

1. Introduction

Portfolio selection is concerned with selecting a portfolio of investments that will fulfill the investment objectives over the investment horizon. Although these objectives are different among investors, a positive and stable payoff on the investments is always desirable.

The portfolio selection problem is complex for at least two reasons: the large number of investment opportunities available and the difficulty to forecast the future. Aside from the many available different investment opportunities, it is nowadays also relatively easy to invest in nearly every country around the world. It is possible to not only invest in the Netherlands, but for a riskier investment one could choose, for example, to invest in Russia or China. The possibility to invest globally expands the investment universe to nearly infinite size and makes it difficult for a person to examine all possibilities.

Investing is always a risky enterprise. An initial investment is made for a certain amount of money, but it is never certain that the value of the investment will increase. Even though there are numerous models to assist an investor with her investment decision, it is never possible to forecast the future with certainty. These two problems make portfolio selection difficult.

There are mainly two approaches to portfolio selection: a heuristic approach and a quantitative approach. In the heuristic approach the portfolio is selected with limited help of a model. The investor forms views about future performance of investments from industry analysis or equity valuation. These views are used to select investments that are believed to have some favorable characteristics that the investor looks for in

her investment portfolio.

The quantitative approach uses a mathematical model to make the final allocation of investments. The model evaluates the characteristics of the investments and determines which ones should be added to the portfolio. Harry Markowitz is the founder of quantitatively making investment decisions. In his seminal paper (1952), Markowitz proposed that when determining an investment one should not only look at the possible payoff of the investment, but also take into account how certain one is that this payoff will actually be acquired. By formulating a mathematical model and making this trade-off explicit, it became possible to allocate investments quantitatively. Although the model inspired a rich field of science and was used by many investors, it does have some obvious flaws. For instance, the model often results in counterintuitive portfolios, which poorly reflect the views of the investor, even though investors could alleviate this problem by introducing extra constraints limiting the range of the possible outcomes.

In view of the shortcomings of Markowitz model (1952), Black and Litterman proposed a means of estimating expected returns to achieve better-behaved portfolio models. Actually the model of Black and Litterman (Black-Litterman model) differs from the Markowitz model only with respect to the estimation of expected return. The Black-Litterman model sets the idealized market equilibrium as a point of reference. The model then specifies a chosen number of market views in the form of expected returns and a level of confidence for each view. The views are combined with the equilibrium returns and the combination of these constitutes the Black-Litterman expected returns. The Black-Litterman expected returns are then optimized in a mean-variance way, creating a portfolio where bets are taken on assets which

investors have opinions about future expected returns but not elsewhere. The size of the bets, in relation to the equilibrium portfolio weights, depends on the confidence levels specified by the user and also on a parameter specifying the weight of the collected investor views in relation to the market equilibrium, the weight-on-views.

Fund of funds has been popular in these years, and how to allocate each fund of the portfolio is also an important issue. In this paper, we apply the Black-Litterman model to constitute a fund of funds. The second section will do a quick review of the fund of funds, the Markowitz model, and literature about the Black-Litterman model. Subsequently, we arrive at the focus of our methodology: the Black-Litterman model. The fourth section covers simulation results. Finally, we will discuss the differences between the traditional Markowitz method and the Black-Litterman model.

