Prospect Theory and Marriage Decisions

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In this paper, I present a marriage decision mechanism and apply the concepts of prospect theory to explain the marriage entry and exit choices of individuals. I derive several results regarding relationship choices under uncertainty. The theoretical setup demonstrates why prospect theory predicts a higher number of active relationships than expected utility theory, even if the relationship is found to be unsuccessful.

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Introduction

From the standpoint of economic theory, an individual's decision to marry is voluntary and is motivated by the potential of increased utility from household integration. The application of economics to marriage begins with the work of Gary Becker (1973), who stipulates the presence of a marriage market in which agents seek to select a partner who would give them the maximum payoffs, subject to constraints. The concept of marriage has been applied in modeling matching, labor supply, consumption and fertility. Moreover, mechanisms originally based on marriage questions, such as the matching principle proposed by Gale and Shapley (1962), have been extended to other fields such as college admissions and kidney exchange. Although questions of marriage and divorce are still considered esoteric by some economists, they continue to be incorporated into economic theory.

In this model, I assume that individuals who choose to enter a marriage derive payoffs from various characteristics of their partner. These payoffs are then mapped by a utility (or value) function, with the goal of utility (or value) maximization. The properties of these functions influence marriage decisions. Becker's (1973) analysis specifies that maximizing utility is equivalent to maximizing household production, which is a function of market goods and services as well as the time inputs of members. The payoffs considered in my model are similar to Becker's production outputs in the sense that they arise from household sharing and partner skill. However, my model assumes a case in which payoffs are uncertain and occur with some probability. I then compare the results arising under two models of decision making under risk: expected utility theory and prospect theory.

There have been some applications of prospect theory to questions of marriage and relationships. Frey and Eichenberger (1996) use implications of prospect theory and of behavioral economics to explain marriage paradoxes such as underestimation of the likelihood of divorce. However, they do not present a theoretical framework. Chaulk, Johnson and Bulcroft (2003) combine concepts from prospect theory and family development theory to evaluate the effect of family structure, marriage and children on financial risk tolerance. Jervis (2004) uses prospect theory concepts to derive propositions about human nature and values. Xiao and Anderson (1997) use prospect theory in a framework designed to evaluate the relationship between household financial need and asset sharing. To my knowledge, none of the literature currently available presents a formal theoretical model aimed at comparing marriage results under prospect theory to those under expected utility theory.

A brief review of the concepts of the two different decision making theories follows.

Theoretical Background

Expected utility theory (EUT) has long been considered the traditional economic approach to describing behavior under conditions of uncertainty. Under EUT, decision making under risk is a choice between gambles that yield outcomes x_i with probabilities p_i, where $\sum_{i=1}^{I} \mathrm{p}_i = 1$ for each gamble. An agent evaluates gambles by weighting the utility of each outcome $u(x_i)$ by the corresponding probability p_i and choosing the outcome that yields the highest total utility $U = \sum_{i=1}^{I} p_i * u(x_i)$. Expected utility theory assumes that agents are risk averse. This is reflected in the concavity of the utility function of their payoffs: $u" < 0$.

However, real-world economic choices made by individuals are frequently not in accordance with the predictions of expected utility theory. Most famously, this is demonstrated in the Allais Paradox, under which different framing of the same choice problem leads laboratory participants to make opposite selections of gambles. Empirical studies display many other examples of such formally inconsistent behavior.

Kahneman and Tversky (1979) present prospect theory (PT), an alternative framework of evaluating gambles, or prospects. When given a prospect, an agent performs operations to simplify the lottery into a form that lends itself to better evaluation by taking actions such as combining probabilities of identical outcomes or segregating a gamble into a risky and riskless component. This is known as the Editing Phase. Afterwards, the value $v(x_i)$ of each outcome is multiplied by its decision weight $\pi(p_i)$, and the prospect with the highest total value $V = \sum_{i=1}^{I} \pi(p_i) * v(x_i)$ is chosen. This is known as the Evaluation Phase.

The value function $v(x_i)$ is analogous to utility in the sense that it also quantifies a person's benefit from an outcome. However, value is a function of the position that serves as the reference point, as well as the amount of change (positive or negative) from the level under consideration. This model assumes that the value function is concave for gains, convex for losses, and steeper in the region of losses than in the region of gains. The weighting function $\pi(p_i)$ relates decision weights to stated probabilities. Decision weights measure not only the predicted likelihood of the event, but also the impact of each outcome on the desirability of the prospect. The marriage framework of this paper will build upon some of the properties of these functions, which are assumed as given from the work of Kahneman and Tversky.

As pointed out by Barberis (2013), despite the fact that prospect theory contains many remarkable insights, it is not ready-made for economic application, and it is difficult to integrate with traditional economic concepts. First of all, the editing operations are subjective and may be performed by some agents and not by others. This leads to uncertainty about the decision weights that result from a person's editing process. Additionally, since value functions depend on wealth levels as well as on changes in position, the analysis is complicated by the need to include the effects of multiple variables. Frequently, there is considerable difficulty in defining gains and losses, because the optimal reference level is unclear. Despite the seemingly attractive characteristics of prospect theory, it presents limitations due to the complexity and subjectivity involved in result generation.

This paper presents a framework that uses prospect theory to explain real-world relationship decisions, relying on observed behavioral trends rather than experimental data. I first introduce a baseline marriage decision mechanism that involves three stages: partner evaluation, relationship entry and relationship continuity. Next, I extend this model to a case with uncertainty in outcomes. I compare the marriage results predicted under expected utility theory to those predicted under prospect theory.

Baseline Model

To make a marriage decision, the individual evaluates payoffs $x_{m,t}$, $m = 1, \dots, M$, stemming from a partner's characteristics in each time period $t = 0, \dots, T$. These payoffs occur with certainty in the baseline case, though I will introduce uncertainty in the following section. There are M characteristics, which encompass marriage benefits and goods produced by the household. They are divided into four main categories: (1) *tangible benefits* such as enjoyment from the partner's cooking or wealth, (2) *intangible benefits* such as companionship and love, (3) *combination benefits* such as the ability to have children or to file joint tax returns, and (4) *specialization benefits* such as the gains from specializing in the workforce or in household activities.

By assumption, $x_{m,t} \in (-\infty, \infty)$. Therefore, the payoffs received from a quality can be both positive and negative. If $x_{m,t} > 0$, the relationship is defined to be *good* in characteristic m, corresponding to a case where an agent derives positive utility from this quality of his partner. If $x_{m,t} = 0$, the relationship is defined to be *neutral* in characteristic m, meaning no utility is derived or the characteristic is not present in the household. If $x_{m,t} < 0$, the relationship is defined to be *bad* in characteristic m, meaning the agent derives negative utility from this quality of his partner.

Payoffs from every characteristic are valued equally and, in the baseline case, each quality contributes an equal proportion $\frac{1}{M}$ to total utility. Utility payoffs of $U_t = \sum_{m=1}^{M} \frac{1}{M} u(x_{m,t})$ occur in every time period. I assume utility is separable in terms of characteristics, and there are no interaction effects between skills. Payoffs can vary from period to period due to a change in circumstances, so total lifetime utility is $U = \sum_{t=0}^{T} U_t = \sum_{t=0}^{T} \sum_{m=1}^{M} \frac{1}{M} u(x_{m,t})$. For convenience, I assume the agent does not discount payoffs received at points in the future, so the total lifetime utility is simply the sum of the utilities received in each period.

Every agent picks a partner who maximizes U and gives him the highest potential lifetime payoffs. In this model, the "wealth" that a person hopes to attain is welfare generated by the four categories of marriage benefits. However, it is not necessarily optimal for him to be in a relationship. In the second stage, the person evaluates the possible payoffs from relationship entry. There are positive payoffs from being single, the sum of which is denoted by S. These involve (1) *tangible benefits*, such as more apartment space or free time from not needing to cook for the partner, and (2) *intangible benefits*, such as independence or greater mobility. A person compares the highest possible lifetime relationship utility U_{max} to the utility of being single $U_S = u(S)$ to determine relationship entry. If $U_{max} \geq U_S$, the person chooses to enter the marriage, while if $U_{max} < U_S$, he decides to remain single. Partner search and comparison costs are assumed to be negligible. I also assume that the agent does not factor in the possibility of a future divorce at this stage.

If a relationship is entered, the third stage of the decision mechanism is the choice to stay in the arrangement or to leave it. This is the only step of the mechanism that is repeated every time period. An agent makes a marriage entry decision based on the payoffs he expects to receive. However, these payoffs can change, and a relationship may become bad in one or more characteristics. The presence of negative characteristics increases the likelihood that the marriage becomes unsuccessful and ends in divorce. Marriage dissolution involves *divorce costs*: payoffs with sum $D < 0$, which are divided into four categories: (1) *tangible costs*, such as monetary expenditures to dissolve the marriage or pay child support, (2) *intangible costs*, such as loss of companionship and love, (3) *segregation costs*, such as loss of reputation from being single, and (4) *despecialization costs*, such as the losses incurred from performing household activities which one is worse at than the former partner.

To make the third-stage decision, the agent compares the expected lifetime utility gain from remaining married U_{max} with the utility of divorce costs $U_D = u(D)$. I allow for the possibility of relationship recovery by assuming the negative utility occurs with probability $\rho < 1$, while the relationship recovers with probability $1 - \rho$, leading to payoffs of 0. The expected $E(U_{max}) = \rho * U_{max} + (1 - \rho) * 0 = \rho * U_{max}$. If $E(U_{max}) \geq U_D$, the person chooses to stay in the relationship, while if $E(U_{max}) < U_D$, he chooses to divorce. If divorce occurs, all stages of the decision mechanism repeat as in the initial case. The following table summarizes the complete baseline decision mechanism:

Table 1: Summary of Baseline Decision Mechanism

Stage	Time Period	Action	Mathematical Action
1. Partner Evaluation	$t = 0$	Pick the partner who gives the highest prospective lifetime utility	$\max U = \sum_{t=0}^{T} \sum_{m=1}^{M} \frac{1}{M} u(x_{m,t})$
2. Relationship Entry	$t = 0$	Decide whether or not to enter relationship	$U_{max}\ vs\ U_S$
3. Relationship Continuity	$t = 0, \dots, T$	Decide whether or not to stay in relationship	$E(U_{max})\ vs\ U_D$

Baseline Model with Uncertain Payoffs

In this model extension, consider a scenario in which payoffs are uncertain and they occur with some probability. The reader might wonder about the need for an uncertainty scale if the baseline model already assumes that payoffs may change from period to period. The distinction is necessary because these elements respond to different shocks. Payoffs $x_{m,t}$ can change from period to period due to the influence of outside factors. For example, if during period $t = 4$ an agent's partner receives an injury that no longer permits her to clean some parts of the house, the agent may lower his payoff from the characteristic of house cleaning from 20 to 10 for every $t > 4$. I define such payoff-changing factors to be called *exogenous influences*. If there are no further changes in the information set, the payoff will stay constant at 10 until period T, which is the end of the horizon of consideration in our model. In contrast, probability weights correspond to the likelihood of occurrence of a certain payoff. For example, if the person's partner has the same ability to clean the house corresponding to a payoff of 20, but takes on a job which will limit her time and force her to skip house cleaning on some days, the person will attach a lower probability to the payoff of 20 because now this factor will contribute less to overall utility. I define such probability-changing factors to be called *probability* *influences*. Since I now introduce decision making under uncertainty, I separate the model into the expected utility theory (EUT) case and prospect theory (PT) case.

As in the baseline model, in the first stage I consider an agent who receives payoffs $x_{m,t}$, $m = 1, \dots, M$ from a variety of marriage characteristics in each time period $t = 0, \dots, T$. For every t, he can adjust his value of $x_{m,t}$ based on exogenous influences. However, now he also evaluates the likelihood of occurrence of the specified $x_{m,t}$ based on probability influences. In the EUT case, the expected value of each payoff thus becomes $E(x_{m,t}) = p_{m,t} * x_{m,t} + (1 - p_{m,t}) * 0 = p_{m,t} * x_{m,t}$. By assumption $\sum_{m=1}^{M} p_{m,t} = 1$, but now the person faces uncertainty about the factor shares of each quality in contributing to total utility. There is a utility function mapping the possible outcomes to utility values, $U_t = \sum_{m=1}^{M} p_{m,t} * u(x_{m,t})$. Over the whole time horizon, total utility becomes $U = \sum_{t=0}^{T} U_t = \sum_{t=0}^{T} \sum_{m=1}^{M} p_{m,t} * u(x_{m,t})$. In the second stage, the person compares U_{max} and U_S to arrive at a relationship entry decision, entering the marriage if $U_{max} \geq U_S$ and remaining single if $U_{max} < U_S$. In the third stage, every period he compares $E(U_{max})$ and U_D to decide whether or not to stay in the relationship, continuing the marriage if $E(U_{max}) \geq U_D$ and ending the marriage if $E(U_{max}) < U_D$. Table 2A summarizes the decision mechanism for the EUT case:

Table 2A: Summary of Extended Decision Mechanism for EUT case

Stage	**Time Period**	**Action**	**Mathematical Action**
1. Partner Evaluation	$t = 0$	Pick the partner who gives the highest prospective lifetime utility	$\max U = \sum_{t=0}^{T} \sum_{m=1}^{M} p_{m,t} * u(x_{m,t})$
2. Relationship Entry	$t = 0$	Decide whether or not to enter relationship	$U_{max}\ vs\ U_S$
3. Relationship Continuity	$t = 0, \dots, T$	Decide whether or not to stay in relationship	$E(U_{max})\ vs\ U_D$

In the PT case, the agent completes the editing stage, identifying the potential outcomes and probabilities and simplifying their representation. In the first stage of the decision mechanism, he then considers payoffs $x_{m,t}$ and attaches values to them based on the payoff itself, as well as on the change from the previous welfare position.

Recall that value is a function of the reference point as well as the change from this level. People will respond differently to characteristics based on the expectations they set for their partners. For example, someone who does not expect their partner to drive them around is likely to receive more utility from an additional driving event than someone who is used to getting around only in cars. Rather than including an additional reference level component in the value function, I assume it is already factored into the subjective payoffs. In the case just discusses, an agent who does not expect to be driven around will attach a higher payoff to driving compared to the car-reliant agent.

Although the reference level is factored into the payoffs, the positive or negative wealth change is explicitly defined as $\delta = x_{m,t} - x_{m,(t-1)}$. The resulting value function in each period for each characteristic is $v(x_{m,t}, \delta)$ and by the assumptions of prospect theory it is concave for $x_{m,t} > 0$, convex for $x_{m,t} < 0$, and steeper in the convex region than in the concave region. The agent also has a decision weight function $\pi(p_{m,t})$. In each period, the person gets payoff $V_t = \sum_{m=1}^{M} \pi\left(p_{m,t}\right) * v(x_{m,t}, \delta)$. Over time, the total value received is $V = \sum_{t=0}^{T} V_t = \sum_{t=0}^{T} \sum_{m=1}^{M} \pi(p_{m,t}) * v\left(x_{m,t}, \delta\right)$. The value from being single is $V_s = v(S)$, with no δ component because the marital status remains unchanged. The value from divorce is $V_D = v(D, \delta)$. In the second stage the person compares V_{max} and V_S to arrive at a relationship entry decision, choosing to marry if $V_{max} \geq V_S$ and to stay single if $V_{max} < V_S$. In the third stage, every period he compares $E(V_{max})$ and V_D to decide whether or not to stay in the relationship. Analogous to the baseline case, he chooses continuation if $E(V_{max}) \geq V_D$ and divorce if $E(V_{max}) < V_D$. Table 2B summarizes the decision mechanism for the PT case:

Table 2B: Summary of Extended Decision Mechanism for PT case

Stage	**Time Period**	**Action**	**Mathematical Action**
1. Partner Evaluation	$t = 0$	Pick the partner who gives the highest prospective lifetime value	$\max V = \sum_{t=0}^{T} \sum_{m=1}^{M} \pi(p_{m,t}) * v(x_{m,t}, \delta)$
2. Relationship Entry	$t = 0$	Decide whether or not to enter relationship	$V_{max}\ vs\ V_S$
3. Relationship Continuity	$t = 0, \dots, T$	Decide whether or not to stay in relationship	$E(V_{max})\ vs\ V_D$

I assume that $u\big(x_{m,t}\big) = v(x_{m,t}, \delta)$ for $t = 0$. This initial period can be thought of as a time of marriage consideration, during which a person evaluates the potential characteristics $x_{m,t}$ of a possible partner. The payoffs will be the same for this period under both theories, because they are viewed as given facts about a potential match. Since consideration starts from the same initial position, we have that $\delta = 0$. Once the couple enters into marriage, the EUT and PT predictions start to diverge, because over time household activity and production can be valued differently under the two theories.

Also, note that if $p_{m,t} = \frac{1}{M}\ \forall\ m, t$, then the model does not have true uncertainty, and it reduces to the baseline case. In this case, the results discussed below will not be applicable, as there is no risk component involved.

Model Predictions

This section will apply the EUT and PT frameworks of this model to explain real-world relationship choices. Although agent actions given in this paper are not based on experimental data, they are nevertheless robust as they are consistently witnessed in practice. The key focus of this section will be the predictions of PT as well as the differences between PT and EUT. The first several results deal with the first and second stages of the decision mechanism, namely questions of payoff evaluation and relationship entry. Afterwards, I will evaluate results from the third stage of the decision mechanism, specifically choices between relationship continuation and divorce.

Result 1: Prospect theory predicts higher relationship entry than expected utility theory.

To explain this result, consider a case in which an agent considers some potential partner characteristic $x_{m,t}$, which is of higher value to the partner than to the agent. The agent knows there is a possibility that he will benefit from this characteristic of his partner after marriage. However, because he does not consider this element to be very important, the likelihood that he will dedicate time and other costs to learning this skill is quite low, and the probability of getting this payoff is small. By EUT, the resulting expected utility of this quality will be $p_{m,t} * u(x_{m,t})$. By PT, the value of the payoff expected from this characteristic will be $\pi(p_{m,t}) * v(x_{m,t}, \delta)$. Since we are in the initial consideration period $t = 0$, $\delta = 0$, and $u(x_{m,t}) = v(x_{m,t}, \delta)$ by assumption. By the overweighting property of PT, $\pi(p_{m,t}) > p_{m,t}$ for small $p_{m,t}$. Therefore, $\pi(p_{m,t}) * v(x_{m,t}, \delta) > p_{m,t} * u(x_{m,t})$, and the agent's valuation of his partner based on this characteristic in the initial period is higher under PT than under EUT. If preferences stay consistent in the future, the benefits of this quality will translate even to subsequent periods where $u(x_{m,t}) \neq v(x_{m,t}, \delta)$, because valuation of this skill has already been established. Assuming this partner is a marriage candidate, $V_{max} > U_{max}$. By transitivity, there is a higher likelihood that $V_{max} \geq V_S$ than $U_{max} \geq U_S$. Because qualities with such properties can be found for every person, there is a higher chance of relationship entry under PT than under EUT.

This prediction is consistent with real-world trends to rush into serious relationships. In this framework, such actions can be explained by an overweighting of small probabilities of large gains. Agents overvalue the potential marriage benefits from qualities that are present but not necessarily significant, which contributes to an affirmative decision of marriage entry. For example, a woman may know that her husband enjoys playing golf. She herself has never played the sport and does not attach much significance to it, but she considers the possibility that in the future she may learn to play it as well and derive some payoff. Realistically, learning this sport will not be a priority of her household life, but the potential payoffs have still been factored into her marriage decision, increasing the likelihood that the benefits from marriage will exceed the benefits from staying single. Therefore, if the person adopts a prospect theory mindset, he is more likely to enter a marriage relationship.

Result 2: Under prospect theory, less relationship entry occurs as the mean-preserving distribution of probability influences over time becomes wider.

Recall that probability influences are factors that impact the probability of receiving a payoff from a characteristic $x_{m,t}$. If the mean-preserving distribution of probability influences becomes wider, this means we have more variation in the likelihood of outcomes. Hence, we have some set $PM_1 = \{p_{m,1}, p_{m,2}, \dots, p_{m,T}\}$ and some set $PM_2 = \{p_{m,1}, p_{m,2}, \dots, p_{m,T}\}$ such that $Var(PM_1) > Var(PM_2)$. An agent will compare the summary functions $U_{max} = \sum_{t=0}^{T} p_{m,t} * u(x_{m,t})$ and $V_{max} = \sum_{t=0}^{T} \pi\left(p_{m,t}\right) * v(x_{m,t}, \delta)$. Note that in this case we are summing over time for one characteristic only. By construction, if probabilities are taken from PM_1, there will be more expected losses than if probabilities are taken from PM_2. In the EUT case, both gain and loss payoffs of $p_{m,t} * x_{m,t}$ lead to an equal absolute value change in utility. However, the PT value function depends on $p_{m,t}$ as well as on δ, and it is convex in the region of losses and steeper for losses than for gains. So, the losses are felt sharper under PT than EUT. Hence, $V_t < U_t$ by loss aversion for periods of losses. Therefore, $V_{max} < U_{max}$ in PM_1 compared to PM_2 since more losses are present in this case. By transitivity, there is a higher likelihood that $V_{max} < V_S$ compared to $U_{max} < U_S$. Hence, under PT, there is a lower chance of relationship entry in the case of a wider mean-preserving distribution of probability influences.

Stated informally, this result implies that, under PT, less people will enter relationships in which the probability of receiving the payoff is volatile among time periods. To see why, suppose an agent expects to derive some benefits from his partner's possession of a car and the resulting driving ability. Consider a possible distribution of returns generated by the agent:

Table 3: Sample Payoffs

Time Period	Probability	Payoff	Expected Payoff	Change from $t-1$
0	0.5	50	25	N/A
1	0.9	50	45	Gain
2	0.3	50	15	Loss
3	0.3	50	15	No Change
4	0.1	50	5	Loss

With prospect theory, the losses occurring in periods 2 and 4 will be felt sharply by this individual. When a person with PT preferences considers a potential relationship in which payoffs are subject to much variation, there is a higher likelihood that the calculated relationship value will be lower than the benefits of staying single. This result can explain why in the real world people invest in learning about the lifestyle of their partner to confirm the perceived likelihood of obtaining benefits. If we notice that a potential partner is unreliable and may not consistently provide the benefits we desire, we are less inclined to marry this person.

Result 3: In a case with potential relationship recovery, prospect theory predicts more people staying in unsuccessful relationships than expected utility theory.

The third stage of the decision mechanism, the relationship continuity choice, involves comparison of the expected value of mapped benefits (U_{max} in the EUT case and V_{max} in the PT case) to mapped divorce costs U_D or V_D. Consider a relationship in which bad characteristics outweigh good and neutral ones; hence for some time period $t = n$, we have $\sum_{m=1}^{M} x_{m,t} < 0$, $U_{max} < 0$ and $V_{max} < 0$. The person faces payoff gambles $g_1 = (\sum_{t=n}^{T} \sum_{m=1}^{M} p_{m,t} * x_{m,t},\ \rho\ ;\ 0,\ 1-\rho)$ and $g_2 = (D, 1)$. Gamble g_1 is the case of staying married. The formula comes from the fact that an agent can receive either negative payoffs with probability ρ, or no payoffs with probability $1-\rho$. The no payoff case models relationship recovery and occurs when the person's worst expectations about a relationship do not materialize, though the marriage does not improve to the point of providing positive payoffs. Gamble 2 is the case of divorce, which involves incurring divorce costs D with certainty. The complete marriage dissolution decision for the EUT case can be defined as a choice between $U_C = \left[\sum_{t=n}^{T} \sum_{m=1}^{M} p_{m,t} * u\left(x_{m,t}\right)\right] * \rho$ and $U_D = u(D)$. In the PT framework, the decision becomes a comparison between $V_C = \left[\sum_{t=n}^{T} \sum_{m=1}^{M} \pi\left(p_{m,t}\right) * v\left(x_{m,t}, \delta\right)\right] * \rho$ and $V_D = v(D, \delta)$.

Now, consider a case in which $\left[\sum_{t=n}^{T} \sum_{m=1}^{M} p_{m,t} * x_{m,t}\right] * \rho = D$. The agent faces a choice between a negative payoff with some probability and a less negative payoff with certainty, such that the expectation of the first option is equal to the value of the second option. By the expectation principle of EUT, $U_C = U_D$, so an EUT agent is indifferent between family conservation and divorce. However, in a PT framework, the person sees either a loss with certainty or a gamble giving him some possibility $1 - \rho$ of avoiding this loss. Because his value function is convex in the region of losses, he is risk-seeking and will choose g_1 in hopes of getting no payoff instead of a negative payoff. Under such payoff conditions, an agent with PT preferences will strictly choose family conservation over divorce. Therefore, PT predicts more people staying in unsuccessful relationships than EUT. Even though the proof presented has focused on the case when expected payoffs from conservation and divorce are equal, loss aversion will still imply more conservative relationship choices compared to a framework without this property.

The choice to keep trying with a failing marriage is certainly not uncommon in the real world. Due to loss aversion, people prefer to stay in a bad relationship in hopes of recovering their losses and coming back into a neutral or good situation, rather than incurring definite costs to end it.

Recall the example in Result 1, in which a husband's golf skills are valued higher under PT than EUT, even though they have a small probability of contributing to total utility. This overweighting of positive features increases the relationship's valuation under PT, and is another reason why people are more likely to stay in unsuccessful relationships.

Together, Results 1, 2 and 3 imply:

Result 4: Under probabilities of payoffs that are nondecreasing from the reference level, prospect theory predicts a higher number of existing relationships than expected utility theory.

Result 1 demonstrated how overweighting of partner characteristics leads to a higher number of relationships in a PT framework. Result 3 demonstrated the existence of cases under which people will strictly prefer relationship conservation under PT, but not necessarily under EUT. Result 2 demonstrated a possible caveat, describing how uncertainty in probability influences can make people less inclined to enter relationships under PT assumptions. In the current result, we assume that we are looking only at cases for which probability influences are nondecreasing with no changes in higher moments, hence the payoffs are received either at reference level $p_{m,r} * x_{m,r}$ or at some higher level $p_{m,t} * x_{m,t} > p_{m,r} * x_{m,r}$. Under these conditions, Result 2 does not apply, and PT leads to a higher number of relationships than EUT as explained in Results 1 and 3.

In fact, the assumption of payoff probabilities nondecreasing from the reference level is not as limiting as it may initially seem. If we set the reference payoff to be 0, any result other than that will be viewed as a gain and will increase the likelihood of an affirmative relationship entry decision due to the absence of losses and of resulting hesitation in a PT mindset.

In a real-world context, people are likely to derive more utility from relationships when they set low or reasonable expectations for their partners – recall the driving example given earlier in this paper. As long as we consider relationships in which a partner can certainly provide some minimum reference level of comfort (which could be zero if we incorporate low expectations as discussed in the previous paragraph), this framework predicts that the number of relationships will be higher under PT than under EUT.

This result also highlights a subtle point about the structure of this marriage decision mechanism. The relationship entry decision was influenced by properties relating to probability weights, while the relationship exit decision stemmed from the values of the payoffs. Manipulation of probability weights in the first case leads to a variety of nonnegative payoffs. This allows comparison with the benefits of being single S in the second stage. However, manipulation of payoffs opens up the potential of negative total payoffs, which is the only option leading to divorce, since the relationship continuity decision comes from comparison with the costs of divorce. Hence, the flexibility of these elements of my model allows for interesting conclusions.

Result 5: A prospect theory agent is more likely to choose marriage conservation that an expected utility agent even in the case when he has not adapted to the negative characteristics of his relationship.

Consider an agent who is in a bad relationship and has already incurred payoffs of y such that $D < y < 0$. During period $t = n$, he faces a relationship continuity decision in which he compares payoff gambles $g_1 = (\sum_{t=n}^{T} \sum_{m=1}^{M} p_{m,t} * x_{m,t}\ ,\ \rho\ ;\ 0,\ 1-\rho)$ and $g_2 = (D, 1)$. Again, assume for simplicity that $[\sum_{t=n}^{T} \sum_{m=1}^{M} p_{m,t} * x_{m,t}] * \rho = D$. If a person has adapted to the negative characteristics, we assume he treats the payoffs y as a sunk cost and does not consider them at all. The gambles of this *non-inclusion* case are as listed above. If he has not adapted to the downsides, the payoffs y are still fresh in his mind and are included in the current payoff level, and hence in the expected sum of lifetime benefits from the relationship. This is the *inclusion* case. For someone who has not adapted, the payoff gambles become $g_1 = ([\sum_{t=n}^{T} \sum_{m=1}^{M} p_{m,t} * x_{m,t}] + y,\ \rho\ ;\ y,\ 1-\rho)$ and $g_2 = (D + y, 1)$. Even in the inclusion case, an EUT agent is still indifferent between the two options by the expectation principle. The PT agent is still likely to choose g_1 (relationship conservation) in hopes of receiving the smallest possible negative payoff, which is y.

This result is plausible in the real-world context because people who have not yet accepted their partner's bad behavior may consider it a one-time occurrence and work on saving the relationship. Such a "red flag" does not necessarily equate one's negative relationship payoffs with the cost of divorce. People are likely to take the gamble of preserving their marriage, even in the case when unpleasant events are fresh in their mind.

Result 6: Prospect theory predicts the presence of an endowment effect from the relationship that is larger than under expected utility theory.

The endowment effect predicts that a person's valuation of an item increases with ownership. Assume the presence of a characteristic defined as *continuation*, whose payoffs are increasing over time, so $\delta > 0$ for every t. Since the value function in the PT framework incorporates payoffs x_m as well as the gain element δ, and the utility function in the EUT framework incorporates only payoffs x_m, the value of the relationship will be higher in the PT framework due to the attractiveness of constant gains. Therefore, $V_{max} > U_{max}$. Transitivity implies that there is a higher likelihood that $E(V_{max}) > V_D$ compared to the likelihood of $E(U_{max}) > U_D$. Therefore, PT with the presence of an endowment effect leads to a lower likelihood of divorce.

This result predicts that people will become more attached to their partners as time goes by, and this attachment is stronger under PT preferences than under EUT beliefs. Over time, people derive more and more benefits from the integration of activities and the strengthening of bonds. Therefore, this relationship becomes more valuable, and the effect necessary to incite breaking it off becomes larger, especially considering that older people may have less of the energy required to incur a divorce. This framework explains the result by pointing to the increase in value that occurs from simply being with a person.

This completes the listing of results that have been derived in this paper. Of course, I have not been able to cover every possible application of the marriage decision mechanism in the context of PT and EUT. The following section will present some extensions that can be tackled by future research.

Future Research Directions

Although the results of this model appear to be plausible considering the real-world behavior of agents, one possible next step to enhance the robustness of the framework would be to evaluate a variety of relationship studies to provide scientific evidence of the behavioral trends and relationship choices outlined. Admittedly, distinguishing effects consistent with EUT and PT will be much more difficult for a relationship choice context than for a gamble choice context as in Kahneman and Tversky's original paper. However, a careful attempt to do so would serve as a valuable addition to the content presented in this paper.

Additionally, the U_{max} and V_{max} functions presented here did not take into account the present value of future payoffs. A possible extension could incorporate a discount factor to create a more complicated optimization problem that considers the fact that payoffs received in the future may be less valuable than those received today.

This model assumes that there are no partner search or comparison costs in the relationship entry stage, and the possibility of future divorce is not considered in this step. Also, there are no gains from remarriage in the relationship continuity stage. Subsequent work can introduce these elements and thus enhance the relevance of this model to real-world conditions.

The current framework allows for the possibility of changing payoffs, yet it does not make an attempt to describe the processes governing these changes. I only assume that payoffs can either increase or decrease depending on exogenous influences. A possible extension could attempt to create a formal framework for the change in payoffs based on factors such as learning costs.

Finally, this model predicts relationship entry decisions based on potential utility benefits. However, it does not consider a case where there are multiple agents who have different preferences for each other. Another extension could explore a possible matching mechanism for agents with varying preferences, resulting in an allocation that is stable and optimal.

These varied examples demonstrate that this model is a useful benchmark that is flexible enough to be extended to more sophisticated economic questions.

Conclusion

The results derive in this model demonstrated that, in general, prospect theory predicts more relationship entry and less relationship exit than expected utility theory.

Formally, these results come from the properties of the weighting function and the value function when applied to a summation of the payoffs expected from each of the partner's characteristics. Practically, PT incorporates some important behavioral trends that are indeed present in many aspects of daily life, including relationship choices. Thus, the PT approach allows for a more realistic evaluation of relationship decisions compared to an EUT approach. Although there are considerable difficulties that arise when modeling PT relationships due to the subjectivity of editing operations and complexity of the weighting and value functions, it is nevertheless possible to apply PT to explaining real-world behavior. Hopefully, the marriage decision mechanism of this paper can serve a valuable extension of prospect theory to the economic analysis of marriage.

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