



Time-based versus money-based decision making under risk: An experimental investigation [☆]



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ABSTRACT

This paper investigates whether individuals make similar decisions under risk when the outcomes are expressed in time versus monetary units. We address this issue in two studies measuring individual risk preferences and prospect theory parameters (i.e., utility curvature, probability weighting, and loss aversion) for both time and money. In the first (resp., second) study we consider relatively small (resp., large) time and monetary outcomes. We find that individuals hold similar risk preferences for time and money; we also find evidence that “time is money” with regard to the utility curvature for gains, loss aversion, and decision weighting. However, individuals have different valuations of losing time and money. The utility function for small losses of money is more concave and variable than the utility function for small losses of time (Study 1), but the utility function for large losses of time is more concave and variable than that for large losses of money (Study 2). We argue that these results reflect a difference in the perceived slack of the respective resource.

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1. Introduction

Every day, individuals make risky decisions involving time outcomes, i.e. gains and losses of time—for instance, when weighing whether to take the longer, traffic-free way home (with the certainty of a 50-min drive) or the shorter, traffic-sensitive route (with equal chances of a 40-min or a 60-min drive), or when deciding whether to take the longer waiting line being serviced by an experienced cashier (with the certainty of a 10-min wait) or the shorter one serviced by an inexperienced cashier (with equal chances of a 5-min or a 15-min wait). Making these choices efficiently has become increasingly important in societies where more and more individuals experience “time poverty” (Leclerc, Schmitt, & Dubé, 1995). For many, time is not just a scarce resource, it is the scarce resource.

Despite the importance of time in daily life, we have a limited understanding of decision making when risky time outcomes are involved. One reason for this state of affairs may be the economic assumption that time-based decisions under risk should abide by the same principles as monetary decisions under risk (i.e., “time is money”; Becker, 1965). Yet, a growing body of psychological literature demonstrates that individuals treat time and money differently. Therefore, findings in

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the money domain do not always translate perfectly to the time domain (Leclerc et al., 1995; Okada & Hoch, 2004; Saini & Monga, 2008; Soman, 2001; Zauberman & Lynch, 2005).

In this paper we explore whether individuals make decisions under risk similarly when the outcomes are expressed in time versus monetary units. The current research thus considers time as an outcome (gain/loss) that a person receives in risky choice (and not as a duration that a person needs to wait in intertemporal choice). Following Abdellaoui, Bleichrodt, and l'Haridon (2008), we use the certainty equivalents (CEs) of two-outcome prospects to measure individual preferences for time and money under conditions of risk. The main advantage of a simple design based on CEs is that it allows for the measurement of attitudes toward risk without imposing any particular model of choice. Yet, in a next step, we also use Prospect Theory (PT, Tversky & Kahneman, 1992) to parsimoniously capture risk attitudes using psychologically meaningful parameters (Wakker, 2010). This is especially relevant for our purposes, since we attempt to illuminate decision processes in a relatively understudied domain.

Our results show that, without committing to any specific model of choice, individuals hold similar risk preferences for time and money. When assuming PT, we further obtain individual information on the utility function, probability weighting, and loss aversion. We find additional evidence for the claim that “time is money”—in particular, the utility function for gains, the loss aversion coefficient, and decision weights in the gain and loss domains do not differ across time and monetary contexts. Yet we also find evidence that “time is not money”: the utility function for losses differs across time- and money-based contexts. That is, the utility function for small money losses is more concave and variable than the utility function for small time losses, whereas the utility function for time is more concave and variable than the one for money when stakes are large.

The paper proceeds as follows. After reviewing the literature on time- versus money-based decision making, we describe the model-free measurement of risk preferences as well as the PT parameters for time and money outcomes. Next we report the results of our two studies, and we conclude with a discussion of our results.

2. Time-based versus money-based decision making under risk

In economic theory, it is assumed that the value of time can be derived from the value of money (i.e., “time is money”) and hence that time-based decisions under risk should abide by the same principles as monetary decisions under risk (Becker, 1965). The implication of this assumption is that individuals will make the same choice regardless of whether alternatives are described using monetary units or time units.

Contrary to the economic literature, research in psychology suggests that people treat time and money differently (Leclerc et al., 1995). For instance, Soman (2001) demonstrates that past expenditures (i.e., sunk costs) are given less weight when contemplating the investment of time than of money. Saini and Monga (2008) find that quick-and-easy heuristics are used more in the context of time-based than monetary decisions. Okada and Hoch (2004) show that, when individuals pay in time rather than money, they are willing to pay more for high-risk-high return gambles (that are expressed in monetary terms). Zauberman and Lynch (2005) show that individuals expect slack for time to be greater in the future than in the present (i.e., individuals expect to have more spare time a month from now than today) and, moreover, that this expected growth of slack is more pronounced for time than for money (i.e., individuals have relatively lower expectations of having more money a month from now than today).

The observed differences in time-based versus money-based decision making are primarily explained by the value of time being more “ambiguous” than the value of money (Okada & Hoch, 2004; Saini & Monga, 2008; Soman, 2001). Unlike money, which can be stored and is unambiguous (a dollar is a dollar in all circumstances), the value of time is perishable, malleable, and impossible to determine precisely. The use of time may well vary from one situation to another; the value of time is often determined ad hoc because it depends on characteristics of the individual and the situation. Zauberman and Lynch (2005) expand on this explanation by stating that, although the value of time is more ambiguous than the value of money in the long run, this is probably not the case in the short run. With regard to the distant future, the value of time is more ambiguous than the value of money because future plans are vague and can be easily moved around. In the immediate future, however, the value of time may be even less ambiguous than the value of money because immediate plans are concrete and difficult to move around. These psychological findings show that individuals treat time and money differently, but the literature has not clarified exactly how these two resources differ.

In sum, there are two conflicting views regarding the possibility that time- and money-based decision making are similar. Standard economics assumes that “time is money” and psychological literature assumes that “time is not money”. The aim of this paper is to investigate whether “time is money” when individuals make decisions *under risk*. Toward that end, we will use a robust and tractable method to measure individual preferences under risk both for time and for equivalent monetary amounts. A key advantage of this method is that it offers a systematic approach to studying the components that underlie decision making under risk (i.e., utility, probability weighting, and loss aversion). More specifically, we shall first obtain a model-free measure of an individual's risk preferences for time and money outcomes (in the form of CEs of several two-outcome prospects). Next we obtain information—at the individual level—about the PT parameters on which such a model-free measure is based (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). We are then able to address the question of whether “time is money” with respect to each PT component separately. For example, individuals may be equally optimistic about the chance of obtaining a specific time or monetary outcome (decision weights are equal across resources) but nonetheless value the outcomes differently (utility functions differ across resources).

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