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Aggregate investor preferences and beliefs in stock market: A stochastic dominance analysis

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ABSTRACT

This paper analyzes whether the market portfolio is efficiently related to benchmark portfolios formed on size, value, momentum and reversal with various utility theories by using stochastic dominance criteria. The results support the prospect theory including assumption of loss aversion at monthly and yearly horizons, which indicates the market utility is S-shaped, and steeper for losses than for gains. And, the findings do not provide convincing evidence for positive skewness preference. Therefore, it should probe into asset pricing model and financial puzzles by prospect theory preferences. It may thus be difficult for the market to benefit from the asset through its features on skewness or other higher order central moment. We also develop several bootstrap procedures with favorable properties in statistical size and power for testing stochastic dominance efficiency.

1. Introduction

The aggregate of investor preferences and beliefs in stock market is the starting point of economics study and finance research, and is a much-debated topic in financial economics. Several asset pricing anomalies suggest that the market portfolio is significantly mean–variance (MV) inefficient relative to the stock portfolios formed on variables such as market capitalization (size), book-to-mark equity ratio (value), price momentum, and price reversal.[1] So it should extend or change traditional quadratic form utility to understand the market. Moreover, various risk preferences could be investigated with the pricing model by introducing alternative classes of utilities.

This paper uses the implied risk preferences to test three popular and competing utility theories. The first theory is the traditional expected utility theory with the assumption of global risk averse, that is, the utility function is everywhere concave. The second theory

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[1] See for example, Fama and French (1992, 1993, 1996), Jegadeesh and Titman (1993), Conrad and Kaul (1998). Levy and Roll (2010) thought the market portfolio is significantly MV inefficient with ex-post parameters, but it may be not true with ex-ante parameters. However, Levy and Roll (2010) also considered their research doesn't constitute a proof of the empirical validity of the CAPM, but it shows that the model cannot be rejected. Moreover, their research has not examined other type preferences. Hence, it can't reject any other type preference.

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is the prospect theory (PT) of Kahneman and Tversky (1979), which assumes an S-shaped utility function that is risk seeking for losses and risk averse for gains. The third theory, named Markowitz utility theory stemming from Markowitz (1952) and Thaler and Johnson (1990), indicates that is contrary to the prospect theory with a reverse S-shaped utility, that is, investors may risk averse for losses and risk seeking for gains.

The paper adopts the stochastic dominance (SD) method, introduced by Hadar and Russell (1969), Hanoch and Levy (1969), to identify aggregate risk preferences. It analyzes whether the market portfolio is SD efficient relative to benchmark portfolios formed on size, value, momentum and reversal with various preferences considering anomalies.

It finds the bootstrap method of Post and Levy (2005) may easily commit Type I error (rejecting the null when it is true). Therefore, we develop two bootstrap testing procedures for SD efficiency. One procedure adjusts the bootstrap statistic of Post and Levy (2005) corresponding to various significance levels. Another procedure shifts the entire distance between the original estimator of statistic and zero, which is an extended implementation of the method of Linton et al. (2005) for a critical estimation with full-sample bootstrap. However, there is a boundary effect, which may result in inconsistency in the bootstrap statistics. Hence, we also introduce the smoothed bootstrap statistics following the work of Simar and Wilson (1998). The simulation shows the statistics of the new bootstrap procedures have favorable statistical properties for both size and power with large sample size. Even with small sample size, the statistics also have satisfactory statistical size.

Moreover, the paper further imposes a restriction of three order derivative on utility function to examine skewness preference. Many empirical evidences imply that the perception of risk is more complex than variance. The phenomena of positive skewness[2] and kurtosis preference[3] have attracted much attention among scholars. Accounting for the kind of preference, we adopt the SD criterion of Wong and Chan (2008) and extend the empirical examination for the assumption of positive skewness preference.

The paper also tests the SD conditions that catch an important aspect of PT, namely, loss aversion as suggested by Benartzi and Thaler (1995, 1999). Baucells and Heukamp (2006) proposed that the loss aversion play a central role in behavioral decision research in PT. It captures the psychological intuition that losses loom larger than gains, and is a very important explanation for many economic and financial puzzles.[4] We incorporate the feature in this study with preference condition introduced by Wakker and Tversky (1993) into the SD criterion of S-shaped utility to analyze investor behavior.

The paper investigates the market efficient further not only on monthly data but also on yearly data. Hansson and Persson (2000) considered the recommendation that investors with long investment horizons tilt their portfolios toward stocks is commonplace and an investor can gain from time diversification. Recently, Levy and Duchin (2004) thought that the investors are diverse at their planned investment horizons and the optimal investment decision of an investor may change at different horizons. The study on yearly data will discover the effect of longer horizon on asset equilibrium price and aggregate preferences.

The remainder of this paper is organized as follows. Section 2 reviews methods of empirical study on aggregate preferences and the method of SD. Section 3 introduces the SD efficiency criteria. Section 4 investigates the test statistics on bootstrap methodology with newly proposed test procedures. Section 5 presents empirical findings of the aggregate investor preferences of US stock market. Finally, Section 6 gives the conclusions.

2. The aggregate preferences and stochastic dominance method

2.1. The research of aggregate preferences

Many researchers investigate the individual risk preference mainly by psychological experiments. The results show that people's preferences may be diverse. And, there is much controversy about some experimental results.[5]

Furthermore, stock market is a complex network of heterogeneous components that interact nonlinearly, to give rise to emergent behavior. Mauboussin (2002) considered that it is not possible to understand the stock market by paying attention to individual analysis. So it cannot inference the aggregate preferences straightforward by risk preferences of individuals.

Other studies presuppose risk preference of investor and examine the specific preference. Post (2003) considered economic theory gives minimum guidance for the specification of utility function.[6] Thus, even the examination cannot reject their presuppose preference, the assumption is not confirmed with the only correct option because other risk preferences are not tested. So, the results are not sufficient.

A better understanding of the aggregate preferences of the market should not depend too much on the researches for individual, especially on the experiments for individual. Moreover, it should not solely test whether the aggregate preferences is consistent with a presuppose risk preference alone. It should examine various risk preferences under a general framework and find out the aggregate preferences of the market.

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[2] See for example, Kraus and Litzenberger (1976), Friend and Westerfield (1980), Harvey and Siddique (2000).

[3] See for example, Dittmar (2002).

[4] For example, the endowment effect (Thaler, 1980), and equity premium puzzle (Benartzi and Thaler, 1995, 1999).

[5] For example, Levy and Levy (2002) considered they find support for the Markowitz utility function in an experiment, which is the opposite of the PT. However, Wakker (2003) pointed that all the data of Levy and Levy are perfectly consistent with the predictions of the PT, if they don't neglect the probability weighting function. Baltussen et al. (2006) further put forward that they find severe violations of the PT and the Markowitz utility in a classroom choice experiment with mixed gambles and moderate probabilities.

[6] In various assumptions, only non-satiation can be accepted widely.