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The benefits of international diversification with weight constraints: A cross-country examination

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ABSTRACT

This paper measures the effect of allocation weight constraints on the potential benefits from international diversification for investors with long investment horizons in 34 countries. Naive international diversification does not provide positive benefits for all investors during the 1993–2014 investment period. Relaxing the market allocation weight constraints applied to in-sample mean-variance optimized portfolios increases the potential for diversification gains. The return-to-risk benefits that these portfolios provide versus the domestic market portfolio are not statistically significant for many investors. There is also an imbalance between the global demand for equity in markets that provide portfolio efficiencies versus the supply of available equity, which is an additional constraint that may limit the efficiency gains that can be captured in equilibrium.

1. Introduction

Quantifying the potential gains from international diversification is useful for assessing the significance of the home bias puzzle. The mutual fund theorem (Lintner, 1965; Sharpe, 1964) and the capital asset pricing model (CAPM) extended to an international setting (Sercu, 1980; Solnik, 1974a) assume risk-sharing investors can improve portfolio efficiency by diversifying into a naive market capitalization weighted ($1/M$) portfolio. Early literature reports weak correlations between markets and concludes that there are benefits from international diversification (e.g., Grubel, 1968; Lessard, 1973; Levy & Sarnat, 1970). Studies measuring the potential benefits from diversification over long investment horizons available from optimized portfolios with restrictions on short sales report there are benefits from diversification into developed and emerging markets for U.S. investors (De Roon, Nijman, & Werker, 2001; Li, Sarkar, & Wang, 2003), U.K. investors (Fletcher & Marshall, 2005) and investors in other countries (Driessen & Laeven, 2007). These benefits are reported to be reduced for U.S. investors diversifying out of the U.S. market, but not eliminated, when weight constraints on market allocations are considered (Chiou, 2008). McDowell (2017a) extends these results and finds U.S. investors do not achieve statistically significant positive return-to-risk (RR) improvements from either naive international diversification or portfolios optimized with relaxed constraints on overseas market allocations and no short sales over the 1988–2014 investment period. This paper addresses a gap in the literature regarding the potential diversification benefits available to global investors with long investment horizons by investigating the following questions: Are investors in different countries likely to achieve significant benefits from diversification into a naive global $1/M$ portfolio? Does relaxing the weight constraints on market allocations improve the significance of the diversification gains? Do these optimal portfolios share risk across markets and achieve an equilibrium in the global demand for markets that offer efficiency gains and the supply of equity available in those markets?

While modern portfolio theory assumes that mean-variance optimizing investors will diversify internationally in order achieve efficiencies in portfolio performance, investors puzzlingly exhibit a bias for local investments.[1] An investor must form accurate estimates of future market returns and correlations in order to

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[1] This bias is identified in the early literature investigating the potential benefits from international diversification (e.g., Levy & Sarnat, 1970; Solnik, 1974b, 1974c). French and Poterba (1991) highlight the extent of this bias across countries. Investors are increasing the size of foreign asset positions over time but the home bias persists (e.g., Stulz, 2005; Tesar & Werner, 1995). For a broader survey of the literature on the equity home bias puzzle refer to Cooper, Sercu, and Vanpee (2013).

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successfully optimize their portfolio. The time-varying nature of market returns and correlations introduces estimation error into ex-ante mean-variance optimization which can result in poor out-of-sample performance relative to naive investment strategies (e.g., DeMiguel, Garlappi, & Uppal, 2009; Jorion, 1985). Strategies designed to reduce estimation error through sample covariance matrix shrinkage (Ledoit & Wolf, 2003, 2004a, 2004b) or constraints on the allocation weights in the optimization solution (Behr, Guettler, & Miebs, 2013; DeMiguel, Garlappi, Nogales, & Uppal, 2009; Levy & Levy, 2014) have been reported to provide inconsistent ex-ante performance improvements over naive portfolios of U.S. equities. Constraints on asset weight allocations is equivalent to constructing an unconstrained portfolio optimized using the shrunk covariance matrix derived using Lagrange multipliers from the constraints (Jagannathan & Ma, 2003). Jacobs, Müller, and Weber (2014) find estimation error reduction strategies do not provide significant improvement over naive allocation strategies for European investors diversifying amongst the four regional equity indices of North America, Europe, Asia and emerging markets. McDowell (2017b) reports that a naive global 1/*M* portfolio provides significant RR gains versus the naive local market portfolio with similar frequency as portfolios optimized out of sample using estimation error reduction strategies for investors in the 34 countries measured.

This paper contributes to the literature investigating the potential benefits of international diversification for investors with long investment horizons in several ways. First, this paper follows the in-sample mean-variance optimization with constant correlations methodology presented in McDowell (2017a) to measure the potential benefits from diversification available to investors in 34 countries from a naive global 1/*M* portfolio, and from maximum return-ro-risk portfolios (MRRPs) and minimum variance portfolios (MVPs) optimized with various levels of market allocation constraints during the 1993–2014 investment period. The cross-country results extend the single country perspective that the related literature presents on this topic (e.g., Chiou, 2008; De Roon et al., 2001; Fletcher & Marshall, 2005; Li et al., 2003; McDowell, 2017a). Measuring the potential benefits from diversifying into the MVP, as well as consideration of market constraints, extends the cross-country results presented in Driessen and Laeven (2007), which only considers short selling restrictions into the MRRP.

Next, the Ledoit and Wolf (2008) studentized time series bootstrap confidence interval tests are used to report the significance of the benefits achieved by the optimized portfolios versus the domestic market portfolio. These tests are designed to address the non-normality of returns and fat-tail events that occur with historical financial data. Using a bootstrap technique, inference methods are performed on paired data points of a given block size between the monthly returns of two portfolios to provide a *p*-value measuring the significance of the hypothesis that the difference between the two portfolios is zero.

The in-sample benefits from diversification presented in this paper are likely greater than the benefits that can be captured by most investors forming optimal portfolios ex ante because of estimation error (e.g., DeMiguel, Garlappi, & Uppal, 2009; Jorion, 1985). The Ledoit and Wolf (2008) bootstrap testing methods assist in determining the level of relaxed weight constraints at which an optimized portfolio has the potential to offer an investor significant positive diversification benefits from optimization. The test results find that the 1/*M* portfolio and the MRRPs with and without positive weight constraints and no short sales do not provide statistically significant RR improvements beyond the domestic market portfolio for a majority of investors. The MVPs with relaxed weight constraints can provide lower volatility levels that are statistically different from the local market. However, these MVPs do not provide statistically significant positive RR improvements compared to eighteen of the twenty-one developed markets measured.

Finally, I report that the global and local market allocations for the various MRRPs and MVPs presented in this paper do not achieve an equilibrium between the global demand for markets that provide potential portfolio efficiencies and the supply of available equity in those markets. This is an additional constraint that may restrict the potential efficiency gains that investors can expect to capture.

This paper is divided into four more sections. Sections 2 and 3 present the data and methods used to measure the potential benefits from international diversification. Section 4 presents the results of this study. Section 5 concludes with suggestions for future study.

2. Data

Monthly total return MSCI equity index data for 21 developed and 13 emerging markets is used in this study. The MSCI indices are designed to measure 85% of the free float-adjusted market capitalization of equities in a market. The indices are industry benchmarks and are used in previous studies measuring the potential benefits from international diversification (e.g., Driessen & Laeven, 2007; Jacobs et al., 2014; Li et al., 2003). The index data is retrieved from Datastream. The first calendar year that index data for all 34 markets in each of the 34 currencies is available is 1993. The sample period covers December 31, 1992 to December 31, 2014.

Annual market capitalization data in U.S. dollars from 1993 to 2012 is from two sources: the World Bank and the World Federation of Exchanges. The World Bank data is available for 33 of the 34 markets. The 1993 Ireland capitalization is not available. This incomplete data is calculated using the annual change to the MSCI index to backward fill the missing 1993 capitalization value from the 1994 Ireland market capitalization data. The Taiwanese market capitalization data is retrieved from the World Federation of Exchanges.

Table 1 reports the market capitalization of each market used in this study in U.S. dollars as a percent of all 34 markets combined at the end of 1993 and 2012. The table also presents the geometric annual returns, the standard deviation of returns and the RR ratios of these markets as measured in the domestic currency for the 1993–2014 holding period. The characteristics of the 1/*M* portfolio, and both the MRRP and the MVP optimized with no short sales and no positive weight constraints in the local currency of each of the 34 countries are also reported. The 1/*M* portfolio is the most strongly weight constrained portfolio reported in this paper with market allocations restricted to equal the 1993 market capitalization weight of each market.[2] The MRRP and MVP optimized with no short sales and no positive weight constraints are referred to as unconstrained portfolios in this study.

Should an investor believe that the assumptions underlying the mutual fund theorem hold – that there are no significant transaction costs and markets are perfectly transparent – then an investor might seek to invest in the mutual fund in order to capture the naive diversification benefits available from the less than perfectly correlated markets. Table 1 reports that the volatility of the 1/*M* portfolio formed using the market capitalization weights at the start of the sample period is lower than the domestic market for most investors. Only the U.S., the U.K. and Suisse markets have a lower

[2] Chiou (2008) uses market weights from the end of the investment period for the weight constraints. As reported in McDowell (2017a), this can introduce a hindsight bias into the results that can increase the measured benefits from diversification. It seems reasonable to this author that the market weights from the beginning of the period must be used to reflect the optimization decision facing an investor at that time.

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