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Superiority of optimized portfolios to naive diversification: Fact or fiction?

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ABSTRACT

DeMiguel, Garlappi, and Uppal (2009) conducted a highly influential study where they demonstrated that none of the optimized portfolios consistently outperformed the naive diversification. This result triggered a heated debate within the academic community on whether portfolio optimization adds value. Nowadays several studies claim to defend the value of portfolio optimization. The commonality in all these studies is that various portfolio optimization methods are implemented using the datasets generously provided by Kenneth French and the performance is measured by means of the Sharpe ratio. This paper aims to provide a cautionary note regarding the use of Kenneth French datasets in portfolio optimization without controlling whether the superior performance appears due to better mean-variance efficiency or due to exposures to established factor premiums. First, we demonstrate that the low-volatility effect is present in virtually all datasets in the Kenneth French online data library. Second, using a few simple portfolio optimization models that are said to outperform the naive diversification, we show that these portfolios are tilted towards assets with lowest volatilities and, after controlling for the low-volatility effect, there is absolutely no evidence of superior performance. The main conclusion that we reach in our paper is that a convincing demonstration of the value of portfolio optimization cannot be made without showing that the superior performance cannot be attributed to profiting from some known anomalies.

1. Introduction

The mean-variance portfolio model developed by Harry Markowitz constitutes a cornerstone of modern portfolio theory. However, the mean-variance portfolio optimization is difficult to implement in practice due to the challenges associated with forecasting the vector of mean returns and the variance-covariance matrix. In a highly influential study by DeMiguel et al. (2009), the authors evaluate 14 portfolio optimization models on 7 empirical datasets and convincingly demonstrate that, in out-of-sample tests, none of the portfolio optimization methods delivers consistently better performance than that of the naive diversification strategy. These authors conclude that portfolio optimization adds no value.

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Since the publication of the paper by DeMiguel et al. (2009), several studies claim to defend the value of portfolio optimization. Kritzman et al. (2010) consider the performance of the minimum-variance strategy and the mean-variance strategy where the asset risk premium is estimated using a long data sample. They show that both these strategies outperform the naive diversification. Tu and Zhou (2011) consider the optimal combination of the naive strategy with an optimized strategy and also show that these combinations outperform the naive diversification. Kirby and Ostdiek (2012) introduce two novel portfolio optimization methods, the volatility timing strategy and the reward-to-risk timing strategy, and again demonstrate that these strategies outperform the naive strategy.

The two major commonalities in all above mentioned empirical studies are as follows. First, researchers implement various portfolio optimization methods using the datasets generously provided by Kenneth French. Second, researchers measure the performance by means of the Sharpe ratio without controlling for the risk-based explanation of the superior performance of their optimized portfolios. This issue raises a major concern about the possibility that the superior performance of some optimized portfolios appears as a result of profiting from some known market anomalies. As a matter of fact, Scherer (2011); De Carvalho et al. (2012), and Goldberg et al. (2014) demonstrate, using the stock market data, that the superior performance of the minimum-variance strategy documented in many empirical studies can be attributed to tilting towards value stocks. Specifically, they find that, after controlling for the value anomaly, the superior performance of the minimum-variance strategy vanishes.

In this paper we do not pursue the goal of revising the profitability of every optimized strategy that is claimed to be superior to the naive diversification strategy. Rather, our goal is more modest, but just as important in the heated debate on whether portfolio optimization adds value. Namely, this paper aims to provide a cautionary note regarding the use of Kenneth French datasets in portfolio optimization without controlling for the risk-based explanation of superior performance. First, using 17 empirical datasets from the Kenneth French online data library, we demonstrate that virtually all of them exhibit the low-volatility effect. This low-volatility effect refers to the tendency for low-volatility stocks to outperform their high-volatility peers (Blitz and van Vliet, 2007; Baker et al., 2011; Blitz et al., 2013). Second, using 3 relatively simple portfolio optimization models that are said to outperform the naive diversification, we show that these portfolios are tilted towards assets with lowest volatilities and, after controlling for the low-volatility effect, there is absolutely no evidence of superior performance. The logical conclusion that inevitably emerges from the results of our study is as follows. In order to demonstrate the value of portfolio optimization, one needs to show that the superior performance cannot be attributed to exposures to established factor premiums. In this regard, the results of our study also cast doubts on whether there is to date a convincing demonstration that portfolio optimization adds value.

The rest of the paper is organized as follows. Section 2 reviews the low-volatility anomaly. Section 3 presents the Kenneth French datasets used in our empirical study and demonstrates the presence of the low-volatility effect in virtually all datasets. We revisit the superiority of some optimized portfolios in Section 4. Section 5 summarizes and concludes the paper.

2. Low-Volatility anomaly

Blitz and van Vliet (2007) were the first to document the existence of a “low-volatility anomaly” in the U.S., European, and Japanese equity markets. In a follow-up paper, Blitz et al. (2013) report a similar low-volatility anomaly in emerging equity markets. Contrary to basic financial principles, these authors find that portfolios consisting of stocks with low volatilities significantly outperform portfolios consisting of stocks with high volatilities. The low-volatility anomaly is, in fact, a part of a more general “low-risk anomaly” in financial markets. Already Black et al. (1972) and Fama and MacBeth (1973) observe that the relation between beta and return is flatter than predicted by the CAPM. Baker et al. (2011) present empirical evidence that portfolios consisting of low-beta stocks outperform portfolios consisting of high-beta stocks. More recent studies that confirm the presence of the low-beta anomaly include Baker et al. (2014) and Asness et al. (2014). Ang et al. (2006) find that portfolios with low idiosyncratic volatility outperform portfolios with high idiosyncratic volatility. This finding is subsequently verified by Guo and Savickas (2010) and Chen and Petkova (2012).

In sum, the low-risk anomaly consists in that low-risk stocks offer a combination of relatively low risk and high returns. Baker et al. (2011) suggest that the low-risk anomaly is “candidate for the greatest anomaly in finance”. In spite of the mounting empirical evidence on the low-risk anomaly, researchers disagree on whether the low-risk anomaly represents a distinct anomaly or another manifestation of the value anomaly. Indeed, the value stocks (i.e., stocks with high book-to-market value) are also low-volatility and high-return stocks. For example, long-only minimum-variance portfolios are heavily tilted towards low-volatility stocks. Therefore the superior performance of the minimum-variance strategies (documented by Clarke et al. (2006) and Clarke et al. (2011)) can logically be attributed to the implicit exposure to the low-volatility anomaly. However, Scherer (2011); De Carvalho et al. (2012), and Goldberg et al. (2014) find that the High-Minus-Low (HML) Fama-French factor explains the superior performance of the minimum-variance strategy. These authors conclude that the superior performance of the minimum-variance strategies is largely attributable to implicit value tilts. On the other hand, Blitz (2016) constructs a distinct low-volatility risk factor and confirms that this factor is indeed highly positively correlated with the HML Fama-French factor. This high correlation verifies that it is very difficult to disentangle the value and low-volatility effects. Yet, using several examples this author demonstrates that in some cases the HML factor cannot explain the superior returns of the low-volatility portfolios.

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