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## None for the Money: How We Actually Make Monetary Decisions

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### Abstract

*Often, critics of academic scholarship point to the failure of academic findings translating to practical applications. This paper tackles an issue that most people deal with every single day, how to make smart decisions with their money. The literature scrutinizing the psychology of monetary decisions is vast. However, in a literature so comprehensive it can be easy to miss the forest for all the trees. By returning primarily to two authors who did much of the foundational research on the subject and expanding upon their work, this paper examines the overwhelming prevalence, causes, and future implications of irrational monetary decision making.*

*Keywords: decision-making, money, heuristics, positive psychology*

### A Literature Review

Life is uncertain, and there is a lot of information available about a stunning number of variables. However, monetary transactions are often anything but rational. The lay consensus seems to be that “other people” make irrational decisions with money, but few people would admit to any systematic irrationality, especially their own. How monetary decisions are made obviously has a huge effect on everyday life, since monetary transactions and the decisions surrounding them are absolutely integral in all forms of society. If people are making decisions differently than they themselves realize, how can they expect to make them well? Also, if economic models do not account for these patterns of irrational decision-making, how can they purport to accurately predict consumer behavior on a macro or micro level? And just how irrational can people be, and how does that affect purchasing decisions and general decision-making involving money? What further research can be done to advance our understanding of these phenomena?

Amos Tversky and Daniel Kahneman were influential Israeli psychologists who helped pioneer the field of behavioral economics. Their historic collaboration began in 1971 at the Oregon Research Institute (Poundstone, 2010, p. 87). To further understand how people make decisions about money, they simply asked two questions with 2 possible responses to each. In the first decision, participants were asked whether they would rather have a 100% chance of gaining \$240 (Option A) or a 25% chance of gaining \$1,000 and a 75% chance of gaining nothing (Option B). 84% of subjects chose Option A. The second decision was either a sure loss of \$750 (Option C) or a 75% chance of losing \$1,000 and a 25% chance of losing nothing (Option D). 87% of subjects chose Option D (Tversky, 1981, p. 454). These decisions do not seem ridiculous at face value.

A sure gain puts dollars in one's hand right now, and if there's any chance one can avoid a loss he or she might as well try to. Overall, 73% of respondents chose both Options A and D.

However, when framed in a different way, those two decisions are exposed as the least rational decisions one could possibly make given those options. Subjects were asked to choose one of two options, both involving two scenarios. The first option involved first a 25% chance to win \$240 and then a 75% chance to lose \$760 (Option 1). The second option involved first a 25% chance to win \$250 and then a 75% chance to lose \$750 (Option 2). When framed this way, 100% of the subjects chose the Option 2, and who would not? One has an equivalent chance of both gaining more money as well as losing less. Taken together, the Option 1's scenarios are mathematically equivalent to the most common responses given during the first series of questions Options A and D, while the second option's scenarios are mathematically equivalent to the least popular series of decisions, Options B and C (Tversky, 1981, p. 454-455). However, as can now be observed, the combination of Options B and C is the most logical, rational combination that one could choose. Only 3% of the subject pool chose both options B and C. However, it would be understandable to believe that this effect might disappear whenever real money and payouts are involved because then people will actually care enough to pay close attention. These same kinds of questions have been asked with real money on the line, and the effect remains (Tversky, 1981, p. 454-455). So while most everyone believes they are rational in general and especially when it comes to money, empirical data says that not only are our internal calculators broken, they are probably not even properly turned on.

Studies in this vein are not flashy to run or participate in. There are no gorillas running through the video, no confederates screaming as fake shocks are administered, and no college students transforming into ruthless prison guards and submissive prisoners. However, researchers are discovering what affects our abilities to be rational about money and all the important decisions surrounding monetary transactions. This data can be used to better understand why markets rise and fall, how reasonable, intelligent people can be suckered into loans that make foreclosure all but certain, and just how bad people are at valuing the possessions they treasure. Admittedly, the literature on this topic is so vast that there is no way that it can be adequately covered in a single paper. As a result, rather than just bouncing around aimlessly from study to study, much of the initial literature review will focus on the work by Tversky and Kahneman. Kahneman won the Nobel Prize for Economics in 2002 for his work with Tversky, who was denied an opportunity to share in the prize himself only by his untimely death several years before.

Following the initial examination of the literature, this review will primarily focus on practical applications of this vast academic knowledge. First, the importance of monetary transactions will be established. There are probably very few souls who would argue against the importance of monetary decisions, but the breadth and depth of their importance on an everyday basis is often taken for granted and goes unnoticed by most of the population. Next, the inherent irrationality in many of these monetary decisions will be exposed and examined. People's abilities to be human calculators doing the arithmetic of utility in their heads will come under serious fire. Then, the implications of the irrationality of these decisions will be discussed. Is being more rational always the answer? Finally, with better decision making processes regarding money in place, the definition of utility will be further challenged. While human beings according to some economic models want nothing more than to die with the most toys, while some real life human beings want to see Europe and leave their kids to fend for themselves without a trust fund on which they can rely. Therefore, the emotional side of utility will be further explored.

People could view money as valuable for a variety of reasons. For many, money is the commodity that can be used to acquire basic living conditions and food. Smaller amounts of money are worth more to people who have less. For instance, people become much happier as they earn more money in a year up until just past a living wage. After

that, the amount that people get happier per unit of money drops considerably (Myers, 2008, p. 41). For some, money is the means to achieving high status in society, which can be telegraphed through expensive material goods and/or experiences. In this case, people care about their social status as measured by material wealth because that material wealth can symbolize non-observable abilities (Rege, 2008, p. 240). A surgeon would not expect his friends to understand his skills relative to a particularly difficult surgery, but assumes they will understand he is skilled if he has a fancy car and a big house.

For others, money is security, providing them with a safety net if something goes wrong in their lives. For example, people aged 55-64 are the people most likely to start a new business while people aged 20-34 are actually the least likely age group to do so, despite the conventional wisdom that younger people take risks more often. While a variety of factors could be at work, one possibility is that with money in the bank and financial security assured, baby boomers can justify leaving jobs with health insurance, benefits, etc. because they have security in case of failure and/or emergency. On the other hand, 20-34 year olds most likely do not have that nest egg stored away, and cannot justify taking the same risks (Stangler, 2009, p. 4).

However, money being viewed as opportunity is one big factor that often gets overlooked when the value of money is being discussed. If one has money, then one can anticipate all the different desirable experiences and things that the money can buy. This line of reasoning can even apply to those who do not have money. They view having money as the potential to move out of a crime-infested neighborhood, take their spouse out more often, or send their kids to a better school. In many cases, anticipation of good things actually makes people happier than experiencing the good things themselves (Richins, 1992, p. 230). Money in the bank, or even just the idea of it, allows people to hope for and anticipate a wide variety of things, and as the money increases so can the anticipatory imagination. These conditions are surely not isolated, as all of them likely play a role in the valuation of money for each individual. Essentially, money may function and be viewed in a range of different ways, but all of those functions and views are essential to how the individual operates. The field of positive psychology would do well to further address the conception of money as opportunity.

Convincing anyone that monetary transactions are important is not very difficult. Convincing that same person of the often-stunning

irrationality of monetary decisions will prove far more difficult. Obviously, there is a huge disconnect between reality as portrayed by research and the reality perceived by a vast majority of people. The above average effect could conceivably account for the difference between perception and reality. In general, the above-average effect predicts that people will, on average, rate themselves as above average on a wide variety of skills. This effect affects people's perceptions of their ability to make monetary decisions (Dunning, 1989, p. 1082). However, this factor alone probably does not account for the lack of rational decision-making. Imagine a group of athletes who wake up early one morning to go a tryout for a prestigious team. For all of these athletes, doing well in this tryout is essential to their livelihoods and their future in the sport. If you gave all of these players a survey before the tryout and asked how good at this sport they were relative to the others trying out, it is relatively safe to say that one would see the above-average effect, as this effect has generalized to a wide variety of skills (Dunning, 1989, p. 1082).

Then, the players are asked by the coaches to individually give a demonstration of their skills for a few minutes for the coaches. After all the players demonstrate the skills, the coaches use a systematic scoring system to rate their abilities. The next day, all the players are called back in to the arena by the coaches. The shocked players are informed none of them have made the team. Some players had performed poorly relative to the others, but some players had done systematically better compared to the others. There may have even been one or two special players who showed a spectacular skill set. So why did no one make the team? All of the players demonstrated soccer skills during their tryouts, and the coaches were holding a tryout for a basketball team.

The above average effect alone cannot explain the entire disparity between people's perceived abilities and actual abilities. If people are not playing the game they think they are, the above average effect is the least of their worries. Monetary decisions really are made on an entirely different playing field than most people realize. If an athlete thinks that he or she needs soccer skills to be successful both now and in his or her future, he or she will spend a lot of her efforts developing soccer skills. Some of those skills will have generalizability to sports in general, but many will not. Since many people believe monetary decisions are primarily rational, they arm themselves with data, spreadsheets, and algorithms. Unfortunately, while these skills are by no means useless, they are not the complete skill set necessary for monetary decisions.

So what are the necessary tools for dealing with monetary decisions? Before one can understand that, one must more closely examine some of the irrational decision making behaviors that have been systematically measured and analyzed. By understanding the variety of problems with the rational decision making model of behavior, one can hone in on different skill sets that can be improved outside of what he or she might expect.

The Tversky example given at the start of the paper is a good place to begin. The shock value of only 3% of people making the rational choice under certain conditions is useful as an attention grabber. However, understanding the conditions that produce that level of irrationality is far more intriguing. Tversky describes several other situations where people make irrational choices, and his main explanation for the irrationality is the framing of the questions. For instance, in the first example, 100% of people make the rational choice when they only have to make one decision and choose between two options. However, only 3% make the correct decision when the options are framed as 2 separate decisions with two options each. One possible explanation is that people fail to consider the cumulative implications of their decisions when the decisions are presented separately. Essentially, people appear to be making the decisions independently without regard for how the other decision should impact their choice. This effect is known as minimal account, where only the direct consequences of an act are considered before it is made (Tversky, 1981, p. 455-457).

Another phenomenon that can have a profound effect on decision-making is outcome framing. Tversky uses the example of a down on his luck gambler who has lost \$140 at the horseracing track. Now, it's the last race of the day, and the gambler is considering betting \$10 on a horse that has 15:1 odds to win the race. How he or his buddies frame this bet will likely determine whether he will actually make it or not. One way to frame the decision would be as a likely total loss of \$150, since the horse with 15:1 odds is unlikely to win the race. However, if the gambler does not adjust his reference point, he will view the gamble as a potential to break even instead of as a likely loss, thereby rationalizing a gamble he would not have made on the first race of the day. Studies show that the most bets placed on long odds horses occur on the last race of the day, so it appears that the second type of outcome framing impacts hard luck gamblers (Tversky, 1981, p. 456). And anyone who had money in the stock market during the recent crash and recession had to feel like a hard-luck gambler, so could this effect have caused at least some people to take even more risks to win

back what they had lost? This paper was not able to find any current data to that effect, but perhaps that domain should be further explored, along with what differentiated people willing to take on more potential loss to try to win it all back from people who pulled out of the market.

Extensions on minimal account theory have included work that looks at how much people value their time. The typical study includes first a calculator priced at a lower amount, \$15, and a jacket priced at \$125. In that scenario, 68% of subjects are willing to drive twenty minutes to save \$5 on the calculator assuming they're about to buy both items. However, when the jacket costs \$15 and the calculator costs \$125, only 29% were willing to drive twenty minutes to save \$5 on the calculator. By this virtue, people are only accounting for the price of the calculator and not the jacket. Since they do not look beyond immediate consequences, people end up placing very different money values on their time in different situations. In a follow up study, which included nine different pricing scenarios and fill in the blank prices to eliminate other potential confounds, subjects ended up valuing twenty minutes of time from as valuable as \$454.81 to as inconsequential as \$1.88 (Azar, 2007, p. 6).

While these framing effects do have profound effects on decision-making, so far many of the mechanisms of how they work are less well understood. Minimal account could be explained via a biological mechanism. From an evolutionary perspective, the people that survived were the ones who were able to make snap decisions that kept them alive, not people who would crunch long-term calculations in their heads. On the other hand, minimal account could be explained as a result of cognitive heuristics. If someone is paying only minimal attention to the decision, he or she will make the decision using peripheral processing. This route relies on shortcuts, known as heuristics, to make decisions (Tversky, 1974, p. 1124). Going back to the original Tversky example, the sure gain of \$240 just seems right, and any subsequent decisions are not factored into the choice, a decision made as a result of heuristic based decision-making. Central processing, where one is focused solely on making the decision and willing to spend the cognitive resources to make the decision, would make the decision by taking both options into account and actually performing all the calculations necessary to make the best choice. As previously discussed, this type of decision-making is paradoxically both common sense and appears to almost never happen in real world decision-making.

Going outside of the normal realms explored while addressing this issue, the social psychological concept of cognitive dissonance could provide an explanation for outcome framing. People want to view themselves in a positive light and will change their beliefs to give their actions more of a positive spin. Consider again the case of the gambler with the \$140 debt and the choice whether to bet \$10 on the horse with 15:1 odds. One reason he might choose to frame his outcome as a chance to break even is because he has been gambling all day. He does not want to view his past actions in a negative light, so he changes his beliefs. He likely would not believe a 15:1 shot had a great chance to win at the start of the day, but to resolve his dissonance he will gladly change his beliefs as long as he can justify his previous actions (Harmon-Jones, 2008, p. 73).

However, this is not to say that only particular combinations of choices lead to irrationality. There is another framing phenomenon affecting the individual choices. People systematically have been shown to be risk-averse when making decisions about potential gains, but risk-taking when making decisions about potential losses. Tversky's dramatic example includes choosing a program that either certainly saves 200 people from a diseased population of 600 or a program that has a one third chance of saving everyone in that population and a two-thirds chance of saving no one. 72% of the subjects chose the certainty. However, when the question was reframed, the result was very different. If the options were framed as either adopting a program where 400 people will die or a program that has a one third probability of no one dying, 78% of subjects chose the program that has a one third probability of no one dying (Tversky, 1981, 453). Again, these options are mathematically equivalent, but the framing of the questions drastically affected the outcome. This decision-making quirk extends to monetary decision-making, as these principles are the bedrock of prospect theory, developed by Tversky and Kahneman in 1979 (Levy, 1992, p. 180).

There have been a multitude of variations on this particular study, and some of them have directly involved monetary decisions. One variation involved measuring certain emotions being experienced by the subjects and then having them make monetary decisions, one positively framed and the other negatively framed. The study found that the negative emotions distress and anger do not moderate framing effects. Essentially, negative emotions are not associated with people given a positively framed question becoming more risk averse, nor are they associated with subjects given a negatively framed

question become more risk-taking. Also, the positive emotion enthusiasm does not appear to moderate framing effects either. However, the emotion of enthusiasm was associated with greater risk taking behavior overall (Druckman, 2008, p. 311).

This study should definitely be expanded upon. First, the inability of negative emotions to moderate framing effects could speak to the theory that negative emotions tend to focus one's attention on a problem and might therefore even exacerbate certain framing effects (Kok, 2008, p. 3). Also, positive emotions other than enthusiasm could have differential effects on framing as well. In the same study, the experimenters also examined the effects of emotion on a non-monetary decision, one that involved saving lives. In that scenario, the emotions experienced had a significant effect on how much the subject was affected by the framing. Subjects who reported being more distressed were shown to be much more susceptible to framing. However, subjects who reported enthusiasm were much less affected by framing. Anger did not appear to either accentuate or diminish the framing effect (Druckman, 2008, p. 310).

Perhaps the link between the emotions and the monetary question itself was not strong enough to measure the effects adequately, since there was no experimental inducement of any emotion. While the other question dealt life and death, an emotionally loaded topic, the monetary question dealt with \$1,000 of a community's money. While \$1,000 is not a small sum of money, an entire community losing that amount is likely not associated with nearly as much emotion as the possibility of hundreds of people dying. Future experimenters would have several options. First, the experimenters could experimentally induce different positive and negative emotions, and then observe the effects on adherence to framing effects while making a monetary decision. If the experimenters choose to stick with self-reported emotions, they could raise the stakes of the question by having the subject imagine a substantial amount of their own money being on the line, such as a college or retirement fund. Also, as alluded to earlier, there should be greater differentiation among emotions, especially positive emotions, where differentiation is often neglected. For example, could elevation have a different effect than *schadenfreude* on adherence to framing? A differential in the effects of different positive emotions on other processes suggests that this is a possibility worth exploring (Kok, 2008, p. 4).

While these framing effects are all interesting and flow together well, they were not

Tversky and Kahneman's first or most well recognized contribution to the field. Not to say that the framing effect research was not influential, on the contrary it is one of the defining foundations of understanding practical decision-making in real marketplaces. However, the original collaboration between Tversky and Kahneman, while not dealing much with monetary decision making directly, broke down the use of heuristics in decision-making processes when uncertainties were involved (Tversky, 1974, p. 1124). First, an understanding of this influential paper is necessary for anyone wanting to understand the psychology of decision-making in general and can be applied in a multitude of ways to understand monetary choices.

The paper primarily discusses heuristics, which were briefly mentioned before as an explanation for minimal account. The use of heuristics in decision-making is widespread and the data should be terrifying to anyone who thinks that any type of decision is made rationally with any consistency whatsoever. Three different types of heuristics play a key role in decision-making: Representativeness, Availability, and Anchoring/Adjustment. By examining these heuristics at a basic level, one can acquire a more general understanding that will allow them to apply their knowledge of the heuristic to a variety of monetary decision-making processes (Tversky, 1974, p. 1124).

The first heuristic the duo explores is representativeness. Simply put, the representativeness heuristic causes one to make decisions based on how similar something, someone, or a situation seems to other things, people, or situations people have encountered (Tversky, 1974, p. 1124). On the surface, this strategy might seem like a good idea. People learn from their previous experiences, so being able to tell that something is similar to something else does not seem like it should necessarily lead to poor judgments. However, people will often allow their intuitive judgments that two things are similar overwhelm substantial evidence that would result in a different decision being made. For example, people are often insensitive to base rates, or how prevalent a certain thing or person is in a particular sample. People were told that they were reading a description of one man out of 100 possible subjects. The description is as follows: "Dick is a 30 year old man. He is married with no children. A man of high ability and high motivation, he promises to be quite successful in his field. He is well liked by his colleagues (Tversky, 1974, p. 1125)." The subjects were then asked to assign a probability that Dick was an engineer. In one condition, the subjects were told

there were 30 engineers and 70 lawyers, and in the other condition the subjects were told there were 70 engineers and 30 lawyers. Subjects assigned a probability of 50% in both conditions. If the subjects had been paying attention to base rates, they certainly would have rated Dick being an engineer as a greater probability in the 70 engineers condition and a lesser probability in the 30 engineers condition.

The unlikelihood that someone is attending to base rates can have a profound effect on his or her ability to make decisions about money. Essentially, learning a minimal amount of information about something where the base rates are not known causes people to make more irrational decisions than if they did not have that information. So, someone being swayed by one particular article or quick advice from a friend of a friend will likely make poorer choices about which product to buy or which stock to invest in than someone who knows generally what kind of stocks or products are available in that category and nothing else. Based on this principle, it may be better to go in blind than gather incomplete information.

Tversky and Kahneman also explain how the gambler's fallacy contributes to errors in the context of the representativeness heuristic. The gambler's fallacy occurs when people convince themselves that events independently determined by chance somehow have memory and that a certain outcome is "due." A classic example is someone seeing red come up several times in a row on a roulette wheel, then betting on black for the next spin (Tversky, 1974, p. 1125). This fallacy occurs because of a poor understanding of how chance translates to small number settings. Since a fair coin has a 50/50 chance of coming up heads in the long run, people will believe that a heads is inevitable after a run of tails. However, the law of large numbers applies to exactly what it says it does, large numbers of trials. Trying to apply the law of large numbers to a series of ten coin flips is the equivalent of trying to apply the theory of relativity to a car going twenty miles per hour, both misguided and not likely to help one address the relevant issues. Investors may be susceptible to this fallacy as well. If the market has gone unexpected directions several times, it might be tempting for the investor to intuit that the market somehow owes him or her one. This temptation can lead to devastating results, because the movement of the market is entirely independent of one individual's decisions.

The gambler's fallacy has also been observed in real casinos with players betting their own money. Interestingly, if a person exhibits a tendency towards the "hot hand" fallacy as well,

where the player will bet on a particular outcome because it has occurred several times in a row (Sundall, 2006, p. 9). While obviously the gambler cannot commit both of these fallacies at the same time, the fact that gamblers who are susceptible to one are often susceptible to the other could be useful data in several ways. First, there could be an underlying cause that contributes to fallacies. Locus of control has been suggested as a possible cause but the data gathered seems insufficient (Sundall, 2006, p. 10). However, regardless of whether locus of control is the underlying cause, understanding that the two fallacies often do coexist can help researchers reassess the issue of finding the causal mechanism for both fallacies. Also, if the gambler's fallacy is related to the hot hand fallacy, perhaps it and/or other fallacies are also interrelated. Further research where experimenters investigated the intercorrelations between a variety of fallacies would be a difficult undertaking, but a worthwhile endeavor to see how these decision making shortcuts are related. Isolating and examining the effects of individual fallacies in the lab is a great starting point, but observing how these fallacies are related during actual decision making processing will give investigators a wide potential of new avenues to study.

Another effect that sneaks past people's attention is their general insensitivity to predictability. If one reads a description of a company, how favorable the description is in regards to the company affects how profitable that person thinks the company will be, even if the description has nothing to do with things that would generate profit (Tversky, 1974, p. 1126). In other words, if someone were to show a subject a positive description of a student's extensive volunteer work with the homeless, that subject would rate that student's potential for academic success at a higher rate than if the description of the volunteer work was only mildly favorable, even though how a person is as a volunteer likely says very little about how they are as a student, considering the myriad of contextual differences between the two situations.

A cousin of this fallacy is the illusion of validity. This illusion plays on the fact that people will generally make predictions about someone or something based on whatever information they have, even if they know that information is spotty at best or woefully out of date (Tversky, 1974, p. 1126). Especially when the information is consistent with itself, such as a ROTC cadet receiving several identical scores on aptitude tests, people will be especially confident with their predictions as opposed to their confidence when the scores on the aptitude test are more varied but average to the same score

However, predictability is statistically more valid if the input scores are independent and varied as opposed to redundant inputs, which give a sparse amount of information by comparison to the more diverse inputs (Tversky, 1974, p. 1126).

When it comes to monetary decisions specifically, one example has already been illustrated. Investors might be enthralled by a glowing report about one large company's efforts to go green by adding solar panels to their main office headquarters. However, this type of information has very little to do with overall profits of the company, thus making the data relatively useless to potential investors. On the other hand, a mediocre report about the complexities of employing green practices throughout the inner workings of another company would likely not cause investors to experience any kind of excitement, even though those changes are much more likely to have an impact on long term profits and could make the company a smart investment.

Also, someone can be swayed into believing that costs will be lower for a project than they actually will be because they do not attend to cues that could affect pricing. Unlike the other examples, the person is not duped primarily by the tone of the presentation, but rather by not knowing which predictive effects are important to attend to (Gunner, 1999, 269). So, while he makes every effort to attend to the proper data, his inherent lack of knowledge causes him to attend to details that might prove inconsequential while ignoring data that could be crucial. The vicious cycle of incompetence assures that someone who is incompetent does not have the capacity to realize his or her own incompetence (Dunning, 2005, p. 15). Without this realization, many people will continue to believe they are making decisions about as well as can be expected, even if their objectively their decision making processes are completely nonsensical.

Going back to the tryout analogy, it's as if the coaches do not flat out tell the players they were rejected because they displayed soccer skills while they were trying out for a basketball team. Instead, the coaches give somewhat ambiguous feedback, leaving the players scratching their heads. This is often how real feedback from monetary decision-making works, as the results of the decisions can be flat out misleading. Sometimes due to chance, investing in the company with the solar cells will turn out to be a great investment, even if the actual reason for investing in the company was suspect. On the other hand, maybe the company that is trying to institute green practices throughout the organization

turns out to be a bad investment because an area of senior management is found cooking the accounting books. If people look only at the consequences of the decision making process instead of the process itself, they will be giving themselves a lot of false feedback on what works and what does not.

The last element of the representativeness heuristic Tversky and Kahneman examine is misunderstanding of regression to the mean. They do not directly reference their earlier discussion of gambler's fallacy, but the two are related. People committing the gambler's fallacy expect an instantaneous regression to a statistical mean, despite the fact most elements of chance have no memory. However, there is another way to misunderstand regression towards the mean. The classic example is flight instructors who gave praise after the best landings and punishments after the worst. Subsequently, the instructors noticed that the pilots who had been punished improved on their next landing while those who had been praised had a poorer landing the next time they were graded. These data points led the instructors to believe that punishment improved performance while praise diminished performance (Tversky, 1974, p. 1127).

This conclusion demonstrates a gross unawareness of regression to the mean. If an average pilot has an exemplary landing, it follows that a subsequent landing will likely be less exemplary since the pilot has performed at the top of the scale and his average performance lies in the middle of the same scale. Thus, for every exemplary performance, there will be a correspondingly poor performance. This works the same way in reverse when an average pilot has a horrible landing (Tversky, 1974, p. 1127). So, the instructors, ignorant of the regression to the mean, falsely attributed the improvements in performance to punishment and began using more punishment in their teaching curriculum while essentially eliminating the use of praise. However, the psychological literature suggests these strategies are both counterproductive to improving performance, so the flight training school ended up seeing decreases in performance across the board. Investors can make this mistake as well. After watching an investment over-perform for a while, it is infinitely tempting to dissect every possible reason it starts performing more normally again. However, by seeing patterns where there are none, people could end up making poor decisions not only with that investment, but in the future as well. Misunderstanding of regression to the mean has been shown to negatively impact investment decision-making dealing with mutual funds (Moore, 1999, p. 98).



The second heuristic examined by Tversky and Kahneman is the availability heuristic. This heuristic states that people will make decisions based on situations or ideas that are most easily accessible in their minds (Tversky, 1974, p. 1127). Memories and experiences are not neatly filed away waiting to be taken off a shelf and re-examined. Manipulating how people recall things can be as simple as showing them a picture of a certain event or presenting numbers in an increasing or decreasing order. One example of a glitch in the availability heuristic is how easy different types of information are to retrieve. For example, subjects who heard a list of male and female celebrities recalled there being more males on the list when the male celebrities were more famous and more females when the female celebrities were more famous (Tversky, 1974, p. 1127). The assumption here is that things that can be more easily recalled for one reason or another will be dubbed as more prevalent. This assumption is validated again by the house on fire example previously alluded to. Subjects primed with a picture of a burning house will report that house fires occur more often than those who were not primed with the picture (Tversky, 1974, p. 1127).

A recent monetary example of this element of the heuristic at work would be when people pull their money out of the stock market after a huge crash, such as the crash that occurred in 2008. While the rational market tip is to buy low and sell high, people were doing the exact opposite, pulling out of the market at its lowest point. And you could count a lot of people out of beginning to invest in the stock market during the crash (Nocera, 2008). In both of these cases, the availability heuristic was likely at work. While rationally, investing for the first time or sticking with a diversified portfolio might have made the most sense over time, people were being assaulted with headlines about the worst economic downturn since the depression and how the government needed to bail out large companies so that the entire economy would not go under. In the aftermath of all this negative fall out, it would be very easy for people to recall things going spectacularly wrong, and hard to remember that the stock market had very recently been and still would be a good investment on average over the long term.

An offshoot of this inability to recall is an insufficient ability to perform a certain type of search for something in one's memory. For example, the classic test for this is asking subjects what is more common, words starting with the letter "r" or words where "r" is the third letter. A large number of subjects answer words where "r" is the first letter, since it is much easier to recall words by their first

letter than their third letter. This phenomenon likely stems from the fact that people perform searches for words by their first letter and almost never perform searches for words by their third letter (Tversky, 1974, p. 1127). An example of this search error in monetary decision-making requires more of a subtle touch. Often people make shortsighted monetary decisions because they simply do whatever they have been doing without regard for other potential alternatives. Since they have often performed their chosen method for buying products or making investments, that style is easily recalled and applied. Also, confirmation bias will cause people to see the situation as confirming what they already believe, in this case that their monetary decision is a smart one. However, there could be better alternatives left unexplored because of the use of this heuristic (Nickerson, 1998, p. 175).

Another bias examined is the bias of imaginability. There are some situations that are just easier to conceive of than others. For example, it is easier to construct all the possible two person committees from ten people than trying to construct all the possible eight person committees with those same ten people. With smaller numbers of committee slots, it is easier for a subject to mentally construct groups that entirely distinct from each other containing none of the same members. The more complex and difficult the situation becomes to imagine, these types of committees get harder and harder for someone to form, and so the total number of groups the person is able to imagine goes down (Tversky, 1974, p. 1128). The bias might help explain why people approaching retirement are reluctant to invest in annuities, which involving investing a sum of money and then having the annuity pay out a set amount of that money each year. This avoidance of annuities is especially peculiar when one considers they have a high relative utility. However, especially at retirement age, imagining the possibility of death could be much more salient than the possibility of living to an old age. Taking this into account, many retirees might choose to invest their money other ways, since they would not want to lose the enjoyment they might get from their money by investing it in an annuity that could tie up some of those funds for a long haul they might not get to see. Their worry that they will not be around to enjoy the money overcomes logic and they choose to invest elsewhere (Hu, 2007, p. 78)

Also, this imaginability bias can take another form entirely. If someone looks at the after graduation backpacking trip a student intends to take, he or she can probably imagine a lot of situations, like an avalanche, that the recent graduate would not

be able to deal with easily. However, how easily these situations are imagined is by no means correlated with how likely those events are to occur. In fact, focusing and planning for extremely unlikely disaster scenarios can take away valuable resources from considering and examining problems the backpacker is much more likely to face (Tversky, 1974, p. 1127).

Another bias that takes away attention from actual concerns is the illusory correlation effect. In a study that demonstrates this effect, subjects look at a drawing of a mentally ill person had drawn along with that person's diagnosis. Subsequently, the subjects vastly overestimated how often things that would be intuitively related to a diagnosis, such as larger eyes in the drawings being correlated with suspiciousness. This illusory correlation continued to effect subjects even when the correlation between the two was actually inverted, where drawings with smaller eyes were directly correlated with suspiciousness (Rabin, 1998, p. 29). This phenomenon could easily extend to monetary decisions. If someone has a belief about how a purchase might help her, she will likely see patterns that confirm this belief. As discussed earlier, challenging one's own beliefs can be incredibly difficult, and the illusory correlation plays a big role in that self-deception. This viewing of nonexistent patterns is completely unconscious, so no incentive will help anyone correct this line of thinking.

The last heuristic Tversky and Kahneman examined was the anchoring and adjustment heuristic. The other two heuristics have at least made sense on the surface, even if one did not understand their pervasiveness or the depth of their impact. However, this heuristic has dizzying effects that defy any superficial logical explanation. Essentially, given a starting point, people cannot adequately adjust for what the actual value might be, meaning that one can easily influence the response given by introducing starting points of different values (Tversky, 1974, p. 1128). To demonstrate this effect, experimenters had subjects observe a spun wheel that had different number values from 0 to 100. Subjects were asked to estimate whether the percentage of African countries in the United Nations was higher or lower than the spun number, then give their estimate of the exact percentage.

The wheel was manipulated so that for half the subjects it landed on 65 and the other half it landed on 10. The average estimate of subjects who initially saw a 65 was 45 percent, while the average estimate of subjects who initially saw a 10 was 25 percent. Again, these subjects merely saw that number come up on a spinning wheel that they had

no reason to assume would be anything but random. However, this arbitrary number resulted in estimates twenty percentage points apart (Tversky, 1974, p. 1128). Even scarier, these anchoring effects take hold even when the numbers serving as anchors are entirely ridiculous. Everyone knows that the average temperature of San Francisco is nowhere near 558 degrees Fahrenheit, and as amazing as the Beatles were they did not have anywhere near 100,025 top ten albums. However, subjects in both cases gave significantly higher estimates than those who were primed with a low anchoring number (Poundstone, 2010, p. 13).

Anchoring also explains why people erroneously tend to choose conjunctive events or disjunctive events while trying to win a bet. Logically, the conjunctive events, where the first one must occur for the second one to even be possible, are less likely to occur because if the first event fails the second event cannot even occur, reducing the possibility of a favorable outcome to zero. In disjunctive events, only one of the events has to succeed to have a favorable outcome. When the focus of a subject narrows to the apparently higher probabilities of the conjunctive events, they anchor to it and cannot sufficiently adjust for the fact that the disjunctive events actually offer better mathematical odds (Tversky, 1974, p. 1129). Anchoring is hugely important when one considers pricing and value of various objects people purchase. What exactly makes a car worth \$20,000? Or a jar of peanut butter \$3.49? People often cannot comprehend something's absolute value, so they rely entirely on comparison to other similar goods. A car that seems similar to the \$20,000 car might seem like a steal at \$18,000 even if the car's absolute worth is only \$5,000 (Poundstone, 2010, p. 204).

While lay people are often completely unaware of this fact, people who sell things for a living know the trick well. The author of this paper recently visited a country where bargaining is the rule in monetary transactions. In markets, the sellers would start out with prices so high that naïve people assumed that the product was worth about that much, and only bargain down to a slightly lower price. However, savvy buyers would name a very low price first and walk away if the seller named too high a price in return. Both sides were attempting to use anchoring to their advantage, and the key factor seemed to be the willingness to walk away. Often in monetary transactions, the possibility of not buying a product or service seems too inconvenient to consider walking away. Perhaps the willingness to walk away in bartering situations gives people a low anchor, the potential that this particular service or good is worth

zero in that particular context, which helps them avoid overpaying.

Preference reversals are another beyond mind-blowing effect examined by Tversky and Kahneman. In another reversal, Tversky and Kahneman did not perform the original work on this theory. The original examination of the stunning effect was actually done by Ward Edwards, Sarah Lichtenstein, and Paul Slovic. Slovic later collaborated with Tversky and Kahneman to dissect the possible causal mechanisms. In the research scenario, subjects are offered the choice between a bet where they have a high chance of winning a small amount of money or losing a tiny amount of money, designated as the P bet, or a very low chance of winning a lot of money and a high chance of losing a moderate amount of money, designated as the \$ bet. In the original study done by Slovic and Lichtenstein, the subjects first went through a task where they looked at pairs of bets, one P bet and one \$ bet. The subjects then indicated which of the two bets they preferred. Then, after an hour of filler tasks, the subjects were shown first 6 unrelated bets and then the 13 bets that they had seen before in the previous preference task. The subjects were then asked for each bet separately to give an amount of money they would cause him to not care whether he got to play the bet or accept the selling price (Lichtenstein, 1971, p. 47). Out of 173 subjects, 123 of them said that they preferred the P bet during every preference choice, but without fail said they would demand a higher selling price for the \$ bets. Nearly every subject reversed preferences at least once. Essentially, the subjects were saying they preferred one bet, but placed a higher dollar value on the other one. This experiment was replicated several times with slight variations, such as having people bid on the bets instead of thinking about a selling price (Lichtenstein, 1971, p. 47-55). That variation in particular was done to combat the endowment effect, where people overvalue something they already have from a monetary standpoint. During all those replications, the preference reversal still occurred.

A phenomenon like this seems like it must be an artifact of a research laboratory. The paper did receive some criticism, especially that people who knew that there was no money involved were simply being lazy and not attending enough to the information given to them to make correct decisions (Poundstone, 2010, p. 72). However, an opportunity arose to show that this phenomenon occurred when there were much higher stakes in a real world setting. Edwards had a benefactor who owned a large casino in Las Vegas. The benefactor allowed the experimenters to run a ten-week study with no house

advantage to test if the preference reversal translated to real life scenarios. The game was extensive and transferred the principles of the laboratory to a roulette game with adjustments to ensure the honesty of participants. The results were the same, the P bets were preferred and the \$ bets were priced higher, and this was when the participants were playing with their own money. The greatest loss and adjusted for inflation were both around \$500, but a particularly intriguing statistic was that the average player lost money (Poundstone, 2010, p. 74). This occurred despite the complete lack of a house advantage. The implications of these preference reversals cannot be understated. They shatter the idea that people make choices based on the greatest expected utility of those decisions. When asked to evaluate choices in terms of preference, people go with the seemingly rational, safe decision. However, once they have to describe their preferences in dollar amount, people completely lose their bearings. But how is all this related back to Tversky and Kahneman? The explanation for the causal mechanism of preference reversals is the anchoring and adjusting heuristic proposed by the dynamic duo of Tversky and Kahneman. They proposed that when subjects had to describe the bets in terms of money, they anchored to other monetary amounts, namely the higher prizes. When they tried to adjust to that anchor they performed insufficient judgments, consistent with principles of the heuristic, and therefore the monetary valuations were closer to the high prize. When looking at the pairs of bets they preferred and no need to give a monetary answer, the subjects went with the bet they were more likely to win because their frame of mind was focused on what they wanted, not how they would exactly value it (Tversky, 1990, p. 215). The author chose to focus on this original preference reversal paper because it is considered to be the paper that revolutionized the field. However, the experimenters ended up using work by Tversky and Kahneman that explained the causal mechanism of the phenomenon. Lichtenstein, Slovic, and Edwards may have fired the first shot of the revolution, but Tversky and Kahneman were the ones who understood how to load the gun.

As evidenced by the myriad of previous examples, Tversky and Kahneman's original papers provided the foundation for much of the future work done on the monetary decision making process. One of the main features of all of these heuristics is that incentives to overcome them did not diminish their effects. As Kahneman stated in a later paper, incentives can eliminate careless errors, but they will not nullify complete cognitive self-deceptions (Kahneman, 1991, p. 144). Going back to the confused players trying out for the basketball team,

being paid just to perform well at the tryout might have eliminated some careless free kicks, but the players would have still been playing soccer instead of basketball. So, even when people are trying to play close attention and perform their best because there are real stakes, they still make the same mistakes. These mistakes are not limited only to everyday people. Even highly trained researchers make the same mistakes if the situation is disguised sufficiently (Tversky, 1974, p. 1130).

So what is the ideal decision making process? Since a wide variety of studies examined thus far have looked at the fallacies of heuristics, an obvious option would be to endorse a completely rational decision making process. In this process, people would determine all their options, compute the probability of that outcome occurring, and assess the desirability of each of those potential outcomes (Bohanec, 1988, p. 60). However, there are several aspects of this system that cast doubt upon its fitness as a one size fits all decision making model. For instance, in practical situations it is often impossible to conceive of all the possible alternatives to a monetary choice. Will the car someone really want go on sale in a week after they bought the car that made the most sense financially? Will having onion rings make someone happier than the side salad they purchased instead? Is there another small market stock someone would have a better chance seeing long terms gains from? The alternatives to nearly every choice people make in the real world can seem endless, and taking time even to try to list all the plausible would, in a myriad of cases, be spectacularly inefficient. One could argue, as has been stated earlier in this paper, that heuristics are time savers that sacrifice accuracy for speed. However, there is an emerging literature that suggests the possibilities that using heuristics, paradoxically, might be the most rational way to make decisions in given contexts, even more so than the rational decision making model (Gigerenzer, 2011, p. 455). The environmental structure, dictated by uncertainty, redundancy of the cues, sample size, and the uniformity of the cues, can determine both if the use of heuristics are appropriate at all and which heuristics are appropriate in that given context. Also, there is some evidence that there is such thing as information overload, where having only a few pieces of information can lead to better predictive abilities of outcomes than having all of the

information (Gigerenzer, 2011, p. 455). However, there needs to be further expansion upon this research to topple the paradigm of heuristics as sacrificing accuracy for the sake of time.

Further examination of the effects of emotion on the decision-making process is necessary. Real-life monetary decisions are never made in a vacuum, they are made by harried schoolteachers, stressed parents, and sad executives. Further understanding how emotions play a role in these decisions will allow people to put themselves in the best possible situations when making important decisions.

Overall, monetary decision-making is even more complicated than it is at face value. Not only must one take into account a myriad of numbers and options, one must take into account the actual decision-making process and all the potential pitfalls on the road to good decisions. One of the more discouraging elements of the data gathered on the heuristics in particular was that even once subjects were made aware of the heuristics themselves the heuristically-oriented thinking remained. However, there are some bright spots. For example, merely phrasing the question differently can get people to attend to base rates, and if people are taught base rates they tend to attend to them in that context (Mellers, 1998, p. 462). If any wisdom can be derived from this paper, it is that people make monetary decisions far differently than they believe they do. Training oneself to realize when one is using those heuristics can be time consuming in itself, but likely worthwhile. If one can at least recognize when heuristics are being used, when a truly consequential choice is being made the individual can step back and make the decision in as well-informed a manner as possible. Also, while heuristics may result in some errors, one has to decide how much his or her time is worth. Is the time saved by buying a slightly more expensive cereal box worth more or less the amount of money one would save by spending the time figuring out the least expensive cereal that that person enjoys? And what about the possibility of other cereals that he or she does not know about but could enjoy? Or the further possibility of other grocery stores that might be offering a better deal? Psychologists can statistically define how much people's time might be worth, but only the individual can decide how much his or her time is truly worth.

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