changes under consideration. Therefore, if anything, the survey was conducted during a period of unusually high consumer awareness of this topic.

The survey was executed by the Opinion Research Corporation as part of its regular CARAVAN survey. All CARAVAN[9] interviews are conducted using Opinion Research Corporation's computer assisted telephone interviewing (CATI) system. Opinion Research Corporation utilizes an unrestricted random sampling procedure that controls the amount of serial bias found in systematic sampling to generate its random-digit-dial sample. The sample is fully replicated and stratified based on the four core regions as defined by the U.S. Census: North East, North Central, South, and West. Only one interview is conducted per household with the youngest person being requested by specific (rotated) gender. Of potential respondents determined by Opinion Research Corporation to be "eligible" for the survey, 68.9% completed the survey call. Unlike published directories, the probability telephone sample includes both unlisted numbers and numbers issued after publication of the directories. All sample numbers selected are subject to up to four attempts to complete an interview.

Up to four attempts were used to reach respondents at selected sample numbers. To ensure reliable and accurate representation of the total population, completed interviews are weighted by four variables: age (18 years or older), sex, geographic region, and race.

The raw data are weighted by a custom designed program that automatically develops a

weighting factor for each respondent. Interviewing was conducted September 12–15, 2008, with calling times on weekdays of 5:30 p.m. to 9:00 p.m. (respondent time) and 10:00 a.m. to 5:00 p.m. on weekends. The questions described here were the first questions asked in this survey. However, Opinion Research Corporation does ask questions on multiple topics in the same survey. On this particular survey, subsequent questions (sponsored by other parties) dealt with issues that included digital television, flu precautions, holiday stress, and home-owners insurance.

Seventy percentage of respondents reported using a credit card. This is very close to the 2007 Survey of Consumer Finances which reported that 73% of families used a credit card (Bucks et al., 2009). Only respondents who used a credit card were included in the results reported on here. All calculations shown in this report are for weighted results. Respondents who did not have a credit card and who did not respond to a particular question were excluded from the results shown. The survey is shown in its entirety along with demographics for the survey respondents in Appendix B.

Seventeen percentage of respondents utilized cash advances while 56% used promotional rates. Cash advance use was significantly more common among African Americans and respondents with income less than $40,000. Promotional rate use was significantly higher among African Americans and Hispanics. It was significantly lower for respondents with income less than $40,000.

6. Survey results

The relationship between pricing and risk from the simulation results suggest that somehow price competition has failed. One possible explanation for this is that there are information shortfalls and cognitive limits on consumers that cause competition to fail. The survey results confirm that there are indeed information issues that limit price competition.

For a borrower to understand the power of payment allocation, they must have knowledge of three distinct things:

1. They must be aware that they are being charged different rates for different types of account activity (e.g., separate cash advance rate);[10]
2. They must be aware of the issuer's payment allocation policy;
3. If they are aware of 1 and 2, they still need to be aware of how large an impact this seemingly minor rule can have on a customer's effective interest rate.

6.1. Awareness of rate differences

Despite the fact that virtually all the very large credit card issuers charge a different rate for cash advances, public awareness that their card has multiple rates is surprisingly low. In fact, many major research studies on credit card rates often treat cards as if they had a single rate, and even the Federal Reserve makes this assumption: Two of the Fed's most used data sources for credit cards, the Survey of Consumer Finances and the Survey of Credit Card Plans, still report data as if credit cards have a single rate.

Most credit card users surveyed do not know that the cash advance interest rate is different from other rates on their card, with 48.8% stating the correct answer, 16.9% believing the rate was the same, and 34.3% stating that they were unsure if it was different (see Table 1). People with good or excellent knowledge of personal finance are more significantly more likely to know that the rate is different than people with fair or poor knowledge. However, even among people with "good" or "excellent" knowledge, about half of the respondents do not know the correct answer.

One might expect people who used cash advances to be more knowledgeable than other credit card users. However, there is no statistically significant difference between cash advance users and other respondents. People with higher levels of education—defined as having an Associate's degree or higher—were significantly more likely to be aware of the rate difference. However, this difference was small, with only 53% of respondents with at least an Associate's degree knowing the rate was difference in this group. Even among people with a postgraduate degree, only 56% are aware of the rate difference. People with lower incomes (defined as less than $40,000) are significantly less likely to be aware of the rate difference (43%) than people with higher incomes (53%).

6.2. Awareness of issuer's current payment allocation policy

Where an issuer applies a borrower's payment is one of the detailed disclosures of practices that is typically not featured prominently in the application or solicitation materials (Furletti, 2003). Given the lack of prominent disclosure and the complexity of payment allocation policy, it perhaps is not surprising that many people are unaware that almost all issuers apply payments to the consumer's lowest rate first. However, what may be surprising from the survey results is just how many people did not know the key information necessary to understand the implications of payment allocation policy. Only 6.9% of respondents are aware that the introductory rate balance is paid first.

Excluding people who state they are not sure, still only 17% of respondents with a definitive response choose correctly. Because there are four possible responses on the survey (cash advance balance, purchase balance, balance transfer balance, or all paid evenly), even guessing randomly a respondent should be able to get the right answer 25% of the time. In fact, not only do most people not get the right answer, but also the responses to this question are significantly worse than random at the 1% significance level. If the results were no better than random, this is equivalent to saying the possibility cannot be ruled out that respondents are guessing and nobody knows the correct answer. When the results are *worse* than random, this suggests that credit card users' expectations are systematically violated.

Those people with more knowledge of personal finance are more significantly more likely (at the 5% significance level) to choose the right answer. However, even people with excellent knowledge of personal finance only select the correct answer 16.5% of the time.

Although promotional rate users are significantly more aware of which rate is paid first, the overwhelming majority (roughly 90%) still did not know the correct answer. Cash advance users, despite being adversely affected by use of the LRF rule, are not more aware

than other credit card users of the order in which payments are applied. Higher education levels are significantly associated with a higher rate of correct responses, with 8.8% of respondents with at least an Associates Degree answering correctly. Latinos (with 0.0% answering correctly in the sample population) are significantly less likely to know the correct answer than all other respondents. African Americans (with 3.6% answering correctly) also tend to know the correct answer less often than other respondents, though this difference was not statistically significant.

6.3. Awareness of the impact payment allocation can have

Even among the small minority of consumers who know that they are charged different rates and know how payments are allocated, this knowledge does little good if they do not recognize the large the impact of payment allocation policies. The impact of payment allocation policy depends on detailed predictions of just what kind of account activity will take place along with complex calculations based on those forecasts. Respondents were given a credit card account scenario and were asked whether moving the purchase balance to a zero percentage rate or changing where the payment was applied would save them more money. For people who did not know that the rates were different or how payments were allocated, an introductory statement briefly clarified standard industry practices. The question in its entirety is shown in Appendix B.[11] The correct answer to the question is that changing where the payment is applied will save considerably more money than taking the promotional rate.

There are only two possible responses, implying that 50% could get the right response randomly. Only 43.8% of respondents choose the correct answer, which is significantly worse (1% level) than random. Responses generally improve with higher levels of knowledge of personal finance. However, no group has even 50% of the responses correct, the amount one would expect randomly.

Cash advance and promotion/teaser rate users do not differ significantly from others in their responses. People with more education are significantly more likely to get the correct answer (49.1% of those with at least an Associates Degree), and African Americans are significantly less likely to get the correct answer (32.7% answered correctly).

6.4. Combined awareness

As stated previously, for consumers to assess the likely impact of issuer manipulation of where payments go, they must know that APRs differ, know the issuer's payment allocation policy, *and* understand the financial impact of payment allocation policy. In terms of the survey, this implies they need to know the answer to all three of the questions from the prior sections. The percentage of respondents who get all three questions right is only 3% after removing people who did not respond to a question or had no credit cards. Other than stating outright that they do not know, the first question has two possible responses, the second question has four possible responses, and the third question has two possible responses.

Therefore, if a respondent randomly picks one of the substantive answers, the percentage responding correctly would be 6.25% (50% × 25% × 50%). Significantly more people (at the 0.1% statistical level of significance or margin of error) could have gotten the correct answers if they had picked one of the substantive answers at random for each question. Clearly, with only 3.4% of people knowing the correct answers (and even this group possibly selecting the answer at random), the way lenders apply payments is very poorly understood by consumers.

Consumers with higher levels of personal finance knowledge were more likely to get all three questions right. However, even the most knowledgeable group would have been better off guessing randomly, with only 5.8% of people answering all three questions correctly.

People who used cash advances got all three answers right 5.0% of the time, and those who used promotional rates got all three answers right 3.7% of the time. Neither of these differences were statistically significant from the general population.

The knowledge level regarding this topic may virtually be zero based on the fact that credit card users did not know the answer to the above three questions any better than if they had guessed at random. That credit card users in several areas made guesses that were worse than random suggests that not only do they lack knowledge, what they would naturally guess to be true is also wrong.

7. Conclusions

One ongoing controversy regarding credit cards in relates to how competitive the market is for this product. Some researchers cite high market concentration, profits that are abnormally high, and pricing that seems to be unsustainably for a competitive market as evidence that the market is not competitive (Ausubel, 1991; Berlia and Mester, 2004; Calem, Gordy, and Mester, 2006; Calem and Mester, 1995). On the other hand, other researchers argue that the market is in fact competitive (Brito and Hartley, 1995; Cargill and Wendel, 1996; Nash and Sinkey, 1997). It is important to keep in mind that markets can fail to function competitively for reasons outside of monopoly power. Shortages in information and consumer biases can also cause markets to fail to function properly and price competition to break down. The survey results suggest that there are serious consumer information shortfalls on this topic and possible cognitive issues as well.

These findings yield important insight into the competitiveness of credit card markets. In theory, when markets are perfectly competitive, prices will be pushed down to just equal the marginal cost of supplying the product. In other words, credit card issuers will be unable to earn a return beyond what the normal rate of return on investments is for the market at large. In addition, if the market can be broken down into distinct cost segments, pricing for each of those segments must equal the cost of supplying those segments. If the main variable causing the cost of supplying various market segments to vary is risk, then costs should reflect risk. If the price is lower than cost, the firm loses money. In addition, if the market is competitive, when the price is higher than cost, the firm's customers leave to take better offers from the competition.

Price and Cost in Competitive markets
(for firm using LRF policy)

Cost of Supplying

(price too high—will
flee to competition)

Price Charged

(price too low—firm
loses money)

Price or Cost

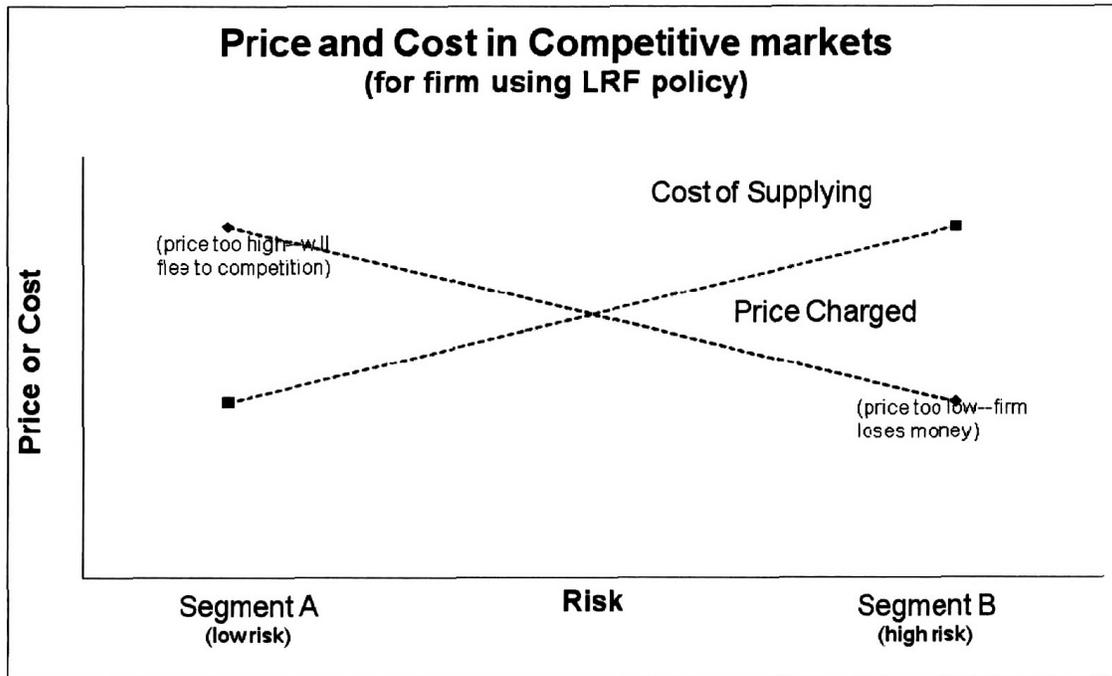Segment A
(low risk)

Risk

Segment B
(high risk)

Fig. 5. Price and cost in competitive market.

This last point is very important since it means that in a perfectly competitive market, strategies to simply charge customers more will not work. In other words, using the LRF order of applying payments because it yields a higher interest rate for issuers simply will not work. A competitive market assumes informed buyers and sellers, which implies that prices are transparent. If an LRF policy causes higher blended interest rates, customers will see through this, and issuers will only get customers if they lower the stated interest rates for the individual balance categories to compensate. Otherwise, a competitor will come along that either uses a method other than LRF to steal customers or uses LRF but with lower rates to steal customers. LRF as a general policy will only dominate in a competitive market if it has some advantage other than raising prices. For example, if LRF allows issuers to better associate prices with risk, it will be commonly used by issuers.

We have seen that in three different ways, under LRF payment allocation, pricing does not match risk. In fact, risk scores show that lower risk customers receive higher prices (i.e., inverse risk-based pricing) under LRF. The problem with this pricing can be seen in Fig. 5, which simplifies risk by dividing customers into two risk levels, with Segment A being low risk and Segment B being high risk. In a competitive market, an issuer using an LRF policy will price Segment A higher than cost. These customers will therefore flee to take offers from competitors. Segment B will be priced below cost, and these customers will gladly stay. The result is that the only customers staying with the LRF firm will be those that yield a negative average profit.

This scenario does assume that some competition uses a payment policy other than LRF. However, in a competitive market, this would happen since alternative policies price better for risk, allowing the competitor with the alternate payment allocation policy to steal

profitable customers. The argument that this requires a market innovation is not valid because issuers are well aware of the major alternative payment allocation policies available to them. The fact that issuers fail to use these alternatives is simply more evidence that price competition is failing in this market.

In a market with limits on consumer information and cognition, the LRF policy presents some important advantages. LRF acts as n obscure rate increase by converting balances to higher rates over time, while the stated rates remain the same. While the effective APR rises, the rates shown on a statement for promotional, purchase, and cash advance balances look exactly the same. To see that the average APR has been affected, a customer would need to perform a weighted average APR calculation and comparison.

In addition, increasing rates through payment allocation policy may allow issuers to utilize known behavioral biases. The LRF policy tends to make rates rise over time. Just like a short-term promotional interest rate, to the extent that consumers even notice the impact of LRF, it could complement a general marketing strategy of making up-front prices low, and raising prices in the future. Just like underestimating the chance that they will pay late, borrowers also might underestimate the chance that they will take a cash advance. Therefore, to the extent that consumers understand the impact of LRF, they may still underestimate how likely it is to influence them.

7.1. Optimal strategy for regulators

The results of this analysis suggest that it may have been appropriate for Congress to limit issuers to a single payment allocation option (at least for the amount above the minimum payment). Although there is often a strong default preference in public policy for free choice in the market, it appears unlikely that consumers are able to make optimal choices regarding trade-offs between payment allocation and other dimensions of price. Given the extent to which knowledge falls short of the ideal and the complexity of the issue, it is unlikely that consumer education can be an adequate policy response. It is likely, given multiple options that issuers would continue select the policy that leads to the highest APR rather than the most efficient pricing. Therefore, in this case, mandating a single payment allocation option can improve market efficiency whereas at the same time making pricing more transparent.

7.2. Optimal strategy for card issuers

Given that consumers will be unlikely to differentiate between payment allocation methodologies when selecting a credit card, issuers have an incentive to select the methodology that yields the highest APR. Before February 2010, this resulted in issuers almost universally adopting the LRF methodology. After this date, issuers will have much less flexibility in selecting a payment allocation methodology. However, they still have some flexibility in selecting how they distribute the minimum payment. Most likely, issuers will utilize the LRF methodology for the minimum payment to maximize the APR, given the new regulatory constraints. Issuers that seek to act in the best interest of their customers (such as member-owned credit unions, or banks for whom credit cards are not a core product and who are

interested primarily in maintaining a positive long-term relationship with their customer base who typically hold other financial products), may have an incentive to avoid using the LRF policy, even if it reduces short-term profitability.

7.3. Optimal strategy for consumers

· After February 2010, consumers will be much less affected by payment allocation policy and need not attend to its impact as much. However, for the time period before that, and in countries that do not limit allocation policy, there are a number of actions consumers can take. They can closely scrutinize credit card terms and conditions, paying attention to the stated allocation policy and taking this dimension of price into account when choosing a product. Consumers should also be aware that promotional rates could last a much shorter term than anticipated because of payment allocation and that a cash advance may raise interest rates for longer than expected. Consumers with enough available credit should use separate cards for borrowing at a promotional rate, making purchases, and taking cash advances. If each credit card carries only one type of balance, borrowers can control the allocation of payments by paying the most to the card with the highest utilized rate. For consumes unable to segregate their card use, a "maximin" payoff strategy may be a good rule of thumb for regimes that allow the LRF allocation method. This strategy looks at the lowest rate in use on each card, and targets the maximum of these lowest rates as the card to pay off first.

For consumers in the United States after February 2010, it is important to be aware that the minimum payment is treated less favorably than the rest of the balance. This creates an additional argument in favor of making payments above the minimum on credit card balances.

Notes

1. Nationwide is a member-owned organization like a credit union in the United States and claims to be the only "major credit card provider" in the United Kingdom to have this policy. Some other large credit unions in the United States do not have any explicit allocation policy because they charge only one rate (whereas in some cases still offering cash advances), making payment allocation policy irrelevant.

2. The average difference between the purchase and cash advance APR for banks in their survey was 7% points. The analysis throughout this study assumes that the cash advance rate is higher than the purchase rate. Although in theory it is possible for the opposite to occur, after examining hundreds of offers, we have yet to encounter an instance of this occurring. Even for temporary rates, when 0% cash advance teasers are given out, generally the purchase balance receives a similar promotional rate.

3. To get a feel for why individual account information matters rather than merely working with aggregate averages, consider two situations. In one situation, there are

two account holders, each of whom has a $2,500 purchase balance and a $2,500 cash advance balance. As they make payments, the portion of their balance at purchase versus cash advance rates can shift dramatically based on the payment allocation rules. Under the LRF policy if the consumer pays down half of their balance, they will have all of their remaining balance at the higher cash advance rate. On the other hand, if the highest rate is paid first, all the remaining balance would be at the lower purchase rate. Using the average difference found in one survey this would result in a change in the interest rate of 6.99% just from changing the payment allocation. However, now consider if the same issuer had $10,000 in balances, but this time rather than both customers having both a purchase and cash advance balance, one customer has a $5,000 cash advance balance and the other customer has a $5,000 purchase balance. In this case, payment allocation method makes no difference in interest earned since each customer has only one relevant interest rate. Note that the aggregate cash advance and purchase balances are the same in both scenarios, but the diversity of balances in individual accounts can make a very big difference in the outcome.

4. There can also be some modest impact on the level of the cash advance balance because of the fee, but this is ignored in the simulation. Alternatively, another way of conceptualizing it is that the activity levels assumed for cash advances are inclusive of fees.

5. This creates seven scenarios: four policy options times two versions (with and without the minimum payment exclusion) −1 (because issuers are expected to pay the lowest rate first with the minimum payment portion of payments, there is only one version of the LRF policy because the exclusion does not matter). For simplicity, many results show only the four primary policy options, while other results include all seven variations.

6. A separate set of simulations before this adjustment yielded similar results.

7. This is a bit of a simplification since balances will grow slightly faster for cash advances because of a higher APR.

8. The assumption that payments are 10% of balances is made only to illustrate what happens in one sample scenario. No such assumption is made in the simulation results. However, 10% may be a good rough approximation for a typical payment for a credit card borrower. The payment rate average of 2005 and 2006 from FitchRatings as reported in CardTrak.com (http://www.cardtrak.com/news/2006/09/06/minimum_payments), was approximately 20%. However, at least 10% of balances are from people who pay in full each month. After netting out these non-borrowing consumers, very roughly 10% of balances are paid each month by borrowers.

9. CARAVAN is not an acronym but simply the product name for Opinion Research Corporation's omnibus survey services.

10. Consumers also need to know what rates they were charged. However, because we have no way to determine their actual rates independent from their survey responses, this question was not asked. This has the result of making our estimates of how many consumers have adequate knowledge conservative.

11. The question was designed to be as simple as possible given the complexity of the issue, rather than focusing on scenarios where payment allocation policy is the most deceptive. A more complex version of the question was given to a non-random group of respondent who all worked in the finance sector. The majority of these professionals also chose the incorrect answer.

Appendix

Appendix A: alternative simulation results

The relationship between payment policy and risk-based pricing, was found to be very robust to changing simulation parameters and are summarized in Table 6 below. In all of these alternative scenarios, the LRF method resulted in significant inverse risk-based pricing, and it was less efficient as risk-based pricing than alternative payment allocation methods. In almost all scenarios, HRF resulted in proper risk based pricing. Nevertheless, there were two specifications where HRF had inverse risk-based pricing. However, the amount of APR driven by risk for HRF in these two scenarios was extremely small, and in any case, they were still significantly better in risk-based pricing than the LRF method. It is also interesting that both of these scenarios increase the relative importance of 0% promotional rates, which causes an increase risk-based pricing distortion regardless of the payment allocation method.

Table 6   Summary of APR and risk relation for alternative scenarios

Scenario	APR difference (basis points)	Risk score regression coefficent HRF	Risk score regression coefficent LRF	Risk score regression R^2 HRF	Risk score regression R^2 LRF
Autoregressive parameters-heavy	355	−0.89	1.05	0.038	0.022
Autoregressive parameters-moderate	352	−0.91	1.08	0.038	0.023
Cash down 50%	246	0.17	1.84	0.001	0.048
Purchase down 50%	367	−1.70	0.76	0.021	0.006
Balance transfers down 50%	350	−1.53	0.61	0.049	0.008
Payments down 50%	327	−0.80	1.06	0.033	0.020
Cash up 100%	396	−1.30	0.21	0.151	0.003
Purchase up 100%	253	−0.24	0.79	0.011	0.030
Balance Transfers up 100%	303	0.36	1.70	0.005	0.061
Payments up 100%	306	−1.07	0.61	0.037	0.007
Payments correlated with month's activity	233	−0.80	0.57	0.038	0.008
Payments correlated with 6 months activity	232	−1.12	0.83	0.061	0.013
Truncated normal distributions	546	−1.47	1.21	0.059	0.019

LRF, lowest rate first; HRF, highest rate first.

Appendix B: survey demographics and text of survey questions

Table 7 shows counts of respondents for the survey broken down by a variety of demographic factors. The percentages of respondents in each category are also shown both unweighted and using survey weightings. For comparison purposes, demographics for the United States as a whole using Census Bureau data are also shown.

Below is the content of the survey questions related to this research topic. The same Caravan survey included additional questions on other topics commissioned by other parties. However, these questions all came after the relevant research questions.

Table 7   Survey demographics

	Unweighted count	Unweighted percent	Weighted percent	Census average
Male	503	50.0%	48.4%	49.3%
Female	503	50.0%	51.6%	50.7%
Age: 18–24	49	5.0%	12.2%	12.9%
25–34	81	8.2%	18.1%	17.8%
35–44	146	14.8%	19.4%	18.7%
45–54	209	21.2%	19.5%	19.5%
55–64	229	23.2%	14.5%	14.8%
65+	272	27.6%	16.4%	16.3%
North east	187	18.6%	18.7%	18.1%
North central	224	22.3%	22.3%	22.0%
South	367	36.5%	36.5%	36.6%
West	228	22.7%	22.5%	23.2%
Metro	780	77.5%	77.7%	79.0%
Non-metro	226	22.5%	22.3%	21.0%
White (non-hispanic)*	794	78.9%	67.3%	79.8%
African American*	81	8.1%	11.0%	12.8%
Hispanic*	45	4.5%	12.7%	15.4%
Income: <$25K	131	15.4%	16.2%	17.0%
$25K–$35K	81	9.5%	9.3%	9.6%
$35K–$50K	156	18.3%	19.0%	13.7%
$50K–$75K	166	19.5%	19.0%	19.6%
$75K+	318	37.3%	36.3%	40.1%
Household size: 1	209	20.9%	15.5%	25.8%
2	387	38.7%	32.2%	32.6%
3 or more	405	40.5%	52.3%	41.6%
Education: High school incomplete	68	6.9%	8.0%	14.2%
High school graduate	226	23.0%	23.1%	30.9%
College incomplete	283	28.8%	29.4%	27.9%
College graduate	407	41.4%	39.5%	26.9%

*In survey totals, African American includes non-Hispanics only, whereas in census data these categories may be double-counted.

W1: How would you rate your knowledge in personal finance? would you say . . .
[READ LIST. RECORD ONE ANSWER.]

    01 Excellent
    02 Good
    03 Fair
    04 Poor
    99 DON'T KNOW/REFUSED

W2: Which of the following have you used your credit card for?
[READ LIST. RECORD AS MANY AS APPLY. WAIT FOR YES OR NO FOR EACH.]

    01 Cash advances
    02 Purchases at the regular interest rate
    03 Purchases at an introductory interest rate
    04 Balance transfers at the regular interest rate
    05 Balance transfers at an introductory interest rate
    98 DON'T HAVE A CREDIT CARD
    99 DON'T KNOW/REFUSED

    IF DON'T HAVE CREDIT CARD, W2 [98], SKIP TO NEXT SECTION.
                ALL OTHERS CONTINUE

W3: Does the credit card you use the MOST apply a different interest rate for cash advances than to other charges, such as purchases? Would you say . . .
[READ LIST. RECORD ONE ANSWER]

    01 Yes
    02 No
    03 Or, are you not sure
    99 REFUSED

W4: When you make a payment on your credit card, how is your payment applied by the company? is it applied . . .
[READ ENTIRE LIST BEFORE RECORDING ONE ANSWER]

    01 To cash advances first
    02 To purchases at the normal interest rate first
    03 To purchases or balance transfers at an introductory interest rate first
    04 The payment is split evenly
    05 Or, are you not sure
    99 REFUSED

As you may know, many people use their credit card to receive cash advances as well as make purchases. These cash advances typically are charged a higher interest rate and when you pay your bill, the payment is normally applied to the PURCHASES FIRST. Many credit

cards also offer very low promotional interest rates, such as 0% for a specific period, or sometimes even for the life of the balance. [PAUSE]

W5: For the next question, please assume you have a credit card that has a $1,000 balance, split evenly between purchases and cash advances. Your purchase interest rate is 11% and your cash advance interest rate is 18%. You are trying to pay off the card, so you do not use the card anymore, but each month you make a $20 payment.

Your credit card company gives you one of two options—which one do you think is better for you financially?
[READ ENTIRE LIST BEFORE RECORDING ONE ANSWER. ROTATE. PROBE BEFORE ACCEPTING DON'T KNOW: Which is your best guess?]

01   Move your purchase balance to a permanent interest rate of 0% (or)
02   Direct your payments to the cash advance balance first (or)
99   DON'T KNOW/REFUSED

The correct answer to the final question is "Direct your payments to the cash advance balance first". The difference in total payments is approximately $127, and the balance would be paid off approximately six months earlier than if the other option is taken. The $127 in lower payments is a savings of 21% in the total interest charges paid compared to the other scenario.

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