Chapter 25
Evaluating the Role of Three Basic Factors of Prospect Theory in Decision Making: An Empirical Study

Evanthia K. Zervoudi
Athens University of Economics and Business, Athens, Greece

ABSTRACT

The main aim of this paper is to empirically evaluate the role of three significant factors of the Prospect Theory: the S-shaped value function, the loss aversion, and the distortion of probability, in decision making. In order to do this, a general behavioral reward-risk model is firstly setup and an empirical evaluation about the role of each of these factor, separately and in interaction, on the optimal solutions of the problem follows. For the analysis, well known US equity portfolios consisting by stocks listed in NYSE, AMEX, and NASDAQ formed on investment style are employed. The findings indicate that agents differentiate their behavior according to their type of preferences and their loss aversion level but they seem to always prefer high positively skewed assets such as small and value stocks. The attractiveness of positively skewed assets is re-enforced when probability distortion is introduced in the model. The introduction of probability distortion also affects the optimal perspective values of the problem increasing significantly their magnitude. After that, results show that as loss aversion increases agents tend to follow more conservative strategies, with and without probability distortion, while the value functional form has also its role in the model; bounded value functions as the negative exponential function drives agents to more conservative behaviors while unbounded value functions as the piecewise power function give the incentive to agents to undertake great risks and follow more aggressive strategies. The examination of the interaction of these factors indicate that the combination of an unbounded value functional form with a large loss aversion index may reduce agents' aggressiveness and limit (but not alter) the value functional form effect on optimal solutions.

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1. INTRODUCTION

For several years, Markowitz's (1952a) mean-variance rule was widely used in portfolio decision making analysis. This rule suggests a tradeoff between two simple but powerful criteria, the reward (mean) and the risk (variance); agents choose maximum mean portfolios under the constraint that the variance will remain below a specific risk level, or alternatively minimum variance portfolios under the constraint that the mean will remain above a specific reward level. Note that this rule concerns only totally risk averse investors whose preferences are described by a totally concave utility function while it assumes normally distributed asset returns. In practice, risky asset returns are usually not normally but positively skewed distributed while investors are not totally risk averse.

Kahneman and Tversky (1979) proposed the Prospect Theory (PT), as an alternative decision making theory that revolutionized the classical financial theories. In PT, agents behave rationally (prefer more than less) but they are neither totally risk averse nor totally risk seeking; more specifically investors tend to be risk averse for returns considered as gains and risk seeking for returns considered as losses. Gains and losses are determined by a reference point depending on the formulation of the offered prospects and the expectations of the decision maker; in the original version of Prospect Theory (Kahneman and Tversky, 1979) the most representative preference function is an S-shaped value function which is concave above the reference point (for gains) and convex below the reference point (for losses). This type of preferences, the S-shaped function, is characterized by two important parameters: the reference point (rp) and the loss aversion coefficient β. Another important issue in Prospect Theory is the probability distortion, i.e. the observation that investors do not weight outcomes linearly, but they tend to overweight small probabilities and underweight large and moderate probabilities. Several papers (Karmarkar (1978), Bleichrodt, Pinto and Wakker (2001), Nawrocki and Viole (2014) among others) are referred on how the use of Prospect Theory could improve the descriptive use of Expected Utility by taking into account issues as the probability distortion and the change of investors' risk attitude from gains to losses that the Expected Utility cannot capture.

This paper empirically evaluates the role of the three basic factors of Prospect Theory (PT): the value functional form, the loss aversion, and the probability distortion, within a PT framework. For the empirical analysis, are employed well known US equity portfolios formed on investment style, consisting by stocks listed in NYSE, AMEX, and NASDAQ, for the period between 1927 and 2013. The paper contributes to the relevant literature in a number of ways. Firstly, in order to examine how the type of agents' preferences affects decision making, two value functional forms, the piecewise power function and the negative exponential value function, are empirically evaluated and compared; these two value functions represent different types of investors while they have different properties that affect the analysis in a separate way. Secondly, in order to examine the effect of loss aversion on optimal solutions, some of the most popular loss aversion indices in the literature are employed; the choice of each of the loss aversion indices has been done in an appropriate way so as to be consistent to the value functional form under consideration. In this way, the paper arrives at general conclusions about how risk and loss aversion interact and how this interaction may affect the optimal asset allocations; the robustness of results are examined in view of loss aversion variations.

Thirdly, in order to examine the impact of the probability distortion on optimal solutions, two methods of weighting outcomes are used: (1) the classical linear probability weighting where the objective probabilities are used, as in the classical Expected Utility Theory (no probability distortion), and (2) the objective probabilities are replaced by decision weights using three different probability weighting