Advance Payment Systems:

Paying Too Much Today and Being Satisfied Tomorrow

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Abstract

Advance payment systems represent a pricing innovation, in which companies predict customers' future consumption for the following year and then bill a series of monthly, uniform advance payments. Any difference between predicted and actual consumption gets settled at the end of the year with a refund or extra payment. Companies thus gain earlier access to funds and lower risk of customer defaults; customers benefit from predictable monthly payments. However, customers' reactions to a refund or extra payment sequence in an advance payment system remain unclear. Three theoretical lenses offer predictions about customers' advance payment system preferences: prospect theory, with a focus on silver lining and hedonic editing principles; mental accounting; and the value of sequences. Using three empirical studies with survey and billing data of more than 20,000 customers to examine their reactions to refunds and extra payments, this paper reveals that receiving a refund reduces customers' price awareness, increases their recommendation likelihood, and reduces churn and tariff switching, as long as the refund is not too high. The findings illustrate both the consequences and the boundary conditions of the silver lining principle with large-scale field studies.

Keywords: innovation; pricing; satisfaction; payment sequence preferences

1. Introduction

As Hinterhuber and Liozu (2014, p. 413) explain, "innovation in pricing may be a company's most powerful—and, in many cases, least explored—source of competitive advantage," in that it can jointly increase customer satisfaction and company profits. True pricing innovations can disrupt entire industries, as demonstrated by the introduction of auctions to sell online advertisements (Abou Nabout et al., 2012) or revenue management systems to sell flights (Shugan and Xie, 2005). Another recent pricing innovation relies on advance payment systems (APS). Companies predict customers' future consumption over a longer period (usually a year) and derive a series of uniform, smaller (usually monthly) advance payments over that period. Similar to income taxes, any difference between the predicted and actual consumption is resolved at the end of the period, such that customers receive a refund (if they paid for more than they consumed) or must make an extra payment (if they paid for less than they consumed) with their last bill.

Such systems are increasingly common in European and U.S. utility markets; they also are expanding into real estate (e.g., ancillary expenses paid in advance) and credit (e.g., credit card owners make weekly advance payments before the monthly statement is issued) markets.[1] For companies, this pricing innovation offers various benefits, including earlier access to funds and lower risk of customer defaults. In addition, because APS require exact consumption measures only at the end of the period, they potentially decrease operating costs. APS can be adopted by any company that offers recurring services and wants to decouple consumption and payments in time. For example, telecommunication companies could predict customers' yearly usage and receive a fixed advance payment at the beginning

[1] See for example: http://www.bankingmyway.com/credit-center/micropayments-good-things-small-packages or http://www.creditcards.com/credit-card-news/help/micropayments-cut-down-credit-card-debt-6000.php.

of every month, instead of charging customers variable amounts, based on their actual usage, at the end of each month (i.e., post-payment systems) or requiring customers to pre-pay for a certain amount of future usage (i.e., pre-payment systems).

An essential element of APS is the need for companies to predict future usage, and they might strategically set customers' advance payments higher or lower, to increase the chances of a refund or extra payment at the end of the period. However, the best design of such APS is not clear, because we lack evidence about how customers react to the experience of different advance payment sequences. In particular, we do not know how sequences that end with a refund or extra payment affect customers' subsequent perceptions, attitudes, and behaviors.

With this study, we investigate whether customers prefer refunds or extra payments by examining their attitudinal and behavioral reactions to both types of sequences, in the form of changes in price awareness, the likelihood of recommending the company, and the probability of churn and switching tariffs. Furthermore, we examine whether customers' preferences shift with the relative magnitude of the last bill—that is, with the percentage of the overall payment amount that they must pay or receive as a refund with the last bill.

Our findings thus yield novel insights that can contribute to the existing literature on pricing innovations and consumer behavior. First, we present three theoretical lenses to derive distinct hypotheses about customers' preferences for advance payment sequences: prospect theory, mental accounting, and the value of sequences. Second, our findings of customers' positive reactions to small refunds and negative reactions to large refunds can be best described by the silver lining principle, derived from prospect theory and the value of sequences. This article is the first to confirm the predictions from these theories with large-scale field studies and to reveal the consequences of customers' preferences, beyond choices, on key success measures such as price awareness, likelihood of recommendation, churn, and tariff switching.

2. Applications of Advance Payment Systems (APS)

Various APS are already common for utility services, such as gas, water, and electricity, in many European and the U.S. markets, though they adopt different names (e.g., direct debit, automatic payment, budget billing, and balanced payment plan) between countries and even among companies in the same countries. Table 1 shows the usage of APS among the top five utility services companies in the U.S. and European key markets. Payment via APS is mandatory in Germany but is an alternative payment form in all other countries.

Insert Table 1 about here

Theoretically, APS offer a range of benefits to companies and customers alike, relative to the more common payment form: post-payment systems. Companies enjoy reduced risks of customer defaults, because the payment occurs prior to consumption, and paying customers do not have to bear the costs of customers who fail to pay. The customers can plan their own budgets better in advance too, because the monthly payments are certain and consistent. Companies often highlight the advantages of uniform monthly payments as a key benefit when they communicate with customers (see Section 1 in the online appendix). In addition, APS potentially reduce the operating costs associated with billing, usage determination, and communications with customers, because the payments are determined and adjusted less frequently. This advantage is especially important when costs for usage determination are high, such as for calculating electricity and water consumption in less populated areas. Customers benefit from these lower operating costs if they result in lower prices. In Table 1, 7 of the 22 companies that offer APS provide incentives for customers to switch to APS, such as lower prices or yearly kickbacks (see section 1 in the online appendix).

Finally, companies receive payments earlier, which improves their liquidity and investment abilities (i.e., to earn interest). In comparison with prepayment systems (e.g., reloadable mobile phone SIM cards), APS may enhance retention rates, because they avoid confronting customers with new purchase decisions every time their allowance reaches a low level.

3. Literature Review

Although no research on APS appears in the business domain, some indications from the tax domain suggest that people prefer higher advance payments and corresponding refunds over lower advance payments and corresponding extra payments (Ayers, Kachelmeier, and Robinson, 1999; Jones, 2012). Ayers et al. (1999) demonstrate, with a hypothetical scenario, that 43% of MBA students faced with a predicted tax liability of $16,000 preferred to make advance payments greater than the $12,000 required minimum amount. Jones (2012) analyzes real taxpayer data and finds that only 23% of taxpayers downward adjusted their advance payments, after the required minimum amount decreased.

However, in the tax domain, customers have limited reaction opportunities (i.e., no contexts for recommendations, churn, or switching), thus, these findings are less informative about the potential consequences in a business setting. If preferences for higher advance payments also exist in a business setting and primarily reflect customers' desire to reduce their last extra payment or increase their chances of a refund, customers should display relatively positive attitudinal and behavioral reactions after experiencing a refund sequence but relatively negative reactions after an extra payment sequence. We derive distinct predictions about advance payment sequence preferences from three theoretical lenses: prospect theory, mental accounting, and the value of sequences.

3.1. Predicted Sequence Preferences Based on Prospect Theory's Value Function

Prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1991; Tversky and Kahneman, 1992) describes a subjective value function that is based on three principles:

- Reference dependence: Value gets created through positive and negative deviations from a reference point—that is, gains and losses, rather than final wealth positions.
- Loss aversion: Losses loom larger than gains, even if their absolute amounts are equal.
- Diminishing sensitivity: The values of marginal gains or losses decrease with their magnitude.

These three principles are reflected mathematically in the value function:

$$(1)\ \ v(x) = \begin{cases} x^{\alpha} & ,if\ x \geq 0 \\ -\lambda \cdot (-x)^{\alpha} & ,if\ x < 0 \end{cases},$$

where x describes the deviation from the reference point, which may be negative (=loss) or positive (=gain); λ refers to the value of losses relative to gains, such that any value λ > 1 weighs losses larger than gains (i.e., loss aversion), any value λ < 1 weighs gains larger than losses, and λ = 1 weights loss and gains equally; and α describes sensitivity to marginal losses and gains as their magnitude increases, such that α > 1 translates into an increasing sensitivity, and 0 < α < 1 translates into a diminishing sensitivity. In their parameter estimation, Tversky and Kahneman (1992) find a median λ of 2.25, in accord with loss aversion, and a median α of .88, indicating diminishing sensitivity to losses and gains.

3.1.1. Silver Lining Principle

When faced with a decision that involves a sequence of events, decision makers do not always use the sum of the events' values as the basis for their evaluation (i.e., integration). Instead, they might evaluate each event of a sequence separately (i.e., segregation) (Auh, Shih, and Yoon, 2008; Jarnebrant, Toubia, and Johnson, 2009; Lambrecht and Tucker, 2012). This basic principle is important in APS, in which the bill at the end of the period contains two components: the last payment due (extra payment or refund) and the sum of the monthly advance payments already made. Thus, the last payment (extra payment or refund) may be evaluated separately from the advance payments.

If decision makers segregate events in their evaluation and exhibit diminishing sensitivity for losses, it follows that splitting a large loss into two events—a slightly higher loss and a small gain—might improve the overall value, because the small gain provides a "silver lining" to the large loss (see Thaler, 1985). However, as Jarnebrant et al. (2009) show in their formal analysis of the silver lining principle, there is a limit to how high the gain can be and still improve overall value. This limit depends on the combination of diminishing sensitivity and loss aversion. The value function is steep for small gains, but it becomes flatter for larger gains, so small gains have a large positive effect on the value of a sequence, but this positive effect diminishes with the size of the gain. In contrast, a slight increase of a large loss has a relatively small negative effect. Because losses loom larger than gains, the negative effect of a large increase in losses can have a reverse effect on the overall value and thus, on decision makers' preferences. Jarnebrant et al. (2009) illustrate Thaler's (1985) argument in small-scale experiments,2 involving the integration and segregation of vacation days and monetary gambles.

For our study setting, preferences for refunds or extra payments likely depend on the magnitude of loss aversion and diminishing sensitivity. For example, the lower λ is, the more likely it is that refund sequences are preferred, independent of whether loss aversion exists for advance payments (Bateman et al., 1997). Similarly with lower α, refund sequences are more likely to be preferred to extra payment sequences. If we assume that loss aversion exists for both advance and extra payments, and that there is a diminishing sensitivity parameter α of .88, as found by Tversky and Kahneman (1992), we can predict (for details see Section 2 in the online appendix):

1. Customers prefer refund sequences over extra payment sequences.
2. A threshold exists for the magnitude of the refund, after which the value of a refund sequence decreases.

However, some dispute remains about the assumption that all payments for goods are associated with loss aversion (Bateman et al., 2005; Tversky and Kahneman, 1991). Novemsky and Kahneman (2005) conclude that there is no loss aversion for money provided in return for planned purchases. If loss aversion thus does not apply to advance payments (i.e., $\lambda = 1$) but does affect uncertain extra payments (i.e., $\lambda > 1$), the predicted threshold for the magnitude of the refund, after which the overall value of the refund sequence decreases, would no longer exist. This conclusion holds as long as the sum of the advance payments is greater than the refund for any $\alpha < 1$ (i.e., diminishing sensitivity). The intuition is that the

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[2] Experiment 1 in the context of vacation days: N = 53; Experiment 2 with monetary gambles: N = 163.

diminishing sensitivity effect is the same for advance payments and refunds (see Equation 1), just multiplied by a different sign.

3.1.2. Hedonic Editing

On the principle that customers can both integrate and segregate events, Thaler (1985) hypothesizes that they mentally adjust the way they code events to maximize value. From this hedonic editing hypothesis within prospect theory, we predict that customers integrate advance payments and extra payments but segregate advance payments and refunds, if and only if the corresponding value $v(x)$ increases.

If customers integrate advance payments and extra payments, it follows that the distribution of payments should have no influence on the overall value of the extra payment sequence. Thus, no threshold exists for the extra payment after which its sequence value decreases. However, in refund sequences, the value function contains separate parts, similar to the silver lining principle, with loss aversion for the advance payments. The value function first increases and then decreases after a threshold, depending on the magnitude of loss aversion and diminishing sensitivity. For overly high refunds, customers likely re-integrate the payments, such that the value is equal to that attained in the overly high extra payment sequence (see Section 2 in the online appendix).

These predictions are based on the assumption that loss aversion applies to advance payments (Bateman et al., 1997). If no loss aversion arises for advance payments (i.e., $\lambda = 1$), but only for the extra payments (Novemsky and Kahneman, 2005; Tversky and Kahneman, 1991), the hedonic editing hypothesis cannot apply, because advance and extra payments cannot be integrated unless they induce the same loss aversion (see the hedonic editing formula in Thaler, 1999, p. 187).

In line with the theoretical predictions of hedonic editing, empirical evidence consistently shows that people prefer to segregate gains (Thaler, 1999), though it does not show that people like to integrate losses. If at all, the evidence seems to point in the opposite direction: Gourville (1998) finds that people are more likely to donate if the choice is presented as $1 dollar per day rather than $365 per year. Thus, it is unclear if the predictions derived from the hedonic editing hypothesis hold for APS.

3.2. Predicted Sequence Preferences Based on Mental Accounting Principles

Mental accounting describes a set of rules about how customers record, summarize, and analyze financial transactions (Thaler, 1999). Two rules are particularly relevant in relation to APS: budgeting and decoupling of the payment and consumption times.

3.2.1. Budgeting

A basic principle of mental accounting is that money gets labeled, and expenditures grouped into budgets (Heath and Soll, 1996). Budgets help customers exert self-control and make more rational trade-off decisions across the competing uses of their money (Thaler and Shefrin, 1981), such as food, housing, or electricity. With APS, consumption gets predicted upfront, and the uniform advance payments are set to cover the value of consumption, so the sum of the uniform advance payments may determine customers' balanced budgets. Deviations from such a budget then become apparent with the last bill. Thus, extra payments may be interpreted as budget deficits and elicit negative reactions; refunds may be interpreted as budget surpluses and elicit positive reactions. Unlike prospect theory, budgeting does not predict a threshold after which the magnitude of the refund decreases the value of the refund sequence.

3.2.2. Decoupling of Payments from Consumption in Time

Research on pre- and post-payment systems argues that customers like to decouple payments from consumption in time and prefer to pre-pay for hedonic goods, so they can enjoy their consumption without thinking about the payment; as Prelec and Loewenstein (1998) show empirically, 60% of participants in a hypothetical scenario study preferred to pre- rather than post-pay for a vacation (hedonic product). Patrick and Park (2006) further reveal that preferences for pre-payment exist only for hedonic products that are not durable. Prelec and Loewenstein (1998) argue that decoupling payment from consumption has a lesser importance for durable utilitarian than for hedonic products, because their consumption is not enjoyable, so the financial advantages of later payments may become decisive. The authors illustrate this point by showing that 84% of participants in a hypothetical scenario study preferred to post- rather than pre-pay when purchasing a washer/dryer unit (utilitarian product).

If we transfer this finding to the utilitarian electricity market, we might expect customers to prefer later payments—specifically, to pay as late as possible. Extrapolating from research into pre- versus post-payment systems to our APS setting, we expect customers to prefer extra payment sequences over refund sequences. If it were possible, they should prefer to pay for all of their consumption with the last bill, at the end of the period. This decoupling, as part of mental accounting, does not predict a threshold after which the magnitude of the refund or extra payment decreases the value of either sequence.

3.3. Predicted Sequence Preferences Based on the Theory of Sequence Preferences

Loewenstein and Prelec (1993) propose a theoretical preference model for sequences of events that is distinct from traditional intertemporal choice models for two reasons. First, traditional models of intertemporal choice are focused on single events that could either occur now or at a later point in time. Second, traditional models of intertemporal choice assume positive time discounting, which implies that people prefer to sort events within a sequence by their value, starting with the event with the highest value. This prediction is not in line with the observation that people prefer an increasing standard of living or improving health when their total lifetime standard of living or wealth remains unchanged (c.f., Loewenstein and Sicherman, 1991). Thus, their theoretical model describes a negative time preference if the decision maker views the particular choice as embedded in a sequence of outcomes.

The value of the sequence equals the weighted sum of three factors: the total utility provided by the events in the sequence, improvements to the utility of the events, and deviations from uniform utility spreading (c.f., Equation 3 in Loewenstein & Prelec 1993). The basic principles of this theory are also relevant in APS, in which advertisements and the last bill present two separate components that draw attention to the sequential nature of the events: the sum of the previous monthly advance payments followed by the last amount due (extra payment or refund).

3.3.1. Preference for High Total Utility Provided by Events in the Sequence

As in all other models of intertemporal choice, the total sum of the utility of single events is a key predictor. However, in contrast with other models of intertemporal choice, there is no discount factor for the utility of single events in Loewenstein and Prelec's (1993) model, because observed preferences for sequences of events often imply positive time discounting. As a consequence, predictions based on time discounting factors are difficult.

In the case of APS, the only prediction we can issue is that the amount of the total yearly bill has a negative effect on sequence preferences. If the amount of the total yearly bill is held constant though, this attribute becomes irrelevant to the customers' preferences for a refund versus an extra payment sequence.

3.3.2. Preference for Improvement of the Utility of the Events in the Sequence

Vast empirical evidence in various decision domains indicates that people generally prefer sequences with increasing utilities. For example, they consistently prefer improving over decreasing income sequences, even when the total sum of received income stays constant (Chapman, 1996; Loewenstein and Sicherman, 1991; Matsumoto, Peecher, and Rich, 2000; Schmitt and Kemper, 1996). In the gambling domain, Ross and Simonson (1991) report people's preferences for a sequence that ends with a win (i.e., lose $15 then win $85) over a sequence that ends with a loss (i.e., win $85 then lose $15). Even in a sensory domain, such as pain perception, Kahneman et al. (1993) illustrate that adding another but relatively less painful experience at the end of a sequence of pain-inducing events significantly increases the subjective value of the sequence.

These preferences for sequences with improving utility may be explained by adaptation and loss aversion, anticipatory dread and savoring, and recency effects (Loewenstein & Prelec, 1993). First, because people adapt to existing levels of utility within the sequence, any subsequent event gets evaluated relative to the previous one. If a subsequent event has less utility than the preceding one, it will be interpreted as a loss. Because losses loom larger than gains, negative deviations from the preceding level of utility decrease the value of a sequence more than positive deviations increase that value. Second, the concept of dread describes anticipatory discomfort if the person expects a negative event in the future (Read and Powell, 2002). Expected negative events at the end of a sequence decrease the sequence's overall value; expected positive events benefit from anticipatory savoring. Third, recency effects arise when people take a retrospective perspective but overweigh the most recent events of a sequence in their overall evaluation (Ross & Simonson, 1991). According to these principles underlying preferences for sequences with improving series of events, customers generally should prefer refund over extra payment sequences.

3.3.3. Preference for Minimal Deviation from Uniform Utility Spreading in the Sequence

Noting that people prefer to spread the utilities of events evenly over time, Loewenstein and Prelec (1993) include deviations from uniform utility as a third factor in their model. For example, customers prefer even monthly payments over fluctuating payments, even if the amount of the total yearly bill would be higher (Lambrecht & Skiera, 2006), and they are more likely to make a donation presented as $1 per day rather than $365 per year (Gourville, 1998). In the case of extra payment sequences, we expect that customers display an increasing valuation for sequences with decreasing relative magnitudes of the extra payment, because the payments would be spread more evenly over time in that case.

However, as one of the limitations of their model, Loewenstein and Prelec (1993, p. 106) acknowledge, “it is an open question how well the model generalizes to sequences involving losses or combinations of gains and losses,” because they only test the model for sequences of gains. Thus, it is unclear whether preferences for minimal deviations from uniform utility spreading apply to the case of extra payment sequences, which involve only losses. We also do not know if this preference applies to refund sequences, which involve combinations of losses and a gain. If a general preference for uniformity exists independent of the sign of the value (i.e., positive or negative), customers should display increasing valuation for sequences with decreasing relative magnitudes of the last bill, regardless of whether they face an extra payment or a refund sequence.

3.4. Contributions to Prior Research

As has been illustrated above, we can derive distinct predictions about sequence preferences and magnitude effects, depending on the theoretical lens applied and the assumptions made about the existence of loss aversion in purchase transactions. Table 2 summarizes the main predictions, ordered by their theoretical lens. Yet, even with these theoretical arguments about whether and how much companies should overcharge, large-scale empirical evidence is missing (Jarnebrant et al., 2009).

Insert Table 2 about here

Research into tax policies provides some evidence that taxpayers prefer to make higher advance payments than necessary, but customers likely react differently to the experience of different advance payment sequences in a business context. More generally, as Meyer (2013) recommends, marketing researchers must realize whether research results are applicable in marketing practice.

Thus, we extend existing research on APS by investigating customer preferences for refund versus extra payment sequences in a business context. Our findings clarify which theoretical lens best explains the observed preferences. Furthermore, we investigate, for the first time and with large-scale studies, the impact of the relative magnitude of the last bill on customers’ preferences, as well as their subsequent attitudes and behaviors: price awareness, likelihood of recommendation, churn, and tariff switching.

4. Empirical Studies

In three empirical studies, we analyze customer preferences for advance payment sequences, as summarized in Table 3. In Study 1, we analyze the existence and robustness of payment sequence preferences (choice), using online survey data collected from 259 household electricity service customers. In Study 2, we investigate the impact of different advance payment sequences on customers' perceptions (price awareness) and attitudes (likelihood to recommend the service provider). This study relies on two matched data sets: individual billing data from 779 electricity service customers (i.e., households) and these same customers' responses to a survey. Finally, in Study 3, we measure the behavioral consequences of APS by linking actual churn (i.e. changing to a competing electricity company) and tariff switching to customers' experience of advance payment sequences. This study again relies on two matched data sets: individual billing data from more than 20,000 electricity service customers (i.e., households) and these same customers' status (new tariff versus previous tariff and current versus past customer) in the 12 months after the last bill in which they received a refund or had to make an extra payment. The customers of studies 2 and 3 are all from the same electricity service provider.

Insert Table 3 about here

All three studies were conducted in Germany, where all electricity companies use APS as their sole payment collection system. Customers do not have the ability to choose among different payment systems (e.g., advance vs. pre- vs. post-payment system), but they can switch tariffs (e.g., from a higher-priced base tariff to a contractual tariff that binds them for a longer period to the company in exchange for lower usage costs) or move to an entirely different electricity company. Many electricity companies operate in Germany, and customers can rather easily switch tariffs within a company or switch between companies;

specialized price comparison sites even help them compare various offerings (e.g., http://www.verivox.de).

Because APS is the sole payment system offered in the German electricity market, customers are used to APS and its billing procedure: They know that at the end of a current billing year (start dates differ among customers), the electricity companies measure each household's actual total consumption over the current billing year (often by making physical visits to households to read the meters) and determine whether to issue a refund (if customers paid for more electricity than they consumed) or request an extra payment (if customers paid for less electricity than they consumed). Companies then send out a year-end letter to customers with key information, including the final balance for the current billing year (refund or extra payment amount), the sum of the uniform monthly advance payments that have been made in the current billing year, and actual usage.

4.1. Study 1: Advance Payment Sequence Preferences (Choice)

4.1.1. Method

Study 1 examined if household electricity service customers prefer extra payment or refund sequences and how strong these preferences are. For this, 259 household electricity service customers participated in an online survey in exchange for a chance to win one of five gift certificates for Amazon.de, each worth 20€.

The survey consisted of various questions, including a choice task adapted from Nunes (2000) and Lambrecht and Skiera (2006), that sought to identify customers' preferences for nonlinear pricing schemes. The choice task asked respondents to assume expected total electricity usage valued at 600€ over one year, corresponding to an average monthly cost of 50€ (i.e., 600€/12 months). They then considered two alternative options—an extra payment and a refund payment sequence—and chose which one they would prefer.

The respondents saw a total of four binary choice sets, across which we systematically varied the magnitude of the refunds and extra payments, in a 2 × 2 full-factorial, within-subject design. For the extra payment sequences, the monthly advance payments were 40€ or 45€, which required an expected extra payment of either 120€ (= 12 × 10€; more extreme sequence) or 60€ (=12 × 5€; more uniform sequence). For the refund sequences, the monthly advance payments were 55€ and 60€, which resulted in an expected refund of either 60€ (more uniform sequence) or 120€ (more extreme sequence). We excluded a zero balance (no refund and no extra payment) scenario, because customers' actual usage nearly always deviates from their predicted usage (for all choice sets, see Table 4). We also controlled for order effects by randomizing, for each respondent, the positioning of the refund and extra payment sequence options on the left or right side of the screen.

Insert Table 4 about here

In addition to this version, we created three other versions of the survey to test for the robustness of sequence preferences across respondents. Most of the theoretical lenses we described previously suggest a preference for a refund sequence over an extra payment sequence, so the second version of the survey tested respondents' preferences when the extra payment sequence was cheaper. That is, we reduced the amount of the refund from 60€ to 57€ and 120€ to 115€, keeping everything else the same. Versions 3 and 4 incorporated different levels of confidence or uncertainty with respect to the total yearly bill. The task description stated explicitly that past experience indicates the total yearly bill would vary between 580€ and 620€ (version 3; low uncertainty/high confidence) or 520€ and 680€ (version 4; high uncertainty/low confidence). Participants were randomly assigned to one of these four survey versions. An illustration of a choice set from version 4 can be found in Section 3 of the online appendix.

4.1.2. Results

As we show in Table 5, when given a choice, the respondents significantly preferred refund over the extra payment sequences (overall: 63%, significantly different from 50% at $p < .01$). Their preferences for refund sequences were greatest (72%) when the choice was between a refund that was more similar to the monthly payments and an extra payment that was most different from the monthly payments (i.e., choice set 4). Preferences for refund sequences were lowest (50%) when the choice involved a more extreme refund and more uniform extra payment (i.e., choice set 3). Thus, preferences for refund sequences decrease with the magnitude of the refund, relative to the magnitude of the extra payment.

Insert Table 5 about here

The preference for a refund sequence also was robust across all four survey versions: Even in the version with a higher total yearly bill for the refund sequences (version 2), most (56%) respondents still preferred refund sequences over extra payment sequences ($p < .05$), though the share of respondents who chose refund sequences was lower than in the equal total yearly bill versions (version 1 $p > .1$; cf. version 3 $p < .1$; version 4 $p < .01$). Thus, the majority of respondents were willing to pay more to receive a refund at the end of the billing period.

Uncertainty about the total consumption value (versions 3 and 4) also increased respondents' preferences for refund sequences. Specifically, introducing relatively low uncertainty, respectively high confidence (version 3) resulted in preference shares for the refund sequences that were similar to the no uncertainty survey version 1 (64% and 61%; $p > .1$). However, increasing uncertainty (version 4) significantly ($p < .05$) enhanced preferences (71%) for refund sequences, in comparison to version 3 (64%). This observation indicates that customers who are less certain about their total yearly energy consumption prefer refund sequences even more so than customers who are certain about their yearly energy consumption.

Table 6 contains the results of two binary logistic regressions, with choice of refund sequence as the dependent variable. The effects of the choice set variables remained about the same when we controlled for several available variables (e.g., demographics). Moreover, relatively high uncertainty had a positive effect on refund sequence preferences ($p < .1$; cf. version 1 with no uncertainty); higher total yearly bills for the refund sequence had negative effects on refund sequence preferences ($p < .1$; cf. version 1 with equal total yearly bills). Respondents who had received a refund in the past were significantly ($p < .01$) more likely to choose refund sequences; male respondents were less likely to do so ($p < .01$).

Insert Table 6 about here

4.2. Study 2: Perceptual and Attitudinal Consequences of Experienced Payment Sequences

4.2.1. Method

In Study 2, we examined potential consequences of experiencing the two types of payment sequences on two key measures of company success: the likelihood of recommending a service company – a popular customer satisfaction metric in practice – and price awareness, which is linked to customers' decision to search for better offers from other electricity companies (Kujala and Johnson, 1993). We worked with an electricity company to survey its customers, then linked their survey responses to the customers' actual billing data. The company included a request to participate in a customer online survey in a letter sent out at the start of December 2011. To incentivize participation, respondents were promised entry into a lottery to win one of three iPads and 100 coupons for 200kWh (unit of energy consumption: kilowatt-hours) of free electricity. Each letter featured a unique, eight-letter code that we later used to match survey responses to customers' billing data. Customers only gained access to the survey if they entered their correct code. To comply with privacy protection laws, all data were anonymous.

The online survey consisted of various questions from both the electricity company and us, including three questions for the current study. We first asked customers to assess their likelihood of recommending their electricity service provider to others on a single-item, 10-point scale (Mittal, Kumar, and Tsiros, 1999): “How likely are you to recommend your current electricity company to your friends and family?” (from 1 = very unlikely to 10 = very likely). With two other questions, we aimed to assess price awareness. Following Lambrecht and Skiera (2006) we asked customers to estimate their last total yearly bill (total payment in the last yearly billing cycle) and their current monthly advance payment. Both responses were compared against these customers’ actual payments, available from the billing data. We used the absolute percentage error on each of these two questions as a measure of price awareness (e.g., Dickson and Sawyer, 1990): the smaller the error, the higher the price awareness. The survey also assessed gender, age, and net income.

4.2.2. Sample Description

The survey remained active for two months, from December 2011 to January 2012. A total of 906 household electricity service customers completed the survey. We excluded 127 respondents that either were new clients (i.e., had not experienced a full year’s billing cycle) or maintained two tariffs with the electricity company (e.g., one for thermal storage heating and one for regular electricity usage).

Our partnering utility company seeks a zero last bill, but its predictions cannot ever be completely accurate, so in our data set (N = 779), approximately half of the customers (N = 381) received a refund at the end of their last billing cycle, and the other half (N = 398) made an extra payment to the company (see Table 7). These equal sizes affirm the representativeness of our sample, because in the absence of systematic consumption shocks, it should be equally likely for customers to conclude the billing year with an extra payment or a refund. In our sample, customers who had experienced an extra payment sequence at the end of the last yearly billing cycle made average extra payments of 99.23€; customers who experienced a refund sequence received, on average, 86.45€. These amounts did not differ significantly in absolute values ($p > .1$). We also did not detect significant differences between customer groups (refund versus extra payment customers) in terms of the average price they paid (in €) per kWh in the last year's billing cycle, the total payment in the last year's billing cycle, gender, age, or income ($p > .1$).

Insert Table 7 about here

4.2.3. Results

Table 8 contains the mean results for our two dependent measures across both customer groups. The average percentage error with respect to their current monthly advance payment was 38.81% for respondents who had experienced a refund sequence, which is 18.80 percentage points higher than the average error of respondents who had experienced an extra payment sequence ($p < .05$). For the total payment in the last yearly billing cycle, the difference in average percentage error was even higher: 74.25% for respondents who had experienced a refund sequence and 45.70% for respondents with an extra payment sequence ($p < .05$). Thus, customers who had experienced a refund in their last billing cycle were less aware of the price (in terms of both their last total yearly payment as well as their current monthly advance payment) than those who had experienced an extra payment sequence. Both types of customers overestimated their current advance payments and total payment in the last yearly billing cycle, but those who had experienced a refund did so significantly more ($p < .01$ for advance payments, $p < .05$ for total payment).

The mean recommendation likelihood among respondents who experienced a refund sequence was 6.44, compared with 6.13 among respondents who had experienced an extra payment sequence. That is, it was weakly significantly higher ($p < .1$).

Insert Table 8 about here

Next, we ran linear regressions with our price awareness measures and the likelihood of recommendation as the dependent variables. We captured the payment sequence with two models (see Table 9). In Model 1, we used a dummy variable to describe the nature of the payment sequence, equal to 1 for a refund sequence and 0 otherwise. In Model 2, we replaced the payment sequence dummy by two independent continuous variables: the relative magnitude of the refund, equal to the absolute value of the refund relative to the total payment in the last yearly billing cycle (in case of an extra payment, it was coded 0), and the relative magnitude of the extra payment, equal to the absolute value of the extra payment relative to the total payment in the last yearly billing cycle (in case of a refund, it was coded 0). This latter approach allowed us to test for not only the effect of the size of the refund or extra payment but also potential asymmetric effects between these two types of sequences.

Insert Table 9 about here

In both models, we controlled for demographics and tariff information. In particular, we controlled for the time between the receipt of the last yearly bill and participation in the survey. Because the start dates of yearly billing cycles vary across customers, the time between the completion of a billing cycle (i.e., receipt of the final billing letter) and our survey varied across respondents, which might have affected our measures. In addition, we controlled for three kinds of customer-specific information: usage, average price (in €) paid per kWh in the last yearly billing cycle, and the length of the relationship with the company. Customers with higher usage seemingly should react more positively (negatively) to a refund (extra payment), because they face higher absolute refunds (extra payments) at the end of the year. A higher average price paid per kWh might lead to less satisfied customers, resulting in a lower likelihood to recommend. Finally, for customers with a long relationship with the company, we expected a higher level of satisfaction, trust, or inaction, such that the length of the relationship should be negatively associated with price awareness (i.e., higher absolute percentage errors) and positively linked to the likelihood to recommend.

According to the results in Table 9, including the control variables did not substantially change price awareness or the likelihood of recommendation. In Model 1, the experience of refund sequences led to significantly lower price awareness ($p < .01$ for advance payments, $p < .05$ for total payment) and had a positive, but only marginally significant, effect on the likelihood of recommending the company ($p < .1$). Model 2 suggests asymmetric effects: The relative magnitudes of the refunds significantly decreased customers' price awareness ($p < .05$ for advance payments, $p < .01$ for total payment) and increased the likelihood of recommending the company ($p < .0l$). Thus, overpaying more in advance and receiving a higher refund in the end seems to have a positive impact on customers' judgments of the service and the company. The relative magnitude of the extra payment sequence also significantly reduced price awareness of the total payment—perhaps due to avoidance or attention disengagement strategies that customers commonly adopt in response to negative consequences (see Vohs and Baumeister, 2004). However, it had no significant effect on price awareness about the current monthly advance payments or the likelihood of recommendation.

A key assumption in our analysis is that only random prediction errors affect extra payments and refunds. However, especially if their absolute amounts are extraordinarily high, they might be driven by consumption shocks, which in turn could determine price awareness and the likelihood of recommendation. As a robustness test, we reran our models and excluded customers with extraordinarily high last bills (i.e., very high absolute magnitude of refund or extra payment relative to total payment), according to various cut-off levels. The results remained consistent (see Section 4 in the online appendix).

4.3. Study 3: Behavioral Consequences of Varying Advance Payment Sequences

4.3.1. Method

With Study 3, we examine whether the type of experienced refund sequence affects actual behaviors that determine customer lifetime value: churn (leaving to competitors) or tariff switching (changing tariffs within the company). We first compared the distribution of refund versus extra payment sequences and the mean relative magnitude of the last bill (i.e., positive values for refunds and negative values for extra payments, divided by total payment in the last yearly billing cycle) of churners and tariff switchers against a sample of passive customers, who continued in the same tariff with the same company. Next, similar to Study 2, we ran two models of a multinomial logistic regression (Model 1 with a dummy variable to describe the nature of the payment sequence, equal to 1 for a refund sequence and 0 otherwise; Model 2 with two variables to represent the relative magnitudes of the refund and the extra payment).

4.3.2. Sample Description

Our data set consisted of billing data from 22,921 customers (i.e., households) of the same electricity company from Study 2. This sample included all customers in the basic tariff in 2010 who churned (changed providers) or switched to a lower-priced Contract Base tariff or Contract Green tariff within 12 months of the receipt of their last bill.[3] It also included a randomly chosen subset of passive customers who neither churned nor switched tariffs. In this total sample, 2,672 customers churned, 3,411 switched to lower priced contract tariffs within the same company, and 16,838 were passive.

4.3.3. Results

Table 10 reports for each subsample (churners, tariff switchers, passive customers) the percentage of customers who received a refund and the mean relative magnitude of the refund or extra payment. If payment sequences exerted no effect on churn or tariff switching decisions, the results should be the same across the three subsamples. However, 52.73% of passive customers experienced refunds in their last yearly billing cycle, whereas significantly fewer of the other categories did so ($p < .01$): only 37.24% of churners and 43.56% of tariff switchers. This skewed distribution emerged in the relative magnitude of the refund and extra payments too. The mean relative magnitude of the refund and extra payments was close to 0 (.67%) among passive customers, but churners made an average extra payment of 5.09% of their total yearly bills with the last bill, and tariff switchers made an average extra payment of 2.29%. These mean values differed significantly ($p < .01$) from the mean values in the passive customer subsample.

Insert Table 10 about here

Next, we ran multinomial regression models to examine the effects of payment sequences on tariff switching and churn while controlling for yearly usage, average price (in €) paid per kWh in the last yearly billing cycle, and the length of the customers' relationship

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[3] The basic tariff was the most expensive one and could be changed any month. The contract base tariff offered lower prices per kWh but forced customers to bind themselves to the company for 24 months. The contract green tariff was similar to the contract base tariff with slightly more expensive kWh to ensure that electricity was generated from renewable resources.

with the company. The passive customer subsample provided the baseline. The odds ratios reported in Table 11 reveal the structural differences for churners and tariff switchers.

Insert Table 11 about here

As can be seen in Table 11, the conclusions from the customer subsample comparisons derived from Table 10 hold, even when we control for the last billing year's usage, average price paid per kWh, and the length of the customers' relationship. That is, customers who experienced a refund sequence were significantly less likely to churn subsequently to a competing company or switch to one of the company's lower-priced tariffs (Model 1, $p < .01$). The asymmetric magnitude Model 2 also showed that paying too much in advance and receiving a very high refund could have negative effects on churn and tariff switching—though the odds ratio of the extra payment magnitude effect was 5 times higher than that for the refund magnitude effect on churn and 2.5 times higher on tariff switching behavior. A very high overpayment in advance may have a negative effect, but a very high underpayment in advance is far more dangerous, from the company's perspective.

Similar to Study 2, we ran a robustness test to control for the possibility that these reactions reflected demand shocks rather than random prediction errors. When we reran the models with different cut-off levels of the absolute magnitude of the refund and extra payments relative to the total yearly bill, the results remained consistent (see Section 5 in the online appendix).

Together, the Study 3 results demonstrate that charging advance payments that are higher than the value of the actual usage, such that customers receive a refund at the end, reduces the likelihood to change providers or switch to lower priced tariffs. However, there is a limit to how much the provider can overcharge.

5. Conclusion

5.1. Summary

Innovation in pricing may be "a company's most powerful and, in many cases, least explored source of competitive advantage," which can jointly increase customer satisfaction and company profit (Hinterhuber and Liozu, 2014, p. 413). Advance payment systems (APS) represent one such innovative pricing strategy and achieve increasing applications in various domains (e.g., utility services, real estate, credit markets, taxation), likely due to their potential for reducing non-payment risks as well as billing and usage determination costs, and because of increasing the present value of payments.

Yet little is known about the extent to which the type of payment sequence (refund or extra payment) affects key performance indicators, such as word of mouth (which has a significant role in the acquisition of new service customers and makes referred customers more valuable than non-referred customers; e.g., Bansal and Voyer, 2000; Schmitt, Skiera, and Van den Bulte, 2011) or price awareness (which is an indicator of search behavior and thus, loyalty; Kujala and Johnson, 1993). Other critical indicators include churn and tariff switching, which have direct impact on important drivers of customer lifetime value, such as retention rates, revenues, and margins per customer (Schulze, Skiera, and Wiesel, 2012). The question of how to design advance payment sequences optimally thus is of utmost importance for companies that offer APS.

Experiencing a refund sequence generally reduces customers' price awareness, churn probability, and tariff switching probability, but it increases customers' willingness to recommend their service provider. Furthermore, Study 1 shows that customers actively choose higher advance payments to receive a refund later when given a hypothetical choice.

However, a threshold exists for the magnitude of the refund, after which preferences for the refund sequence decrease.

As we demonstrated with our literature review in Section 3, several explanations from prior research might apply to preferences for refund sequences, including the silver lining principle, hedonic editing, the concept of mental budgeting, and empirical evidence about preferences for sequences with improving utility of events. The positive reaction to refund sequences that we find supports Thaler's (1985) argument that a small increase of a large loss to provide a silver lining improves subjectively perceived total value. This refund sequence preference also is in line with research that consistently shows that people prefer improving over decreasing sequences of utilities of events, if the total utility of the events is equal (Loewenstein & Prelec, 1993). However, the predicted preference depends on the parameters used in the prospect theory value function. A value calculation based on standard parameters (Tversky and Kahneman, 1992) wrongly predicts a preference for extra payment sequences; a smaller diminishing sensitivity parameter value is necessary to model the observed preference of a refund (see section 2 in the online appendix).

Loewenstein and Prelec's (1998) research on preferences for payment timing also suggests that customers prefer to pre-pay, however only for hedonic goods, because then they can enjoy their consumption without thoughts of payment. In contrast, for utilitarian goods they prefer to post-pay, because financial advantages are more decisive for consumptions that are less enjoyable anyway. Our results show that though electricity is a utilitarian good, the financial advantages related to the later payment in extra payment sequences still are not decisive.

Regarding the negative magnitude effect of refunds, this result can derive only from the silver lining principle. As Thaler (1985) argues, there must be a limit on how much a loss can increase to create a gain, though only limited empirical support has emerged for this hypothesis (Jarnebrant et al., 2009). Our results, showing that very high refunds can increase churn and tariff switching, provide further evidence in support of Thaler's hypothesis, as long as we assume that advance payments are losses and that customers experience loss aversion for these advance payments, though this assumption is highly disputed (Novemsky and Kahneman, 2005). In conclusion, explaining theoretically the preference for refund sequences and the negative magnitude effects is far from trivial and should inspire further research.

5.2. Managerial Implications

The basic idea of APS is attractive to both customers and companies. For example, Lambrecht and Skiera (2006) show that customers prefer stable monthly payments and are not necessarily interested in post-dated monthly bills that reflect their exact usage. Customers benefit from stable advance payment plans; companies benefit from reduced non-payment risk, lower operational costs, and increased net present values of payments. Service industries that might adopt similar strategies include communications, public transportation, and digital media. That is, recurring service companies that offer APS can likely increase customer advocacy and loyalty toward the service and company by setting advance payments that ensure a sizable refund at the end of the billing period. Ultimately, this policy should increase profits.

These insights came from our examination of an electricity services setting, but they are not necessarily restricted to the electricity domain. For example, building landlords often collect advance payments for shared services such as garbage, cleaning, or heating. In casual discussions with landlords, we learned of their parallel experiences: Tenants frequently ask for a complete disclosure of utility costs when they are required to make an extra payment but simply accept any refund offered.

Service companies already applying APS may increase the economic success of their service in two ways. First, they should aim at moderately increasing the monthly advance payments (e.g., by 5% or 3.45€ on average per household and per month in our sample). Such an increase would augment the probability of receiving a refund (from 49% to 70%) and decrease churn probability (by 7.7% in our sample). That is, just slightly higher advance payments can increase profits—as long as they do not affect customers' company choices in the first place.

In most markets where APS dominate, such as in utility markets, payment sequences have little impact on company choices, because communications about uniform advance payments are rare. For example, the utility price comparison sites in Germany compare total payments over a yearly billing cycle for a specified number of kWhs, without mentioning the monthly advance payments. Second, if companies suspect substantial heterogeneity in customer preferences for one of the two types of advance payment sequences (i.e., refund or extra payment) or operate in markets with highly salient monthly advance payments, they might offer a moderate increase in the monthly advance payments as an optional service. For example, when signing a contract, companies could include a checkbox, such that if customers select it, their monthly advance payments would increase by 5%, which then would increase the probability that they might receive a refund at the end of the billing cycle.

Table 1: Availability of Advanced Payment Systems (APS) Among Top 5 Utility Companies by Countries

	Company	**APS Offered?**	**Optional or Mandatory?**	**Name**	**Incentive Provided to Switch to APS?**
France	EDF	Yes	Optional	Direct debit	Yes
	ENI	Yes	Optional	Automatic payment	No
	GDF Suez	Yes	Optional	Automatic payment	Yes
	Poweo Direct Energy	Yes	Optional	Automatic payment	Yes
	Eon Fr	No	–	–	–
Germany	EnBW	Yes	Mandatory	Anticipated payment	–
	Eon Germany	Yes	Mandatory	Anticipated payment	–
	EWE	Yes	Mandatory	Anticipated payment	–
	RWE	Yes	Mandatory	Anticipated payment	–
	Vattenfall Europe	Yes	Mandatory	Anticipated payment	–
Italy	Acqua Gas Azienda Municipale	No	–	–	–
	Aem	No	–	–	–
	Edison SpA	No	–	–	–
	Enel	No	–	–	–
	Hera Group	No	–	–	–
Spain	EDP Renováveis	No	–	–	–
	Endesa	Yes	Optional	Bills with estimated consumption	No
	Eon Spain	No	–	–	–
	Gas Natural	Yes	Optional	Plan with fixed payments	No
	Iberdrola	Yes	Optional	Fixed rate	No
UK	EDF Energy	Yes	Optional	Direct debit	Yes
	Eon UK	Yes	Optional	Direct debit	No
	National Grid	Yes	Optional	Direct debit	Yes
	RWE npower	Yes	Optional	Direct debit	Yes
	Scottish and Southern Energy	Yes	Optional	Direct debit	Yes
US	AES	Yes	Optional	Budget billing	No
	Duke Energy	Yes	Optional	Budget billing	No
	Exelon	Yes	Optional	Budget billing	No
	Pacific Gas & Electric	Yes	Optional	Balanced payment plan	No
	Southern Company	Yes	Optional	Budget billing	No

Table 2: Relevant Literature by Theoretical Lens and Derived Hypotheses

Literature				Derived Hypothesis	
Theoretical Lens	**Principles**	**Relevant Papers**	**Empirical Evidence**	**Refund vs. Extra Payment Sequence Preference and Resulting Reaction**	**Existence of Threshold for Magnitude of Last Bill**
Prospect Theory's value function (Kahneman and Tversky, 1979)	Silver lining principle without loss aversion for advance payments	Jarnebrant et al. (2009)	Lab studies with up to 163 participants	Refund sequence preference; positive reaction to refund sequence	No threshold: More refund always better
	Silver lining principle with loss aversion for advance payments		Not available	Refund sequence preference; positive reaction to refund sequence with $\alpha < .88$	Threshold exists
	Hedonic editing without loss aversion for advance payments	Not available	Not available	Not applicable	Not applicable
	Hedonic editing with loss aversion	Thaler (1985)	Lab study with up to 87 participants	Refund sequence preference; positive reactions to refund sequences with small refunds. For refund sequences with high refunds, the preference is the same as for any extra payment sequence.	Threshold exists
Mental accounting (Thaler, 1985)	Budgeting	Heath and Soll (1996)	Lab studies with up to 114 participants	Refund sequence preference; positive reaction to refund sequence.	No threshold: More refund always better
	Decoupling of payments from consumption	Prelec and Loewenstein (1998); Patrick and Park (2006)	Lab studies with up to 215 participants	Extra payment sequence preference; positive reaction to extra payment sequence.	No threshold: More extra payment always better
Value of sequences theory (Loewenstein and Prelec, 1993)	Preference for improvement of the utility of the events	Matsumoto et al. (2000); Schmitt and Kemper (1996); Chapman (1996)	Lab Studies with up to 376 participants	Refund sequence; positive reaction to refund sequence.	-
	Preference for little deviation from uniform utility spreading	Lambrecht and Skiera (2006)	Billing data of tele-communications customers	-	Unclear

Table 3: Overview of Empirical Studies

Study and Analysis	Type of Data	Respondents/Customers Included	N
Study 1: Payment sequence preferences (choice)	Survey	Household electricity service customers	150
Study 2: Perceptual and attitudinal consequences of payment sequences (price awareness and propensity to recommend the company)	Survey merged with billing data	Customers of a German electricity company	779
Study 3: Behavioral consequences of payment sequences (tariff switching)	Billing data	Customers of a German electricity company, including churners (2,672), tariff switchers (3,411), and a random sample of passive customers (16,838)	22,921

Table 4: Choice Set Details: Version 1, Study 1

	Alternative 1: Extra Payment Sequence		**Alternative 2: Refund Sequence**	
	Monthly advance payments	Predicted extra payment at end of year	Monthly advance payments	Predicted refund at end of year
Choice set 1	45€	60€	55€	60€
Choice set 2	40€	120€	60€	120€
Choice set 3	45€	60€	60€	120€
Choice set 4	40€	120€	55€	60€

Table 5: Study 1, Preferences for Refund over Extra Payment Sequences

Choice Set (Extra Payment, Refund)	**Version 1 Equal Total Yearly Bill; Certainty**	**Version 2 Higher Total Yearly Bill for Refund; Certainty**	**Version 3 Low Uncertainty, High Confidence**	**Version 4 High Uncertainty, Low Confidence**	**Total across all Versions**
N	66	60	64	69	259
Choice set 1	62%**	58%	67%***	75%***	65% ***
Choice set 2	64%**	61%*	67%***	67%***	64% ***
Choice set 3	47%	39%*	52%	64%**	50%
Choice set 4	73%***	67%***	72%***	77%***	72% ***
Total across all choice sets	61%***	56%**	64%***	71%***	63% ***

*Significantly different from 50% in one sample t-test at 10% confidence interval. ** Significantly different from 50% in one sample t-test at 5% confidence interval; ***Significantly different from 50% in one sample t-test at 1% confidence interval.

Table 6: Study 1, Odds Ratios in Binary Logistic Regressions to Explain Choice of Refund Sequence

		All Design Variables	**Design + Control Variables**
Uncertainty/total payment conditions (base: version 1)	Higher total yearly bills for refunds (version 2)	.80	.70*
	Low uncertainty (version 3)	1.13	1.08
	High uncertainty (version 4)	1.54**	1.44*
Choice set variables (base: choice set 1)	Choice set 2: high extra payment, high refund (dummy variable = 1)	.97	.96
	Choice set 3: low extra payment, high refund (dummy variable = 1)	.53***	.51***
	Choice set 4: high extra payment, low refund (dummy variable = 1)	1.36	1.39*
Control variables	Refund received in past; self-reported (dummy variable = 1)		1.72***
	Male (dummy variable = 1)		.43***
	Number of people in household (numerical value)		.97
	Age (numerical value)		.95
	Education (categorical variable: 1 = lowest education; 7 = highest education)		.91
	Net income (categorical variable: 1 = lowest income; 6 = highest income)		1.07
	Refund shown on right-hand side (dummy variable = 1)		.67***
Constant		1.76***	5.13***
Model fit	N	1036	1036
	Nagelkerke R-square	5.2%	13.1%
	Correct classification	64.8%	67.5%

****p* < .01. ***p* < .05. **p* < .1. Notes: All significantly different from 1.

Table 7: Study 2, Comparison of Respondents with Extra Payment and Refund Sequences

Variable	Respondents with Extra Payment Sequence (N = 384)	Respondents with Refund Sequence (N = 398)	Mean Difference
Absolute mean last payment in € (= absolute mean extra payment or refund)	99.23	86.45	12.49
Mean price in € per kWh paid in last year's billing cycle (= total yearly bill/number of kwh)	0.25	0.24	0.01
Share of male respondents	0.75	0.75	-0.00
Mean age	50.41	51.22	-0.81
Mean net income level (1 = lowest income; 6 = highest income)	3.72	3.70	0.02

Table 8: Study 2, Comparison of Perceptual Consequences of Customers with Refund and Extra Payment Sequences

Variable	Customers with Extra Payment Sequence in 2011	Customers with Refund Sequence in 2011	Mean Difference
Advance payment awareness: Mean absolute percentage error[1]	20.00%	38.81%	-18.81%**
Total yearly bill awareness: Mean absolute percentage error[1]	45.70%	74.25%	-28.55%**
Overstatements of advance payments: Mean difference between self-stated and actual advance payments[2]	9.89%	32.30%	-22.42%***
Overstatement of total yearly bill: Mean difference between self-stated and actual total yearly bill[2]	37.39%	65.81%	-28.42%**
Likelihood of recommending the company (1 = very unlikely to 10 = very likely)	6.13	6.44	-0.31*
N	381	398	

***p < .01. **p < .05. *p < .1.
[1]The higher the absolute percentage error, the lower the price awareness.
[2]Positive percentage errors indicate overestimation.

Table 9: Study 2, Coefficients of Linear Regression Analyses on Perceptual Consequences of Payment Sequences

		Model 1: Refund Sequence Dummy			Model 2: Asymmetric Magnitude		
		Advance payment awareness: Absolute percentage error	Yearly bill awareness: Absolute percentage error	Recommendation likelihood (10-point scale)	Advance payment awareness: Absolute percentage error	Yearly bill awareness: Absolute percentage error	Recommendation likelihood (10-point scale)
Payment sequence information	Refund sequence dummy	0.24 ***	0.28 **	0.31 *	-	-	-
	Relative magnitude of the refund	-	-	-	0.74 **	3.61 ***	2.64 ***
	Relative magnitude of the extra payment	-	-	-	-0.09	2.23 ***	0.93
Customer information	Total consumption (in kWh/yr) in past year's billing cycle	0.00 *	0.00 **	0.00	0.00	0.00 *	0.00
	Average price per kWh paid (in €) in past year's billing cycle	3.70 ***	1.61 ***	0.72	3.66 ***	1.59 ***	0.70
	Length of customer relationship (in months)	0.02 *	-0.01 ***	-0.03	0.03 **	0.00	-0.00
Tariff information	Basic tariff (dummy = 1)	0.02	0.02	-0.20	0.00	0.05	-0.22
	Contract green tariff (dummy = 1)	0.32	0.03	0.10	0.29	-0.22	-0.04
	Time between receipt of last payment and participation in survey	0.01	0.01	0.03	0.01	0.01	-0.04
Demographics	Male (dummy = 1)	0.00	0.02	0.04	0.31	0.03	0.26
	Age (numerical)	0.00	-0.01	0.03 ***	0.01	0.00	0.03 ***
	Net income (categorical: 1 =	0.01	0.01	-0.11 *	0.01	0.02	-0.10 *
Model fit	R-square	0.15	0.07	0.03	0.15	0.14	0.05
	F-Value	13.29 ***	5.23 ***	2.60 ***	11.85 ***	10.85 ***	3.41 ***
Number of observations		779	779	779	779	779	779

****p* < .01. ***p* <.05. **p* < .1. Notes: All significantly different from 0.

Notes: The service company offered three different tariffs with distinct monthly fixed fees and variable costs per kWh. The contract base tariff was the baseline. Because price awareness is measured by absolute percentage error, positive coefficients represent an increase in error and thus a decrease in price awareness.

Table 10: Study 3, Comparisons across Churners, Tariff Switchers, and Passive Customers

	Percentage of Customers with a Refund Sequence	**Mean Relative Magnitude of the Last Bill (>0 = Refund; <0 = Extra Payment)**	**N**
Passive customers	52.73%	0.67%	16,838
Churners	37.24%***	-5.09%***	2,672
Tariff switchers	43.56%***	-2.29%***	3,411

****p* < .01, or significantly different from passive customer sample.

Table 11: Study 3, Odds Ratios of Multinomial Logistics Models: Behavioral Consequences of Payment Sequences

		Model 1: Refund Sequence Dummy		**Model 2: Asymmetric Magnitude**	
		Churn	Tariff switch	Churn	Tariff switch
Payment sequence information	Refund sequence dummy	0.63***	0.79 ***	-	-
	Relative magnitude of the refund	-	-	1.53*	1.71***
	Relative magnitude of the extra payment	-	-	8.49***	4.19***
Customer information	Total consumption (in kWh/yr)	1.08 ***	1.06 ***	1.08***	1.06***
	Average price per kWh paid (in €/yr)	0.62 ***	1.01	0.58***	1.00
	Length of customer relationship (in months)	0.88 ***	0.88 ***	0.88***	0.88***
Model fit	Nagelkerke's R-square	0.33		0.33	
	-2 Log-likelihood	28,025		28,076	
	Chi-Square	6,731		6,777	
Number of observations		22,921		22,921	

****p* < .01; **p* < .1, for odds ratios significantly different from 1

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Online Appendix to "Advance Payment Systems: Paying Too Much Today and Being Satisfied Tomorrow"

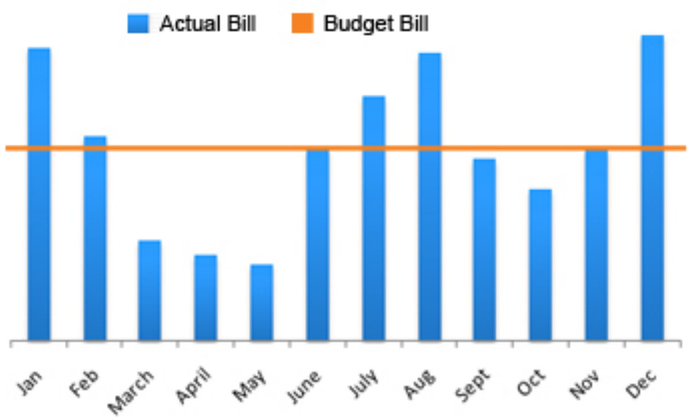
Table of Contents

1 How Companies in the United States, Spain, and United Kingdom Explain and Advertise Advance Payment Systems to Customers

Figures A1–A5 provide examples of how companies explain the advantages of advance payment systems (APS) when customers have choices among different kinds of payment systems.

Figure A5 also provides the example of EDF Energy (UK), which incentivizes the use of APS by offering a price discount of 6%.

Figure A1: Explanation of Advance Payment Systems by DP&L (US)



Your unique Budget Billing amount is based on your location's historical usage and is periodically adjusted to reflect abnormal weather conditions or changes in your usage patterns.

Source: http://www.dpandl.com/customer-service/account-center/payment-assistance/budget-billing/ (accessed January 6, 2015).

Figure A2: Explanation of Advance Payment Systems by Endesa (Spain)

How are bills adjusted with estimations?

Bills with estimated consumption are always adjusted in the next bill issued which reflects the actual meter reading.

Here's how it works:

We've billed you for less than your actual consumption

Imagine that you get a bill in June with an estimated reading of 100 kWh.

The following month, you get a bill with the actual meter reading of 300 kWh, which corresponds to your actual consumption during the months of June and July.

Because in your June bill you were billed for 100 kWh, now in your July bill you'll have to pay the difference, in other words, the 200 kWh not yet billed.

We've billed you for more than your actual consumption

Imagine that you get a bill in June with an estimated reading of 300 kWh.

The following month, you get a bill with the actual meter reading of 200 kWh, which corresponds to your actual consumption during the months of June and July.

Because in your June bill you were billed for 300 kWh, now in your July bill you'll be reimbursed the difference, in other words, the 100 kWh not consumed.

Source: http://www.endesaclientes.com/en/understand-your-bill/estimated-consumption/

(accessed January 6, 2015).

Figure A3: Explanation and Benefit Communication of Advance Payment Systems at Iberdrola (Spain)

WE KNOW THE PEACE OF MIND IT GIVES YOU TO ALWAYS PAY THE SAME

Sign up for the free Fixed Charge and enjoy all of its advantages:

> **We adapt the charges for your consumption** so that they meet your needs.
> At the end of the year, we add it all up, **comparing your charges and your consumption** for the past 12 months. In addition, if your rates have been higher than your actual usage, we'll deposit the difference directly in your account (1). On the other hand, if your rates have been lower than your consumption, we will spread the difference over 12 monthly payments so that you can pay more conveniently (2).
> There will only be one monthly charge to be paid, as we don't add on additional charges.
> The Fixed Charge adapts to you: at no cost, you can ask for **your payment date to be changed**, **the amount to be changed** or **deactivate it** whenever you like.
> You'll continue to receive bills, as before, **with information on your actual usage and cost**.
> You can **sign up for free** and it is also compatible with any other offer.

Source: *https://www.iberdrola.es/customers/home/services/bill/fixed-rate* (accessed January 6, 2015).

Figure A4: Communication of Different Payment Systems by British Gas (UK)

Direct Debit

Type of Direct Debit	How it works
Monthly fixed Direct Debit	✔ Spread your energy costs evenly throughout the year. ✔ Know exactly what your payments are each month. ✔ We review the monthly fixed amount usually twice a year.
Monthly variable Direct Debit	✔ Pay for what you use each month based on your meter readings.
Quarterly variable Direct Debit	✔ Pay for the energy you use on a quarterly basis based on your meter readings.

Source: http://www.britishgas.co.uk/help-and-advice/Bills-payments/Ways-to-pay/How-can-I-pay.html (accessed January 6, 2015).

Figure A5: Communication of and Incentives for Advance Payment System Benefits at EDFEnergy (UK)

Save money and spread your payments. That's the beauty of Direct Debit.

By choosing to pay by monthly Direct Debit when signing up to one of our tariffs you will benefit from the following:

You could save money | **Paying a fixed amount** | **Smoothing out the highs and lows** | **You can forget the hassle**

Choosing to pay by Direct Debit on your new tariff with us, means that you will receive either a 6% discount or a lower unit rate dependent on the tariff you choose. View all our current tariffs and go through a quote to see how much you could potentially save.

By choosing to pay by monthly Direct Debit when signing up to one of our tariffs you will benefit from the following:

You could save money | **Paying a fixed amount** | **Smoothing out the highs and lows** | **You can forget the hassle**

Another reason to pay by Direct Debit is that you always pay a fixed amount each month – making it easier to budget. We agree this with you up front and you tell us which day of the month you'd like your Direct Debit to be paid. Your payments will be spread throughout the year, helping you avoid bigger bills over the winter.

Source: http://www.edfenergy.com/for-home/help-support/direct-debit (accessed January 6, 2015).

2 Formalization and Numerical Examples of Predictions Based on Prospect Theory

Financial economists use the prospect theory value function *v(x)* to model asset allocation and pricing (e.g., Benartzi and Thaler, 1995), with the general form specified in Equation A1, where *x* describes the deviation from the reference point (negative, i.e., a loss, or positive, i.e., a gain); *λ* represents the value of losses relative to gains, which is expected to be larger than 1; and *α* describes diminishing sensitivity with increasing *x*, which is expected to be between 0 and 1.

(A1) $$v(x) = \begin{cases} x^{\alpha} & ,if\ x \geq 0\,(\text{for gains}) \\ -\lambda \cdot (-x)^{\alpha} & ,if\ x < 0\,(\text{for losses}) \end{cases}.$$

We transfer this general prospect theory value function to the context of advance payment systems (APS) to formalize respondents' assessments of extra payment and refund sequences. We develop mathematical representations for each of the three focal principles: the silver lining principle with loss aversion for advance payments, the silver lining principle without loss aversion for advance payments, and the hedonic editing principle with loss aversion for advance payments. Finally, we employ the observed median values for the parameters *α* (.88) and *λ* (2.25) of the laboratory experiment of Tversky and Kahneman (1992), here called "standard parameters of prospect theory" and numerically plot the corresponding value functions *v(x)*.

For the silver lining principle with loss aversion for advance payments, we assume the same value of parameter *λ* for the advance payments and extra payments in an extra payment sequence. Let the advance payment sequence be specified by the total yearly bill *b* and the cumulative amount of money Δ that a customer over- or underpays during the course of the year. Positive values for Δ indicate overpayments, resulting in refunds; negative values indicate underpayments, resulting in requests for an extra payment. According to the silver lining principle, the last bill is segregated from the advance payments, so the value of a sequence *v(b, Δ)* can be specified as:

$$v(\mathrm{b},\Delta) = -\lambda \cdot (-(\mathrm{b}+\Delta))^{\alpha} + \begin{cases} \Delta^{\alpha} & ,\mathit{if}\ \Delta \geq 0 \\ -\lambda \cdot (-\Delta)^{\alpha} & ,\mathit{if}\ \Delta < 0 \end{cases} \tag{A2}$$

The silver lining principle without loss aversion incorporates Novemsky and Kahneman' (2005) argument that there is no loss aversion for money given up for planned purchases. Therefore, the silver lining principle specified in Equation A3 differs, in that we assume loss aversion only for the extra payments (e.g., $\lambda = 2.25$), not for the recurring advance payment rates (i.e., $\lambda = 1$). Thus,

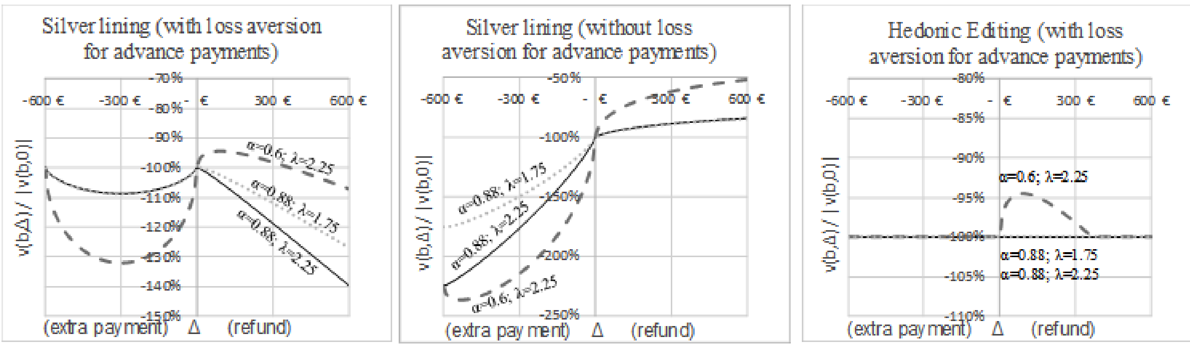
$$v(\mathrm{b},\Delta) = -1 \cdot (-(\mathrm{b}+\Delta))^{\alpha} + \begin{cases} \Delta^{\alpha} & ,\mathit{if}\ \Delta \geq 0 \\ -\lambda \cdot (-\Delta)^{\alpha} & ,\mathit{if}\ \Delta < 0 \end{cases} \tag{A3}$$

The hedonic editing principle with loss aversion for advance payments assumes that customers mentally adjust event codes to maximize value. They either integrate or segregate the last bill, depending on which maximizes the perceived value of a sequence. Thus,

$$v(\mathrm{b},\Delta) = \max\left(-\lambda \cdot (-\mathrm{b})^{\alpha}; -\lambda \cdot (-(\mathrm{b}+\Delta))^{\alpha} + \begin{cases} \Delta^{\alpha} & ,\mathit{if}\ \Delta \geq 0 \\ -\lambda \cdot (-\Delta)^{\alpha} & ,\mathit{if}\ \Delta < 0 \end{cases} \right) \tag{A4}$$

Figure A6 illustrates the value functions of Equations A2–A4 in a numerical example that assumes a yearly bill of 600€ and plots the perceived value of the APS using the standard parameters of prospect theory parameter values (λ = 2.25, α = .88). Each graph contains two additional lines to reflect the effect of a lower parameter α (i.e., .60) and lower parameter λ (i.e., 1.75).

Figure A6: Numerical Illustration of Predicted Relative Value of an Advance Payment Sequence for the Prospect Theory Principles



For the silver lining with loss aversion for advance payments, a value calculation based on standard parameters of prospect theory (Tversky and Kahneman, 1992) predicts a low perceived value for most refunds and thus a preference for extra payment sequences. However, lower values of α (<.88) shift the value function, such that value increases for small refunds but decreases again for larger refunds. For the silver lining without loss aversion, we predict an increasing value function with increasing refunds without thresholds: More refunds are always better. Finally, hedonic editing with standard parameters predicts indifference between any extra payment and refund sequence, because customers prefer to integrate all payments to maximize their perceived value.

3 Study 1: Task Description and Choice Set

Table A1: Illustration of a choice set in Study 1, version 4 (high uncertainty)

Subsequently, we will show you alternative advance payment sequences for your electricity bill. Please assume that the average total yearly bill of your household was about 600€ in previous years, which corresponds to about 50€ each month. Based on your experience, you know that your total yearly bill varied between 520€ and 680€. You need to make an advance payment to the electricity company each month. Please assume in each of the following scenarios that you have the choice between the presented two sequences. Which of them would you choose?		
Which of the two following advance payment sequences would you choose?		
Monthly payments	45€ (corresponds to 540€ per year)	55€ (corresponds to 660€ per year)
Expected extra payments or	Extra payment: 60€	Refund: 60€

refunds: In the average case, if the total yearly bill for your electricity consumption is 600€		
In the best case, if the total yearly bill for your electricity consumption is 520€	Refund: 20€	Refund: 140€
In the worst case, if the total yearly bill for your electricity consumption is 680€	Extra payment: 140€	Extra payment: 20€
	☐	☐

4 Study 2: Robustness Tests

Table A12: Study 2, Robustness Tests of Coefficients in the Linear Regression Analyses by Controlling for Absolute Last Bill < 0.9 × Total Yearly Bill

Controlling for Absolute Last	Model 1: Refund Sequence	Model 2: Asymmetric

Bill < 0.9 × Total Yearly Bill		Dummy			Magnitude		
		Advance payment awareness: Absolute percentage error	Yearly bill awareness: Absolute percentage error	Recommendation likelihood (10-point scale)	Advance payment awareness: Absolute percentage error	Yearly bill awareness: Absolute percentage error	Recommendation likelihood (10-point scale)
Payment sequence informatio	Refund sequence	0.24 ***	0.27 **	0.30	-	-	-
	Relative magnitude	-	-	-	0.87 **	4.10 ***	3.12 ***
	Relative magnitude	-	-	-	-0.06	2.56 ***	1.15
Customer information	Total consumption (in kWh/yr) in past	0.00 *	0.00 **	0.00	0.00	0.00 *	0.00
	Average price per kWh paid (in €) in	3.69 ***	1.59 ***	0.71	3.65 ***	1.53 ***	0.66
	Length of customer	0.00 *	-0.01 ***	-0.00	0.00 **	0.00	-0.00
Tariff information	Basic tariff (dummy	0.02	0.02	-0.19	0.01	-0.02	-0.20
	Contract green tariff	0.32	0.05	0.12	0.29	-0.25	-0.07
	Time between receipt of last billing	0.01	0.01	0.04	0.01	0.01	0.04
Demographics	Male (dummy = 1)	0.03	0.06	0.21	0.03	0.05	0.27
	Age (numerical)	0.00	-0.01	0.03 ***	0.00	0.00	0.03 ***
	Net income	0.01	0.01	-0.11 *	0.01	0.02	-0.11 *
Model fit	R-square	0.15	0.06	0.03	0.15	0.14	0.05

	F-Value	13.23 ***	5.01 ***	2.60 ***	11.85 ***	10.87 ***	3.50 ***
Number of observations		758	758	758	758	758	758

****p* < .01. ***p* <.05. **p* < .1. Notes: All are significantly different from 0.

Notes: The service company offered three different tariffs with distinct monthly fixed fees and variable costs per kWh. The contract base tariff was the baseline. Because price awareness is measured by absolute percentage error, positive coefficients represent an increase in error and thus a decrease in price awareness.

Table A13: Study 2, Robustness Tests of Coefficients in the Linear Regression Analyses by Controlling for Absolute Last Bill < 0.8 × Total Yearly Bill

Controlling for Absolute Last Bill < 0.8 × Total Yearly Bill	**Model 1: Refund Sequence Dummy**			**Model 2: Asymmetric Magnitude**		
	Advance payment awareness: Absolute percentage error	Yearly bill awareness: Absolute percentage error	Recommendation likelihood (10-point scale)	Advance payment awareness: Absolute percenta	Yearly bill awareness: Absolute percentage error	Recommendation likelihood (10-point scale)

					ge error		
Payment sequence informatio	Refund sequence	0.25 ***	0.26 **	0.29	-	-	-
	Relative magnitude	-	-	-	1.19 **	5.06 ***	3.45 ***
	Relative magnitude	-	-	-	-0.29	3.24 ***	1.14
Customer information	Total consumption (in kWh/yr) in past	0.00 *	0.00 **	0.00	0.00 *	0.00 *	0.00
	Average price per kWh paid (in €) in	3.72 ***	1.81 ***	0.69	3.63 ***	1.60 ***	0.54
	Length of customer	0.00 *	-0.01 ***	0.00	0.00 **	0.00	0.00
Tariff information	Basic tariff (dummy	0.02	0.01	-0.21	0.02	0.02	-0.19
	Contract green tariff	0.31	0.07	0.06	0.31	-0.14	-0.02
	Time between receipt of last billing	0.01	0.02	0.03	0.01	0.01	0.03
Demographics	Male (dummy = 1)	0.03	0.06	0.28	0.03	0.04	0.26
	Age (numerical)	0.00	-0.01	0.03 ***	0.00	0.00	0.03 ***
	Net income	0.01	0.02	-0.11 *	0.02	0.02	-0.11 *
Model fit	R-square	0.15	0.07	0.03	0.16	0.15	0.05
	F-Value	13.26 ***	5.27 ***	2.62 ***	12.20 ***	11.69 ***	3.37 ***
Number of observations		745	745	745	745	745	745

****p* < .01. ***p* <.05. **p* < .1, all significantly different from 0.

Notes: The service company offered three different tariffs with distinct monthly fixed fees and variable costs per kWh. The contract base tariff was the baseline. Because price awareness is measured by absolute percentage error, positive coefficients represent an increase in error and thus a decrease in price awareness.

5 Study 3: Robustness Tests

Table A14: Study 3, Robustness Tests of Odds Ratios in the Multinomial Logistics Models by Controlling for Absolute Last Yearly Billing Rate < 0.9 × Yearly Bill

	Controlling for Absolute Last Bill < 0.9 × Total Yearly Bill	**Model 1: Refund Sequence Dummy**		**Model 2: Asymmetric Magnitude**	
		Churn	Tariff switch	Churn	Tariff switch
Payment sequence information	Refund sequence dummy	0.63 ***	0.79 ***	-	-
	Relative magnitude of the refund	-	-	1.42	1.69 **
	Relative magnitude of the extra payment	-	-	10.77 ***	5.20 ***
Customer informatio	Total consumption (in kWh/yr)	1.08 ***	1.06 ***	1.08 ***	1.06 ***

n	Average price per kWh paid (in €/yr)	0.50 ***	1.02	0.46 ***	1.01
	Length of customer relationship (in months)	0.88 ***	0.88 ***	0.88 ***	0.88 ***
Model fit	Nagelkerke's R-square	0.33		0.33	
	-2 Log-likelihood	27,879		27,917	
	Chi-Square	6,731		6,790	
Number of observations		22,852		22,852	

***$p < .01$; *$p < .1$, for odds ratios significantly different from 1.

Table A15: Study 3, Robustness Tests of Odds Ratios in the Multinomial Logistics Models by Controlling for Absolute Last Yearly Billing Rate < 0.5 × Yearly Bill

	Controlling for Absolute Last Bill < 0.5 × Total Yearly Bill	**Model 1: Refund Sequence Dummy**		**Model 2: Asymmetric Magnitude**	
		Churn	Tariff	Churn	Tariff

			switch		switch
Payment sequence information	Refund sequence dummy	0.63 ***	0.78 ***	-	-
	Relative magnitude of the refund	-	-	1.33	1.51 *
	Relative magnitude of the extra payment	-	-	13.696 ***	6.31 ***
Customer information	Total consumption (in kWh/yr)	1.08 ***	1.06 ***	1.08 ***	1.06 ***
	Average price per kWh paid (in €/yr)	0.51 ***	1.03	0.48 ***	1.02
	Length of customer relationship (in months)	0.88 ***	0.88 ***	0.88 ***	0.88 ***
Model fit	Nagelkerke's R-square	0.33		0.33	
	-2 Log-likelihood	27,693		27,726	
	Chi-Square	6,664		6,727	
Number of observations		22,743		22,743	

***$p < .01$; *$p < .1$, for odds ratios significantly different from 1.

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