Available online at www.sciencedirect.com

SciVerse ScienceDirect

Systems Engineering Procedia 3 (2012) 209 – 216

Procedia Systems Engineering

Performance Evaluation of Investment Funds with DEA and Higher Moments Characteristics: Financial Engineering Perspective

Jian Guo[a], Chaoqun Ma[a], Zhongbao Zhou[a,b] *

[a] *Hunan University, Changsha, 410082, P. R. China*
[b] *RiskLab, University of Toronto, Toronto, M5S 3G3, Canada*

Abstract

With the development of funds market, the research of funds performance evaluation are becoming an important topic in the field of financial engineering. In the previous research, performance evaluation of investment funds was based on some typical hypothesis, and higher moment of the assets return was mostly neglected. However, a great amount of research, both theoretical and empirical, has supported the existence of nonnormality of portfolio return and the important role of higher moments of return in the investors' utility. This has led to widespread suspicion of the validity of the traditional evaluation methodology. In this paper, data envelopment analysis (DEA) is used to evaluate the performance of the funds in the consideration of higher moments. The results show that the evaluation score is related to the utility preference of the investors, which indicates that the evaluation results are more realistic and consistent with the investors' preference.

Keywords: investment fund; performance evaluation; higher moments; data envelopment analysis; financial engineering

1. Introduction

In the 1960s, Makowitz (1952) laid the foundation of modern portfolio theory with his mean-variance(M-V) model [1]. Later, Sharpe(1964)，Lintner(1965) and Mossin(1966) proposed a capital asset pricing model (CAPM) [2-4]. Based on their research, many scholars have put forward a number of portfolio performance evaluation methods, such as Treynor index, Sharpe ratio and Jensen index. These performance evaluation methods were popular with investors and widely used in practice. However, these evaluation methods have theoretical flaw. According to Hanoch and Levy (1969) [5], Leland (1999) [6], the validity of mean-variance model must meets the following two conditions: First, the asset return is normal probability distributions; Second, the utility functions of investor preferences are quadratic. Many empirical studies show that portfolio returns are not normal distribution, which has become the fact generally is accepted by researchers.

On the other hand, some other researchs [7-9] confirmed that investors prefer the third-order central moment of returns (skewness) and disgust the fourth-order central moment (kurtosis), which means that utility functions of investors are not quadratic. The existence of higher-order moments characteristics affect the selection of portfolio. Since the mean-variance theory has the theoretical flaw, the existing performance evaluation methods which is based on mean-variance theory inherently possess the aforementioned theoretical flaw.

To measure the performance of portfolios or mutual funds, data envelopment analysis (DEA) has been used frequently to this aim. The DEA methodology has its unique advantages which don't need the hypothesis of validity of the capital market and avoid the impact that the selection of the market portfolio and risk-free rate on the evaluation results.

The purpose of this paper is to use the DEA methodology to measure the fund performance in the higher moment framework, considering the higher order moment characteristics of funds return which reflect the preference of investors. The evaluation model can take into account not only the investment cost, but also the higher moments (skewness, kurtosis), which is more consistent with the distribution of returns and utility preferences of investors. So, the evaluation results are more effective, and also overcome the problems of the former evaluation methods.

The rest of this paper is established as follows: Section 2 review the portfolio performance literature; Section 3 introudces the higher moments characteristics; Section 4 gives the evaluation model in higher moments framework; we present computational

* Corresponding author. Z.B.Zhou@163.com.

2211-3819 © 2011 Published by Elsevier Ltd. Selection and peer-review under responsibility of Desheng Dash Wu.
doi:10.1016/j.sepro.2011.10.033