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# Why home-based investing makes sense – evidence from the US market.

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## Abstract

Despite the benefits of international diversification, investors continue to display a preference for home-based investments. Given this preference, we investigate whether it is possible to mimic the benefits of international diversification via domestically traded products. We test this from the perspective of US investors for 37 countries between 1996 and 2011. We attempt to replicate the equity index of each country with domestically-traded US products such as Industry Indices, Multinational Corporations, American Depository Receipts, Closed-End Country Funds and iShares to investigate whether the benefits of international diversification can be exhausted domestically. While the benefits of international diversification vary significantly across sub-periods, portfolios which include all of the US products can replicate almost all of the foreign country indices in periods of both under- and over-performance of the US market. US investors do not need to invest overseas to reap the benefits of international diversification.

*Keywords*

iShares, ADRs, MNCs, international diversification, home bias

*JEL Classification*

F21, F23, G11, G15

# 1. Introduction

Practitioners and academics alike recommend holding a well-diversified portfolio to reduce the risk of equity investment. The benefits of international portfolio diversification have been extensively highlighted throughout the literature (Levy and Sarnat, 1970; Solnik, 1974; Driessen and Laeven, 2007), as historically, low correlations among national stock markets allowed investors to reduce their risk for a given return. Moreover, as highlighted by Baxter & Jermann (1997), given an individual’s probable exposure to the economic performance of their domestic market via the property and labour market, it would be advisable to diversify investments internationally to mitigate that exposure. Possible deterrents to foreign investment include exchange-rate risk, foreign investment restrictions, capital controls, transaction costs and asymmetric information. In recent decades the costs and restrictions on foreign investments have fallen substantially, yet investors continue to hold a disproportionate amount of their equity portfolio investment domestically. This phenomenon is known as the home bias puzzle (Ahearne, Griever and Warnock, 2004; Suh, 2005).

The international capital asset pricing model recommends that investors hold the world market portfolio of risky assets regardless of their country of residence. The proportion of foreign stocks held by US investors represents a disproportionately small share of overall equity holdings when compared to the relative stock market capitalisation of other countries. The US equity market represents around 31 percent of the world equity capitalisation, while the rest of the world represents around 69 percent.[[3]](#footnote-3) In 2011 the Department of the Treasury estimated US foreign holdings at just 14 percent of total equity, implying a large degree of home bias in equity portfolio allocations. This phenomenon is not confined to the US; Chan, Covrig and Ng (2005) conduct a study in 26 developed and developing countries and find substantial home bias in every country.

Traditionally international diversification involves directly investing in equities traded abroad, which entails costs, such as transaction costs and withholding taxes, and risks such as FX, liquidity, country and capital control risk. In addition, investors investing directly in foreign markets need to fully understand local market conditions, for example, trading mechanisms, information that may be difficult and time consuming to obtain. Investing in broad-based foreign country indices are often used to measure the benefits of international diversification. Investing in all of the shares that comprise these indices is not a realistic option for most investors given the transaction costs and restrictions on portfolio size. An alternative is to invest in equities that trade domestically and provide international exposure. This may provide an indirect method of obtaining the benefits of international diversification, while avoiding the costs and inconveniences of investing abroad.

There are several indirect routes by which an investor may achieve exposure to foreign equity returns in a domestic setting. US Multinational companies (MNCs) operating in overseas markets may provide exposure to foreign country indices. Some of the gains from international diversification are considered to be due to differences in industrial structure across countries (Flavin, 2004), therefore investment in specific Industry Indices may mimic foreign country index returns. Other products traded in the US provide access to foreign equities such as American Depository Receipts (ADRs), which represent a claim on foreign equities, and exchange-traded country funds; Closed-End Country Funds (CCFs) and iShares. We combine the available equity products for each country to examine whether it is possible to exhaust the benefits of international diversification by investing in domestically-traded products, thereby negating the need to invest overseas. Using stepwise regression we create three types of replicating portfolios for each country, the first of US Industry Indices, the second of Industry Indices, the Russell 1000 and MNCs, and the third of Industry Indices, the Russell 1000, MNCs, ADRs, CCFs and iShares. We test the diversification benefits of these portfolios over a 15 year period from 1996 to 2011 and in three sub-periods, using Mean-Variance Spanning tests. If the benefits of diversifying internationally can be exhausted by investment in domestically traded products, investors no longer need to invest in equities traded overseas.

The contributions of this study are as follows. A study of the indirect international diversification benefits of US-traded equity products between 1976 and 1993 was conducted by Errunza, Hogan, & Hung (1999). We extend and update that study, during a period in which the US saw two booms and busts, the dotcom bubble of 1999/2000 and the credit crisis of 2007/2008. There have been a number of developments which warrant a more recent investigation of this topic. Firstly, since that study, there is a greater availability of US-traded products which offer foreign exposure, for a greater number of countries, allowing an increase of the number of countries included in the study from 16 to 37. Secondly, a substantial increase has occurred in the internationalisation of US MNCs, as firms increase their foreign operations. The Errunza, Hogan, & Hung (1999) study selects the largest MNCs ranked by total sales in 1976, making the assumption that the firms which have the greatest total sales are also the firms with the greatest level of internationalisation. We select MNCs using a more robust method, selecting firms which have foreign sales in at least four regions of the world in every year from 1996 to 2010. Thirdly, the growing relative importance of industrial versus country diversification since the early 1990s has been highlighted in many studies (Baca, Garbe, & Weiss, 2000; Cavaglia, Brightman, & Aked, 2000; Serra, 2000), which may alter the relative importance of Industry Indices as diversification tools. Fourthly, iShares were introduced in 1996, and have experienced huge growth since their inception. Given these changes, we investigate whether the results of the Errunza et al., (1999) study have changed substantially.

Our findings are as follows. For the full period and for two sub-periods, we find that the benefits of international diversification can be comprehensively exhausted via all of the replicating portfolios. When all products are included, ADRs, iShares or CCFs have the largest weighting for 31 of the 37 countries. Prior to 2003, the US outperforms almost all foreign country indices. In the period 2003 to 2007, the US underperforms most foreign country indices and in the period after 2007, developed markets underperform and emerging markets outperform the US. When the US underperforms foreign country indices between 2003 and 2007, many portfolios which do not include ADRs, iShares and CCFs, do not exhaust the benefits of diversifying internationally. Portfolios which include all products span the foreign market indices in almost all cases. Our results suggest that US-traded products provide an excellent source of foreign equity exposure and that trading overseas is no longer necessary. While the Errunza et al. (1999) study finds that the diversification benefits can be exhausted domestically for 11 of 16 countries we find that they can be exhausted for all 37 countries in our sample.

The remainder of the paper is structured as follows. In Section 2 we review the literature in the area of the international diversification benefits of US equity products. In Section 3 we describe the data used. Section 4 details our methodology. In Section 5 we present our results and finally in Section 6 we summarize our findings and describe our conclusions.

# 2. Literature Review

The benefits of international portfolio diversification have long been highlighted throughout the literature. Grubel (1968) finds substantial international diversification benefits for US investors with countries furthest from the US providing greatest benefit. Levy & Sarnat (1970) find investment in emerging market countries to be of particular benefit to US investors. Solnik (1974) and Lessard (1974) find that substantial risk reduction can be achieved by adding foreign county indices to a domestic portfolio. De Santis & Gerard (1997) find that although contagion occurs in times of financial crises, the long-term gains from international diversification are substantial and not decreasing. Goetzmann, Li, & Rouwenhorst (2001) suggest that globalisation brings with it both advantages and disadvantages; expanding the investment opportunity set but causing diversification benefits to rely increasingly on investment in peripheral markets. Driessen & Laeven (2007) conduct a study of the diversification benefits of 52 countries, and find that benefits exist for almost all of the countries examined, but that the benefits are decreasing over time. They find that most of the benefits are gained from investment outside the region in which each country is located. You & Daigler (2010) find that the benefits of international diversification are time-varying and dependent upon the benchmark used. A marked increase in correlations between country indices was evident during the 2007/2008 financial crisis, but since then the long term benefits of international diversification have been defended by Asness et al. (2011). They find that international diversification works over longer time periods, financial crises can have a spillover effects in the short term, but country-specific performance is the dominant factor in the long run. Christoffersen, Errunza, Jacobs, & Langlois (2012) find that international diversification benefits are still available for emerging markets but have dramatically reduced for developed markets.

Despite this, investors in the US and elsewhere continue to hold a large proportion of their equity investments in domestic assets. Home bias was first documented by French & Poterba (1991) and Tesar & Werner (1995) and more recently by Ahearne et al. (2004), Suh (2005), Sercu & Vanpee (2007) VanNieuwerburgh and Veldkamp (2009) and Morse and Shive (2011). Possible explanations include exchange rate risk, country risk, taxes, transaction costs and asymmetric information. Tesar & Werner (1995) estimated that US investors held less than 2 percent of their investments in foreign equities in 1975 and Ahearne et al. (2004) estimated that this had risen to 10 percent in 1997. Table 1 presents a timeline of US foreign equity holdings from 2003 to 2011 showing a peak of 18 percent in 2010. This appears disproportionately small when compared to the 69 percent of world market capitalisation represented by other countries in 2011. In 2003 the US equity market represented 46 percent of the world market capitalisation. By 2011 that had fallen to 31 percent.[[4]](#footnote-4) Therefore, although US investors may be investing more overseas, the market capitalisation of the US as a percentage of the world has fallen over the same period, thereby causing little reduction in the degree of home bias.

Traditionally international diversification involves directly investing in equities traded abroad. Errunza et al., (1999) introduce the concept of ‘home-made’ international diversification. Investing in securities that trade domestically and provide international exposure may be an indirect method of reaping the benefits of international diversification, while avoiding the costs and inconvenience of investing abroad. Many estimates of investors’ exposure to foreign markets include only direct international portfolio investments, ignoring the indirect exposure that can be achieved via domestic equity products. Investors’ tendencies to overinvest domestically may be partly due to a preference for this *indirect* foreign exposure. A study by Cai & Warnock (2012) argues that a more comprehensive analysis of the home bias puzzle requires careful distinction between ‘domestic’ and ‘international’ investment. They contend that the degree of home bias is overestimated when home-based foreign exposure is not counted as ‘foreign’ investment.

Errunza, Hogan, and Hung (1999) combine US Industry Indices, MNCs, CCFs and ADRs into portfolios which attempt to replicate each of 16 foreign country indices, 9 emerging markets and 7 developed markets. Using data from 1976 to 1993, they find that US investors can mimic foreign market returns with domestically-traded securities. They claim that the gains from international diversification are overstated and should only be measured beyond those attainable through home-based diversification. They find that most of the diversification benefits are found when portfolios include ADRs and Country Funds. Using Mean-Variance Spanning they find that the replicating portfolios provide diversification benefits for 9 countries using Ordinary Least Squares (OLS) estimation and for 11 countries using Generalised Method of Moments (GMM) estimation. A similar study was conducted in the UK by Antoniou, Olusi, & Paudyal (2010) which tests whether portfolios of UK-traded equity products can mimic foreign market indices between 1994 and 2003. They find international diversification benefits to be mainly attainable via UK MNCs, cross-listings and country funds and less so via industrial diversification. They conclude that overseas investment is no longer necessary for UK investors to reap the benefits of international diversification.

While these two studies compare several equity products, there are many studies on the diversification benefits of individual equity products. With regard to industry diversification, earlier studies find that country effects dominate industry effects and that diversification across countries is preferable to diversification across industries (Lessard, 1974; Roll, 1992). Subsequent studies find industry effects to be increasing in importance (Baca, Garbe, and Weiss, 2000; Cavaglia, Brightman, and Aked, 2000; Serra, 2000; Ferreira and Ferreira, 2006) while Flavin (2004) and Moerman (2008) find that industry effects dominate country effects in European countries. More recently, however, Phylaktis & Xia (2006) find that country effects are still stronger than industry effects in emerging markets, and Lee & Hooy (2012) find similar results in the Asean 5 countries. Bekaert et al. (2009) find that the increasing relative importance of industry factors appears to have been temporary, while De Moor & Sercu (2011) conclude that country factors remain influential and find no sign that this is being severely altered. Marcelo, Quirós, & Martins (2013) contend that although country diversification is generally preferable, industry diversification is of relatively more benefit in volatile times.

MNCs with substantial foreign operations may provide benefits of international diversification domestically. Many studies have considered whether investors can benefit from indirect international diversification via investments in MNCs. To date there is a lack of agreement on the topic. Studies by Jacquillat & Solnik (1978), Brewer (1981), Michel & Shaked (1986) and Salehizadeh (2003) find that US MNCs do not mimic international returns. On the other hand, Agmon and Lessard (1977), Mikhail and Shawky (1979), Logue (1982) and Rowland and Tesar (2004) and Berrill and Kearney (2010) find that MNCs provide significant international diversification benefits. The results of these studies are difficult to compare as different methods are used to select MNCs by their level of internationalisation, such as the proportion of foreign sales, foreign subsidiaries, foreign tax revenue or the number of countries in which a firm has foreign subsidiaries. However, in most cases, MNCs are selected using percentage foreign sales or the number of foreign subsidiaries to rank firms by their level of internationalisation, which measures the degree of foreign activity but not the scope or location of that activity. With the exception of Omer et al. (1998), all previous studies select based on criteria at one point in time.

An ADR represents the shares of a non-US company that trades in US financial markets. Some studies find that they offer excellent diversification opportunities to US investors (Officer and Hoffmeister, 1987; Wahab and Khandwala, 1993; Patro, 2000; Fang & Loo, 2002) while others find that they are significantly correlated with the US market (Jiang, 1998; Webb, Officer, and Boyd, 1995). Peterson & O’Shaughnessy (2000) find that South American ADRs provide good diversification benefits to US investors. Gagnon & Andrew Karolyi (2010) find that the returns on ADRs, compared with their underlying shares, have higher correlation with US indices than with their corresponding home market indices. Kabir, Hassan, & Maroney (2011) find that ADRs are a good substitute for foreign investment for many countries but with some exceptions for Latin America. Lee, Chen, Li, & Chang (2011) compare ADRs in different regions and find that the home market returns have a large impact on Latin American ADRs but that the US market sentiment has the biggest impact on Asian country ADRs. Peterburgsky & Yang (2013) find that ADRs are less effective than holding the underlying stocks as they trade during US hours, on US exchanges and their clientele is different from the investors buying the underlying stock. In summary, ADRs are found in many cases to be a good diversification tool but their effectiveness may depend on their country of origin.

Two types of exchange traded country funds are prevalent in the US, closed-end country funds and iShares. Closed-end country funds (CCFs) are mutual funds that issue a fixed number of shares at inception. Like other mutual funds, they are actively managed. A shareholder in a closed-end fund redeems shares with the issuer as with open-end funds, but may trade shares. As the number is fixed, the value of shares in a closed-end fund is determined by demand and supply as well as the fund's net asset value (NAV). The values of CCFs have been found to deviate significantly from their NAV. Studies by Bodurtha, Kim, and Lee (1995), Chang, Eun, and Kolodny (1995) and Patro (2001) find that CCFs perform more like US assets than their underlying assets but conclude that they still offer some diversification benefits. Charitou, Makris, & Nishiotis (2006) find that foreign markets have more influence on CCFs than the US market. Chen, Morse, & Nguyen (2009) look at the impact of the growth of iShares on CCFs, and find that although the volume of investment in CCFs is significantly reduced, their liquidity has not been affected.

IShares are a family of exchange-traded funds (ETFs) managed by BlackRock.[[5]](#footnote-5) Single country iShares are designed to track MSCI country indices. The index tracking capability of some iShares may be affected by the fact that they only invest in a subset of the MSCI index that they claim to track (Tsai and Swanson, 2009). This is achieved by using a portfolio optimisation approach which seeks to minimise transaction costs. Demand and supply does not have a significant effect on the value of the fund, as new shares can be created or redeemed at will (Pennathur, Delcoure, & Anderson, 2002). IShares have been shown to closely resemble the country index they represent (Phengpis and Swanson, 2009). Miffre (2007) finds them to be a low-cost, low-tracking error and tax-efficient means of gaining international exposure and Huang and Lin (2011) find them to be an effective diversification tool when compared to direct foreign investment. However, Zhong and Yang (2005) find that the returns are significantly influenced by US market risk and question their diversification benefits.

A small number of studies compare the diversification benefits of two equity products. For example, Pennathur et al. (2002) assess the exposure of iShares and CCFs to the home market they represent and to the US market and find that iShares more closely replicate the home index but that both products are considerably exposed to the US market returns. Harper et al. (2006) measure the risk-adjusted performance of iShares and CCFs and find that iShares deliver superior risk-adjusted returns. Tsai and Swanson (2009) compare the performance of iShares and CCFs, and find the risk-adjusted performance of iShares to be higher than CCFs and the diversification benefits to be greater. Coe (2002) compares the performance of ADRs and CCFs and finds ADRs to be a superior investment. Peterburgsky & Yang (2013) find that ADRs are a better diversification tool than CCFs but only in periods of positive returns. While ADR returns are sensitive to the state of the US economy, it seems to have little impact on the diversification benefits of CCFs.

# 3. Data

We investigate five US-traded equity products that may provide international diversification benefits in a domestic setting; Industry Indices, MNCs, ADRs, CCFs and iShares. The treatment of these five products differs with respect to how they are counted as foreign or domestic portfolio holdings. Investments by US investors in MNCs and Industry Indices are counted as domestic equity holdings. Holdings of ADRs, CCFs and iShares are counted as foreign equity holdings.[[6]](#footnote-6) We use weekly data for equity returns from March 1996 to June 2011. The start date is determined by single country iShares which began trading in March 1996. Only products with data for the full time period are selected, and only countries with data for an ADR, iShare or CCF are included. This yields a sample of twenty-two developed markets; Argentina, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Portugal, Singapore, Spain, Sweden, Switzerland and the UK and fifteen emerging markets; Brazil, Chile, China, Colombia, India, Indonesia, Korea, Malaysia, Mexico, Philippines, Russia, South Africa, Taiwan, Thailand and Turkey.[[7]](#footnote-7) MSCI country indices are used to measure foreign market returns as these are the indices that iShares are designed to track. Two proxies are used for US returns, the Russell 1000 index and a portfolio of purely domestic firms. The Russell 1000 Index includes approximately 1,000 of the largest firms in the US based on their market capitalisation, and represents approximately 92 percent of the US market. We create a portfolio of purely domestic firms from the constituent list of the Russell 1000 as of June 2011. We select firms which have no foreign sales in any year from 1996 to 2011. We form an equally weighted portfolio of 105 domestic firms with full data. For all data we use Datastream’s return index (RI) which calculates the total return including dividends. The weekly 3 month T-Bill rate is used as the risk free rate.

We use S&P Industry Indices for our analyses which follow the Global Industry Classification Standard (GICS) classification.[[8]](#footnote-8) The ten sectors represented are Consumer Discretionary, Consumer Staples, Energy, Financials, Healthcare, Industrials, Information Technology, Materials, Telecommunications and Utilities. MNCs are selected from the 2011 constituent list of the Russell 1000. Most prior studies select MNCs using measures such as percentage foreign sales or number of foreign subsidiaries, making no differentiation between, for example, an American firm with 50 percent of its sales in Canada, and another with 50 percent of its sales spread across Asia, Australia and Europe. We question the usefulness of these approaches, given the findings of Baxter & Kouparitsas (2005) that correlations of business cycles decrease with distance. We consider it important to take the location rather than the level of foreign activities into account when selecting firms that may provide diversification benefits. Following Berrill & Kearney (2010) we divide the world into six regions. We obtain the geographical breakdown of each firm’s sales for every year from 1996 to 2010 and categorise each firm in each year by the number of regions in which its sales occur. We select firms which have sales in at least four regions in every year, of which there are 29.

An ADR represents the shares of a non-US company that trades in US financial markets. It must meet the listing requirements of the US exchange, comply with Securities and Exchange Commission regulations and follow US accounting standards. ADRs are denominated, and pay dividends, in US dollars, and may be traded like shares of US companies and enable domestic [investors](http://en.wikipedia.org/wiki/Investor) to buy the securities of a foreign company without the accompanying inconveniences of cross-border and cross-currency transactions. Four banks issue ADRs; J.P. Morgan, Citibank, Deutsche Bank and BNY Mellon. Level 1 ADRs are traded over the counter, level 2 ADRs are traded on exchanges. Price data is not readily available for level 1 ADRs. There were approximately 400 Level 2 and Level 3 ADRs listed on the New York Stock Exchange, American Stock Exchange and Nasdaq as of June 2011. Price data was available for 95 ADRs from 26 countries for the full period from 1996 to 2011.

Closed-end country funds (CCFs) are mutual funds that issue a fixed number of shares at inception. Like other mutual funds, they are actively managed. A shareholder in a closed-end fund redeems shares with the issuer as with open-end funds, but may trade shares. As the number is fixed, the value of shares in a closed-end fund is determined by demand and supply as well as the fund's net asset value (NAV). Many CCFs have been liquidated since 2002/03, but data was available for the full period for 19 countries. iShares are a family of exchange-traded funds (ETFs) that are designed to track a bond or stock market index. They represent around 45 percent of the US ETF market. There are currently 28 single country iShares that trade on the New York Stock Exchange but only 17 exist since 1996.

Table 2 lists the iShares, CCFs and ADRs available for each of the 37 countries in our sample. IShares are available for 17 countries, CCFs for 19 and ADRs for 26. For the 15 emerging markets in our sample, iShares exist for 2 countries, CCFs for 11 and ADRs for 9. For the 22 developed markets in our sample, iShares exist for 15 countries, CCFs for 8 and ADRs for 17. Given that the analysis is from the perspective of a US investor, we convert MSCI foreign country indices into USD using weekly bilateral exchange rates.

# 4. Methodology

## 4.1 Stepwise regression

We create a pool of assets for each country, which contains the relevant iShare, CCF and ADRs, 29 MNCs, 10 US Industry Indices and the Russell 1000. The UK has the largest pool containing 56 assets, while 14 countries have the lowest number of 41 assets. From these assets we create portfolios for each country which aim to replicate its foreign country index. In order to reduce the number of explanatory variables, we aim to remove those variables which have no explanatory power. This common problem of selecting a subset of independent variables in regression analysis has led to various subset selection procedures. Stepwise least squares regression allows some or all of the variables in a standard linear multivariate regression to be chosen automatically, using various statistical criteria. It uses a stopping criterion using a p-value statistic for adding or removing independent variables that maximise the squared partial-correlation coefficient with the dependent variable, given the variables already selected. The process ‘stops’ whenever the sample partial correlation is ‘non-significant’ as shown by the standard F test (Bendel & Afifi, 1977). We use stepwise least squares regression with a forward p-value threshold of 0.05 to create replicating portfolios for each country.[[9]](#footnote-9) This effectively optimises the weighting in each asset so as to maximise the correlation of the replicating portfolio with the foreign country index, which results in the equation

(1)

Where Ri,t is the return of country i at time t and Rj are the returns of the US-traded assets.

Errunza et al. (1999) and Antoniou et al. (2010) employ a threshold p-value of 0.20 when using stepwise regression. We elect to be more stringent in our portfolio selection and to use a threshold of 0.05 which results in a smaller number of independent variables. Portfolios with a smaller number of assets will have lower transaction costs. If a smaller portfolio can achieve the same diversification benefits as a larger portfolio, the smaller will always be preferable due to these not insignificant costs. We subsequently test the diversification benefits of each portfolio using Mean-Variance Spanning. For any portfolios which do not span the relevant foreign country index, we test whether by allowing a higher threshold for the p-value or by using a standard regression including all possible predictor variables alters the results. We reconstruct those portfolios using a stepwise threshold of 0.20 and using all variables in an OLS regression for comparative purposes.

We create three types of replicating portfolios. Firstly, an industry portfolio (D1) is created to investigate if a foreign country index can be replicated by US Industry Indices. Secondly, a portfolio is created from Industry Indices, the Russell 1000 and MNCs (D2) to investigate if portfolios of US companies only can replicate foreign market indices. Thirdly, a portfolio of all US-traded equity products is formed from Industry Indices, Russell 1000, MNCS, ADRs, iShares and CCFs available for that country (D3) to investigate if US-traded products can replicate the foreign country index. D1 and D2 contain only firms that are headquartered in the US and are counted as domestic equity. An increase in the holding of these products and a decrease in foreign holdings would cause an increase in the recorded home bias. D3 portfolios include ADRs, CCFs and iShares, which are counted as foreign holdings. Although domestically-traded products, an increase in their holdings and a decrease in domestic holdings would cause a decrease in home bias. D1 and D2 portfolios attempt to replicate foreign markets using US-traded domestic equity only. D3 portfolios attempt to replicate foreign markets using a combination of US-traded domestic and foreign equity holdings.

We calculate the correlation of each replicating portfolio with the foreign country index and its risk per unit of return. We investigate whether the benefits of international diversification can be exhausted using domestically traded products by adding the foreign country index to the replicating portfolio and testing whether the foreign country index is spanned by the replicating portfolio. That is, does the addition of the foreign country index shift the mean variance frontier of the replicating portfolio and are there addition diversification benefits to be gained by investing in the foreign country index beyond those available via investment in US traded equity products? We test this using mean variance spanning tests.

## 4.2 Mean Variance Spanning Tests

To test for diversification benefits we use Mean-Variance Spanning tests. The methodology of Mean-Variance Spanning is documented by Huberman and Kandel (1987), and its geometric interpretation by Kan & Zhou (2012). It is used by Driessen and Laeven (2007) to investigate how the benefits of international diversification differ across countries from the perspective of a local investor. It is also used by Bekaert, Urias, and Francisco (1996), Errunza et al. (1999), Bekaert & Urias (1999), Rowland and Tesar (2004) Charitou, Makris, & Nishiotis (2006), Berrill and Kearney (2010), Antoniou et al. (2010) and Kabir, Hassan, & Maroney (2011) in studies of home-based international diversification.

Mean-Variance Spanning tests consider a set of K benchmark assets and N test assets and investigate whether, conditional on the K benchmark assets, the addition of the N test assets can shift the mean-variance efficient frontier. Alternatively, conditional on the K+N benchmark and test assets, can the subset of K benchmark assets yield the same diversification benefits? We define R1,t as the K×1 vector of returns on the K benchmark assets at time t, we define R2,t as the N×1 returns on the N test assets at time t, and we combine R1,t and R2,t in the K+N vector Rt=[R1,t, R2,t]. The expected returns E[Rt] and the covariance matrix of these K+N assets can be written as

  (2)

where V is assumed to be nonsingular. The Mean-Variance Spanning test proceeds by estimating the following model which regresses the N test asset returns on the K benchmark asset returns,

 (3)

with

and (4)

Where 0N is an N-vector of zeros and 0Nxk is an N by K matrix of zeros. α and β can also be expressed as;

 (5)

and

 (6)

where α is an N-dimensional constant term, β is an N x K matrix with slope coefficients and εt is an N-dimensional vector with zero-expectation error terms.

The null hypothesis states that the K benchmark assets span the entire market of all K+N assets. This is equivalent to testing the restrictions that α = 0 and β1K =1. If this hypothesis is upheld, it implies that for every test asset, it is possible to obtain a portfolio of the K benchmark assets that has the same expected return (because α=0N and β1K =1N) and a lower variance (because R1,t and εt are uncorrelated while Var(εt) is positive definite). In effect, the test assets are spanned by the benchmark if it is possible to use the benchmark returns to mimic the return on the test assets. In that case the test assets returns do not offer diversification benefits, and we cannot reject the hypothesis that the frontier of the benchmark plus test assets returns is the same as the frontier generated by only the benchmark returns.

Huberman and Kandel (1987) estimate equation 3 using OLS. They propose testing the coefficient restrictions α = 0 and β1K =1 using a likelihood ratio test. Kan & Zhou (2012) compare three methods to test the coefficient restrictions, the likelihood ratio test, the Wald test and the Lagrange Multiplier test, which they show to be closely related tests of mean variance spanning. They show that although the power of the tests is difficult to gauge when N>1, in the case where N=1, the Wald test is the strongest of the three. In our tests N=1, therefore we proceed using the Wald test to test the coefficient restrictions.

## 4.3 Modified Value-at-Risk

In addition to Mean-Variance Spanning tests, we consider an additional methodology that goes beyond the mean-variance framework, modified Value-at-Risk. Standard Value-at-Risk calculates the maximum loss of a portfolio over a given period of time for a given probability level. Risk measured by portfolio standard deviation can be underestimated if returns are skewed or have excess kurtosis. Investors generally desire high positive skewness (more positive returns), and those with low tolerance for risk avoid high kurtosis (fat tails). The four-moment Modified Value-at-Risk (MVaR), developed by Favre & Galeano (2002) and used by You & Daigler (2010) and Antoniou et al. (2010) incorporates skew and kurtosis into the calculation of the maximum loss that a portfolio is expected to experience over a given period. The two-moment VaR is a special case of the four-moment VaR when the skewness and excess kurtosis are zero. The number of standard deviations specify the probability of this loss occurring. The four-moment VaR developed by Favre and Galeano (2002) is as follows:

(7)

Where μp, σp, Sp, and Kp are the first four moments of portfolio P (Kp represents excess kurtosis). Zc is the negative number of standard deviations that specifies the tail probability level associated with the four moment VaR. We calculate the MVaR of each portfolio for a 95 and 99 percent confidence level, or -1.96 and -2.33 standard deviations.

## 4.4 Sub-period Selection

The results of our tests are based on historical data and any inferences drawn from the results rest on the assumption that the past will repeat itself. In order to strengthen the usefulness of the results, we divide our time period into sub-periods. This will test our results under different market conditions, making any results common to all sub-periods robust to different market conditions. In the 15 year period used in this empirical study, the US experienced two booms and busts, the dotcom bubble of 1999/2000 and the credit crisis of 2007/2008. We divide our 15 year period into sub-periods as follows.[[10]](#footnote-10)

Figure 1 graphs the weekly returns of the S&P500 between 1996 and 2011. The period between mid-2003 and mid-2008 is noticeable for its low volatility, compared to the periods that precede and follow it, which correspond to the dotcom bubble and the 2007/08 credit crisis. In addition we compare the performance of the S&P500 to that of the 37 foreign country indices on an annual basis. The results are shown in Figure 2, which graphs the annual risk-adjusted return of an equally weighted portfolio of developed markets, emerging markets, all foreign country indices and the S&P500 between 1996 and 2011. In each of the years 2003 to 2007, equally weighted portfolios of foreign country indices outperform the S&P500. Prior to 2003, developed markets and the S&P500 outperform emerging markets. From 2008 on emerging markets outperform the other markets. We sub-divide our dataset into periods of differing volatility in the US; March 1996 to December 2002, January 2003 to December 2007 and January 2008 to June 2011. These sub-periods coincide with differing results for the performance of the S&P500 relative to the performance of foreign market indices. These sub-periods allow us to test if our results are robust to varying market conditions.[[11]](#footnote-11)

# 5. Results

## 5.1 Portfolio Composition

In Table 3 we list the average compositions of the replicating portfolios for developed and emerging markets. The largest weighting in the D1 portfolios of Industry Indices for both developed and emerging markets is in Materials, 21 and 26 percent. I.T. has the second highest weighting for emerging markets, 14 percent, and the third for developed markets, 10 percent. For the D2 portfolios of Industry Indices, MNCs and Russell 1000, the largest average weighting is in Industry Indices, 24 percent for developed and 30 percent for emerging markets. The weightings in the Russell 1000 and MNCs are similar at between 14 to 17 percent. In the D3 portfolios of all products, ADRs, iShares and CCFs account for 75 percent of the portfolios of both emerging and developed markets. iShares have a larger weighting for developed markets, due to their greater availability for developed markets. Emerging markets are most heavily weighted in ADRs. The Russell 1000 has a negligible average weighting, while MNCs and Industries form a modest proportion of the portfolios on average, of between 6 and 12 percent.

## 5.2 Preliminary Statistics

Table 4 lists the correlations of the foreign country indices with the US market and with the replicating portfolios. We firstly list the correlations of the foreign country indices with an equally weighted portfolio of purely domestic US firms and then with the Russell 1000. Firms with no foreign activity should in theory have the lowest correlation with foreign market indices, and would not be expected to provide benefits of international diversification. The Russell 1000 is intended to be a broad representation of all US firms. The average correlation of emerging markets countries with the US market is lower than for developed markets, 34 percent versus 51 percent. The lowest correlations with emerging market countries are with Thailand, Malaysia and Indonesia at between 16 and 23 percent. The lowest with a developed market is with Japan at 27 percent. The highest correlation with an emerging market country is 61 percent with Mexico and with developed markets with Canada, the UK, France and Germany between 61 and 66 percent. The countries closest to the US; Mexico and Canada are amongst those countries with the highest correlation while those with the lowest correlation are geographically distant. This concurs with previous findings that business cycles correlations decrease with distance (Baxter & Kouparitsas, 2005).

Subsequent columns list the correlations of the replicating portfolios with the foreign country indices. Starting with D1, the changes from the correlations with the domestic portfolio are modest, increasing by approximately 5 percent for most countries. The lowest correlations are with Indonesia, Malaysia, Philippines and Thailand at between 24 and 27 percent. The average increase from the correlations with the domestic portfolio to the correlations with D2 is 9 percent and the lowest correlation is 31 percent with Indonesia. For the D3 portfolios, there is a substantial increase in the correlations. The average increase in correlation is 23 percent, substantially higher than for the other two portfolio types. The lowest correlation is 43 percent with China, while the highest is 88 percent with Australia. The addition of ADRs, iShares and CCFs has a large impact on the correlation of the replicating portfolio with the relevant foreign country index.

We next analyse the performance of each foreign country index and its replicating portfolios. The risk and return for each foreign country index and its 3 replicating portfolios are listed in Table 5. Emerging markets have higher volatility on average, 38.2 percent, while the average for developed markets is 25.7 percent. Emerging markets also have a higher average return than developed markets, 8.2 percent versus 6.9 percent. However, the average return per unit of risk is lower for emerging markets than developed markets, 0.23 versus 0.27. The risk of the replicating portfolios is lower than the risk of the foreign country indices in almost every instance, apart from the D3 portfolio for Russia. For every country the risk of the D3 portfolio is greater than that of the D2 portfolio, and the risk of D2 greater than the risk of D1. The returns of the replicating portfolios are mostly lower than those of the foreign country indices; for 30 D1, 32 D2 and 33 D3 portfolios. The return per unit of risk for the replicating portfolios is lower than the foreign country index for 14 D1, 19 D2 and 25 D3 portfolios. Stepwise regression selects assets to maximise the correlation of the portfolio with the country index, but as the correlations increase improved performance does not necessarily follow. We next investigate the benefit of adding the foreign country indices to the replicating portfolios.

## 5.3 Diversification Benefits

We investigate whether the benefits of international diversification can be exhausted using domestically-traded products by adding the foreign country index to the replicating portfolio and testing whether the foreign country index is spanned by the replicating portfolio. That is, are there addition diversification benefits to be gained by investing in the foreign country index beyond those available via investment in US-traded equity products? We test this using Mean-Variance Spanning tests. The F-statistics and p-values from the Wald test of the joint coefficient restrictions are presented in Table 6. The p-values represent the probability of not rejecting the null hypothesis that the benchmark asset, the replicating portfolio, spans the test asset, the foreign country index. If the benchmark asset spans the test asset, the addition of the foreign country index does not shift the mean variance frontier of the replicating portfolio and does not yield additional diversification benefits. Using OLS estimation we find that the p-values for all of the replicating portfolios are above 0.23 for 36 countries, leading us to not reject the null hypothesis for 36 of the 37 countries. The exception is Colombia which has p-values of 0.09 and 0.08 for its D1 and D2 portfolios, for which we reject the null hypothesis of spanning at the 10 percent critical level. It does however have a p-value of 0.14 for its D3 portfolio. These results are considerably stronger than those of Errunza et al. (1999). For 16 countries between 1976 and 1993, spanning is rejected for replicating portfolios for 5 emerging markets and 6 developed markets.

As a further test which incorporates measures of skew and excess kurtosis in portfolio returns, we calculate the modified Value-at-Risk of the foreign country indices and the replicating portfolios. Standard measures of Value-at-Risk (VAR) calculate the maximum expected loss of a portfolio for a given confidence level for a specified period of time. Modified VAR (mVAR) incorporates skew and kurtosis into the calculation of the maximum expected loss for a $100 portfolio over a period of one week. The results are presented in Table 7. We calculate the mVAR for each portfolio for 95 and 99 percent confidence level, or -1.96 and -2.33 standard deviations. In every case the maximum expected loss of the replicating portfolio is lower than the maximum expected loss of the corresponding country index. The maximum loss decreases from D1 to D2 to D3. This further strengthens the results for the replicating portfolios.

## 5.4 Sub-period Analysis

To test the robustness of our results over time, we divide our data period into sub-periods, March 1996 to December 2002, January 2003 to December 2007 and January 2008 to June 2011. In Table 8 we list the correlations of the foreign country indices with domestic firms and with the three replicating portfolios for the three sub-periods. As for the full period, the average correlations of developed markets with the US market are higher than the average emerging market correlations. What is striking is the increase in correlations from the first to the last sub-period; the correlations increase steadily for all countries as time progresses. This is consistent with the observed increases in interdependence between countries’ equity markets (Buraschi, Porchia, & Trojani, 2010). The greatest differences between the correlation of the domestic firms with the foreign indices and the replicating portfolios with the foreign indices occur in the first two periods. Developed country indices have an average of 24 and 51 percent correlation with domestic firms in the first two sub-periods, and an average of 49 and 90 percent correlation with the D3 portfolios. Emerging market indices have an average of 12 and 38 percent correlation with domestic firms in the first two sub-periods and an average 39 and 79 percent correlation with the D3 portfolios. These increases become less pronounced in the last sub-period, where developed market indices are 69 percent correlated with domestic firms and 92 percent correlated with the D3 portfolios, and emerging market indices are 60 percent correlated with domestic firms and 88 percent correlated with the D3 portfolios.

Table 9 lists the risk-adjusted returns for the three sub-periods for the foreign country indices and for the replicating portfolios. The performance of the US market is included for comparative purposes. The risk-adjusted returns are highest for both developed and emerging markets in the period 2003 to 2007. The average risk-adjusted return of both DM and EM countries outperform the US in this period, which was characterised by low volatility in the US and strong performance of most foreign country indices in the absence of any major financial crises. In the period before 2003, the risk-adjusted performance of either the S&P500 or Russell 1000 was better than all but one country, Finland. Emerging market returns are mostly negative in this period. In the period after 2007, the US and most of the developed markets experience negative returns, while emerging markets have proportionally more countries with positive returns. The average risk-adjusted return for emerging markets is 0.12 in this period, compared to -0.19 for developed markets and -0.17 for the S&P500. When comparing the replicating portfolios to the foreign country indices, developed markets have on average a lower performance than the foreign country indices in the first two sub-periods and an equal or better performance after 2007. For emerging markets, the portfolios on average outperform the foreign country indices before 2003, and underperform the foreign country indices in the other two sub-periods.

Table 10 lists the Mean-Variance Spanning results for the three sub-periods for D1, D2 and D3 portfolios. In the first and last sub-periods, spanning is not rejected for any portfolio for any country at a 10 percent critical level, with the exception of Ireland after 2007. The results for the period 2003 to 2007 are mixed. Spanning is rejected in this period for 15 D1 portfolios, 16 D2 portfolios and 3 D3 portfolios. When ADRs, iShares and CCFs are included, it is possible to replicate 34 of the 37 foreign country indices. Without the inclusion of these products, the D1 and D2 portfolios do not replicate almost half of the foreign country indices. This result is differs to the other two sub-periods, where for 36 of the 37 countries the replicating portfolios convincingly span the foreign country indices in all cases. When international diversification benefits are at their highest in 2003 to 2007, the Russell 1000, Industry Indices and MNCs do not exhaust the benefits of investing in the foreign index for all countries. ADRs, iShares and CCFs are essential in this period to adequately replicate investment in foreign country indices. Comprised of US headquartered companies, Industry Indices and MNC are more highly correlated with the US market than with foreign country indices. This has the greatest impact in the period 2003 to 2007 when the US underperforms foreign markets.

In order to test the robustness of our results, for the 16 D1 portfolios, 15 D2 portfolios and 3 D3 portfolios in the 2003 to 2007 period which do not span their corresponding foreign country index, we recreate the replicating portfolios. We use a 0.20 stepwise regression forward stopping value, which increases the number of independent variables included in the regression. We also create portfolios with weightings in all of the assets available for each country using a standard OLS regression. The results are in listed in Table 11. By increasing the threshold for stepwise regression there is in most cases no change in the spanning results. The results change for 2 of the 3 D3 portfolios, for 2 D2 portfolios and for 1 D1 portfolio, for which spanning is rejected. For example for India, when using a 0.05 stopping value, spanning is rejected for its D1, D2 and D3 portfolios, with p-values of 0.02, 0.02 and 0.04. When we repeat the stepwise regression using a stopping value of 0.20 and using no stopping value, the results for the D1 and D2 portfolios only increase to 0.03 and 0.04. The results for the D3 portfolio increase to 0.15 and 0.13. Therefore we do not reject spanning for the D3 portfolio but the result is unchanged for the D1 and D2 portfolios, spanning is rejected. By expanding the number of independent variables, the likelihood of spanning being not rejected is either unchanged or increased. There is no instance of a substantial reduction in the likelihood of spanning. This confirms our earlier analysis that a lower p-value represents a more stringent requirement for the construction of the replicating portfolios.

The D1 and D2 portfolios are comprised of Industry Indices, MNCs and the Russell 1000 index. All contain US headquartered companies only and are counted as domestic equity holdings. For the full period, these portfolios can replicate 36 of the 37 foreign country indices. This means that home bias, i.e. holding domestic equity, is not sub-optimal over this period. However, in our sub-period analysis, the D1 and D2 portfolios do not replicate almost half of the foreign country indices in the period 2003 to 2007, demonstrating that home bias can be sub-optimal over shorter time horizons. However, the consistent results for the D3 portfolios should convince any investor that investing in US-traded products only is an adequate diversification strategy.

# 6. Conclusion

In this paper we test whether US-traded equity products can replicate the returns of 37 foreign country indices, over the period 1996 to 2011. We form three types of replicating portfolios, the first of Industry Indices, the second of the Russell 1000, Industry Indices and MNCs and the third of Russell 1000, Industry Indices, MNCs, ADRs, CCFs and iShares. We examine the diversification benefits of these portfolios for the full period and three sub-periods, and test whether the benefits of investing overseas can be fully replicated using domestically traded products.

For the full period our results are very conclusive, by investing in all three types of replicating portfolios investors can achieve most of the benefits of investing directly in foreign equity markets. When divided into sub-periods, the results are more varied. In the period 2003 to 2007, the foreign country indices can be replicated for 36 of the 37 countries, but for nearly half of the countries the addition of ADRs, iShares or CCFs to the portfolio is essential. In the other sub-periods and in the full period, replicating portfolios comprised of Industry Indices only and of Industry Indices, MNCs and the Russell 1000 can replicate the foreign indices with or without the inclusion of ADRs, iShares and CCFs.

We contribute to the earlier findings by Errunza et al. (1999) using an expanded dataset which includes more products and countries. Our results are more robust due to the greater role of industrial diversification, the increasing foreign exposure that can be provided by MNCs, the increase in the availability of ADRs and the introduction of iShares. US investors who invest only in US-traded products are not forgoing the benefit of international diversification. We find that those benefits can be exhausted domestically, negating the need to negotiate foreign equity markets. Further study will extend this analysis to other countries with sufficient data, such as Eurozone countries or Japan, to test whether investing only in domestically traded products is an optimal strategy in countries other than the US and the UK.

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Table 1 US Holdings of Foreign Equity

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| 1. US foreign equity holdings[[12]](#footnote-12) | 2,079 | 2,560 | 3,318 | 4,329 | 5,253 | 2,748 | 3,995 | 4,647 | 4,501 |
| 2. Market cap of US firms[[13]](#footnote-13) | 17,941 | 22,002 | 23,941 | 26,508 | 31,710 | 28,714 | 22,647 | 24,633 | 30,998 |
| 3. Foreign holdings of US firms[[14]](#footnote-14) | 1,564 | 1,930 | 2,144 | 2,430 | 3,130 | 2,969 | 2,252 | 2,814 | 3,830 |
| 4. US total equity holdings = 1. + 2. - 3. | 18,456 | 22,632 | 25,115 | 28,407 | 33,833 | 28,493 | 24,390 | 26,466 | 31,669 |
| % foreign holdings = 1./4. | 11% | 11% | 13% | 15% | 16% | 10% | 16% | 18% | 14% |

Notes: This table calculates the holdings by US investors of foreign equities as a percentage of their total equity holdings. The total equity holding is the market capitalisation of all US firms less the amount of that which is held by foreign investors plus foreign equity holdings by US investors.

Table 2 List of US-Traded Products for each Country

|  |  |  |  |
| --- | --- | --- | --- |
|  | iShare | Number of ADRs | CCF |
| *Developed Markets* |  |  |  |
| Argentina |  | 5 |  |
| Australia | √ | 2 | Aberdeen Australia Equity Fund |
| Austria | √ |  |  |
| Belgium | √ |  |  |
| Canada | √ |  |  |
| Denmark |  | 1 |  |
| Finland |  | 1 |  |
| France | √ | 2 |  |
| Germany | √ | 2 | New Germany Fund |
| Hong Kong | √ |  | Greater China Fund |
| Ireland |  | 4 | New Ireland Fund |
| Israel |  | 2 | Aberdeen Israel Fund |
| Italy | √ | 4 |  |
| Japan | √ | 10 | Japan Equity Fund |
| Netherlands | √ | 6 |  |
| New Zealand |  | 1 |  |
| Portugal |  | 1 |  |
| Singapore | √ |  | Singapore Fund |
| Spain | √ | 3 |  |
| Sweden | √ | 1 |  |
| Switzerland | √ | 2 | Swiss Helvetia Fund |
| UK | √ | 15 |  |
| *Emerging Markets* |  |  |  |
| Brazil |  | 4 |  |
| Chile |  | 7 | Aberdeen Chile Fund |
| China |  | 2 | China Fund |
| Colombia |  | 1 |  |
| India |  |  | India Fund |
| Indonesia |  | 2 | Aberdeen Indonesia Fund |
| Malaysia | √ |  | Malaysia Fund |
| Mexico | √ | 8 | Mexico Fund |
| Philippines |  | 1 |  |
| Russia |  |  | Templeton Russia & Eastern European Fund |
| South Africa |  | 5 |  |
| South Korea |  | 2 | Korea Fund |
| Taiwan |  |  | Taiwan Fund |
| Thailand |  |  | Thai Fund |
| Turkey |  |  | Turkish Investment Fund |

Notes: This table lists the number of ADRs for each country and whether an iShare or CCF exists for each country. Only countries for which either an ADR, iShare or CCF exists are included in the dataset.

Table 3 Average Compositions of Replicating Portfolios

|  |  |  |
| --- | --- | --- |
|  | Developed Markets | Emerging Markets |
| D1 | | |
| Consumer Discretionary | -4% | 0% |
| Consumer Staples | 1% | 0% |
| Energy | 12% | 8% |
| Financials | 10% | 2% |
| Healthcare | 0% | 3% |
| I.T. | 10% | 14% |
| Industrials | 0% | -4% |
| Materials | 21% | 36% |
| Telcommunications | 6% | 4% |
| Utilities | 9% | 3% |
| D2 | | |
| Industries | 24% | 30% |
| Russell 1000 | 16% | 17% |
| MNCs | 17% | 14% |
| D3 | | |
| Industries | 12% | 11% |
| Russell 1000 | -5% | 3% |
| MNCs | 9% | 6% |
| ADRs | 23% | 37% |
| CCFs | 18% | 31% |
| iShares | 58% | 35% |

Notes: This table shows the average weighting in each asset type in the replicating portfolios, D1, D2 and D3 for developed and emerging markets. For example iShares have an average weighting of 54% in developed market D3 portfolios.

Table 4 Correlations with Foreign Country Indices

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Country Indices | Domestic Firms | Russell 1000 | D1 | D2 | D3 |
| *Developed Markets* |  |  |  |  |  |
| Argentina | 37% | 37% | 44% | 47% | 63% |
| Australia | 59% | 59% | 66% | 70% | 88% |
| Austria | 55% | 48% | 58% | 63% | 84% |
| Belgium | 58% | 53% | 57% | 61% | 78% |
| Canada | 64% | 66% | 72% | 75% | 80% |
| Denmark | 55% | 53% | 59% | 62% | 71% |
| Finland | 45% | 50% | 54% | 57% | 74% |
| France | 63% | 66% | 69% | 71% | 81% |
| Germany | 61% | 65% | 69% | 70% | 81% |
| Hong Kong | 36% | 38% | 41% | 45% | 47% |
| Ireland | 54% | 49% | 53% | 57% | 77% |
| Israel | 29% | 40% | 47% | 48% | 57% |
| Italy | 56% | 58% | 61% | 63% | 75% |
| Japan | 27% | 31% | 36% | 41% | 71% |
| Netherlands | 60% | 61% | 65% | 68% | 82% |
| New Zealand | 44% | 42% | 48% | 52% | 68% |
| Portugal | 43% | 43% | 47% | 50% | 62% |
| Singapore | 39% | 39% | 43% | 45% | 60% |
| Spain | 55% | 55% | 59% | 60% | 79% |
| Sweden | 58% | 63% | 67% | 69% | 80% |
| Switzerland | 55% | 54% | 58% | 60% | 77% |
| UK | 65% | 64% | 69% | 72% | 84% |
| Average | 51% | 51% | 56% | 59% | 74% |
| *Emerging Markets* |  |  |  |  |  |
| Brazil | 49% | 51% | 57% | 60% | 74% |
| Chile | 43% | 45% | 49% | 53% | 72% |
| China | 28% | 30% | 32% | 37% | 43% |
| Colombia | 32% | 27% | 32% | 33% | 48% |
| India | 33% | 37% | 40% | 44% | 59% |
| Indonesia | 23% | 23% | 25% | 31% | 58% |
| Korea | 33% | 35% | 43% | 48% | 61% |
| Malaysia | 18% | 22% | 24% | 34% | 53% |
| Mexico | 61% | 60% | 63% | 68% | 76% |
| Philippines | 25% | 24% | 27% | 32% | 48% |
| Russia | 29% | 29% | 31% | 37% | 45% |
| South Africa | 50% | 50% | 57% | 60% | 67% |
| Taiwan | 30% | 34% | 40% | 44% | 60% |
| Thailand | 16% | 19% | 27% | 34% | 44% |
| Turkey | 33% | 31% | 33% | 40% | 57% |
| Average | 34% | 34% | 39% | 44% | 58% |

Notes: This table shows the pairwise correlation of each foreign country index with a portfolio of domestic US firms, with the Russell 1000, with D1 comprised of Industry Indices, with D2 comprised of the Russell 1000, MNCs and Industry Indices, and D3 comprised of the Russell 1000, MNCs, Industry Indices, ADRs, iShares and CCFs.

Table 5 Risk-adjusted Return

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Country indices | | | D1 | | | D2 | | | D3 | | |
| *Developed Markets* | Return | Risk | Return/Risk | Return | Risk | Return/Risk | Return | Risk | Return/Risk | Return | Risk | Return/Risk |
| Argentina | 7.9% | 39.2% | 0.20 | 7.9% | 17.2% | 0.46 | 7.9% | 18.5% | 0.43 | 7.9% | 24.5% | 0.32 |
| Australia | 10.2% | 23.7% | 0.43 | 10.2% | 15.6% | 0.65 | 10.2% | 16.6% | 0.61 | 10.2% | 20.9% | 0.49 |
| Austria | 5.4% | 28.0% | 0.19 | 5.2% | 16.1% | 0.32 | 5.2% | 17.7% | 0.29 | 5.2% | 23.4% | 0.22 |
| Belgium | 4.7% | 24.0% | 0.20 | 3.3% | 13.7% | 0.24 | 3.5% | 14.6% | 0.24 | 3.2% | 18.7% | 0.17 |
| Canada | 11.4% | 23.6% | 0.48 | 5.7% | 16.9% | 0.34 | 3.9% | 17.8% | 0.22 | 7.1% | 18.7% | 0.38 |
| Denmark | 11.5% | 23.5% | 0.49 | 3.6% | 14.0% | 0.26 | 4.0% | 14.4% | 0.28 | 7.5% | 16.6% | 0.45 |
| Finland | 10.8% | 34.3% | 0.31 | 5.1% | 18.5% | 0.27 | 5.2% | 19.5% | 0.27 | 5.7% | 25.2% | 0.23 |
| France | 7.7% | 23.8% | 0.32 | 5.2% | 16.6% | 0.31 | 4.7% | 16.7% | 0.28 | 4.9% | 19.2% | 0.25 |
| Germany | 7.4% | 25.7% | 0.29 | 5.7% | 17.7% | 0.32 | 5.2% | 18.1% | 0.29 | 4.8% | 20.8% | 0.23 |
| Hong Kong | 6.2% | 26.6% | 0.23 | 3.6% | 10.8% | 0.33 | 3.8% | 12.1% | 0.32 | 3.8% | 12.6% | 0.30 |
| Ireland | -2.2% | 28.3% | -0.08 | 5.2% | 15.1% | 0.34 | 3.2% | 16.2% | 0.20 | 3.5% | 21.6% | 0.16 |
| Israel | 8.1% | 23.9% | 0.34 | 3.4% | 11.2% | 0.31 | 3.3% | 11.5% | 0.29 | 5.9% | 13.7% | 0.43 |
| Italy | 5.7% | 26.3% | 0.22 | 5.2% | 16.0% | 0.32 | 4.6% | 16.6% | 0.28 | 3.7% | 19.5% | 0.19 |
| Japan | -0.9% | 21.3% | -0.04 | 2.8% | 7.9% | 0.35 | 0.2% | 8.6% | 0.02 | -2.3% | 15.1% | -0.15 |
| Netherlands | 6.4% | 24.3% | 0.26 | 5.2% | 15.9% | 0.33 | 4.4% | 16.4% | 0.27 | 3.0% | 19.8% | 0.15 |
| New Zealand | 4.9% | 22.3% | 0.22 | 2.7% | 10.6% | 0.26 | 1.2% | 11.5% | 0.10 | 1.8% | 15.1% | 0.12 |
| Portugal | 6.5% | 22.6% | 0.29 | 3.0% | 10.6% | 0.28 | 2.3% | 11.3% | 0.20 | 3.9% | 13.9% | 0.28 |
| Singapore | 4.8% | 26.5% | 0.18 | 3.2% | 11.3% | 0.28 | 3.3% | 12.0% | 0.28 | 1.9% | 15.9% | 0.12 |
| Spain | 10.7% | 26.3% | 0.41 | 4.8% | 15.9% | 0.30 | 4.1% | 15.9% | 0.26 | 7.1% | 20.7% | 0.34 |
| Sweden | 10.4% | 29.0% | 0.36 | 3.9% | 19.5% | 0.20 | 4.9% | 20.0% | 0.25 | 7.1% | 23.4% | 0.31 |
| Switzerland | 8.2% | 21.4% | 0.38 | 3.9% | 12.3% | 0.32 | 2.7% | 12.8% | 0.21 | 4.1% | 16.4% | 0.25 |
| UK | 6.2% | 20.5% | 0.30 | 4.7% | 14.2% | 0.33 | 3.1% | 14.4% | 0.22 | 4.4% | 17.1% | 0.26 |
| Average | 6.9% | 25.7% | 0.27 | 4.7% | 14.4% | 0.32 | 4.1% | 15.1% | 0.26 | 4.7% | 18.8% | 0.25 |
| *Emerging Markets* |  |  |  |  |  |  |  |  |  |  |  |  |
| Brazil | 15.1% | 40.4% | 0.37 | 10.4% | 30.3% | 0.34 | 6.4% | 30.3% | 0.21 | 11.4% | 30.3% | 0.38 |
| Chile | 10.4% | 25.4% | 0.41 | 3.5% | 12.3% | 0.28 | 2.9% | 13.6% | 0.22 | 7.4% | 18.2% | 0.40 |
| China | 4.2% | 37.0% | 0.11 | 4.5% | 12.0% | 0.37 | 2.5% | 13.6% | 0.18 | 4.8% | 15.9% | 0.31 |
| Colombia | 19.2% | 31.3% | 0.61 | 3.1% | 10.0% | 0.31 | 2.6% | 10.4% | 0.25 | 5.2% | 15.0% | 0.35 |
| India | 11.5% | 30.0% | 0.38 | 0.4% | 12.0% | 0.03 | 0.4% | 13.2% | 0.03 | 0.6% | 17.7% | 0.03 |
| Indonesia | 5.8% | 48.8% | 0.12 | 3.0% | 12.3% | 0.24 | 5.0% | 15.0% | 0.33 | 3.8% | 28.5% | 0.13 |
| Korea | 4.1% | 29.0% | 0.14 | 4.2% | 17.8% | 0.23 | 3.5% | 19.9% | 0.18 | 4.1% | 25.6% | 0.16 |
| Malaysia | 14.2% | 30.5% | 0.47 | 1.9% | 7.0% | 0.27 | 2.6% | 9.7% | 0.27 | 0.8% | 15.4% | 0.05 |
| Mexico | -1.2% | 30.9% | -0.04 | 5.2% | 19.2% | 0.27 | 6.4% | 20.7% | 0.31 | 8.5% | 23.1% | 0.37 |
| Philippines | 6.8% | 70.9% | 0.10 | 2.0% | 8.4% | 0.24 | 3.0% | 9.7% | 0.31 | 2.9% | 14.4% | 0.20 |
| Russia | 8.2% | 29.5% | 0.28 | 9.4% | 22.4% | 0.42 | 9.2% | 26.0% | 0.35 | 5.1% | 31.6% | 0.16 |
| South Africa | 7.9% | 41.7% | 0.19 | 5.5% | 16.8% | 0.32 | 3.6% | 17.7% | 0.21 | 4.6% | 19.7% | 0.24 |
| Taiwan | 4.3% | 28.7% | 0.15 | 2.9% | 11.5% | 0.25 | 1.7% | 12.8% | 0.14 | 1.3% | 17.2% | 0.08 |
| Thailand | -0.2% | 41.3% | 0.00 | 2.1% | 11.1% | 0.19 | 0.8% | 13.9% | 0.06 | -2.4% | 18.0% | -0.13 |
| Turkey | 12.1% | 57.3% | 0.21 | 5.2% | 19.0% | 0.27 | 5.0% | 22.9% | 0.22 | 6.4% | 32.7% | 0.20 |
| Average | 8.2% | 38.2% | 0.23 | 4.2% | 14.8% | 0.27 | 3.7% | 16.6% | 0.22 | 4.3% | 21.6% | 0.20 |

Notes: This table shows the annualised return and annualised standard deviation for the MSCI index of each country and of each of the replicating portfolios, D1, D2 and D3.

Table 6 MVS Test Results

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | D1 | | D2 | | D3 | |
| *Developed Markets* | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value |
| Argentina | 0.03 | 0.97 | 0.06 | 0.94 | 0.11 | 0.89 |
| Australia | 0.43 | 0.57 | 1.95 | 0.15 | 1.54 | 0.23 |
| Austria | 0.01 | 0.99 | 0.08 | 0.92 | 0.11 | 0.89 |
| Belgium | 0.04 | 0.96 | 0.03 | 0.97 | 0.07 | 0.93 |
| Canada | 0.53 | 0.38 | 2.05 | 0.17 | 0.75 | 0.49 |
| Denmark | 1.52 | 0.26 | 1.50 | 0.28 | 0.43 | 0.63 |
| Finland | 0.28 | 0.74 | 0.28 | 0.74 | 0.39 | 0.67 |
| France | 0.12 | 0.88 | 0.25 | 0.79 | 0.29 | 0.73 |
| Germany | 0.02 | 0.98 | 0.11 | 0.89 | 0.22 | 0.8 |
| Hong Kong | 0.09 | 0.91 | 0.08 | 0.92 | 0.08 | 0.92 |
| Ireland | 0.76 | 0.48 | 0.40 | 0.66 | 0.77 | 0.47 |
| Israel | 0.37 | 0.69 | 0.39 | 0.67 | 0.09 | 0.91 |
| Italy | 0.01 | 0.99 | 0.02 | 0.98 | 0.09 | 0.91 |
| Japan | 0.25 | 0.77 | 0.02 | 0.98 | 0.07 | 0.93 |
| Netherlands | 0.02 | 0.98 | 0.08 | 0.92 | 0.41 | 0.65 |
| New Zealand | 0.08 | 0.91 | 0.27 | 0.75 | 0.26 | 0.76 |
| Portugal | 0.23 | 0.79 | 0.35 | 0.70 | 0.17 | 0.85 |
| Singapore | 0.03 | 0.97 | 0.03 | 0.97 | 0.16 | 0.86 |
| Spain | 0.45 | 0.55 | 0.77 | 0.47 | 0.37 | 0.69 |
| Sweden | 0.75 | 0.49 | 0.41 | 0.59 | 0.27 | 0.75 |
| Switzerland | 0.43 | 0.63 | 0.78 | 0.46 | 0.49 | 0.51 |
| UK | 0.08 | 0.92 | 0.35 | 0.71 | 0.19 | 0.83 |
| *Emerging Markets* |  |  |  |  |  |  |
| Brazil | 0.40 | 0.66 | 0.43 | 0.57 | 0.10 | 0.9 |
| Chile | 0.77 | 0.47 | 0.51 | 0.39 | 0.22 | 0.8 |
| China | 0.01 | 0.99 | 0.02 | 0.98 | 0.01 | 0.99 |
| Colombia | 2.48 | 0.09 | 2.50 | 0.08 | 1.97 | 0.14 |
| India | 0.44 | 0.56 | 0.47 | 0.53 | 0.38 | 0.68 |
| Indonesia | 0.03 | 0.97 | 0.01 | 0.99 | 0.02 | 0.98 |
| Korea | 0.07 | 0.93 | 0.11 | 0.89 | 0.10 | 0.9 |
| Malaysia | 0.04 | 0.96 | 0.02 | 0.98 | 0.15 | 0.87 |
| Mexico | 0.53 | 0.36 | 0.51 | 0.39 | 0.47 | 0.53 |
| Philippines | 0.09 | 0.91 | 0.14 | 0.86 | 0.18 | 0.84 |
| Russia | 0.01 | 0.99 | 0.01 | 0.99 | 0.01 | 0.99 |
| South Africa | 0.09 | 0.91 | 0.26 | 0.76 | 0.21 | 0.81 |
| Taiwan | 0.02 | 0.98 | 0.07 | 0.93 | 0.12 | 0.88 |
| Thailand | 0.02 | 0.98 | 0.01 | 0.99 | 0.03 | 0.97 |
| Turkey | 0.11 | 0.89 | 0.13 | 0.87 | 0.10 | 0.9 |

*Notes:* For each portfolio, this table shows the F-statistic and p-values from the Wald tests of Mean Variance spanning, which tests if the addition of the foreign country index to the replicating portfolio shifts the mean variance efficient frontier. If spanning is not rejected, the addition of the foreign country index does not shift the mean variance frontier and there is no significant diversification benefit to be gained by investing overseas.

Table 7 mVAR Results

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Country Indices | | D1 | | D2 | | D3 | |
| *Developed Markets* | 1.96 σ | 2.33 σ | 1.96 σ | 2.33 σ | 1.96 σ | 2.33 σ | 1.96 σ | 2.33 σ |
| Argentina | 17.27 | 31.16 | 6.66 | 11.20 | 7.60 | 13.24 | 10.19 | 17.64 |
| Australia | 12.20 | 23.80 | 6.04 | 10.19 | 7.53 | 13.68 | 9.47 | 16.81 |
| Austria | 14.24 | 27.11 | 6.21 | 10.63 | 8.16 | 15.12 | 10.87 | 19.43 |
| Belgium | 10.29 | 17.62 | 5.23 | 8.95 | 6.34 | 11.54 | 8.28 | 14.42 |
| Canada | 9.86 | 17.71 | 6.65 | 11.23 | 7.94 | 14.33 | 8.31 | 15.18 |
| Denmark | 10.29 | 18.49 | 5.47 | 9.35 | 6.54 | 11.86 | 7.31 | 13.51 |
| Finland | 11.73 | 19.68 | 6.48 | 10.06 | 6.81 | 10.51 | 8.71 | 13.53 |
| France | 9.68 | 16.92 | 6.59 | 11.33 | 7.58 | 13.81 | 8.62 | 15.91 |
| Germany | 10.20 | 17.69 | 6.94 | 11.73 | 7.71 | 13.66 | 8.82 | 15.76 |
| Hong Kong | 12.69 | 26.59 | 4.11 | 6.80 | 4.68 | 7.77 | 5.47 | 9.12 |
| Ireland | 14.65 | 27.88 | 6.28 | 11.14 | 7.67 | 14.31 | 10.28 | 19.40 |
| Israel | 7.83 | 13.65 | 3.99 | 6.24 | 4.00 | 6.20 | 4.71 | 7.34 |
| Italy | 10.67 | 19.42 | 6.42 | 11.06 | 7.69 | 14.19 | 9.17 | 16.86 |
| Japan | 7.13 | 11.41 | 2.85 | 4.58 | 3.21 | 5.21 | 5.36 | 8.78 |
| Netherlands | 11.30 | 21.02 | 6.46 | 11.21 | 7.53 | 13.83 | 9.16 | 16.77 |
| New Zealand | 9.20 | 15.64 | 4.12 | 7.12 | 5.40 | 10.10 | 7.01 | 13.41 |
| Portugal | 8.96 | 15.45 | 4.19 | 7.35 | 5.28 | 9.94 | 6.47 | 12.22 |
| Singapore | 10.51 | 19.32 | 4.02 | 6.42 | 4.30 | 6.95 | 5.86 | 9.40 |
| Spain | 11.06 | 19.73 | 6.28 | 10.95 | 6.83 | 12.27 | 8.88 | 16.01 |
| Sweden | 10.79 | 18.18 | 7.00 | 11.27 | 7.16 | 11.59 | 8.28 | 13.45 |
| Switzerland | 9.68 | 18.13 | 4.96 | 8.53 | 6.39 | 12.28 | 7.92 | 15.95 |
| UK | 9.85 | 18.90 | 5.83 | 10.23 | 7.05 | 13.26 | 8.21 | 15.54 |
| *Emerging Markets* |  |  |  |  |  |  |  |  |
| Brazil | 17.76 | 31.55 | 9.15 | 15.66 | 8.92 | 14.89 | 11.26 | 18.74 |
| Chile | 14.22 | 29.09 | 4.96 | 8.54 | 6.79 | 13.11 | 9.07 | 17.49 |
| China | 15.12 | 30.58 | 4.54 | 7.38 | 5.56 | 9.32 | 6.12 | 10.65 |
| Colombia | 12.99 | 24.78 | 3.83 | 6.28 | 4.05 | 6.72 | 5.59 | 9.49 |
| India | 10.31 | 16.80 | 4.30 | 6.81 | 5.04 | 8.19 | 6.38 | 10.61 |
| Indonesia | 22.64 | 42.37 | 4.24 | 6.65 | 5.22 | 8.05 | 9.52 | 14.77 |
| Korea | 17.05 | 37.11 | 6.08 | 9.27 | 6.95 | 10.77 | 8.33 | 13.03 |
| Malaysia | 13.91 | 30.57 | 2.46 | 3.82 | 3.34 | 5.04 | 4.72 | 7.15 |
| Mexico | 13.44 | 25.05 | 7.53 | 13.09 | 8.03 | 13.75 | 9.15 | 15.47 |
| Philippines | 13.08 | 24.72 | 2.90 | 4.54 | 3.72 | 6.17 | 5.58 | 9.32 |
| Russia | 60.71 | 150.24 | 8.55 | 14.18 | 9.51 | 15.56 | 11.80 | 19.12 |
| South Africa | 11.69 | 21.24 | 6.12 | 9.80 | 6.53 | 10.63 | 7.12 | 11.67 |
| Taiwan | 9.69 | 16.30 | 3.97 | 5.99 | 4.30 | 6.48 | 5.65 | 8.52 |
| Thailand | 19.06 | 38.18 | 3.70 | 5.50 | 6.02 | 10.55 | 7.26 | 13.33 |
| Turkey | 27.75 | 59.36 | 6.64 | 10.31 | 7.72 | 11.93 | 11.54 | 17.61 |

Notes: This table shows the maximum expected loss over a period of one week for a $100 portfolio calculated using the modified Value-at-Risk (mVAR). The mVAR is calculated for the foreign country indices and for the 3 replicating portfolios for each country using 1.96 and 2.33 standard deviations.

Table 8 Correlations for sub-periods

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1996-2002 | | | | 2003-2007 | | | | 2008-2011 | | | |
| *Developed Markets* | *Domestic Firms* | *D1* | *D2* | *D3* | *Domestic Firms* | *D1* | *D2* | *D3* | *Domestic Firms* | *D1* | *D2* | *D3* |
| Argentina | 11% | 16% | 20% | 39% | 41% | 57% | 58% | 79% | 60% | 70% | 75% | 85% |
| Australia | 23% | 41% | 44% | 65% | 46% | 65% | 67% | 95% | 76% | 86% | 87% | 97% |
| Austria | 14% | 15% | 15% | 42% | 44% | 57% | 62% | 95% | 72% | 80% | 84% | 96% |
| Belgium | 31% | 27% | 32% | 50% | 58% | 65% | 69% | 93% | 72% | 75% | 79% | 93% |
| Canada | 35% | 45% | 49% | 49% | 57% | 79% | 79% | 98% | 81% | 94% | 96% | 99% |
| Denmark | 28% | 31% | 35% | 43% | 44% | 60% | 67% | 78% | 73% | 80% | 84% | 88% |
| Finland | 24% | 39% | 42% | 55% | 51% | 66% | 67% | 95% | 72% | 79% | 80% | 94% |
| France | 37% | 43% | 46% | 56% | 68% | 80% | 83% | 96% | 77% | 87% | 89% | 98% |
| Germany | 37% | 45% | 47% | 55% | 67% | 79% | 85% | 97% | 78% | 88% | 90% | 99% |
| Hong Kong | 18% | 19% | 31% | 31% | 42% | 52% | 52% | 60% | 60% | 67% | 70% | 75% |
| Ireland | 26% | 27% | 31% | 50% | 53% | 57% | 61% | 93% | 65% | 70% | 70% | 92% |
| Israel | 23% | 46% | 46% | 51% | 45% | 56% | 56% | 78% | 38% | 46% | 49% | 63% |
| Italy | 30% | 35% | 40% | 44% | 62% | 72% | 74% | 96% | 73% | 83% | 84% | 98% |
| Japan | -1% | 19% | 19% | 57% | 38% | 49% | 51% | 93% | 52% | 61% | 69% | 88% |
| Netherlands | 36% | 39% | 46% | 60% | 64% | 77% | 80% | 95% | 76% | 85% | 88% | 98% |
| New Zealand | 10% | 26% | 26% | 43% | 29% | 37% | 42% | 82% | 73% | 79% | 80% | 88% |
| Portugal | 15% | 24% | 30% | 36% | 35% | 45% | 56% | 76% | 63% | 72% | 77% | 84% |
| Singapore | 14% | 20% | 26% | 33% | 45% | 56% | 61% | 89% | 64% | 70% | 75% | 95% |
| Spain | 31% | 34% | 41% | 46% | 54% | 67% | 74% | 97% | 69% | 77% | 79% | 98% |
| Sweden | 32% | 52% | 52% | 60% | 63% | 73% | 77% | 96% | 77% | 84% | 85% | 98% |
| Switzerland | 30% | 30% | 36% | 53% | 58% | 68% | 76% | 93% | 74% | 82% | 86% | 96% |
| UK | 35% | 36% | 41% | 52% | 64% | 77% | 79% | 95% | 78% | 87% | 90% | 97% |
| Average | 24% | 32% | 36% | 49% | 51% | 63% | 67% | 90% | 69% | 77% | 80% | 92% |
| *Emerging Markets* |  |  |  |  |  |  |  |  |  |  |  |  |
| Brazil | 19% | 28% | 29% | 54% | 62% | 75% | 79% | 92% | 75% | 87% | 91% | 95% |
| Chile | 18% | 20% | 34% | 38% | 51% | 60% | 66% | 92% | 57% | 72% | 80% | 95% |
| China | 8% | 12% | 14% | 22% | 32% | 52% | 61% | 78% | 57% | 67% | 70% | 85% |
| Colombia | 11% | 9% | 11% | 25% | 29% | 39% | 47% | 65% | 61% | 65% | 74% | 85% |
| India | 6% | 21% | 25% | 35% | 34% | 50% | 58% | 72% | 55% | 63% | 73% | 87% |
| Indonesia | 8% | 13% | 23% | 51% | 26% | 42% | 54% | 84% | 53% | 53% | 73% | 88% |
| Korea | 7% | 28% | 32% | 51% | 48% | 60% | 62% | 74% | 63% | 69% | 76% | 85% |
| Malaysia | 12% | 14% | 23% | 41% | 27% | 34% | 41% | 89% | 41% | 52% | 62% | 93% |
| Mexico | 26% | 29% | 44% | 50% | 69% | 74% | 76% | 97% | 85% | 90% | 93% | 98% |
| Philippines | 4% | 12% | 22% | 31% | 31% | 45% | 51% | 71% | 50% | 56% | 59% | 75% |
| Russia | 17% | 16% | 17% | 26% | 26% | 52% | 53% | 71% | 61% | 71% | 78% | 85% |
| South Africa | 20% | 31% | 33% | 38% | 52% | 65% | 67% | 78% | 70% | 79% | 83% | 91% |
| Taiwan | 11% | 26% | 36% | 48% | 38% | 52% | 52% | 81% | 54% | 64% | 67% | 86% |
| Thailand | 2% | 12% | 13% | 28% | 18% | 36% | 36% | 64% | 44% | 58% | 67% | 88% |
| Turkey | 17% | 17% | 27% | 42% | 34% | 41% | 52% | 75% | 69% | 70% | 74% | 86% |
| Average | 12% | 19% | 26% | 39% | 38% | 52% | 57% | 79% | 60% | 68% | 75% | 88% |

Notes: This table shows the correlation of each foreign country index with the domestic firms, and the replicating portfolios D1, D2 and D3 in the 3 sub-periods.

Table 9 Risk-adjusted return for sub-periods

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1996-2002 | | | | | 2003-2007 | | | | 2008-2011 | | | |
| Developed Markets | Country Indices | D1 | D2 | D3 | Country Indices | D1 | D2 | D3 | Country Indices | D1 | D2 | D3 |
| Argentina | -0.27 | -1.66 | -1.35 | -0.71 | 1.38 | 2.44 | 2.39 | 1.75 | 0.03 | 0.04 | 0.04 | 0.04 |
| Australia | 0.13 | 0.32 | 0.30 | 0.20 | 1.62 | 1.14 | 1.00 | 1.42 | 0.01 | 0.01 | 0.01 | 0.01 |
| Austria | -0.06 | -0.38 | -0.38 | -1.34 | 1.66 | 1.32 | 1.52 | 1.49 | -0.42 | -0.54 | -0.50 | -0.44 |
| Belgium | 0.12 | 0.24 | 0.30 | 0.05 | 1.36 | 0.85 | 0.97 | 1.31 | -0.47 | -0.15 | -0.02 | -0.04 |
| Canada | 0.29 | 0.21 | 0.33 | 0.43 | 1.69 | 1.22 | 1.28 | 1.56 | 0.01 | -0.19 | -0.26 | -0.04 |
| Denmark | 0.27 | 0.13 | 0.06 | 0.37 | 1.76 | 1.37 | 1.26 | 1.50 | -0.08 | -0.02 | 0.03 | 0.29 |
| Finland | 0.46 | 0.16 | 0.15 | 0.52 | 0.88 | 1.15 | 1.03 | 0.73 | -0.56 | -0.13 | -0.32 | -0.76 |
| France | 0.22 | 0.22 | 0.22 | 0.11 | 1.37 | 1.22 | 1.08 | 1.27 | -0.19 | -0.13 | -0.09 | -0.26 |
| Germany | -0.04 | -0.08 | 0.23 | -0.08 | 1.49 | 1.15 | 1.09 | 1.45 | -0.17 | -0.03 | -0.04 | -0.19 |
| Hong Kong | -0.10 | 0.24 | 0.17 | 0.17 | 1.43 | 1.10 | 1.36 | 1.32 | -0.05 | -0.06 | -0.24 | -0.36 |
| Ireland | 0.03 | 0.03 | 0.18 | 0.33 | 0.94 | 0.84 | 0.84 | 0.97 | -0.79 | 0.11 | 0.03 | -0.31 |
| Israel | 0.00 | 0.08 | 0.07 | 0.29 | 1.28 | 0.93 | 0.94 | 1.38 | 0.05 | -0.03 | 0.13 | 0.07 |
| Italy | 0.22 | 0.14 | 0.15 | 0.18 | 1.44 | 1.24 | 1.12 | 1.32 | -0.42 | -0.16 | -0.23 | -0.54 |
| Japan | -0.42 | 0.17 | 0.17 | -0.55 | 0.77 | 0.98 | 0.84 | 0.61 | -0.25 | -0.02 | -0.36 | -0.45 |
| Netherlands | 0.14 | 0.11 | 0.18 | 0.12 | 1.22 | 1.26 | 0.98 | 1.10 | -0.23 | -0.06 | 0.03 | -0.29 |
| New Zealand | -0.14 | 0.12 | -0.03 | -0.12 | 1.24 | 1.32 | 0.96 | 0.92 | -0.12 | -0.19 | -0.30 | -0.30 |
| Portugal | 0.15 | 0.00 | 0.07 | 0.08 | 1.72 | 1.45 | 1.56 | 1.45 | -0.42 | -0.02 | -0.21 | -0.17 |
| Singapore | -0.32 | 0.04 | 0.18 | -0.19 | 1.47 | 1.04 | 1.02 | 1.37 | 0.11 | 0.03 | -0.04 | 0.00 |
| Spain | 0.33 | 0.16 | 0.01 | 0.18 | 1.80 | 1.30 | 1.15 | 1.71 | -0.23 | -0.08 | -0.10 | -0.25 |
| Sweden | 0.09 | 0.02 | 0.10 | -0.04 | 1.38 | 1.09 | 1.02 | 1.24 | 0.07 | -0.13 | -0.03 | 0.02 |
| Switzerland | 0.18 | 0.19 | 0.16 | 0.03 | 1.30 | 1.21 | 0.82 | 1.18 | 0.07 | -0.12 | -0.04 | 0.03 |
| UK | 0.22 | 0.22 | 0.19 | 0.29 | 1.31 | 1.33 | 1.11 | 1.21 | -0.19 | -0.14 | -0.14 | -0.24 |
| Average | 0.07 | 0.03 | 0.07 | 0.01 | 1.39 | 1.22 | 1.15 | 1.28 | -0.19 | -0.09 | -0.12 | -0.19 |
| Emerging Markets |  |  |  |  |  |  |  |  |  |  |  |  |
| Brazil | -0.07 | 0.01 | 0.20 | 0.25 | 1.58 | 1.36 | 1.36 | 1.39 | 0.00 | -0.06 | -0.28 | -0.06 |
| Chile | -0.28 | -0.41 | -0.13 | -0.28 | 1.66 | 0.91 | 0.96 | 1.56 | 0.43 | -0.01 | -0.04 | 0.46 |
| China | -0.45 | 0.18 | -0.22 | -0.44 | 1.53 | 0.87 | 0.79 | 1.02 | -0.04 | 0.00 | -0.25 | -0.24 |
| Colombia | -0.06 | -0.04 | 0.23 | -0.41 | 1.69 | 1.35 | 1.37 | 1.77 | 0.68 | 0.03 | -0.14 | 0.42 |
| India | 0.00 | 0.05 | 0.70 | 0.39 | 1.74 | 1.37 | 1.31 | 1.28 | -0.20 | 0.08 | 0.03 | -0.22 |
| Indonesia | -0.39 | 0.04 | 0.21 | -0.19 | 1.49 | 1.20 | 1.27 | 1.14 | 0.29 | 0.00 | -0.10 | 0.11 |
| Korea | -0.05 | 0.12 | 0.11 | -0.09 | 1.02 | 0.97 | 0.87 | 1.05 | 0.04 | -0.03 | 0.01 | -0.20 |
| Malaysia | -0.27 | 0.04 | 0.01 | -0.23 | 1.48 | 0.99 | 1.48 | 1.17 | 0.39 | -0.07 | 0.15 | 0.33 |
| Mexico | 0.27 | 0.24 | 0.32 | 0.07 | 1.45 | 1.08 | 1.05 | 1.40 | 0.06 | -0.08 | -0.16 | 0.00 |
| Philippines | -0.80 | 0.17 | 0.03 | -0.46 | 1.35 | 0.72 | 0.95 | 1.75 | 0.08 | 0.01 | -0.22 | -0.18 |
| Russia | -0.06 | 0.17 | 0.30 | 0.09 | 1.34 | 1.49 | 1.37 | 1.41 | -0.31 | -0.02 | -0.15 | -0.26 |
| South Africa | -0.16 | 0.12 | -0.13 | -0.07 | 1.17 | 1.23 | 1.08 | 0.91 | 0.11 | -0.04 | 0.06 | 0.22 |
| Taiwan | -0.10 | 0.17 | -0.16 | -0.24 | 0.70 | 1.35 | 1.34 | 0.66 | 0.15 | -0.03 | -0.05 | -0.12 |
| Thailand | -0.51 | 0.04 | -0.15 | -0.71 | 1.17 | 1.30 | 1.23 | 0.84 | 0.31 | -0.02 | -0.11 | -0.16 |
| Turkey | -0.01 | 0.18 | 0.11 | -0.03 | 1.07 | 1.34 | 1.18 | 1.23 | -0.13 | -0.18 | -0.06 | -0.14 |
| Average | -0.20 | 0.07 | 0.09 | -0.14 | 1.36 | 1.19 | 1.18 | 1.24 | 0.12 | -0.03 | -0.09 | 0.00 |
| S&P500 | 0.23 |  |  |  | 0.87 |  |  |  | -0.17 |  |  |  |
| Russell 1000 | 0.30 |  |  |  | 1.06 |  |  |  | -0.06 |  |  |  |

Notes: This table shows the annualised return per unit of risk for the MSCI index of each country and for the replicating portfolios D1, D2 and D3 for each sub-period.

Table 10 MVS Results for Sub-periods

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1996-2002 | | | | | | 2003-2007 | | | | | | 2008-2011 | | | | | |
| Developed Markets | D1 | | D2 | | D3 | | D1 | | D2 | | D3 | | D1 | | D2 | | D3 | |
|  | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value |
| Argentina | 0.25 | 0.78 | 0.28 | 0.75 | 0.05 | 0.95 | 1.50 | 0.28 | 1.57 | 0.23 | 0.66 | 0.51 | 0.01 | 0.99 | 0.10 | 0.90 | 0.06 | 0.94 |
| Australia | 0.03 | 0.97 | 0.07 | 0.93 | 0.10 | 0.90 | 2.97 | 0.04 | 4.04 | 0.02 | 1.97 | 0.14 | 0.04 | 0.96 | 0.83 | 0.41 | 0.19 | 0.83 |
| Austria | 0.02 | 0.98 | 0.02 | 0.98 | 0.01 | 0.99 | 2.97 | 0.04 | 2.04 | 0.13 | 1.57 | 0.21 | 0.42 | 0.64 | 0.81 | 0.43 | 0.28 | 0.74 |
| Belgium | 0.01 | 0.99 | 0.01 | 0.99 | 0.04 | 0.96 | 2.75 | 0.06 | 2.27 | 0.11 | 0.32 | 0.71 | 0.55 | 0.59 | 0.84 | 0.40 | 0.07 | 0.93 |
| Canada | 0.16 | 0.85 | 0.07 | 0.93 | 0.03 | 0.97 | 3.75 | 0.03 | 3.75 | 0.03 | 1.57 | 0.23 | 0.59 | 0.57 | 1.31 | 0.27 | 0.37 | 0.69 |
| Denmark | 0.19 | 0.83 | 0.24 | 0.79 | 0.04 | 0.96 | 3.75 | 0.03 | 2.97 | 0.04 | 2.04 | 0.12 | 0.02 | 0.98 | 0.05 | 0.95 | 0.80 | 0.43 |
| Finland | 0.63 | 0.53 | 0.64 | 0.52 | 0.14 | 0.86 | 0.17 | 0.85 | 0.17 | 0.85 | 0.75 | 0.49 | 0.53 | 0.38 | 0.42 | 0.64 | 0.29 | 0.73 |
| France | 0.06 | 0.94 | 0.05 | 0.95 | 0.11 | 0.89 | 1.04 | 0.35 | 2.05 | 0.17 | 0.74 | 0.50 | 0.04 | 0.96 | 0.10 | 0.90 | 0.17 | 0.84 |
| Germany | 0.04 | 0.96 | 0.09 | 0.91 | 0.01 | 0.99 | 2.27 | 0.11 | 0.87 | 0.06 | 0.36 | 0.69 | 0.17 | 0.85 | 0.17 | 0.84 | 0.02 | 0.98 |
| Hong Kong | 0.07 | 0.93 | 0.08 | 0.92 | 0.08 | 0.92 | 0.99 | 0.05 | 2.01 | 0.18 | 1.57 | 0.22 | 0.01 | 0.99 | 0.05 | 0.95 | 0.18 | 0.83 |
| Ireland | 0.01 | 0.99 | 0.01 | 0.99 | 0.08 | 0.92 | 0.78 | 0.46 | 0.75 | 0.49 | 0.03 | 0.97 | 0.98 | 0.08 | 2.27 | 0.11 | 1.03 | 0.07 |
| Israel | 0.01 | 0.99 | 0.01 | 0.99 | 0.10 | 0.90 | 2.04 | 0.13 | 2.04 | 0.13 | 0.22 | 0.80 | 0.01 | 0.99 | 0.01 | 0.99 | 0.01 | 0.99 |
| Italy | 0.11 | 0.89 | 0.10 | 0.90 | 0.08 | 0.92 | 1.57 | 0.22 | 1.97 | 0.14 | 0.83 | 0.41 | 0.43 | 0.63 | 0.29 | 0.73 | 0.55 | 0.61 |
| Japan | 0.7 | 0.49 | 0.71 | 0.49 | 0.05 | 0.95 | 0.26 | 0.76 | 0.38 | 0.68 | 0.63 | 0.53 | 0.17 | 0.85 | 0.01 | 0.99 | 0.18 | 0.84 |
| Netherlands | 0.04 | 0.96 | 0.02 | 0.98 | 0.03 | 0.97 | 0.37 | 0.68 | 1.22 | 0.28 | 0.78 | 0.46 | 0.21 | 0.81 | 0.55 | 0.59 | 0.09 | 0.91 |
| New Zealand | 0.10 | 0.90 | 0.07 | 0.93 | 0.03 | 0.97 | 1.59 | 0.21 | 2.04 | 0.12 | 0.55 | 0.16 | 0.01 | 0.99 | 0.07 | 0.93 | 0.15 | 0.86 |
| Portugal | 0.08 | 0.92 | 0.06 | 0.94 | 0.06 | 0.94 | 3.75 | 0.03 | 4.04 | 0.02 | 2.04 | 0.12 | 0.61 | 0.55 | 0.28 | 0.74 | 0.44 | 0.63 |
| Singapore | 0.38 | 0.68 | 0.45 | 0.61 | 0.26 | 0.77 | 3.75 | 0.03 | 0.56 | 0.06 | 0.68 | 0.50 | 0.03 | 0.97 | 0.07 | 0.93 | 0.23 | 0.79 |
| Spain | 0.28 | 0.75 | 0.38 | 0.65 | 0.26 | 0.77 | 4.80 | 0.01 | 3.75 | 0.03 | 0.79 | 0.45 | 0.12 | 0.88 | 0.11 | 0.89 | 0.01 | 0.99 |
| Sweden | 0.03 | 0.97 | 0.01 | 0.99 | 0.06 | 0.94 | 2.28 | 0.10 | 0.55 | 0.16 | 1.23 | 0.29 | 0.18 | 0.84 | 0.05 | 0.95 | 0.11 | 0.89 |
| Switzerland | 0.05 | 0.95 | 0.05 | 0.95 | 0.12 | 0.88 | 1.04 | 0.35 | 2.44 | 0.09 | 0.77 | 0.47 | 0.14 | 0.87 | 0.06 | 0.94 | 0.04 | 0.96 |
| UK | 0.08 | 0.92 | 0.08 | 0.92 | 0.02 | 0.98 | 0.45 | 0.61 | 1.23 | 0.29 | 0.75 | 0.49 | 0.03 | 0.97 | 0.04 | 0.96 | 0.05 | 0.95 |
| Emerging Markets | | | | | | | | | | | | | | | | | | |
| Brazil | 0.02 | 0.98 | 0.06 | 0.94 | 0.26 | 0.77 | 2.01 | 0.18 | 2.04 | 0.12 | 1.66 | 0.30 | 0.02 | 0.98 | 0.62 | 0.54 | 0.06 | 0.94 |
| Chile | 0.43 | 0.63 | 0.37 | 0.69 | 0.18 | 0.82 | 4.80 | 0.01 | 3.90 | 0.02 | 0.76 | 0.46 | 0.50 | 0.50 | 1.43 | 0.35 | 0.01 | 0.99 |
| China | 0.75 | 0.47 | 0.60 | 0.55 | 0.59 | 0.56 | 2.66 | 0.05 | 3.75 | 0.03 | 2.97 | 0.04 | 0.01 | 0.99 | 0.06 | 0.94 | 0.17 | 0.85 |
| Colombia | 0.01 | 0.99 | 0.02 | 0.98 | 0.01 | 0.99 | 4.04 | 0.02 | 0.99 | 0.03 | 1.65 | 0.30 | 1.50 | 0.28 | 2.27 | 0.10 | 0.66 | 0.52 |
| India | 0.01 | 0.99 | 0.1 | 0.90 | 0.07 | 0.93 | 4.04 | 0.02 | 4.04 | 0.02 | 2.97 | 0.04 | 0.18 | 0.83 | 0.18 | 0.83 | 0.01 | 0.99 |
| Indonesia | 0.56 | 0.59 | 0.65 | 0.51 | 0.38 | 0.68 | 3.75 | 0.03 | 2.48 | 0.09 | 2.48 | 0.09 | 0.20 | 0.82 | 0.44 | 0.62 | 0.76 | 0.47 |
| Korea | 0.03 | 0.97 | 0.03 | 0.97 | 0.01 | 0.99 | 0.73 | 0.49 | 0.84 | 0.41 | 0.34 | 0.72 | 0.01 | 0.99 | 0.01 | 0.99 | 0.25 | 0.77 |
| Malaysia | 0.26 | 0.77 | 0.27 | 0.76 | 0.12 | 0.88 | 3.75 | 0.03 | 2.04 | 0.12 | 2.27 | 0.11 | 0.41 | 0.65 | 0.24 | 0.78 | 0.07 | 0.93 |
| Mexico | 0.14 | 0.86 | 0.07 | 0.93 | 0.26 | 0.77 | 2.27 | 0.11 | 2.48 | 0.09 | 0.34 | 0.72 | 0.16 | 0.85 | 0.58 | 0.58 | 0.14 | 0.87 |
| Philippines | 2.28 | 0.10 | 2.27 | 0.10 | 1.58 | 0.21 | 2.87 | 0.08 | 2.97 | 0.04 | 0.05 | 0.95 | 0.01 | 0.99 | 0.11 | 0.89 | 0.19 | 0.83 |
| Russia | 0.03 | 0.97 | 0.05 | 0.95 | 0.03 | 0.97 | 1.04 | 0.35 | 1.50 | 0.28 | 0.59 | 0.57 | 0.28 | 0.74 | 0.15 | 0.86 | 0.05 | 0.95 |
| South Africa | 0.13 | 0.87 | 0.05 | 0.95 | 0.07 | 0.93 | 0.59 | 0.56 | 0.79 | 0.40 | 1.31 | 0.27 | 0.09 | 0.91 | 0.02 | 0.98 | 0.08 | 0.92 |
| Taiwan | 0.08 | 0.92 | 0.01 | 0.99 | 0.01 | 0.99 | 0.14 | 0.87 | 0.14 | 0.87 | 0.19 | 0.83 | 0.08 | 0.92 | 0.10 | 0.90 | 0.41 | 0.65 |
| Thailand | 0.85 | 0.40 | 0.82 | 0.43 | 0.35 | 0.70 | 1.52 | 0.25 | 1.54 | 0.23 | 1.84 | 0.19 | 0.27 | 0.76 | 0.43 | 0.63 | 1.66 | 0.20 |
| Turkey | 0.01 | 0.99 | 0.01 | 0.99 | 0.01 | 0.99 | 0.78 | 0.44 | 0.66 | 0.51 | 0.14 | 0.87 | 0.01 | 0.99 | 0.03 | 0.97 | 0.01 | 0.99 |

Notes: This table shows the F-statistics and p-values from the Wald tests for Mean-Variance Spanning to test the null hypothesis that the replicating portfolios, D1, D2 and D3 span the foreign country index for the three sub-periods. If spanning is not rejected, the addition of the foreign country index does not shift the mean variance frontier and there is no significant diversification benefit to be gained by investing overseas.

Table 11 Further MVS Results

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2003-2007 | | | | | | | | | | | | |
|  | Stepwise 0.20 threshold | | | | | | OLS Regression | | | | | |
|  | D1 | | D2 | | D3 | | D1 | | D2 | | D3 | |
| *Developed Markets* | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value | F-statistic | p-value |
| Australia | 3.5 | 0.03 | 3.33 | 0.04 |  |  | 3.4 | 0.04 | 3.29 | 0.03 |  |  |
| Austria | 2.96 | 0.05 |  |  |  |  | 2.96 | 0.05 |  |  |  |  |
| Belgium | 1.94 | 0.15 |  |  |  |  | 1.68 | 0.19 |  |  |  |  |
| Canada | 3.29 | 0.03 | 3.29 | 0.03 |  |  | 3.29 | 0.03 | 3.33 | 0.04 |  |  |
| Denmark | 3.29 | 0.03 | 3.56 | 0.02 |  |  | 3.33 | 0.04 | 3.29 | 0.03 |  |  |
| Germany |  |  | 2.79 | 0.06 |  |  |  |  | 2.79 | 0.06 |  |  |
| Hong Kong | 2.46 | 0.07 |  |  |  |  | 2.42 | 0.09 |  |  |  |  |
| Portugal | 3.28 | 0.03 | 2.49 | 0.08 |  |  | 3.33 | 0.04 | 2.49 | 0.08 |  |  |
| Singapore | 3.27 | 0.03 | 2.79 | 0.06 |  |  | 2.79 | 0.06 | 2.79 | 0.06 |  |  |
| Spain | 3.3 | 0.03 | 3.56 | 0.02 |  |  | 3.56 | 0.02 | 4.78 | 0.01 |  |  |
| Switzerland |  | 2.79 | 0.06 |  |  |  |  | 2.61 | 0.07 |  |  |
| *Emerging Markets* | | | | | | | | | | | | |
| Chile | 4.78 | 0.01 | 4.78 | 0.01 |  |  | 4.78 | 0.01 | 4.78 | 0.01 |  |  |
| China | 3.29 | 0.03 | 4.78 | 0.01 | 3.12 | 0.05 | 3.56 | 0.02 | 3.56 | 0.02 | 4.78 | 0.01 |
| Colombia | 3.29 | 0.03 | 3.33 | 0.04 |  |  | 3.56 | 0.02 | 2.49 | 0.08 |  |  |
| India | 3.56 | 0.02 | 3.33 | 0.04 | 1.94 | 0.15 | 3.29 | 0.03 | 3.29 | 0.03 | 2.03 | 0.13 |
| Indonesia | 3.33 | 0.04 | 2.42 | 0.09 |  | 0.18 | 2.79 | 0.06 | 2.22 | 0.11 | 1.54 | 0.20 |
| Korea |  |  |  |  |  |  |  |  |  |  |  |  |
| Malaysia | 3.56 | 0.02 |  |  |  |  | 3.29 | 0.03 |  |  |  |  |
| Mexico |  |  | 2.49 | 0.08 |  |  |  |  | 1.77 | 0.16 |  |  |
| Philippines | 3.33 | 0.04 | 2.79 | 0.06 |  |  | 3.33 | 0.04 | 2.49 | 0.08 |  |  |

Notes: This table shows the p-values for the MVS tests for replicating portfolios created using firstly a 0.20 stopping threshold for stepwise regression and secondly using a standard OLS regression.

Figure 1: S&P500 weekly returns

Notes: This graph shows the weekly returns of the S&P500 from 1996 to 2011

Figure 2: Equally weighted country portfoliosNotes: This graph shows the annual risk-adjusted return of the S&P500, of an equally weighted portfolio of all countries, of developed markets and of emerging markets.

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3. Market Capitalisation figures from World Bank data. [↑](#footnote-ref-3)
4. Market Capitalisation figures from World Bank data [↑](#footnote-ref-4)
5. A US investment management company and the largest issuer of ETFs both in the US and globally (Fortune Magazine, October 2008) [↑](#footnote-ref-5)
6. Report on U.S. Portfolio Holdings of Foreign Securities. Department of the Treasury Federal Reserve Bank of New York, Board of Governors of the Federal Reserve System. [↑](#footnote-ref-6)
7. The 2011 MSCI list of emerging markets is used to classify countries as emerging or developed markets. [↑](#footnote-ref-7)
8. GICS is an industry taxonomy developed by MSCI and Standard & Poor's (S&P). It consists of 10 sectors, 24 industry groups, 68 industries and 154 sub-industries into which all major public companies have been categorized. [↑](#footnote-ref-8)
9. Stepwise regression can use either a forward or a backward p-value threshold. We tested several portfolios using both and found the results to be almost identical. [↑](#footnote-ref-9)
10. We firstly used standard statistical techniques to find breakpoints in the data. We initially considered the Chow test (Chow, 1960). However, this test has been criticised in the literature, most notably its endogeneity, whereby it assumes a break in the data and searches for the most suitable break date accordingly. Given this shortcoming, we instead performed the Andrews-Quandt and Bai-Perron tests on the returns of the US market using the S&P500 as a proxy and several of the foreign country indices. Neither test found a structural break in the data. [↑](#footnote-ref-10)
11. Antoniou et al. (2010) use a similar criteria for their selection of sub-periods to test their results in periods of under and over performance by the UK market. [↑](#footnote-ref-11)
12. Report on U.S. Portfolio Holdings of Foreign Securities as of December 31, 2011. Department of the Treasury

    Federal Reserve, Bank of New York, Board of Governors of the Federal Reserve System. Table 1. [↑](#footnote-ref-12)
13. Source: Report on Foreign Portfolio Holdings of U.S. Securities as of June 30, 2011. Department of the Treasury, Federal Reserve Bank of New York, Board of Governors of the Federal Reserve System, Table 2. [↑](#footnote-ref-13)
14. Source: Report on Foreign Portfolio Holdings of U.S. Securities as of June 30, 2011. Department of the Treasury, Federal Reserve Bank of New York, Board of Governors of the Federal Reserve System, Table 1. [↑](#footnote-ref-14)