



# Skewness persistence with optimal portfolio selection

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## Abstract

Existing studies have found that ex post stock returns are positively skewed, but such skewness is only persistent for individual stocks, not for portfolios. This implies that the ex post knowledge of skewness may not be useful in ex ante portfolio selection. However, the portfolios in these studies are not optimally formed because preferences for skewness are not taken into consideration when forming these portfolios. It is more meaningful to see if the positive skewness would persist in optimally formed mean–variance–skewness efficient portfolios. Using stocks from both Japanese and US markets and a bootstrap method, we find that the portfolios optimally formed by using a polynomial goal programming method, which considers preference for skewness, greatly enhances skewness persistence over time. Our results are robust across both Japanese and US stocks. However, the skewness persistence is stronger for portfolios formed with monthly data than that with weekly data. These findings have practical implications to investors with skewness preferences.

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## 1. Introduction

Previous authors have pointed out that skewness of stock returns is relevant to portfolio selection (Samuelson, 1970; Arditti and Levy, 1975; Harvey and Siddique,

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1999; Friedman and Salvage, 1948; Golec and Tamarkin, 1998). Skewness persistence measures the inter-temporal relationship between skewness indicators from one period to the next. Skewness persistence is important in helping investors exploit skewness in portfolio formation. If skewness persists, investors can use the ex post knowledge of skewness to proxy ex ante skewness. Empirical studies have found that ex post stock returns are positively skewed (Simkowitz and Beedles, 1978; Beedles and Simkowitz, 1980; Singleton and Wingender, 1986; Lau et al., 1989; Muralidhar, 1993; DeFusco et al., 1996), but that skewness is only persistent for individual stocks, not for portfolios. This implies that skewness is diversified away over time in portfolios. However, the portfolios in these studies are not mean–variance–skewness efficient because preferences for skewness are not taken into consideration in their formation. It is more meaningful to see if positive skewness persists in optimally formed mean–variance–skewness efficient portfolios. Using polynomial goal programming (PGP) developed by Lai (1991), and the enhanced bootstrap approach developed by DeFusco et al. (1996) (hereafter DKM), we examine if the skewness of optimally formed portfolios persists.

Chunhachinda et al. (1997) (CDHP hereafter) utilize PGP to determine an optimal portfolio comprising 14 international stock indexes. They find that the incorporating skewness into investors' portfolio decisions causes major changes in the optimal portfolios. Their evidence indicates that investors trade expected returns for skewness. However, as documented by DKM (1996), skewness exists and persists in individual stock returns but not in portfolio returns. Therefore, portfolios thus formed from indexes may not be as mean–variance–skewness efficient as portfolios formed directly from individual stocks. In addition, it is not clear whether the skewness present in CDHP's study should be attributed to stock returns or exchange rate changes, because they convert all indexes into US dollars.

Our contribution is threefold. First, we apply PGP to individual stocks in single countries, which should produce sharper results than applying PGP to indexes. Second, previous studies on skewness and portfolio selection have focused only on the US market. We expand our data set to include both US and Japanese stocks. By comparing evidence on skewness of stock returns and its persistence in the world's two largest markets, we provide better understanding of skewness across markets. Third and most importantly, we use a bootstrap method to test explicitly the persistence of skewness for dynamically optimized mean–variance–skewness portfolios.

The rest of the paper is organized as follows: Section 2 describes the data and methodology. Section 3 presents the results of skewness and skewness persistence for portfolios optimized with PGP and Section 4 concludes the paper.

## **2. Data and methodology**

Monthly and weekly stock returns from May 1975 to December 1997 with dividend reinvested and three-month US and Japanese government Treasury-Bill rates (proxies for risk free rates in the US and Japan respectively) were obtained from

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