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Asymmetric Dominance and Its Impact on Mortgage Default Deficiency Collection Efforts

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The surge in mortgage default rates during the financial crisis has led to a corresponding dramatic increase in the type and number of firms who are entering the deficiency collection space. As such, we study the methods by which hedge funds and private equity collection firms can more profitably unwind this toxic debt. Specifically, we employ the theory of Asymmetric Dominance and find support that introducing a similar payment amount (i.e., a "decoy") significantly induces borrowers to change their preference from one that is optimal for them to one that is suboptimal. We then employ the Left-Most Digit effect in a new manner and demonstrate a statistically significant ability to mitigate the Asymmetric Dominance effect. Finally, we empirically find that Caucasians, males, and those of a greater net worth are more adept at avoiding violating the Independence of Irrelevant Alternatives axiom.

Introduction

Historic mortgage default rates averaged below 1% until the housing crisis, at which time they roughly quintupled (Mortgage Bankers Association 2015). Many defaults were due to a liquidity constraint, or income shock, while others were due to an unwillingness to pay.[1] Whatever the reason, if a mortgage stays in default for too long, the lender eventually forecloses on the property and tries to mitigate losses through the disposition of the asset. Because most of these properties have negative equity (*i.e.*, are underwater), it is often the case that the borrower is left still owing the lender a deficiency amount (assuming the borrower resides in one of the 41 recourse states).[2] Collecting deficiencies on both first and second liens has become such a large business

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[1]See Seiler (2015a, b, 2016, 2017), Collins, Harrison and Seiler (2015), and Seiler and Walden (2015, 2016).

[2]See Ghent and Kudlyak (2011).

that it has attracted outside capital from hedge funds, private equity firms, and the like. Given the burgeoning importance of deficiency collection efforts, we apply the theory of Asymmetric Dominance to test whether these organizations can induce borrowers to self-select into suboptimal annuity payoff cash flow stream settlements.

Asymmetric Dominance describes a situation where a person has two options from which to choose, say A and B. Assume the decision-maker prefers option A. If a third (inferior) option, say C, is introduced that is similar to B, the theory maintains that the decision-maker will narrow his focus from a choice among three options (A, B, and C) to a choice between the two similar options (B and C). Because the newly introduced similar option (C) is inferior, the decision-maker will chose B, the more preferred of the two similar options.[3] Changing a preference from A to B when an inferior additional option is introduced is a direct violation of the Arrow (1951) Independence of Irrelevant Alternatives (henceforth, "IIA") axiom. Yet in voter behavior, buyer behavior, and bargaining studies, IIA violations are well-documented.[4]

In extant studies, Asymmetric Dominance has been applied to qualitative preference decision-making. For example, whether you prefer to eat at restaurant A or B is simply a matter of preference; there is no right or wrong answer. As such, while it might seem strange that Asymmetric Dominance could occur, it is an easier violation of IIA to accept than when being presented with a quantitative set of options where there is a financially definitive correct choice to be made. In the current investigation, we further challenge the theory of Asymmetric Dominance by introducing its application to a decision-making framework where there is a quantifiably correct answer when choosing between the first two options. We then introduce a third (even more inferior) option that is similar to the original inferior option to learn if we can change preferences from the correct choice to the incorrect choice. In an effort to truly test the limits of the power of Asymmetric Dominance, we make the three options dramatically different from each other so that objective, financial preferences are clearer, allowing decision-makers a great opportunity to avoid violating the IIA axiom.

As a secondary hypothesis, we incorporate the Left-Most Digit (LMD) effect into our various treatments to test where there are mitigating variables that

[3]Less formally, this third option is often referred to as the "decoy" because its introduction is not meant to encourage its own selection. Instead, it is presented solely to throw off the decision-maker into changing his preference from A to B. As such, Asymmetric Dominance is sometimes informally referred to as the "decoy effect."

[4]See, for example, Paramesh (1973) and Huber, Payne and Puto (1982).

might have an intervening effect on Asymmetric Dominance. The LMD effect describes how when people read a number (from left to right), the brain processes the information so quickly that the digit they are most likely to remember is the LMD. Say, for example, a person is shown two shirts. The first is priced at $20.00, while the second is priced at $19.97. If asked to recall the price of the shirts days later, the person will remember the second shirt as being substantially cheaper (not just 3 cents cheaper) because his brain takes a mental shortcut and focuses primarily on the LMD. The LMD effect is not only academically well-documented,[5] but is applied to the majority of all items sold worldwide.[6] As the LMD effect applies to our tests of Asymmetric Dominance, we hypothesize that when borrowers are presented with deficiency judgment payoff options, introducing an option with a lower LMD will draw attention to the option and induce greater scrutiny. Upon deeper inspection, the borrower will realize the two similar options are inferior, and will not select either one. That is, they will be more likely to make the right choice.

We find strong empirical support for Asymmetric Dominance as we are able to move a statistically significant percentage of borrowers from the quantifiably correct option to the financially inferior alternative. We further find that the LMD effect mitigates the impact of Asymmetric Dominance, but does not remove it. When considering whether the introduced third option (*i.e.*, "decoy") induces Asymmetric Dominance, we find that a decoy with a similar payment amount (as opposed to a similar number of total payments) induces the greatest error rate. Finally, using logistic regression, we find that Caucasians, males, and those with higher net worth are significantly less affected by Asymmetric Dominance.

Employed Theories

Independence of Irrelevant Alternatives (IIA) Axiom

IIA holds that if there exists a choice set {A, B} and A is preferred to B, then the introduction of an inferior choice "C" cannot make choice B now preferred to A. Informally, because Choice C is inferior to both A and B, it is irrelevant. That is, adding inferior alternatives to a decision should not change the original preference. A classic example is credited to Sidney Morgenbesser, former professor at Columbia University, and is described as follows: After

[5]See Bhattacharya, Holden and Jacobsen (2012) for an application to the stock market and Beracha and Seiler (2015) for an example in the real estate market.

[6]See Holdershaw, Gendall and Garland (1997).

dinner, a patron wants to order dessert. The waitress tells him they offer either apple pie (A) or blueberry pie (B). The patron orders apple pie (A). When the waitress returns, she informs the patron they also have cherry pie (C). Upon hearing this, the patrons says, "In that case, I'll have blueberry pie (B)." This simple example clarifies the concept of Arrow's (1951) IIA.

Asymmetric Dominance

Asymmetric Dominance, or what is sometimes referred to as the "decoy effect," reflects a violation of IIA by introducing an inferior third alternative (*i.e.*, the "decoy")—which is similar to the nonpreferred of the original two choices—in an attempt to change a decision-maker's original preference. The human brain makes decisions primarily by comparing two choices rather than by objectively evaluating alternatives independently. Therefore, the more similar the decoy to the nonpreferred original option, the more likely Asymmetric Dominance is able to switch the preference of the decision-maker.

Left-Most Digit Effect

In its purest form, Dehaene (1997) explains that the LMD effect describes that because we read from left to right, and because our mind works so quickly, our brain actually starts to store the first digit of a number before we even finish reading the entire number. In the short run, if asked to recall the price of an item we just read, we have the mental capacity to recall the precise amount. However, if several days have passed before we are asked to recall the exact price, we will realize a cognitive memory limit and have to rely on a heuristic to take an educated guess (Thomas and Morwitz 2005). That heuristic, or mental shortcut, involves focusing on the LMD, not only because it was the first number we were asked to remember, but because it is in the most financially relevant position (Beracha and Seiler 2015). Simply stated, a number in a price one position to the left is 10 times more economically impactful than the digit immediately to its right, and so forth. As such, this heuristic is not reflective of irrational thinking. Instead, it is a necessary shortcut we use given that our brains have cognitive limits, and remembering the LMD is the most relevant (*i.e.*, most financially impactful) one to remember.

Recognizing the brain's capacity limitations, marketers around the world for centuries have employed a "just below" pricing strategy to make their products appear less expensive than they really are. This is seen in everything from

gas prices[7] to home prices.[8] But, we do not employ the LMD effect in this manner in the current study. That is, we do not show people a price, and then later ask them to recall that price or later ask them to tell us which item was less expensive and by how much. Instead, we conjecture that the LMD matters when people consider prices. To this end, we hypothesize that when presented with a settlement payment option that contains a LMD that is lower than the other option(s), it causes the borrower to more rigorously examine that option which dampens the impact of Asymmetric Dominance.

Experimental Design

There are two primary methods for collecting data for a study such as ours. The first is to use actual transactions data, or in this case, to go to a collection agency and analyze their existing data/collection efforts. The problems with this path are manyfold. First, gaining access to financially sensitive records is extremely impractical. Even before Dodd–Frank created the Consumer Financial Protection Bureau (CFPB), this was exceedingly unlikely to happen. Subsequent to the creation of the CFPB, it is effectively impossible. Second, even if granted access to sensitive private financial records, the odds that a collection firm offers options to borrowers that allow for the precise teasing out of intricate financial theories is next to zero.

For these reasons, we employ an experimental design.

We begin by describing to the participant the following situation, which applies to all subsequent scenarios:[9]

> "Imagine you did not make your monthly home mortgage payments. Even after the lender foreclosed on the home and sold it (to reduce your loan balance), you still owe the bank a deficiency amount of $100,000. To settle this debt, the lender is providing you with payment options from which you can choose. Please select the stream of monthly payments you prefer to make to resolve this debt. Please assume your monthly budget is enough to cover each option."

Participants then moved to the next screen where they were presented with one of 12 scenarios each containing either two or three payment options.

[7]Gas prices include 9/10 of a cent, a unit of currency that technically does not even exist. In Australia, a nickel is the smallest unit of circulated currency, and yet prices are still offered at say, $5.98.

[8]See Beracha and Seiler (2014).

[9]See the Appendix for a description of the experimental design and questions.

The remaining 11 scenarios were then presented separately, one screen at a time.[10] In this sense, we follow a "within-subjects" design.[11] Table 1 reports the 12 scenarios used in the testing of our hypotheses. Note that in concert with experimental design protocol, we randomize the presentation order (to avoid presentation order effects) not just of the 12 scenarios shown here, but also the order in which the options are presented to the participant within each scenario. However, for the purposes of understanding our design, we present the options and scenarios in Table 1 such that Option 1 is always the optimal choice, Option 2 is the second preference, while Option 3 is always the Asymmetrically Dominated decoy. While past applications of Asymmetric Dominance have been applied to qualitative preference sets, we are the first to our knowledge to apply this theory to quantitatively objective choices, resulting in right versus wrong answers. Moreover, to truly test the resolve of this theory, we make our options drastically preferable over on another. For example, Option 1 in all 12 scenarios has an effective interest rate (*i.e.*, annualized cost to the borrower) of −6%. Option 2 has an effective interest rate of +3%, while Option 3 has an effective interest rate of +12%. Note that not only are we holding everything else constant between scenarios, but we have also equally separated the differences in effective interest rate by 9% (18% overall), a huge spread even by debt collectors' standards.[12]

Panels A and B reflect the design for testing how effective a similarity in the number of total payments is at inducing the Asymmetric Dominance effect. Specifically, Options 1 and 2 are presented separately. Then, in a different scenario, Option 3 is added so that differences in error rates can be measured. Panel A differs from Panel B in that it incorporates the LMD effect. Notice how Option 2 has a LMD of "1" whereas all other payments in Panels A and B have a LMD of "2." Panels C and D are comparably designed except now we are testing for similarities in the monthly payment amount. Alternatively stated, the decoy option is similar not in terms of the number

[10]Back-tracking and advancing screens without answering scenarios was disallowed.

[11]In unreported results, we also ran the calculations for a between-subjects design framework. The results show that the error rates are even higher and also more dispersed between treatments, adding support for our hypotheses.

[12]The further apart the returns on the three scenarios, the more likely the borrower is to be able to identify which option is the best. For example, if returns varied by only 1%, it would be easy to trick borrowers into choosing the wrong annuity stream. Conversely, if returns differed by 100%, even a cursory glance at the alternative payment choices would stand out as being better than the other(s). In sum, we chose a very wide return spread so that a firm considering the implementation of our ideas would be convinced of the economic merits of our tests. The academic risk of choosing return spreads as large as we did is reducing the error rate, and thus, not finding significant results.

Table 1 ■ Scenarios shown to participants to test asymmetric dominance and the left-most digit effect.

Option Number	Number of Payments	Monthly Payment
Panel A: Similarity in Number of Payments (Left-Most Digit Effect)		
Option 1	43	$2,078.74
Option 2	61	$1,769.56
Option 3	61	$2,197.80
Panel B: Similarity in Number of Payments (No Left-Most Digit Effect)		
Option 1	35	$2,607.30
Option 2	50	$2,130.10
Option 3	50	$2,551.27
Panel C: Similarity in Payment (Left-Most Digit Effect)		
Option 1	39	$2,315.83
Option 2	59	$1,825.10
Option 3	79	$1,836.98
Panel D: Similarity in Payment (No Left-Most Digit Effect)		
Option 1	34	$2,690.92
Option 2	48	$2,213.43
Option 3	60	$2,224.44
Panel E: Similarity in Number of Payments & Payments (Left-Most Digit Effect)		
Option 1	42	$2,133.76
Option 2	62	$1,743.14
Option 3	62	$2,172.04
Panel F: Similarity in Number of Payments & Payments (No Left-Most Digit Effect)		
Option 1	36	$2,528.34
Option 2	49	$2,170.91
Option 3	49	$2,591.47

Note: This table reports the 6 treatments, or 12 scenarios, shown to each participant. While the order was randomized during the experiment to avoid presentation order effects, we present the options here in order from most attractive (Option 1 = −6% owed) to the borrower to least attractive (Option 3 = +12% owed) with Option 2 being exactly in the middle (+3% owed). Note that the third option represents the "decoy" and is meant to induce movement from Option 1 to Option 2, a less desirable choice for the borrower. Panels A and B represent a similarity in Number of Total Payments; Panels C and D represent a similarity in Payment Amount; Panels E and F represent similarity in both.

of total payments, but instead in the dollar amount that needs to be paid each month.

A second subtlety in Panel C is a test of whether it makes a difference if the LMD comes in the form of the decoy. All other panels reflect an introduced decoy that does not start with a LMD equal to "1." We will later discuss that this has no impact on error rates. Instead, it is the payment effect that dominates. Panels E and F round out the possible treatments by introducing a decoy that resembles the other two options in terms of both the total number of payments and the monthly payment amount. Panel E reflects a LMD consideration, while Panel F does not.

Data

All data are collected through an online existing network of homeowners who carry a mortgage and stand ready to participate in experiments such as ours in exchange for a fee. Because our experiment involves participants getting the "right" answer, we devise a financial reward system to encourage their full participation and attention. Specifically, we double the flat fee paid to all participants who finish in the top 1/3 of performers, where their success is defined as selecting the annuity stream with the lowest return.[13]

The clearinghouse accepts payment from the experimenter and distributes the money to participants only after the experimenter verifies the task was successfully completed. In exchange for the clearinghouse providing a platform to bring together researchers and participants, a 10% fee is charged to the experimenter for every successful completion. The clearinghouse also serves as a method to ensure anonymity to participants so that they can answer openly and honestly to all questions.

When defining a "successfully completed" task, we build several safeguards into our platform. For example, at two random points throughout the experiment, we simply ask the participant to answer, say "7," on a 9-point scale. Given the two questions of this nature, there exists only a 1/81 chance that a person who did not read the question still coincidentally clicked on the right answer. More surreptitiously, we place hidden timers on every page of the experiment. As a result, we screen out participants who take fewer than five seconds to read our instructions. While reading speeds certainly vary from

[13]The flat fee paid to all participants was $1.07 for an experiment that lasted roughly five to seven minutes. This is consistent with the pay structure used by other experimenters on similar-length tasks.

person to person, we believe five seconds is a reasonable cutoff.[14] Another example of how we screen participants is by asking them to select their state and city from a dropdown menu, and then on a future page, ask them for their zip code. It is unlikely that if a person randomly selected a state and city that they would (a) remember what they picked and (b) take the time to look up a zip code that corresponds to that city. A further screening mechanism occurs within our personal database of past participants. While we do not know who is completing our experiments, we do have record of the ID number the clearinghouse assigns them. If they appeared in a past study, we cross-reference their demographic data and disqualify those whose responses do not match up. When a participant fails one of our screens, the platform allows us to forever remove them from our pool of potential participants. A final screening tool is to allow only those people with an overall approval (*i.e.*, successful completion) rating of no less than 95% on all tasks performed from all experimenters (not just ours) to see our invitation to participate.

All these verifications may seem excessive, but allowing noise into our experiment leads towards null results. Hence, there is a built-in incentive to create and maintain rigorous screening standards to avoid "garbage in-garbage out" analysis. The results are a purer test of our hypotheses. Using the screening techniques just described, we began with a sample of 1,992 respondents who were ultimately screened down to 1,911. Because each participant answered 12 independent scenarios, the resulting pooled sample size is 22,932 (1,911 $\times$ 12). Participants hail from all 50 states as well as Washington, DC.

Results

Panel A of Table 2 reports the tests relating to our central hypothesis. Specifically, does the introduction of a third (inferior decoy) option cause borrowers to shift their preference from the right answer to the wrong answer? To address this question, we consider the percentage of choices that are incorrect in each of the 12 scenarios. When considering the first two scenarios, we see that the inclusion of the decoy caused error rates to increase a statistically significant amount, from 21.4% to 25.2%. In fact, for each pair of scenarios, the introduction of a decoy significantly increased error rates at the 99% level of confidence showing strong support for the Asymmetric Dominance effect.[15]

[14]The results are not sensitive to alternative cutoff windows.

[15]It is important to share that the increase in error rate reflected a shift from the best alternative to the second best alternative, not to the decoy itself. Recall that the decoy's job is to erroneously shift preferences from correct choice (A), to the inferior

Table 2 ■ Full sample results for tests of asymmetric dominance and the left-most digit effect.

Comparison Categories	# of Choices	Obs.	% Wrong	*p*-Value
Panel A: Asymmetric Dominance Tests				
Scenario 1—***N (Left-Most Digit Effect)***	3	1,911	25.2%	0.000***
Scenario 2—***N (Left-Most Digit Effect)***	2	1,911	21.4%	
Scenario 3—***N (No Left-Most Digit Effect)***	3	1,911	31.3%	0.000***
Scenario 4—***N (No Left-Most Digit Effect)***	2	1,911	25.1%	
Scenario 5—***Payment (Left-Most Digit Effect)***	3	1,911	31.7%	0.000***
Scenario 6—***Payment (Left-Most Digit Effect)***	2	1,911	25.2%	
Scenario 7—***Payment (No Left-Most Digit Effect)***	3	1,911	35.0%	0.000***
Scenario 8—***Payment (No Left-Most Digit Effect)***	2	1,911	27.4%	
Scenario 9—***N & Payment (Left-Most Digit Effect)***	3	1,911	25.9%	0.000***
Scenario 10—***N & Payment (Left-Most Digit Effect)***	2	1,911	22.6%	
Scenario 11—***N & Payment (No Left-Most Digit Effect)***	3	1,911	29.4%	0.000***
Scenario 12—***N & Payment (No Left-Most Digit Effect)***	2	1,911	25.9%	

Table 2 ■ Continued.

Comparison Categories	# of Choices	Obs.	% Wrong	*p*-Value
Panel B: Left-Most Digit Effect Tests				
Scenario 1 vs. 3	3	3,822	6.1%	0.000***
Scenario 2 vs. 4	2	3,822	3.7%	0.000***
Scenario 5 vs. 7	3	3,822	3.3%	0.001***
Scenario 6 vs. 8	2	3,822	2.2%	0.009***
Scenario 9 vs. 11	3	3,822	3.5%	0.000***
Scenario 10 vs. 12	2	3,822	3.3%	0.000***

Note: This table presents the results from the Asymmetric Dominance tests and the Left-Most Digit Effect for the full sample of 1,911 participants across the 12 scenarios for a pooled sample size of 22,932 observations. Scenario comparisons differ by considering the Left-Most Digit Effect across scenario similarities in Number of Total Payments (*N*) (Scenarios 1–4), similarity in Payment Amounts (*Payment*) (Scenarios 5–8), and similarities in both Number of Total Payments and Payment Amounts (*N* & *Payment*) (Scenarios 9–12). *Number of Choices* represents the number of choices the participant had to choose from where 3 reflects the introduction of the always inferior "decoy" option. *Obs*. represents valid sample size in each category. *%Wrong* reflects the percentage of the questions participants answered incorrectly. The *p*-value reflects the results when comparing scenarios using a paired-samples *t*-test. Panel A reports tests of Asymmetric Dominance, while Panel B reports Left-Most Digit Effect test results. ***Indicates significance at the 1% level.

In Panel B of Table 2, we test our secondary hypothesis relating to the ability of the LMD effect to dampen the Asymmetric Dominance effect. As hypothesized, when there exists a choice set where one of the payment amount options has a "1" as the LMD (as opposed to a "2"), error rates significantly decrease for all pairs at the 99% level. While the LMD effect does not remove the Asymmetric Dominance effect, it certainly does mitigate it.

Having found strong support for the Asymmetric Dominance and LMD effects, we now turn to a deeper understanding of whether or not similarity in the number of total payments, the monthly payment amount, or both might serve as an intervening variable when measuring the strength of Asymmetric Dominance. Table 3 reports the results from the investigation. Specifically, Panel A holds constant the number of choices and the LMD effect while allowing the total number of payments (Scenario 1), the monthly payment amount (Scenario 5), and both (Scenario 9) to change. Panels B–D report different groupings by number of choices and LMD as labeled. The results indicate that a similarity in the monthly payment amount provides the most effective decoy when inducing erroneous changes in preferences. This is seen across all four panels indicating that the LMD effect does not change the conclusion that similarity in payment amount is the mechanism most effective at inducing a higher error rate.

Of the 1,911 subjects who participated in the experiment, 1,065 answered all 12 questions correctly. That is, 44.3% of subjects were not tricked by the decoy option—they held to the correct answer even when the decoy was introduced. A logical next step is to identify who is more susceptible to the Asymmetric Dominance effect. Before addressing this question econometrically, we first examine a series of variables that can be used to provide an answer. The dummy variable *Previous Default* is equal to 1 if the respondent previously defaulted on a mortgage at any point in his life. Of those who have defaulted, respondents were asked to indicate through self-selection whether their default was economic (an inability to pay the mortgage) or strategic (an unwillingness to pay the mortgage) in nature. Note in Table 4 that, 7.38% of borrower participants have previously defaulted on a mortgage, and of those, 17.02% were carried out for strategic reasons. We hypothesize that those who have defaulted (strategically or economically) will have experience considering different workout solutions that may likely involve selecting a payment plan, and as such, might perform better in this experiment.

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choice (B), not to the decoy (C). Only approximately 1% of our sample selected the introduced decoy, meaning that the added alternative is not the reason for the increase in the percentage of people who were moved from the correct to the wrong answer. All this is to say that the decoy worked effectively.

Table 3 ■ Tests of the most effective method of invoking asymmetric dominance: total number of payments, payment amount, or both.

Comparison Categories	Number of Choices	Obs.	*p*-Value
Panel A: Left Most-Digit Effect			
Scenario 1 (*N*) vs. 5 (*Payment*)	3	3,822	0.000***
Scenario 1 (*N*) vs. 9 (*N & Payment*)	3	3,822	0.433
Scenario 5 (*Payment*) vs. 9 (*N & Payment*)	3	3,822	0.000***
Panel B: Left Most-Digit Effect			
Scenario 2 (*N*) vs. 6 (*Payment*)	2	3,822	0.000***
Scenario 2 (*N*) vs. 10 (*N & Payment*)	2	3,822	0.118
Scenario 6 (*Payment*) vs. 10 (*N & Payment*)	2	3,822	0.001***
Panel C: No Left Most-Digit Effect			
Scenario 3 (*N*) vs. 7 (*Payment*)	3	3,822	0.000***
Scenario 3 (*N*) vs. 11 (*N & Payment*)	3	3,822	0.046**
Scenario 7 (*Payment*) vs. 11 (*N & Payment*)	3	3,822	0.000***
Panel D: No Left Most-Digit Effect			
Scenario 4 (*N*) vs. 8 (*Payment*)	2	3,822	0.006***
Scenario 4 (*N*) vs. 12 (*N & Payment*)	2	3,822	0.321
Scenario 8 (*Payment*) vs. 12 (*N & Payment*)	2	3,822	0.057*

Note: This table tests for significant differences in correct responses by borrowers when presented with similarities in the number of total payments (*N*), payment amounts (*Payment*), and both (*N & Payment*). *Number of Choices* represents the number of choices the participant had to choose from where 3 reflects the introduction of the always inferior "decoy" option. *Obs.* represents valid sample size in each category. The *p*-value reflects the results when comparing groups using a paired-samples *t*-test. ***indicates significance at the 1% level, **indicates significance at the 5% level, *indicates significance at the 10% level.

Collected demographic variables include whether the participant lives in a problem state (*i.e.*, resides in either CA, FL, NV, AZ, or MI) or not. These states are documented in the literature to have been hit hardest by the crisis. CA, FL, NV, and AZ were susceptible mainly because they are second home destinations, and if someone has to choose between paying the mortgage of a primary residence versus paying the mortgage on an investment property or second home, it is the second home whose mortgage will stop getting paid first. MI was hard hit because of the failures/bankruptcies in the automotive industry. The hypothesis is that if a borrower lives in one of the hardest hit states, they, or someone they know, likely went through a foreclosure. At a minimum, they may be more privy to a discussion of the housing crisis

Table 4 ■ Univariate summary statistics.

Variable	Obs.	Mean/Median	Std. Dev.	Minimum	Maximum
Behavioral Characteristics					
Previous Default	1,911	7.38%	0.26	0	1
Strategic Default	1,911	17.02%	0.38	0	1
Demographics					
Problem State	1,911	21.92%	0.41	0	1
Child Dummy	1,911	55.73%	1.20	0	1
Male Dummy	1,911	47.62%	0.50	0	1
Married Dummy	1,911	62.74%	0.48	0	1
Age	1,911	36.57	10.53	18	77
Income	1,911	3.65	1.53	1	7
Net Worth	1,911	3.88	1.70	1	9
Positive Net Worth Dummy	1,911	68.94%	0.46	0	1
Ethnicity	1,911				
Caucasian	1,611	84.3%			
African American	109	5.7%			
Hispanic	73	3.8%			
Asian	94	4.9%			
Other	24	1.3%			
Region	1,911				
Midwest	483	25.3%			
Northeast	419	21.9%			
Southeast	637	33.3%			
West	372	19.5%			

Note: This table reports univariate summary statistics for variables considered in the regression analysis. *Behavioral Characteristics* consist of *Previous Default* = 1 if the respondent previously defaulted on a mortgage, 0 otherwise. Of those who have defaulted, respondents self-select into either an *Economic Default* or a *Strategic Default*. *Demographic* variables include Problem State = 1 if the respondent resides in either CA, FL, NV, AZ, or MI; *Child Dummy* = 1 if the respondent has at least one dependent child living at home, 0 otherwise; *Male Dummy* = 1 for males, 0 otherwise; *Married Dummy* = 1 if married, 0 otherwise; *Age*; *Income* on a scale from 1 = under $20,000 to 7 = over $120,000; *Net Worth* on a scale from 1 = under $400,000 to 9 = over $1,000,000; and *Positive Net Worth Dummy* where 1 = greater than zero, 0 otherwise. Finally, *Ethnicity* and *Region* of the country where the respondent is domiciled are reported by category.

and some details of foreclosure ramifications that might help them perform better on the experimental task of selecting the optional payment stream. Remaining demographic variables include whether the respondent has at least one dependent child living at home, gender, marital status, age, income, net worth, ethnicity, and region of the country. While we do not have hypothesized signs for these variables, we include them in a more exploratory sense.

Table 5 reports the results from two logistic regressions where the dependent variable is equal to 1 if the participant answered all the scenarios correctly,

Table 5 ■ Logistic regression results explaining those who did versus did not answer all the scenarios correctly.

Independent Variables	Model I—Initial Model	Model II—Final Model
Intercept	−3.056***	−1.113***
	(0.660)	(0.173)
Behavioral Characteristic		
Previous Default Dummy	0.144	
	(0.429)	
Demographics		
Problem State	−0.010	
	(0.294)	
Male Dummy	0.620***	0.159*
	(0.211)	(0.094)
Child Dummy	0.211	
	(0.231)	
Caucasian Dummy	0.613**	0.587***
	(0.303)	(0.134)
Married Dummy	−0.210	
	(0.0245)	
Income	0.064	
	(0.077)	
Net Worth	0.147**	0.079***
	(0.067)	(0.028)
Age	0.009	
	(0.011)	
Region ($N - 1$ Dummies)		
Midwest Dummy	0.362	
	(0.334)	
Northeast Dummy	0.114	
	(0.360)	
Southeast Dummy	0.194	
	(0.319)	
Observations	1,911	1,911
χ^2	23.274	30.562
p-Value	0.025**	0.000***
−2 log likelihood	561.96	2,564.33
Cox & Snell R^2	0.046	0.016
Nagelkerke R^2	0.066	0.021
Correct classification percentage	72.7%	56.8%

Note: This table reports the results from two logistic regressions where the dependent variable is = 1 if the respondent answered all 12 scenarios correctly, 0 otherwise. The *Behavioral Characteristic*: *Previous Default* = 1 if the respondent has defaulted on a mortgage in the past. *Demographics* include *Problem State* = 1 if the respondent resides in either CA, FL, NV, AZ, or MI; *Male Dummy* = 1 for men, 0 otherwise; *Child Dummy* = 1 if the respondent has at least one dependent child living at home, 0 = otherwise. *Caucasian Dummy* = 1 if the respondent is a Caucasian, 0 otherwise; *Married Dummy* = 1 if married, 0 otherwise; *Income* on a scale from 1 = under $20,000 to 7 = over $120,000; *Net Worth* on a scale from 1 = under $400,000 to 9 = over $1,000,000; *Age*; and *Region*. *Midwest* = 1 for Midwest, 0 otherwise; *Northeast* = 1 for Northeast, 0 otherwise; and *Southeast* = 1 for Southeast, 0 otherwise. *West* is the holdout region. Model I, the Initial Model, reports results when all explanatory variables are included. Model II, the Final Model, reports results when only the significant explanatory variables remain. The inclusion of presentation order, fixed-effects variables do not impact the results, and are thus suppressed from the table. *Indicates statistical significance at the 10% level, **indicates statistical significance at the 5% level, ***indicates statistical significance at the 1% level. Standard errors are reported inside the parentheses.

and 0 otherwise. Model I, the Initial Model, includes all the independent variables. We see that males are significantly more likely to answer all the scenarios correctly at the 1% level. Caucasians and those of a higher net worth answer all 12 scenarios correctly significantly more so than their counterparts at a significance level of 5%. None of the remaining independent variables are statistically significant.

In Model II, the Final Model, we only include the statistically significant explanatory variables from Model I. It is important to re-estimate the model to achieve more accurate coefficient estimates for the significant variables. Consistent with Model I, both regressions reach the same conclusion. Caucasians, males, and those with a greater net worth are less likely to succumb to the Asymmetric Dominance effect.

Policy Implications

Hedge funds and private equity firms have entered the mortgage deficiency collection space because of the potentially lucrative returns surrounding the collection of these toxic debts. Before the CFPB was created, brute force was the preferred method of collection used by debt collection agencies. Subsequent to the creation of the CFPB, however, firms require far more tact and finesse if they hope to ratchet up returns in this increasingly competitive marketplace. Using theories such as Asymmetric Dominance to encourage borrowers to self-select into inferior annuity payment streams (which imply a higher return to the debt collector) is a great way to remain competitive in a space where debt collectors must interact with borrowers more politely.

Based on our findings, collection firms should employ asymmetric dominance techniques. However, they should not employ LMD effect strategies as introducing a difference in the LMD of an annuity payment reduces the self-selection error rate of borrowers, which would reduce the profitability of collection efforts. Future studies should continue to investigate established economic theories to learn if they can be used to increase agency returns through the design of payoff options offered to defaulted borrowers.

Conclusions

As the market for bad mortgage debt collections continues to grow, we argue it is increasingly important to rigorously examine methods that can be employed to better unwind these toxic claims. To this end, we employ both Asymmetric Dominance theory and the LMD effect to determine if it is possible to induce movement away from a quantifiably correct financial choice to a suboptimal preference by the borrower. We find strong support in favor of the Asymmetric

Dominance effect and its ability to increase error rates among decision-makers. At the same time, applying the LMD effect dampens the strength of Asymmetric Dominance, but does not remove its impact.

When considering which type of decoy to employ when implementing the concept of Asymmetric Dominance in mortgage default deficiency settlements, we find that a similarity in monthly payment amount between two of the three options is significantly more likely to increase the error rate in decision-making when compared to introducing a decoy option that is similar in terms of the total number of payments in the annuity stream. Finally, we find that Caucasians, males, and those with a higher net worth are significantly less likely to be influenced by the Asymmetric Dominance effect.

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Appendix Experimental Design and Questions

This appendix reports the experimental design as conveyed to subjects.

We are conducting this study to better understand the residential real estate mortgage market. All responses will remain anonymous. There are "right" and "wrong" answers, so **to encourage you to answer the 12 scenarios correctly, we will pay you DOUBLE for this task if you are among the top 1/3 performers.**

Please READ all screens very CAREFULLY!!

Imagine you did not make your monthly home mortgage payments. Even after the lender foreclosed on the home and sold it (to reduce your loan balance), you still owe the bank a deficiency amount of $100,000. To settle this debt, the lender is providing you with three payment options from which you can choose. Please select the stream of monthly payments you will make to resolve this debt. Please assume your monthly budget is enough to cover each option.

You will now be presented with **12 different scenarios**. Please treat each scenario separately.

(12 treatments presented in random order [with option order also randomized]—as shown in Table 1)

Please select the **STATE and CITY** nearest to where you live from the following drop down menu.

Have you ever defaulted on a mortgage before?

- ○ Yes
- ○ No

(skip function)

In what year was your most recent default? _____

Which type of default was it?

- ○ Economic Default (meaning you simply did not have enough money to make your mortgage payments)
- ○ Strategic Default (where you could afford to keep making your mortgage payments, but decided not to)

Number of children who are financially dependent on you?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ More than 9

What is your 5-digit Zip Code? _____

What is your Gender?

- ○ Male
- ○ Female

What is your AGE? _____

What is your Current Marital Status?

- ○ Single
- ○ Married

What is your Ethnicity?

- ○ Caucasian (White)
- ○ African American (Black)
- ○ Hispanic
- ○ Asian

- ○ Other _____

Your Annual Income Level

- ○ Under $20,000
- ○ $20,001–$40,000
- ○ $40,001–$60,000
- ○ $60,001–$80,000
- ○ $80,001–$100,000
- ○ $100,001–$120,000
- ○ Over $120,000

What is your total Net Worth? Net Worth is defined as total assets (stocks, bonds, price of your home, retirement accounts, etc.) minus total liabilities (outstanding mortgage balance, credit card debt, student loans, auto loans, etc.)

- ○ Less than −$400,000
- ○ −$400,000 to −$200,001
- ○ −$200,000 to $0
- ○ $1 to $200,000
- ○ $200,001 to $400,000
- ○ $400,001 to $600,000
- ○ $600,001 to $800,000
- ○ $800,001 to $1,000,000
- ○ Over $1,000,000